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# Multinational enterprises, service outsourcing and regional structural change

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## Abstract

This paper offers a joint analysis of two phenomena characterizing most advanced economies in recent decades: the rise of foreign ownership in manufacturing activities and the pervasiveness of the service economy. The analysis focuses on a specific intersectoral demand-side channel for structural change: the forward linkage established by foreign manufacturing multinational enterprises (MNEs) with service providers through outsourcing in the UK local labour markets. Descriptive evidence shows that service outsourcing by foreign manufacturing plants is notably larger than that of their domestic counterparts. On this basic premise, we estimate the local multiplier effect that foreign manufacturing activity has on service employment. To test our hypotheses, the methodology adopts an instrumental variable approach. Our findings suggest that foreign MNEs in manufacturing can act as a catalyst for regional structural change by stimulating employment in intermediate services via demand linkages. While the composition of this effect seems to be homogeneous in terms of the knowledge content of services, differences are found once the degree of their spatial concentration is accounted for.

**Keywords:** multinational enterprises, service outsourcing, regional structural change, local labour markets, multiplier

**JEL:** F6, R1, O3

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## **1. Introduction**

This paper focuses on the relationship between two ubiquitous phenomena characterizing most advanced economies in recent decades: the increased foreign ownership in manufacturing and the rise of the service economy. Specifically, the aim of this study is to explore whether and to what extent the outsourcing of services by foreign multinational enterprises (MNEs) operating in manufacturing industries contributes to the structural transformation of regional economic systems in the United Kingdom. The economic impact of foreign direct investment (FDI) is largely researched in the academic literature, and wide attention has been devoted to the estimation of FDI-induced effects on domestic firms within and across industries (e.g., for the UK, Driffield, 2001, Haskel et al., 2007; Crescenzi et al., 2015). However, with few recent exceptions – for instance Mariotti and co-authors' (2013) on backward and forward linkages of foreign MNEs in services, and Castellani et al.'s (2016) contribution on the role of manufacturing in attracting FDI in business services – the issue of inward FDI-stimulated regional intersectoral linkages, that is whether and how foreign MNEs in manufacturing impact tertiary activities through local outsourcing, has remained largely overlooked and represents a fundamental and open area of enquiry.

The case of the United Kingdom is emblematic among advanced economies for both its historically high attractiveness of foreign MNEs and rapid shift to a service-based economy. The stock of inward FDI as a share of GDP was 15.1% in 1995 rising to 49.2% in 2015, as compared to 10.8% and 36.9% respectively for the developed economies as a whole (UNCTAD, 2017). On the other hand, the contribution of the service sector to the nominal GVA in the UK has been the highest of all G7 countries since the mid-2000s (ONS, 2016). Furthermore, employment in the UK business services has exponentially grown in recent decades (Abreu et al., 2010), also as a result of outsourcing (e.g. O'Farrell, 1995; Abramovsky et al., 2004).

The extent to which foreign-owned manufacturing firms contribute to local service outsourcing and employment growth remains surprisingly underexplored, and virtually no study addresses this issue in a subnational perspective. The growth of service employment exerts strong pressure towards the spatial polarisation of labour demand and job opportunities (Wood, 1991), thus feeding the steadily increasing North-South divide of the UK's economy over recent decades (Gardiner et al., 2013).

Filling this gap in the literature represents the objective of this paper, which extends the examination of the effects of foreign investment in manufacturing on recipient economies to the analysis of intersectoral market-mediated relationships. We use plant-level data in the UK for the period 1997-2007, taken from the Annual Census of Production Respondents Database (ARD). By examining different service categories, we provide evidence that MNE manufacturing plants purchase about 16.4% more services than their domestic counterparts. Furthermore, we study the contribution of foreign manufacturing to service employment growth within UK travel-to-work areas (TTWA) by estimating a multiplier effect similar to Moretti (2010) and Faggio and Overman (2014). Our results suggest that foreign MNEs in manufacturing may act as a catalyst of regional structural change by stimulating the generation of jobs in the tertiary sector via demand linkages, particularly directed towards intermediate services.

The paper is structured as follows: the next Section 2 provides a conceptual background in which we first discuss different strands of literature related to our purpose and, second, we develop our hypotheses. Section 3 presents the data and some descriptive statistics on the phenomena here examined. Section 4 investigates the respective engagement of foreign and domestic manufacturing firms in establishing forward linkages with local service producers, whilst Section 5 focuses on the analysis of the potential regional multiplicative effect of foreign ownership in manufacturing on service employment. Section 6 offers some concluding remarks, implications and future research directions.

## **2. Background of the study**

### ***2.1 Foreign multinationals, service outsourcing and regional structural change***

Nowadays services are increasingly being embodied in manufactured products, and the boundaries between the two sectors have become rather blurred (e.g. Antonelli, 1999; Gallouj and Djellal, 2010). The interdependence and complementarities between the two macro-aggregates have been empirically assessed in a number of studies (e.g. Evangelista, 2000; Miozzo and Soete, 2001; Castellacci, 2008). In particular, manufacturing demand for services – and especially for business services – has been identified as a powerful source of growth of output, employment and international competitiveness both within the tertiary sector and in user manufacturing industries (e.g. O’Farrell, 1995; Miozzo and Miles, 2003; Guerrieri and Meliciani, 2005; Tregenna, 2010; Bogliacino et al., 2013; Evangelista et al., 2013), although the role played by economic globalisation in such structural transformation has not yet been thoroughly investigated.

Notwithstanding the ample and established academic literature on the effects of foreign MNEs on the structural features of recipient economies, intersectoral relationships emerging from foreign corporate operations remain an underexplored object of enquiry. One exception is Mariotti et al.’s (2013), showing that backward and forward linkages of foreign MNEs operating in service industries may positively impact the productivity of domestic manufacturing firms, although firm absorptive capacity is a crucial moderator to grasp such benefits. To a large extent, existing empirical contributions have focussed on the relevance of vertical (inter-industry) and horizontal (intra-industry) transmission mechanisms of FDI-induced effects within the manufacturing sector, mainly motivated by the identification of knowledge or pecuniary externalities arising from foreign activities

(e.g. Javorcik, 2004; Haskel et al., 2007; Poole, 2013).<sup>1</sup> These studies show that inward foreign investment can trigger both beneficial and detrimental effects for domestic firms either intra-industry via channels such as labour mobility, demonstration effects or greater competitive pressure (e.g. Driffield and Taylor, 2000; Girma et al., 2001; Ascani and Gagliardi, 2015; Crescenzi et al., 2015), or inter-industry through backward and forward linkages with other manufacturing suppliers or customers (e.g. Ernst and Kim, 2002; Javorcik and Spatareanu, 2008; Blalock and Gertler, 2008). In addition, the investigation of the spatial consequences of inward FDI in manufacturing has also highlighted its impact on labour demand, which tends to favour skilled relative to unskilled labour both inter- and intra-region, thus strengthening within-country inequality (e.g., for the UK regions, Driffield and Taylor, 2000; Bailey and Driffield, 2002, 2007).

Foreign investment can generate effects beyond the boundaries of the two macro-aggregates of manufacturing and service industries. MNEs operating in manufacturing can establish demand linkages with local service producers, thus generating intersectoral effects spanning from secondary to tertiary economic activities. Outsourcing is generally considered as a means to access external specialised skills whenever it is deemed not suitable to invest in the in-house generation of such competencies due to the lack of scale economies and/or the presence of high amortization costs (e.g. Abraham and Taylor, 1996). While still broadly valid, the classical view that the optimal scale of a firm is found in the balance between the costs associated to market transactions and the organisational costs of coordinating activities within the firm (Penrose, 1959; Buckley and Casson, 1976) has been seriously challenged in the last decades. The growth of global alliance capitalism, strategic

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<sup>1</sup> Very limited research, on the other hand, exists on the impact of FDI in the service sector (e.g. Rojec and Knell, 2017): the scant evidence seems to indicate positive productivity effects on domestic services and, even more, manufacturing (Fernandes and Paunov, 2008; Mariotti et al., 2013).

partnerships, outsourcing and offshoring, production, innovation and distribution networks, and asset-augmenting investment, has radically transformed the nature and scope of MNE internalization processes (Cantwell and Narula, 2001). With the geographical fragmentation of global manufacturing production, make-or-buy decisions become a strategic organisational choice for MNEs investing in foreign locations, as part of their mutually interdependent and co-evolving internalisation and location advantages (e.g. Contractor et al., 2010; Iammarino and McCann, 2013). Service outsourcing is an important part of the organisation of MNEs: as they are on average more innovative, productive, and characterised by larger scales of manufacturing operations as compared to domestic companies, outsourcing ancillary activities, such as services, can be a strategy to decrease in-house operational and coordination costs, to gain access to resources and technologies not available internally via external specialised suppliers, as well as to strengthen specialisation in core businesses (Quinn and Hilmer, 1994).

