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Does FDI benefit incumbent SMEs? FDI spillovers and competition effects at the local level

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FDI spillovers and competition effects at the local level

By: Alexander C. Lembcke and Lenka Wildnerova

That global networks provide positive externalities to participating firms is a well-documented fact. Less is known about how the performance of non-participating firms, especially those that are small or medium-sized, changes with exposure to an increase in the presence of globally integrated firms in their vicinity. With global trade being dominated by large firms, the benefits for SMEs are often indirect, e.g. through input relationships with larger companies or through knowledge spillovers that facilitate the adoption of best practices in firms with access to globally integrated peers. This paper combines industry and regional exposure to global links in form of foreign ownership. It uses firm-level microdata for 13 OECD countries, allowing for local spillovers (or crowding out) within the same industry and across industries. Foreign investment in the firm in the same region is associated with increasing productivity of local firms, especially in form of cross-sector externalities. Horizontal (same sector) externalities are negative, especially if they are coming from foreign firms locating in distanced regions. FDI tends to be associated with employment decline in manufacturing firms, but some growth in small firms.

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Table of contents

Acknowledgements **4**

Non-technical summary **5**

1. Introduction **9**

2. FDI, productivity and employment **11**

3. Data description **14**

3.1. Key variables 14

4. Empirical framework **20**

5. Empirical results **22**

5.1. Productivity changes in small and medium-sized firms with higher FDI 22
5.2. Employment in domestic SMEs and FDI 23
5.3. Importance of regional or sectoral proximity 26
5.4. Robustness checks 30

6. Policy conclusions **32**

References **35**

Annex A. Indicators, data and robustness **40**

Tables

Table 3.1. Descriptive evidence: Foreign presence in regions and sectors 16
Table 3.2. Descriptive evidence by firm size 19
Table 5.1. Baseline: Impact of FDI on productivity and employment in domestic firms 25
Table 5.2. Enlarging the geographical unit: TL2 region and 1-letter sector 27
Table 5.3. Detailed industrial breakdown: NACE division (2-digit code) and TL2 regions 29

Figures

Figure 1. FDI intensity varies across regions 17
Figure 6.1. Data representativeness: Average share of Orbis foreign and domestic employment as compared to OECD, all countries 45

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Non-technical summary

Foreign direct investment (FDI) can be and often is an important stimulus to economic development and the creation of jobs, both at the local level and in aggregate for the country as a whole. FDI can bring new jobs to a region as a company (re)locates its production in an area. FDI can also raise aggregate productivity through different channels. As multinational enterprises (MNEs) tend to be more productive, workers leaving less productive local firms and entering the MNE's workforce can raise their productivity (and wages), as well as aggregate productivity. Beyond the direct impact, there is also the hope that FDI creates positive spillovers. Demand for goods and services from other local firms can create employment and productivity benefits. In addition, local firms can gain knowledge about different technologies and production processes that FDI brings, which can stimulate productivity growth in local sectors.

The positive effect of FDI is not necessarily limited to "greenfield" investment, i.e. the creation of a new firm, but can also arise when it takes the form of "brownfield" investment, i.e. the acquisition of an existing firm. Integration into the global network of the investing company can lead to growth of the acquired firm, expanding its production and demand for local workers. Acquired firms benefit from tapping into global production processes and becoming part of global value chains (GVCs). Not only the firm itself can benefit; through its local supply and demand links, other firms in the region can gain access to GVCs as well. FDI might also provide domestic firms with ideas for new markets through the example set by foreign-owned firms and lower the barriers to purchasing intermediate inputs from abroad or selling the goods and services they produce on international markets.

Given the potential benefits of FDI for the local economy, it is often an important component of SME, regional development and investment policies. Policies can be explicitly targeted at linking SMEs with multinational firms, e.g. the missions of investment promotion agencies often focus on facilitating FDI links with domestic firms through various forms of incentives and programmes. The Japanese Ministry of Economy, Trade and Industry, for example, supports investment alliances between foreign companies and Japanese mid-ranking companies and SMEs to leverage technologies owned by Japanese companies and promote their global expansion (OECD, 2017[1]). For inward FDI, the use of Special Economic Zones (SEZs) is widespread across the OECD, e.g. Polish SEZs provide a mix of financial and non-financial incentives combined with public infrastructure investment to attract investors and businesses in specific sectors (OECD, 2016[2]). France's investment incentives prioritise subsidising employment especially from foreign SMEs (Crozet, Mayer and Mucchielli, 2004[3]).