To what extent outsourcing is a relevant mechanism through which economies undergo structural change – i.e. shifting their sectoral composition from manufacturing to services – remains unclear in the academic debate. In fact, outsourcing could merely imply a relabelling of operations across sectors, thus resulting in a zero-sum game rather than entailing a fundamental shift in the composition of economic activity (Herrendorf et al., 2013). On the other hand, some scholars question the view that the tertiarisation of mature OECD economies is simply a reorganisation of activities across macro-sectors (e.g. Montresor and Vittucci Marzetti, 2011); recent evidence has suggested that the size of the contribution of domestic service outsourcing to the economic structural transformation of advanced countries such as the US (Berlingieri, 2014) and Germany (Goldschmidt and Schmieder, 2017) is nontrivial. More generally, the debate about the microeconomic mechanisms of the structural change of economic systems is still open (e.g. Foster and Rosenzweig, 2008; Antonelli, 2014). Existing contributions emphasize the relevance of differences in technological diffusion and industry

life-cycle as drivers of employment in manufacturing and services (e.g. Desmet and Rossi-Hansberg, 2009), as well as the intertwined roles of intermediate demand for services and technological change (Pasinetti, 1981; Lorentz and Savona, 2008), and the relationship between their spatial concentration and degree of tradability (e.g. Jensen and Kletzer, 2005; Meliciani and Savona, 2015).

Yet, general consent exists on the wide heterogeneity of service industries. Some of them, and particularly knowledge-intensive services (KIS: e.g. R&D, telecommunication and computer services, scientific and technical consulting), are recognized to be both important users and main vehicles of innovation diffusion across sectors (e.g. OECD, 1997; Tomlinson, 2002; Gallouj and Savona, 2009; Ciarli et al., 2012), as well as providing beneficial effects to the rest of the economy in terms of knowledge spillovers and skills (e.g. Antonelli, 1998; Evangelista et al., 2013). Being more diversified in their input consumption and in the industries they supply, KIS display wide opportunities to learn and assimilate new knowledge – and the spillovers from the higher R&D performed in manufacturing (Van Stel and Nieuwenhuijsen, 2004) – from their networks of customers and suppliers. This higher reliance on external knowledge sources (Bishop, 2008) has a potential to locally diffuse innovation. On the contrary, low knowledge-intensive services (LKIS: e.g. wholesale and retail trade, service building and industrial cleaning, real estate and tourism services) are less likely to gain from the externalities and spillovers produced by the local manufacturing base and by other service industries, and tend to generate less skilled and qualified employment. However, recent research indicates that increases in high-skilled demand – driven also by internationalisation and MNEs – lie behind the rising polarisation of both wages and employment growth across the US local labour markets (Mazzolari and Ragusa, 2013): spatial inequality seems to be the corollary of such complementarity across skill and competence profiles. Importantly, knowledge intensity is not the only source of heterogeneity in the service sector: most service industries show simultaneously different sources of intermediate and final demand – both domestic and foreign – that “grow at



differing paces and shape the expansion of industries economic activities and jobs (Pasinetti, 1993)” (Bogliacino et al. 2013, 106), and that could be both high or low in knowledge and skill requirements. The recent evolutionary economic geography literature has stressed the importance of the regional capacity to develop new growth paths based on the local existing economic structure as a source of economic development and, in the presence of shocks, regional resilience (e.g. Boschma, 2015; Martin and Sunley, 2015). The study of diversity and change of regional industrial structures has been consistent in showing that sustained employment growth is favoured by diversification in related activities (e.g. Frenken et al., 2007; Boschma and Iammarino, 2009). In this respect, resilient regions are more prone than others to transform their economic structures and to re-allocate resources across activities in order to avoid stagnation (Saviotti, 1996; Christopherson et al., 2010). Importantly for our purposes, such perspectives on regional structural change have also suggested that employment growth in local labour markets seems to be supported by high variety of related service industries; in addition, when looking at diversity externalities between macro-sectors, the service industry is affected by related variety in local manufacturing (Mameli et al., 2012).

By considering MNE activities in manufacturing as catalysts for regional structural change, this paper focuses on one specific mechanism of regional economic reconfiguration: foreign manufacturing demand for local services.

## ***2.2 Hypotheses development***

On the basis of the gap identified at the intersection of the different literatures outlined above, we formulate and test two hypotheses regarding the impact of foreign firms through service outsourcing on regional structural change. First, we test the following hypothesis:

**H1:** *Foreign-owned plants operating in manufacturing industries in a region purchase more local services than their domestic counterparts.*

We aim to provide an empirical justification to the importance of the transmission channel through which foreign manufacturing MNEs can impact the local service industry. By suggesting that foreign-owned plants establish more substantial forward linkages with local service producers than domestic firms, we conjecture that the presence of foreign MNEs in a region can generate more than proportional effects beyond those manufacturing industries in which they are primarily active. Hence, the second hypothesis that we test regards the intensity of the contribution of foreign manufacturing MNE employment to service employment within the region:

**H2:** *The presence of foreign-owned plants operating in manufacturing industries in a region has an overall multiplicative effect on local employment in the service sector via demand linkages (outsourcing).*

We thus hypothesise that the local labour market for services responds to foreign presence in manufacturing with more than proportional increases in employment relative to an increase in foreign manufacturing employment. This finding would be consistent with a view of MNEs as catalysts of a gradual reallocation of resources from secondary to tertiary activities, with implications for both structural change and the resilience of regional economies. The analysis reported below provides an estimate of magnitude and direction of the effect, but does not capture the type and quality of jobs created by foreign MNEs' service outsourcing: evidence on the UK suggests that the structural transformation of the national economy has a distinctive regional pattern, where old traditional manufacturing areas have been the most penalised by the long-term national shift of jobs from manufacturing to services (Coutts et al., 2007; McCann, 2016). The dynamism and intensity of regional structural change largely depends on the production and competence base of the local economy, both in manufacturing – which can be more or less technology-intensive, attractive to foreign investment and internationalized – and in services – which can be for intermediate or final

demand, high- and low-skilled, locally produced or simply imported from other areas nationally and internationally (Meliciani and Savona, 2015).

### **3. Data**

#### ***3.1 Data and regional trends***

Our dataset is based on the Annual Census of Production Respondents Database (ARD), a business-level database collected by the UK Office of National Statistics (ONS). The ARD is a census of large businesses (i.e. those with more than 250 employees) and a stratified sample of smaller businesses. It is constructed on the basis of a mandatory survey requesting detailed information on a number of firm characteristics including employment, sales, purchases, stocks, capital expenditure, investment, retail, industry, ownership, among others. This rich set of information goes back to 1973 for the large majority of businesses in production and construction activities. However, data for the service sector, crucial for the present study, is only available from 1997. Therefore, we employ data for the period 1997-2007, for which it is possible to generate a panel of both manufacturing and service businesses for a time period not affected by the 2008 financial crisis. The ONS questionnaire is administered to the so-called 'reporting units', which may or may not coincide with firms' individual establishments or plants. Therefore, the ARD files on reporting units provide the balance sheet of firms that in some cases are only administrative entities that fill in the ONS questionnaire by including information also on other plants that are part of the same firm. These multi-plant firms represent about 20% of cases (Criscuolo et al., 2012). Other files in the ARD, instead, contain the list of plants and the reporting units they belong to, as well as data on their employment and detailed geographical information at the level of local labour market areas (Travel to Work Areas - TTWAs).<sup>2</sup> In order to link balance

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<sup>2</sup> TTWAs are defined as self-contained labour markets, minimizing the potential bias coming from commuting flows. TTWAs (245 overall) are groups of wards, including both urban and non-urban areas, for which at least 75% of the

sheet data provided by reporting units to plant-level information, we apportion reporting units' balance sheets to plants by adopting employment-based weights by year (Criscuolo et al., 2012).<sup>3</sup>

A fundamental feature of the ARD is the inclusion of information on firms' domestic or foreign ownership, defined as the nationality of the ultimate owner. This allows us to disentangle foreign MNE affiliates from domestic firms. Table 1 presents a data breakdown with descriptive information on domestic and foreign manufacturing plants in different NUTS1 regions for the period under analysis. Overall, we can access information for 164,146 plant-level observations in the UK.<sup>4</sup> Foreign-owned plants represent 12.4% of the sample, with a peak of foreign presence in the North East of England (15% of total manufacturing plants). Not surprisingly, the largest number of businesses, both domestic and foreign-owned, is located in the North West, traditionally a strongly manufacturing-oriented region, followed by South East and West Midlands.

[Table 1 around here]

The importance of foreign affiliates in terms of manufacturing employment notably increased in all UK regions over the sample period. Table 2 shows the incidence of employment in foreign affiliates on the regional manufacturing total in 1997 and 2007: the share of the workforce employed in foreign-owned plants in 1997 ranges between 10.5% in Yorkshire and the Humber, and 20.9% in Wales and Northern Ireland;<sup>5</sup> in 2007 it varies between 16.1% in the North West of England and 28.7% of Wales and Northern Ireland. Hence, a comparison of Tables 1 and 2 indicates that the share of employment

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resident economically active population works in the area, and for which at least 75% of individuals working in the area live there.

<sup>3</sup> More extensive information on how the ARD is constructed can be found in Oulton (1997) and Haskel et al. (2007).

<sup>4</sup> Our final dataset is an unbalanced panel with an average of 14,922 manufacturing plants per year. Plants (in ARD 'establishments') are defined as enterprises or part thereof situated in a spatially identified location where economic activity is carried out.

<sup>5</sup> Wales and Northern Ireland are considered together in Tables 2 and 3 for data confidentiality reasons dictated by the ONS, preventing the provision of figures for Northern Ireland alone.

in foreign-owned plants is higher than the incidence of their number in each region, indirectly suggesting that foreign plants are larger in size than domestically-owned businesses..

[Table 2 around here]

When considering service activities in regional total employment, figures become drastically high, confirming the well-known post-industrial profile of the UK economy.<sup>6</sup> Table 3 reports the share of the workforce employed in the service sector by region in 1997 and 2007 as well as the relative weight of KIS and LKIS: tertiary activities steadily increased their employment shares in every region, while the weight of KIS and LKIS within regions has remained relatively stable.

[Table 3 around here]

### ***3.2 Plant-level variables***

We employ data for individual plants to detect differences between domestically- and foreign-owned plants as far as the external purchase of services is concerned. Table 4 presents plant-level descriptive statistics of the variables used later in the econometric estimation: the top panel reports data for domestic businesses while the bottom panel regards foreign MNE affiliates. Within these panels, the variables are divided between purchases of different categories of services and other relevant plant-level attributes. For the former, the ARD database contains information on the purchase of a set of services, including transport, telecommunication, computer, advertisement and others. Plant-level controls include size (i.e. employment), capital stocks, and turnover as a measure of economic performance. Descriptive statistics suggest that foreign-owned plants purchase more services than domestic plants across different service categories. This provides a descriptive insight in line with

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<sup>6</sup> Figures in Table 3 are in line with the 2011 Census, according to which manufacturing accounts for only 9% of the total workforce, and service industries (including construction) employ about 90% of total workers. Table 3 considers constructions as part of the service sector, as the purpose of the paper is to study the linkages between manufacturing and non-manufacturing industries.

our hypothesis 1; in addition, they are also larger, and possess higher capital stocks and turnover. While Table 4 reports interesting information on the mean differences between domestic and foreign ownership, a more systematic investigation is required to support further our hypotheses about different outsourcing behaviours. Table A.1 in Appendix contains the list of variables with their definition.

[Table 4 around here]

#### 4. Foreign MNEs and service outsourcing in local labour markets

##### 4.1 Estimation strategy: plant-level OLS

We study the relationship between plant ownership and service outsourcing by means of a linear OLS regression model. This approach follows existing contributions analysing differences between exporting and non-exporting firms, as well as foreign premiums in labour market outcomes (e.g. Almeida, 2007; Bernard et al., 2007). Variations of the following equation are estimated:

$$SP_{it} = \alpha + \beta_1 Foreign_{it} + X'_{it}\beta_2 + \delta_t + \sigma_j + \rho_r + \varepsilon_{it} \quad (1)$$

where subscripts  $i$ ,  $t$ ,  $j$  and  $r$  stand for plant, year, SIC-92 industry and travel-to-work-area respectively;  $SP$  represents the purchase of domestic services (expressed in log) by considering different service categories, as described in the previous section;  $Foreign$  is a dummy variable equal to 1 when a plant is foreign-owned, 0 otherwise;  $X'$  is a vector of controls. The latter includes a set of covariates that can be correlated with our dependent variable and the measure of ownership. First, plant size measured with the log of employment: it is well documented in the literature that MNEs affiliates are larger than domestic firms (e.g. Barba Navaretti and Venables, 2004; Frenz and Gillies, 2007), implying that outsourcing may be associated with the larger set of activities of a plant rather than its ownership. Hence, controlling for size is relevant to avoid that our measure of ownership

captures an effect related to the larger scale of operations of MNE affiliates. Second, the log of capital stock is included to control for whether outsourcing decisions are associated with different levels of firms' fixed assets. In fact, in-house production and intra-firm trade, rather than outsourcing, are acknowledged to be more systematically associated with labour-intensive firms (Marin, 2006), thus implying that capital-intensive firms can be more prone to outsourcing the production of intermediates goods, including services. Third, the economic performance of plants is proxied by log turnover. Better performing plants can purchase larger quantities of services from external providers, thus concentrating internal resources on core businesses. As shown in Table 4, foreign-owned plants are characterised by higher turnover: therefore, not controlling for a measure of economic performance can introduce a correlation between the error term and our measure of foreign ownership. In addition, we include (i) a set of year dummies  $\delta$  in order to capture specific time effects shaping plants' purchase of services, (ii) manufacturing industry (SIC 4-digit) dummies  $\sigma$  to consider industry-specific differentials across plants that can affect service outsourcing, and (iii) geographical dummies  $\rho$  to account for territorial trends at the TTWA level that may affect manufacturing plants' purchase of services. Importantly, by including the latter term we investigate whether foreign affiliates purchase more services than domestic firms within a specific labour market area. Finally,  $\varepsilon$  is an idiosyncratic error component. The aim of the analysis lies in the estimation of coefficient  $\beta_1$ , representing the mean difference in outcome  $SP$  between foreign- and domestically-owned plants.<sup>7</sup>

#### ***4.2 Foreign premium in local service outsourcing***

Before discussing the results of the empirical analysis, we graphically explore the patterns of service outsourcing in our data by comparing domestic and foreign-owned plants. Figure 1 plots kernel density estimates of various categories of services purchased by different groups of plants, including

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<sup>7</sup> A study by Girma and Görg (2004) explores a similar question, but it focuses on three sectors only.

also information on domestic firms that will be acquired by foreign MNEs at some point during the sample period. This further distinction allows us to understand whether and to what extent plants that experience a change in ownership outsource more before being taken over relative to those that remain domestic throughout the observed period. Recent empirical evidence on a large set of European firms suggests that acquisition decisions of MNEs are far from being random choices and follow specific patterns (Ascani, 2017). For our purposes, this might imply that foreign MNEs systematically acquire domestic firms that engage more in service outsourcing. This is supported by the graphs in Figure 1, showing not only that service purchases by foreign-owned plants (dashed line) exhibit larger estimates as compared to those purchased by domestic firms (red solid line), but also that estimates for domestic plants that will be acquired by foreign MNEs (green line) are larger than those for plants that remain domestic over time. A reasonable explanation for this could be that these plants are larger and more productive, thus representing a more appealing target for foreign acquisition. Nevertheless, foreign-owned plants exhibit larger estimates than future take-overs: this can be suggestive of the fact that once a domestic plant is acquired, its service outsourcing increases.