Despite the widespread interest in attracting FDI, the overall impact on domestic firms' productivity and employment prospects is still inconclusive. One reason is the complexity of the different channels through which FDI affects domestic firms. Another reason is that trade-offs arise. For example, positive productivity gains for domestic firms from knowledge spillovers could be offset by increased competition for talented workers or an increase in competition in output markets and a possible decline in market shares of domestic firms. For some specific tools, such as tax incentives in Special Economic Zones the existing evaluations tend to disappoint expectations. Only a few countries evaluate the performance of SEZs on regular basis, but available evidence suggests that SEZs can create a temporary economic boom that is, however, followed by slowdown of growth to the rates

similar to the national average (UNCTAD, 2019[4]). In many cases, the underperformance of SEZs is attributed to their attraction of rent-seeking multinational firms that fail to create links with local businesses. However, some countries have succeeded in attracting investments and job creation via SEZs. The establishment of 14 SEZs in Poland between 1994 and 2018 attracted $35 billion of investments and generated almost 450 000 jobs (UNCTAD, 2019[4]).

This study contributes to the discussion by quantifying the spillover of FDI to domestic firms and in particular on small and medium-sized enterprises (SMEs). Two measures of performance of SMEs (or generally firms) are considered as outcomes: multi-factor productivity and employment. The complexity of the channels through which FDI affects the two outcomes is mirrored by the empirical specification underlying the estimates in this study. Exposure to foreign ownership as a proxy for FDI is measured by two indicators: 1) the number of firms with (majority) foreign ownership and 2) the employment in foreign-owned firms. Conceptually, these two measures allow to disentangle the impact at the extensive margin (additional firms) and the intensive margin (no new firms but those that are foreign-owned grow). In addition, the foreign exposure of the domestic firm is split into three dimensions depending on industrial and spatial proximity to the foreign-owned firm: i) FDI in the same industry as the domestic firm and in the same region, ii) FDI in the same region but in other industries and iii) FDI in the same industry but in other parts of the country. The estimates draw on a large firm-level database (Orbis) and cover the period 2007-15 with the final estimation sample including about 8.5 million firm-year observations.

The estimation results underline the complex relationship between FDI and the performance of incumbents firms. Fiercer competition through an increase in foreign-owned competitors, as well as positive demand and knowledge spillovers seem to be at work and balance out to result in small net effects. Foreign-ownership increases in the same sector and region in which a domestic firm operates can create a positive stimulus in terms of employment and productivity, but the net benefits, if any, are of very small magnitude.

For incumbent SMEs there is little overall evidence for gains from FDI in their own sector (so-called horizontal spillovers or “Marshall-Arrow-Romer externalities”). If anything, it seems to be demand effects or cross-fertilisation (so-called “Jacobs externalities”) from FDI in other sectors in the local area that create the strongest positive stimulus for productivity in SMEs. These findings are consistent with results from a related study for manufacturing firms in six European countries. Research finds that productivity spillovers from FDI can be significantly positive, non-existent, or even negative, depending on how technologically close the firms within the given sector are (Fons-Rosen et al., 2017[5]). Positive spillovers only arise when FDI is closely related to the technologies used in the domestic firms (as measured by similarity of patents). Yet, negative effects through increased competition dominate if the FDI is close in product space, i.e. the products of the foreign-owned company are similar to those of the domestic incumbent, but the production technology used by foreign firm differs (and is possibly superior).

The results suggest that FDI (measured as foreign-ownership of firms) is associated with productivity and employment in domestic firms, but the association is complex and depends on the sector and location of the foreign investment as well as the characteristics of the domestic firm. Small firms experience very small or no positive spillovers, as they are less likely to benefit from supplier relationships, are less prepared to invest in

innovation, and are therefore more disadvantaged facing increased competition, as compared to larger firms.

For medium-sized firms there is a small positive impact on productivity associated with Jacobian FDI. If the number of foreign firms in sectors other than the firm's own located in the same region doubles, productivity increases by about 2.6% for medium-sized manufacturing firms and by 3.9% in services. The estimates of cross-sectoral spillovers are strongest for medium-sized SMEs in the service sector if the investment is sufficiently large (measured by number of employees in foreign-owned firms in other sectors). In terms of generating employment, more foreign presence in the same sector and same region tends to be associated with a very small positive impact on SMEs. However, domestic firms tend to decrease employment when the employment in foreign-owned firms increases in other sectors than their own.