[Figure 1 about here]

### ***4.3 Results of plant level estimates***

Table 5 reports the results for a set of regressions where the dependent variable in each column is the purchase of a different category of services. We add a measure of future foreign takeover to our control variables, defined as a dummy equal to 1 in year 1997 for firms that experienced a change in ownership from domestic to foreign over the sample period. The first column of Table 5 reports results where the dependent variable is the log of total purchases of services by plants in the UK. The positive and statistically significant coefficient of our main regressor (Foreign) suggests that, *ceteris paribus*, foreign manufacturing plants buy 16.4% more services locally as compared to domestic firms



in the same industry. Domestic plants that are acquired by foreign MNEs also purchase more services than domestic firms that remain so, but the coefficient is weaker in terms of both significance and magnitude. In line with our hypotheses, control variables enter the equation with the expected sign and they are strongly significant. When considering different categories of services (columns 2-6), foreign affiliates outsource more than domestic plants across all typologies. In other words, as compared to their domestic counterparts within a manufacturing industry and a TTWA, MNE plants spend 14% more for the purchase of transportation services, 13.8% more for telecommunication services, 14% more for computer services, 6.6% more for advertisement and 15.8% more for other services. These results are clearly in line with the idea that manufacturing MNEs establish stronger forward linkages with local service producers than domestic companies.

[Table 5 around here]

## 5. Multiplicative effects of foreign ownership

### 5.1 Estimation strategy: regional level panel regression

Having established that foreign MNEs in manufacturing differ from domestic firms with respect to the volume of services purchased locally, thus supporting our hypothesis 1, we now turn to test hypothesis 2, stating that foreign presence in manufacturing has a multiplicative effect on the local service sector employment. From the empirical standpoint, we analyse the relationship between foreign manufacturing employment and service employment (Moretti, 2010; Faggio and Overman, 2014; Cerqua and Pellegrini, 2018): thus, we aggregate plant-level information on employment at TTWA level and we exploit the panel structure of our data to estimate the following equation:

$$SE_{rt}^{tot} = \gamma_1 M_{rt-1}^{foreign} + \gamma_2 M_{rt-1}^{domestic} + \gamma_3 X'_{rt-1} + \rho_r + \delta_t + u_{rt} \quad (2)$$

where  $SE_{rt}^{tot}$  refers to total service employment in region  $r$  in year  $t$ ;  $M_{rt-1}^{foreign}$  is the lagged manufacturing employment in foreign plants within TTWA  $r$ , and  $M_r^{domestic}$  stands for the lagged domestic manufacturing employment in the same TTWA;  $X$  is a vector of regional control variables;  $\rho$  represents regional fixed effects capturing unobserved travel-to-work area specific characteristics affecting service employment that also possibly correlate with foreign manufacturing employment: thus,  $\rho$  allows us to control for all time invariant regional characteristics that can determine service employment. Finally,  $u$  is the error term, which accounts for time varying characteristics of regions that can affect local service employment. All variables are measured in logs.

The aim of the analysis is to estimate coefficient  $\gamma_1$ , representing the effect on regional total service employment for each additional job generated by foreign plants in manufacturing. Therefore, for  $\gamma_1 = 0$ , employment in foreign-owned manufacturing plants does not add any new job to the service sector within a TTWA, thus rejecting the hypothesis of multiplicative effects. If  $\gamma_1 > 0$ , instead, for an additional job created in the regional manufacturing sector by MNEs, the total service employment in the region increases by  $\gamma_1$ . In this case, the positive effect associated to foreign ownership in manufacturing indicates an increase in employment in services. Conversely, for  $\gamma_1 < 0$ , foreign presence in manufacturing has displacement effects on total service employment: that is for each job generated by MNEs in manufacturing within a region, service employment decrease by  $\gamma_1$ . This can be the case where foreign-owned plants decide to stop purchasing services from local producers and to increase their engagement in international service outsourcing.

While controlling for regional fixed-effects allows us to provide interesting insights on the impact of foreign ownership on service employment in TTWAs, several sources of bias can affect the relationship under analysis. For instance, MNEs may undertake investments in regions where local service producers are thriving in order to access larger markets of intermediate goods. In such a case, the estimated coefficient  $\gamma_1$  is upward biased because of the attractive pull exerted by service

employment on FDI. On the contrary,  $\gamma_1$  can be downward biased in presence of a negative correlation between regional service employment and foreign employment in manufacturing: this may occur in regions where foreign manufacturing operations are dismissed and, at the same time, the economy becomes relatively more service-based. Therefore, we adopt an instrumental variable strategy to estimate  $\gamma_1$ , based on a ‘shift-share’ methodology (e.g. Bartik, 1991). This allows to exogenously shifting foreign employment in manufacturing without moving other omitted factors contained in the error term, thus providing a robust interpretation of coefficient  $\gamma_1$ . We construct our instrument as follows:

$$\hat{M}_{rt-1}^{foreign} = \sum_{rt-1} E_{jr,1997} \times M_{jt-1}^{foreign} \quad (3)$$

where  $E_{jr,1997}$  is the share of employment in manufacturing industry  $j$  in TTWA  $r$  in 1997, considered as the initial period;  $M_{jt-1}^{foreign}$  is the lagged national share of foreign employment in industry  $j$  on total manufacturing employment. Thus, the instrument captures the initial weight of each manufacturing industry and assigns national foreign presence in that industry to regions. We expect that foreign ownership in a specific industry is directed towards areas that are specialised in the same industry in terms of their initial employment shares. Alternatively, it is possible that foreign investment is directed to TTWAs with a different industry specialisation than that of the MNE for reasons such as capturing new market opportunities or diversifying internal competencies.

## ***5.2 Foreign manufacturing and service employment: the regional multiplier***

The estimation of equation (2) is performed for the period 1998-2007, excluding 1997 as this is subsequently used as a base year in the instrumental variable estimation. Table 6 presents the results for the fixed-effects estimates.

[Table 6 around here]

Column 1 reports a restricted version of the model: the coefficient of foreign-owned firms' employment is positive and statistically significant, thus suggesting that MNEs in manufacturing increase local service employment, although the magnitude of the effect remains fairly small. In column 2, we add control variables such as the regional domestic employment in manufacturing, the economic size measured as aggregate local plants' turnover, and the local average wage. When including these controls the statistical relevance and the sign of our variable of interest do not change. Interestingly, the impact of local domestic employment in manufacturing on services is more than double that of foreign employment. This is not surprising considering that our dependent variable measures total service employment, while our hypothesis centres on the fact that foreign affiliates contribute to service employment via outsourcing. Indeed, total regional service employment includes activities that can be hardly interested by outsourcing. Therefore, we split our dependent variable in intermediate and final demand services by using the Supply and Use Tables for the UK in 1997 (i.e. the first year in our sample), based on a SIC 2-digits industrial classification, and we calculate what percentage of output of each service industry is sold to manufacturing industries or to the final demand market. We then classify as intermediate services all the activities that sell more than 50% of their output to manufacturing industries, whilst final demand services are those that sell more than 50% of their output to final consumption.<sup>8</sup> Column 3 and 4 in Table 6 consider employment in these two groups of services as dependent variables respectively. While in both cases we estimate positive effects of employment in foreign manufacturing on that in service, the statistical significance of the coefficient is stronger for intermediate services, and the magnitude of the effect in column 3 is about 6 times larger than that in column 4. In other words, the coefficients imply that a 1% increase in jobs

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<sup>8</sup> Table A.2 in the Appendix reports this classification.

generated by foreign manufacturing MNEs in a region is associated with a 0.06% increase in employment in intermediate services and a 0.01% rise in final demand services.

While these results provide initial support to the hypothesis of a regional multiplier, the estimates can be subject to several sources of bias, as mentioned in the previous section. Table 7 reports the results for the IV estimates. We run three different specifications (all, intermediate and final demand services): results indicate that the strong effect of foreign manufacturing MNEs is displayed on intermediate services only, and the magnitude of the coefficient of interest in column 2 is substantially higher than that in the fixed-effects estimates, thus suggesting that previous results are downward biased. This is due to omitted variables in the model, captured by the error component  $\varepsilon$ , that introduce a negative correlation between service employment and MNEs' manufacturing employment over the sample period. This would be consistent with a comparative advantage shift from manufacturing to services experienced by the UK, as well as other advanced economies, in recent decades, partly as a result of growing wage differentials with developing and emerging countries. The coefficient in column 2 shows that, other things being equal, a 1% increase in manufacturing employment of foreign-owned firms generates a 1.07% increase in intermediate service employment within TTWAs. This is a very relevant effect that supports the idea that outsourcing activities of foreign MNEs can be a notable channel – and act through a multiplier effect – of regional structural transformation. Interestingly, the effect on all services and final demand services remains statistically equal to zero, although the point estimates are positive and higher than that in the fixed-effect analysis. First-stage regressions are reported in the bottom panel of Table 7: F-tests for weak instruments are sufficiently high and the statistical relevance of the instrument is strong. The negative sign in the first stage indicates that actual national foreign presence in manufacturing is negatively correlated with the initial industry profile of regional economies: this suggests that, over the period 1998-2007, foreign

MNEs targeted UK regions where there were fewer competitors in the same manufacturing industry, as defined on the basis of each region's 1997 industry mix.

[Table 7 around here]

### ***5.3 Impact on knowledge-intensive services***

We also consider an important extension of the above analysis: the differentiated impact of foreign MNEs in manufacturing on services that are characterised by heterogeneous knowledge content. The rise of knowledge-intensive services, as discussed in Section 2 above, is a fundamental feature of the current process of globalisation (see, for an extensive review, Ciarli et al., 2012). Activities characterised by lower knowledge content are more at risk of displacement within advanced economies, leading to rising individual and territorial inequalities (Coutts et al., 2007). Recent evidence emphasises strong co-agglomeration patterns between MNEs and knowledge-intensive business services (Jacobs et al., 2014), but the impact of MNEs on the demand of different types of services has received scant attention. Table 8 presents the results of a set of estimates for intermediate and final demand tertiary activities by distinguishing KIS and LKIS.<sup>9</sup>

[Table 8 around here]

The table shows that the impact of foreign manufacturing MNEs is positive and significant for both KIS and LKIS for intermediate tertiary activities (columns 1 and 2), indicating that the latter as a whole experience greater outsourcing from foreign manufacturing companies. In other words, we do not detect any relevant differential effect for intermediate services characterised by diverse knowledge intensity: 1% increase in foreign manufacturing employment in a region is associated with 0.49% and a 0.53% increases in service employment in KIS and LKIS respectively. Attracting FDI

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<sup>9</sup> This distinction is based on the NACE Rev. 2 classification by Eurostat.

in manufacturing can produce multiplicative labour market effects on a large pool of local workers – both high and low skilled –in intermediate service occupations; these effects are much larger than those associated with domestic manufacturing activities. However, consistently with previous results, we detect no statistical significance of the effect of foreign presence on KIS and LKIS in final demand either. Interestingly, column 4 indicates a potential crowding out effect on local LKIS employment (coefficient negative and insignificant). This might be explained by the fact that some LKIS workers leave final demand services to work in intermediate services because of higher opportunities. Overall, the IV estimates reported in Table 8 do not support differentiation by knowledge-intensity: the main discriminant remains associated with the use of the services produced, that is, intermediate or final demand.

#### *5.4 Geographical concentration of services*

Finally, we extend our empirical analysis by considering the extent to which tertiary activities are geographically distributed. Indeed, the spatial distribution of service activities is fundamental to have a sense of their degree of tradability (e.g. Ciarli et al. 2012; Meliciani and Savona, 2015): highly geographically concentrated services are very likely to be tradable (both domestically and internationally), while spatially-dispersed services tend to be non-tradable (e.g. Krugman, 1991; Jensen and Kletzer, 2005). Following Faggio and Overman (2014), we apply a categorisation of service activities into three groups by degree of spatial concentration: high, medium and low.<sup>10</sup> The geographical distribution of services is an important aspect to consider in order to examine whether the MNE presence influences dispersed tertiary activities or tends to boost services that are strongly agglomerated in some regions. In fact, foreign manufacturing MNEs investing in a travel-to-work

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<sup>10</sup> Table A.3 in the Appendix reports this classification based on SIC 3-digits codes.

area can establish demand linkages both with co-localised producers of non-tradable services and with more distant producers of tradable services. For instance, services such as ‘Maintenance and repair of office, accounting and computing machines’ show on average rather dispersed geographical patterns, indicating their mostly non-tradable nature. Thus, foreign MNEs purchasing these services are likely to establish business connections with providers in the same region. Conversely, tertiary activities such as ‘Research and experimental development on natural science and engineering’ are highly concentrated in space and can be easily traded across distance. Hence, foreign MNEs can engage in the purchase of this type of services even if they are located in a different region, thus contributing to the development of the service sector of core regions that serve as ‘service hubs’. The latter are seemingly large metropolitan areas where ‘the advantages of the inner city’ make it convenient for producers of tradable services to locate (e.g. Porter, 1995; Kox and Rubalcaba, 2007).

[Table 9 around here]

[Figure 2 around here]

Table 9 reports the IV results for different groups of services by degree of geographical concentration, while Figure 2 reports graphically the findings by including examples of service activities for each group considered. In this analysis the separation between final demand and intermediate services is maintained, thus allowing taking into account the interaction between the spatial distribution of services and the nature of their demand. Columns 1 and 2 in Table 9 show the results for highly spatially concentrated services: the coefficient of foreign manufacturing employment – albeit small and not significant – is negative and insignificant for intermediate services, and this might be explained by the fact that foreign MNEs acquire these highly tradable services either intra-firm or through international outsourcing (Ernst and Kim, 2002; Yeung and Coe, 2015). In Figure 2, the insignificant negative effect just commented applies to ‘Architectural and engineering activities and related technical consultancy’ as well as ‘Activities of investment trusts’, that is, services that are



simultaneously characterised by a high intermediate demand and spatial concentration. Conversely, we detect a positive and significant impact on employment in geographically concentrated final demand services (column 2). This finding can hardly be explained by the outsourcing dynamics discussed so far: we suggest instead that FDI may indirectly influence employment in final demand services via an income effect particularly in highly agglomerated local labour markets where the demand of high and low skills shows strong complementarity (e.g. Mazzolari and Ragusa, 2013). In other words, the presence of foreign firms that pay higher wages than domestic counterparts (Almeida, 2007) boosts the total demand for services; furthermore, this indirect income effect reinforces service employment in areas where such services are clustered. Therefore, this type of final services is traded from a few regions to meet a growing national final demand. For instance, this category includes services such as ‘Motion picture and video activities’ as well as ‘Repair of boots, shoes and other articles of leather’, as suggested in Figure 2. Columns 3 and 4 of Table 9 report results for tertiary activities that are characterised by a medium degree of spatial concentration. Here our findings are in line with the outsourcing hypothesis: in fact, foreign manufacturing MNEs affect employment in intermediate rather than final demand services. Therefore, once the extent of service tradability decreases, foreign MNEs establish outsourcing linkages with local service providers: this is the case of ‘Data processing’ and ‘Renting of automobiles, transport equipment and machinery’ in Figure 2. Finally, columns 5 and 6 present the results for spatially dispersed tertiary activities. In this group we mainly find non-tradable services and the IV results are again consistent with the outsourcing hypothesis: that is, foreign operations in manufacturing provide employment opportunities to local intermediate service producers. This effect is statistically strong and significant; Figure 2 suggests that this type of activities include services such as ‘Accounting, book-keeping and other auditing activities’ as well as occupations related to ‘Industrial cleaning’, among others.

## 6. Conclusions

This paper has examined the role of foreign manufacturing MNEs in spurring regional structural change towards service activities. We conjectured that foreign manufacturing MNEs represent a considerable force stimulating employment in the service sector through the outsourcing to specialised firms within the same region. By using plant-level data in the UK, we first estimated the average difference in service purchase between foreign- and domestic-owned plants in manufacturing. Our findings corroborate the hypothesis that foreign MNEs establish stronger demand linkages with regional service providers vis-à-vis their domestic counterparts within the same industry. Secondly, we estimated the contribution of foreign manufacturing to service employment within UK travel-to-work areas by means of panel fixed-effects estimates as well as an IV strategy. Results suggest a notable multiplicative effect on intermediate services employment. While the composition of this effect seems not to be affected by the knowledge content of services, differences are found once the degree of their spatial concentration is accounted for.