While these benefits for SMEs from local FDI are small – if at all measurable – there are statistically significant adverse effects on both productivity and employment in SMEs if the investment occurs in other parts of the country. In short, while it is hard for SMEs to tap into the potential benefits from local FDI, if they are geographically far from where the "action" is in their sector, they are losing out. This finding corresponds to research evidence from non-OECD countries. Evaluation of FDI investments in People's Republic of China shows that local horizontal spillovers on productivity of domestic firms are positive, whereas the prevailing negative impact comes from FDI located beyond city boundaries (Lu, Tao and Zhu, 2017[6]).

The results suggest that there is little automatism between FDI and positive spillovers for domestic firms, leaving room for policy instruments at all levels of government to support diffusion of productivity enhancing innovation and demand links. For example, governmental assistance can be targeted at those domestic firms that are capable to benefit from knowledge spillovers from multinational firms with the hope that later they become a connecting link with other domestic SMEs in transmitting the technology. Empirical evidence demonstrates that multinational firms are more likely to disseminate process and product technology to domestic suppliers with better technical capabilities, such as firms that develop technology in their local establishment or that have filed patents (Saliola and Zanfei, 2009[7]). Another tool to promote business links between foreign investors and domestic firms are industry-specific training programmes that help build absorptive capacity in domestic SMEs, i.e. improve their ability to adopt to quality standards, production processes or other standards used by multinationals (OECD and UNIDO, 2019[8]).

Regional institutions and governance structures play a crucial role in shaping the integration of local firms into GVC networks by incentivising the creation of links in the production process and facilitating knowledge transfers (OECD, 2018[10]). Regional institutions might promote specific regional assets to attract high value-added production investments that would unleash regional potential. Regional institutions can also invest in developing the infrastructure and human resources that promote value-enhancement activities (Coe et al., 2004[11]).

Creating the right institutions and incentives requires strong capacity for (regional) policy makers. Effective negotiation with large firms to incentivise linking GVCs into regional economies requires well-informed policy makers. The conditions for efficient negotiations include detailed knowledge about characteristics of the region, in particular location-specific factors that make the region attractive for investments. It also requires knowledge of sector-specific requirements of the investing firm. Additionally, policy makers need to

account for their institutional environment and the motivation of all stakeholders. Finally, if policy makers choose to try to attract foreign investment, they should ensure that there are benefits that create additional value for the region. Therefore, they should focus their efforts on investment that maximises the value added for local actors and ensure that economic value added is retained in the region and distributed across firms. Otherwise, regions risk that all benefits are transferred out of the region through different mechanisms such as profit repatriation (Coe et al., 2004[11]).

1. Introduction

Productivity growth across the OECD has slowed. In the aftermath of the 2007-08 global crisis labour productivity in all major OECD economies was growing at approximately the same rate of only around 1% per year and even the productivity-enhancing momentum that is typically generated in a crisis was short-lived (OECD, 2016[2]). There is a heated debate whether the slowdown is a statistical phenomenon, a secular decline in growth rates or simply the quiet before the next high-growth "storm".1

One argument is that there is actually no lack of technological progress and that the "productivity frontier", i.e. the most productive firms at a given point in time, is actually growing and even expanding at a rapid pace (OECD (2015[12]); Cette, Corde and Lecat (2018[13])). What is lacking is the diffusion of these new technologies, processes and innovations to the rest of the economy (Andrews, Criscuolo and Gal, 2015[14]). A lack of diffusion seems indeed evident across firms and regions within many OECD countries (OECD, 2018[10]). For small and medium-sized enterprises (SMEs), adopting to external knowledge and ideas might be a particularly important challenge. Since the global crisis, the divide between SMEs and large firms in terms of labour productivity has increased, with micro-enterprises in particular lagging behind in a large number of countries (OECD, 2017[1]).

The presence or the creation of foreign companies in a place can be a channel for firms and regions to tap into the global knowledge frontier. Foreign direct investment (FDI), i.e. the entry of foreign-owned firms into a region, or through the acquisition of a domestic firm by foreign owners, can bring new and different ideas to the company. Since firms tend to protect their technological know-how from competitors, it is the integration of local firms into the network of firms with better technology that usually generates productivity improvements, especially if firms become suppliers of the firm with superior technology. Access to such global networks can be through firms becoming part of a global value chain (GVC), i.e. part of a global network of firms that directly or indirectly contribute to the production of a final good or service in another country. FDI and GVCs are also linked as access of firms to global value chains (GVCs) is facilitated by FDI. Estimates show that foreign-owned manufacturing SMEs have more links to GVCs than domestic SMEs. These links are both forward and backwards in the production process, i.e. firms import more inputs (backwards participation) and they can export a much larger share of their production (forward participation) (WTO, 2016[15]).