This evidence provides interesting insights on the intersectoral relationship associated with foreign presence in manufacturing, a neglected area of inquiry on inward FDI impact, but crucial for understanding regional structural change and territorial imbalances. Our results, once validated by further analysis on and beyond the UK case studied here, are also of considerable policy interest, as they suggest that foreign MNEs in manufacturing can indeed have notable employment effects via service outsourcing. However, although the direction of MNE outsourcing indicates employment growth, the final balance on the regional trajectory remains ambiguous, not necessarily implying that local economic structures are able to upgrade through the employment multiplier: the latter may well shift the local service sector towards low skill employment in both intermediate and final services, hampering future regional development and resilience. Although the old division between the ‘manufacturing-oriented North’ and the ‘service-based South’ disappeared long ago (Bachtler, 2004),

it is still true that the UK southern areas – and especially London and the South East – show a comparative advantage in high-technology and knowledge intensive activities, which are associated with highly skilled and paid professional and managerial occupations. Conversely, local labour markets in the North – though with an increasing differentiation within the latter (Gardiner et al., 2013) – appear to have less of such skilled employment (McCann, 2016). As already highlighted, the present study captures the quantitative impact of inward manufacturing FDI, but does not ascertain the qualitative nature of such changes. Our research agenda – based on the increasing availability of detailed microdata on MNE operations in the UK – is to explore the effect of globalisation in terms of the distribution of skills and occupational profiles, as the quality of jobs differs significantly within current industry classifications (e.g. Acemoglu and Autor, 2011) and across subnational regions (e.g. Gagliardi et al., 2015).

Different development trajectories are triggered by structural opportunities and constraints, some of which embedded in the characteristics of local production and innovation systems, and others provided by the interaction with the global reconfiguration of value added creation through spatial and a-spatial networks (Andreoni and Scazzieri, 2014). Managing structural change urgently calls for differentiated, modular and multilevel place-sensitive policies tailored for exploiting global opportunities and removing local constraints across regions (Iammarino et al., 2018). Sustaining prosperity in the core areas, while addressing structural inertia and lack of opportunity in peripheral regions, has become the true policy challenge, as regional inequality in advanced economies has not only proved economically inefficient, but also socially and politically risky.

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## TABLES AND FIGURES

**Table 1: Domestic- and foreign-owned manufacturing plants in the UK regions, 1997-2007**

Region	Domestic		Foreign		Total
	n	%	n	%	n
North East	5,837	85.3	1,005	14.7	6,842
North West	18,060	87.4	2,608	12.6	20,668
Yorkshire and the Humber	15,552	89.1	1,905	10.9	17,457
East Midlands	13,129	88.6	1,685	11.4	14,814
West Midlands	16,058	87.3	2,344	12.7	18,402
Eastern	13,208	87.7	1,852	12.3	15,060
London	9,579	88.7	1,218	11.3	10,797
South East	16,958	87.3	2,456	12.7	19,414
South West	11,453	87.5	1,638	12.5	13,091
Wales and Northern Ireland	8,748	86.0	1,420	14.0	10,168
Scotland	15,291	87.7	2,142	12.3	17,433
<b>Total</b>	<b>143,873</b>	<b>87.6</b>	<b>20,273</b>	<b>12.4</b>	<b>164,146</b>

*Note:* foreign and domestic plants are defined on the nationality of the ultimate owner

*Source:* authors' own elaboration on ARD.

**Table 2: Employment in foreign manufacturing plants on total manufacturing employment in the UK regions (%)**

<b>Region</b>	<b>1997</b>	<b>2007</b>
North East	19.4	25.4
North West	13.7	16.1
Yorkshire and the Humber	10.5	17.2
East Midlands	10.6	18.4
West Midlands	13.6	23.5
Eastern	13.8	17.8
London	12.6	18.9
South East	12.5	19.1
South West	13.3	23.6
Wales and Northern Ireland	20.9	28.7
Scotland	19.1	19.9

*Note:* foreign and domestic plants are defined on the nationality of the ultimate owner

*Source:* authors' own elaboration on ARD.

**Table 3: Share of service employment on total employment by region and by knowledge intensity**

Region	1997			2007		
	All services	KIS	LKIS	All services	KIS	LKIS
North East	89.7	0.36	0.64	92.4	0.35	0.65
North West	89.7	0.30	0.70	91.2	0.31	0.69
Yorkshire and the Humber	88.0	0.32	0.68	91.3	0.35	0.65
East Midlands	85.8	0.30	0.70	90.8	0.34	0.66
West Midlands	85.3	0.30	0.70	90.6	0.32	0.68
Eastern	89.2	0.31	0.69	92.5	0.39	0.61
London	91.7	0.23	0.77	95.2	0.23	0.77
South East	90.7	0.28	0.72	93.6	0.31	0.69
South West	89.9	0.25	0.75	92.6	0.30	0.70
Wales and Northern Ireland	87.7	0.29	0.71	90.1	0.32	0.68
Scotland	91.0	0.35	0.65	93.1	0.33	0.67

*Note:* in the columns ‘All services’ this table reports the share of employment in service activities on total employment, in 1997 and 2007. The columns for KIS and LKIS represent the share of employment in these two service categories on total service employment. For instance, 91.7% of the workforce is employed in services in London in 1997, of which 23% is represented by KIS and 77% by LKIS. The figures for KIS and LKIS are in line with the ‘Growth Dashboard 2015’ statistics by the UK Department for Business, Innovation & Skills (<https://www.gov.uk/government/publications/growth-dashboard>).

*Source:* authors’ own elaboration on ARD.

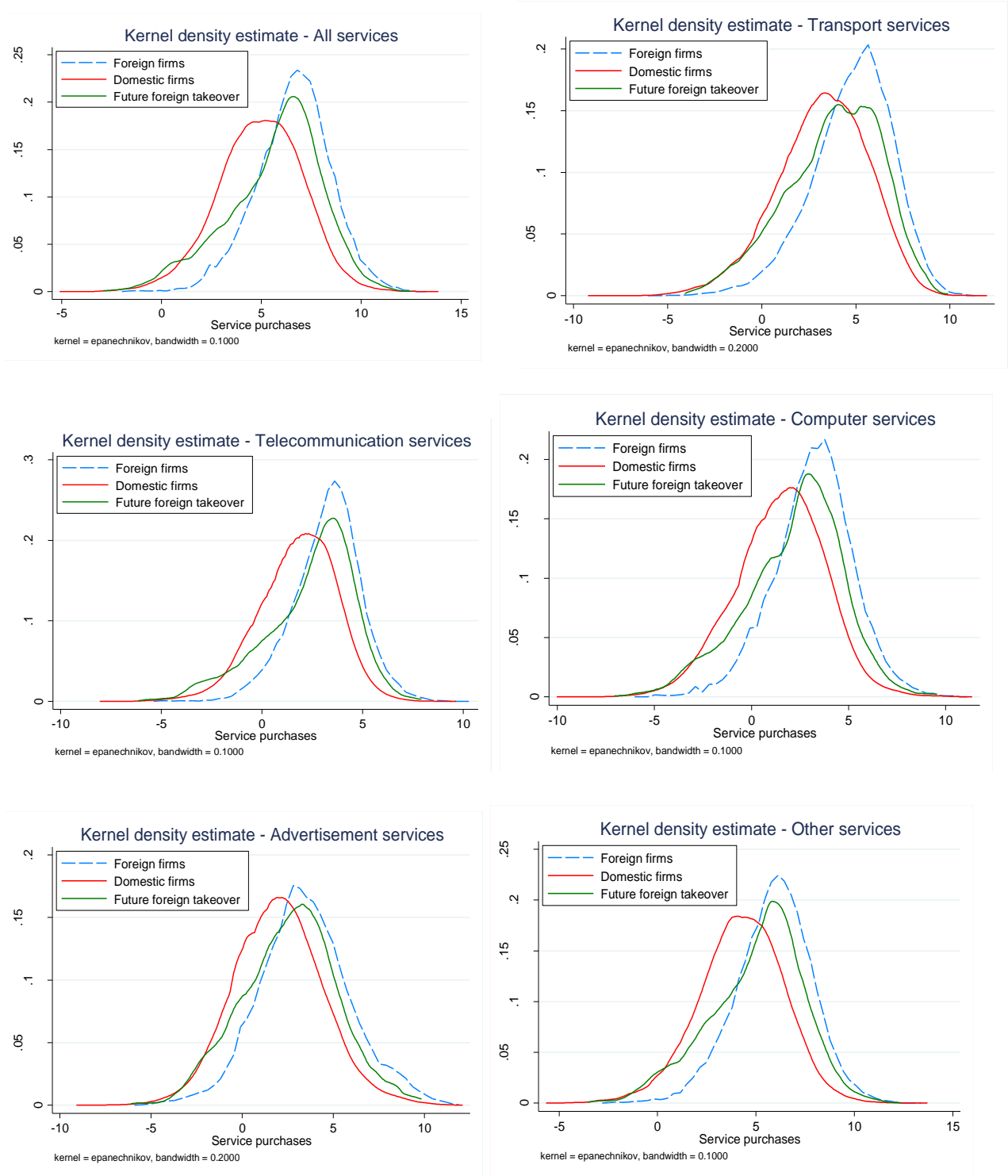
**Table 4: Descriptive statistics for domestic-owned and foreign-owned manufacturing plants**

Variable	Obs.	Mean	SD
Domestic plants			
<i>Purchase of services</i>			
All services	143,873	1181.58	6932.7
Transport	143,873	233.64	1009.69
Telecommunication	143,873	29.54	149.2
Computer	143,873	67.88	829.23
Advertisement	143,873	214.86	2167.02
Other services	143,873	635.66	4676.22
<i>Other variables</i>			
Capital	143,873	479.65	4280.7
Employment	143,873	91.11	256.16
Turnover	143,873	10966.47	57877.60
Foreign plants			
<i>Purchase of services</i>			
All services	20,273	3550.43	12640.82
Transport	20,273	665.95	2022.36
Telecommunication	20,273	95.6	398.21
Computer	20,273	186.43	1156.65
Advertisement	20,273	725.29	4370.20
Other services	20,273	1877.17	8202.47
<i>Other variables</i>			
Capital	20,273	1477.67	7695.23
Employment	20,273	188.51	389.34
Turnover	20,273	39860.68	185485.00

*Note:* foreign and domestic plants are defined on the nationality of the ultimate owner

*Source:* authors' own elaboration on ARD.

**Figure 1: Kernel density estimates of services purchase**



**Table 5: Foreign ownership in manufacturing and service outsourcing, plant-level OLS estimates.**

	(1) All services	(2) Transport	(3) Telecomm.	(4) Computer	(5) Advert.	(6) Other services
Foreign	0.164 <sup>***</sup> (0.021)	0.140 <sup>***</sup> (0.0374)	0.138 <sup>***</sup> (0.023)	0.140 <sup>***</sup> (0.038)	0.066 <sup>*</sup> (0.040)	0.158 <sup>***</sup> (0.029)
Future foreign takeovers	0.056 <sup>**</sup> (0.025)	0.068 <sup>*</sup> (0.037)	0.026 (0.025)	0.058 <sup>*</sup> (0.035)	0.109 <sup>**</sup> (0.044)	0.076 <sup>**</sup> (0.034)
Ln capital	0.100 <sup>***</sup> (0.09)	0.102 <sup>***</sup> (0.008)	0.087 <sup>***</sup> (0.005)	0.108 <sup>***</sup> (0.006)	0.097 <sup>***</sup> (0.006)	0.096 <sup>***</sup> (0.011)
Ln employment	0.275 <sup>***</sup> (0.026)	0.282 <sup>***</sup> (0.028)	0.315 <sup>***</sup> (0.019)	0.349 <sup>***</sup> (0.020)	0.247 <sup>***</sup> (0.024)	0.301 <sup>***</sup> (0.031)
Ln turnover	0.673 <sup>***</sup> (0.029)	0.679 <sup>***</sup> (0.030)	0.571 <sup>***</sup> (0.020)	0.639 <sup>***</sup> (0.020)	0.674 <sup>***</sup> (0.022)	0.622 <sup>***</sup> (0.035)
Year FEs	Y	Y	Y	Y	Y	Y
Industry FEs	Y	Y	Y	Y	Y	Y
TTWA FEs	Y	Y	Y	Y	Y	Y
Observations	164,146	164,146	164,146	164,146	164,146	164,146
R <sup>2</sup>	0.844	0.763	0.820	0.777	0.700	0.768
Adj-R <sup>2</sup>	0.844	0.762	0.819	0.776	0.698	0.767

Standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors clustered at firm level.



**Table 6: Impact of foreign manufacturing employment on service employment, fixed-effects estimates**

	(1)	(2)	(3)	(4)
	All services	All services	Intermediate services	Final demand services
$\ln$ foreign employment <sub>t-1</sub>	0.004** (0.0019)	0.006** (0.0024)	0.057*** (0.013)	0.009** (0.004)
$\ln$ domestic employment <sub>t-1</sub>		0.016*** (0.005)	0.275*** (0.028)	0.024*** (0.009)
$\ln$ economic size <sub>t-1</sub>		0.011** (0.005)	0.074*** (0.019)	0.017** (0.0085)
$\ln$ average wage <sub>t-1</sub>		-0.023*** (0.006)	0.351*** (0.017)	-0.032*** (0.011)
TTWA FEs	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y
Observations	2450	2450	2450	2450
R <sup>2</sup>	0.27	0.28	0.32	0.13

Standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table 7: Impact of foreign manufacturing employment on service employment, 2SLS estimates**

	(1) All services	(2) Intermediate services	(3) Final demand services
In foreign employment <sub>t-1</sub>	0.008 (0.017)	1.065*** (0.251)	0.027 (0.027)
In domestic employment <sub>t-1</sub>	0.015** (0.006)	0.382*** (0.048)	0.021** (0.011)
In economic size <sub>t-1</sub>	-0.010 (0.006)	0.219*** (0.051)	-0.013 (0.010)
In average wage <sub>t-1</sub>	-0.024** (0.011)	-0.469** (0.192)	-0.042** (0.018)
TTWA FEs	Y	Y	Y
Time dummies	Y	Y	Y
Observations	2450	2450	2450
<i>First stage estimates</i>			
Predicted foreign employment <sub>t-1</sub>	-0.336*** (0.048)	-0.185*** (0.040)	-0.335*** (0.048)
First stage F-stat	13.24	12.24	13.33

Standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . First stage estimates in the bottom panel include the covariates indicated in each column.

**Table 8: Impact of foreign manufacturing employment on employment in KIS and LKIS, 2SLS estimates**

	(1)	(2)	(3)	(4)
	Intermediate services		Final demand services	
	KIS	LKIS	KIS	LKIS
ln foreign employment <sub>t-1</sub>	0.494*** (0.089)	0.531*** (0.091)	0.141 (0.104)	-0.009 (0.0204)
ln domestic employment <sub>t-1</sub>	0.149*** (0.043)	0.135*** (0.045)	0.006 (0.024)	0.017** (0.008)
ln economic size <sub>t-1</sub>	0.351*** (0.060)	0.376*** (0.062)	0.019 (0.025)	-0.010 (0.008)
ln average wage <sub>t-1</sub>	0.238*** (0.026)	0.249*** (0.027)	-0.099* (0.057)	-0.011 (0.013)
TTWA FEs	Y	Y	Y	Y
Time dummies	Y	Y	Y	Y
Observations	2450	2450	2450	2450
<i>First stage estimates</i>				
Predicted foreign employment <sub>t-1</sub>	-0.411*** (0.044)	-0.410*** (0.044)	-0.154** (0.066)	-0.336*** (0.48)
First stage F-stat	10.15	10.13	13.02	13.24

Standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . First stage estimates in the bottom panel include the covariates indicated in each column.

**Table 9: Impact of foreign manufacturing employment on service employment, 2SLS analysis by geographical concentration of services**

	(1)	(2)	(3)	(4)	(5)	(6)
	Highly-concentrated		Medium-concentrated		Dispersed	
	Intermediate	Final demand	Intermediate	Final demand	Intermediate	Final demand
ln foreign employment <sub>t-1</sub>	-0.019 (0.076)	0.482*** (0.069)	0.508*** (0.090)	0.016 (0.029)	0.527*** (0.091)	-0.010 (0.020)
ln domestic employment <sub>t-1</sub>	0.040 (0.030)	0.116*** (0.034)	0.145*** (0.044)	0.036*** (0.011)	0.133*** (0.045)	0.012 (0.008)
ln economic size <sub>t-1</sub>	-0.0001 (0.029)	0.332*** (0.047)	0.363*** (0.061)	-0.008 (0.011)	0.374*** (0.062)	-0.010 (0.008)
ln average wage <sub>t-1</sub>	-0.025 (0.049)	0.221*** (0.020)	0.236*** (0.026)	-0.027 (0.019)	0.245*** (0.027)	-0.007 (0.013)
TTWA FEs	Y	Y	Y	Y	Y	Y
Time dummies	Y	Y	Y	Y	Y	Y
Observations	2450	2450	2450	2450	2450	2450
<i>First stage estimates</i>						
Predicted foreign employment <sub>t-1</sub>	-0.336*** (0.048)	-0.411*** (0.044)	-0.410*** (0.045)	-0.335*** (0.048)	-0.410*** (0.045)	-0.336*** (0.048)
First stage F-stat	13.18	10.32	10.15	13.24	10.13	13.24

Standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . First stage estimates in the bottom panel include the covariates indicated in each column.

**Figure 2: Summary of results and examples of services by category**

Intermediate intensity

+***	+***	- Not sig.
<ul style="list-style-type: none"> <li>▪ <b>Accounting, book-keeping and other auditing activities</b></li> <li>▪ <b>Industrial cleaning</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Renting of automobiles, transport equipment and machinery</b></li> <li>▪ <b>Data processing</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ Architectural and engineering activities and related technical consultancy</li> <li>▪ Activities of investment trusts</li> </ul>
- Not sig.	+ Not sig.	+***
<ul style="list-style-type: none"> <li>▪ Maintenance and repair of office, accounting and computing machinery</li> <li>▪ Retail sale in non-specialised stores</li> </ul>	<ul style="list-style-type: none"> <li>▪ Hardware consultancy</li> <li>▪ News agency activities</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Motion picture and video activities</b></li> <li>▪ <b>Repair of boots, shoes and other articles of leather</b></li> </ul>

Geographical concentration / degree of tradability

## Appendix

**Table A.1: Variables list**

Variable	Definition
<i>A. Plant level</i>	
Foreign	Dummy equal to 1 if a plant is foreign-owned at time $t$ ; 0 otherwise
Future foreign takeover	Dummy equal to 1 if a plant is domestic but will be acquired by a foreign MNE during the sample period
All services	Total purchase of services
Transport	Purchase of road transport services
Telecommunication	Purchase of telecommunication services
Computer	Purchase of computer services
Advertisement	Purchase of advertisement services
Other services	Purchase of other services
Capital	Capital stocks
Employment	Number of employees
Turnover	Turnover (excl. VAT)
<i>B. Regional level (TTWA)</i>	
Service employment	Total employment in services
Foreign employment	Total manufacturing employment in foreign-owned plants
Domestic employment	Total manufacturing employment in domestic-owned plants
Economic size	Total turnover
Average wage	Average wage paid by plants in a region

**Table A.2: List of SIC 2-digits intermediate and final demand services, based on UK Supply and Use Tables for 1997**

<b>Intermediate services (&gt;50% output sold to intermediate demand)</b>
Waste collection, treatment and disposal services; materials recovery services
Telecommunications services
Information services
Financial services, except insurance and pension funding
Legal services
Accounting, bookkeeping and auditing services; tax consulting services
Services of head offices; management consulting services
Architectural and engineering services; technical testing and analysis services
Advertising and market research services
Other professional, scientific and technical services
Rental and leasing services
Employment services
Security and investigation services
Services to buildings and landscape
Office administrative, office support and other business support services
<b>Final demand services (&gt;50% output sold to final demand)</b>
Sewerage services; sewage sludge
Construction
Wholesale and retail trade and repair services of motor vehicles and motorcycles
Wholesale trade services, except of motor vehicles and motorcycles
Retail trade services, except of motor vehicles and motorcycles
Accommodation services
Food and beverage serving services
Publishing services
Motion Picture, Video & TV Production, Sound Recording & Music Publishing & Programming And Broadcasting
Computer programming, consultancy and related services
Insurance and reinsurance, except compulsory social security & Pension funding
Services auxiliary to financial services and insurance services
Real estate services, excluding on a fee or contract basis and imputed rent
Real estate activities on a fee or contract basis
Scientific research and development services
Creative, arts and entertainment services
Gambling and betting services
Sports services and amusement and recreation services

**Table A.3: List of SIC 3-digits services by geographical concentration (based on Faggio and Overman, 2014)**

<b>Geographically dispersed services</b>
Construction services <sup>a</sup>
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
Retail sale in non-specialised stores; Retail sale of food, beverages and tobacco in specialized stores; Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles; Other retail sale of new goods in specialized stores; Retail sale of second-hand goods in stores; Retail sale not in stores, except other non-store retail sale
Camping sites and other provision of short-stay accommodation; Restaurants; Bars; Canteens and catering
Monetary intermediation, except central banking; Financial leasing <sup>b</sup>
Renting of personal and households goods not elsewhere classified
Maintenance and repair of office, accounting and computing machinery
Accounting, book-keeping, auditing activities, and tax consultancy <sup>b</sup> ; Industrial cleaning; Miscellaneous business activities not elsewhere classified
Sewage and refuse disposal, sanitation and similar activities
Library and archive activities <sup>b</sup> ; Operation of sports arenas and stadiums <sup>b</sup> ; gambling and betting activities <sup>b</sup> ; Washing and dry cleaning of textile and fur products <sup>b</sup>
<b>Medium geographically concentrated services</b>
Wholesale on a fee or contract basis; Wholesale of food, beverages and tobacco; Wholesale of household goods; Wholesale of machinery, equipment and supplies; Other wholesale
Other non-store retail sale <sup>b</sup>
Repair of electrical household goods <sup>b</sup> ; Repair of watches, clocks and jewellery <sup>b</sup> ; Repair not elsewhere classified <sup>b</sup>
Hotels
Central banking <sup>b</sup> ; Other credit granting <sup>b</sup> ; Insurance and pension funding, except compulsory social security; Activities auxiliary to insurance and pension funding
Real estate activities with own property; Letting own property; Real estate activities on a fee or contract basis; Renting of automobiles; Renting of other transport equipment; Renting of other machinery and equipment; Hardware consultancy; Software consultancy and supply; Data processing; Database activities; Other computer related activities; Legal activities <sup>b</sup> ; Market research and public opinion polling <sup>b</sup> ; Business and management consultancy <sup>b</sup> ; Management activities of holding companies; Technical testing and analysis; Advertising; Labour recruitment and provision of personnel; Investigation and security activities
Activities of business, employers and professional organisations; Activities of political organisations <sup>b</sup> ; Other entertainment activities; News agency activities; Museums activities and preservation of historical sites and buildings <sup>b</sup> ; Botanical and zoological gardens and nature reserve activities <sup>b</sup> ; Other sporting activities <sup>b</sup> ; Other services activities, except washing and dry cleaning of textile and fur products
<b>Highly geographically concentrated services</b>
Wholesale of agricultural raw materials and live animals; wholesale of non-agricultural intermediate products, waste and scrap
Repair of boots, shoes and other articles of leather <sup>b</sup>
Other financial intermediation not elsewhere classified <sup>b</sup> ; Activities auxiliary to financial intermediation, except insurance and pension funding
Research and experimental development on natural science and engineering; Research and experimental development on social sciences and humanities; Architectural and engineering activities and related technical consultancy
Activities of trade unions; Motion picture and video activities; radio and television activities

Notes: <sup>a</sup>2-digit; <sup>b</sup> 4-digit.