FDI can create direct positive effects on the acquired company and thereby raise the prosperity in a region by increasing productivity of local workforce and possibly generating additional employment. Foreign-owned firms are more likely to train their workforce, which can generate productivity gains as employees improve their competencies. Evidence

[1] The argument that this decline in growth is secular as all major advances have been made and the remaining technological progress only promises marginal gains has received significant attention (Gordon, 2012[49]). Countervailing voices have argued that technological pessimism is not a new phenomenon and that the benefits of (and need for) technological progress have simply not yet materialised (Mokyr, Vickers and Ziebarth, 2015[56]). But other arguments relating to e.g. a lack of investment, or constraints in supply and demand have been put forward (see Teulings and Baldwin (2014[57]) for a discussion), as well as issues relating to the measurement of productivity (Byrne, Oliner and Sichel, 2017[51]), or the efficiency of resource allocation (Decker et al., 2017[50]).

shows that the largest wage gains in the acquired firms come from newly hired employees, which suggests that foreign firms tend to attract the most qualified employees from domestic firms by offering them higher wages. The wages of existing staff from before the foreign acquisition tend to increase only slightly with the acquisition, but the positive effect on wages might increase in the long run if wage change eventually spreads from high-wage to all workers within the firm (Arnal and Hijzen, 2008[9]).

FDI can also have an impact on the wider economic eco-system in a region or even in a country. The "spillovers" from FDI can be positive, e.g. knowledge or technologies become available to domestic firms or the development or expansion of a foreign-owned firm creates demand for domestically produced goods and services. But, the FDI spillovers can also be negative as foreign firms compete with domestic producers for market shares or for scarce resources, such as talented workers. In both cases, the aggregate effect on a region's productivity and employment can be positive.

Whether positive spillovers from FDI prevail over the possible disadvantages is an empirical question. Studies highlight that the country context matters, e.g. the effect in developing countries is different from that in more developed countries. The type of FDI matters as well. Recent evidence highlights that technological proximity between multinational enterprises (MNEs) and domestic industries matters. Positive spillovers dominate if foreign firms enter sectors where domestic firms have similar technological capacity to those of foreign-owned firms (measured by the similarity in patents). In contrast, negative spillovers are evident if multinational firm in the same sector uses different technology than incumbent domestic firms. Positive technology spillovers are not constrained to the sector in which the multinational enterprise operates, but domestic firms in other sectors with similar technological capabilities gain in terms of productivity (Fons-Rosen et al., 2017[5]).

This paper contributes to the discussion by focusing on the role of spatial and industrial proximity in estimating spillovers from FDI and by explicitly distinguishing the impact of FDI by the size of domestic firms. The estimates rely on a large-scale commercial dataset of firm-level balance sheet information (Orbis provided by Bureau van Dijk) and includes, in the final estimation sample, more than 8.5 million firm-year observations from 13 OECD countries for the period 2007-15, albeit the majority of observations comes from five European countries.

The estimation results underline the complex relationship between FDI and the performance of incumbents firms. Fiercer competition through an increase in foreign-owned competitors, as well as positive demand and knowledge spillovers seem to be at work. While productivity and employment of small firms in non-financial service sectors increases slightly when facing more firms of the same sector in geographical proximity, productivity in small and medium-sized manufacturing firms falls with more foreign competitors in their own industry division. Results also show that small and medium-sized firms can benefit from technological spillovers from other sectors within their region, but at the expense of employment.

The remainder of the paper is organised as follows. The next section summarises some of the key results relating FDI, productivity and jobs. The third section elaborates the data used in this study and the fourth section describes the empirical methods. The fifth section presents the empirical results, and the last section concludes.

2. FDI, productivity and employment

Foreign direct investment (FDI) can be a catalyst for knowledge diffusion. FDI can also bring new jobs to a region as a company (re)locates its production to an area. The investment brings new capital, machinery or technologies and often training for the company's workforce. The positive effect is not necessarily limited to "greenfield" investment, i.e. the creation of a new firm, but can also arise when FDI takes the form of "brownfield" investment, i.e. the acquisition of an existing firm. For example, productivity from information technology use in European manufacturing firms increased after takeovers by US multinationals with the improvement linked to differences in management practices (Bloom, Sadun and Van Reenen, 2012[16]).

Many countries engage in policies that are explicitly targeted at linking SMEs to global networks. Tax incentive schemes such as tax deduction of costs for multinationals that provide training and development support to local suppliers or tax exemptions for committing to investments which foster technology transfers can promote links of domestic firms with multinationals (UNCTAD, 2019[4]). The Japanese Ministry of Economy, Trade and Industry, for example, supports investment alliances between foreign companies and Japanese mid-ranking companies and SMEs to leverage technologies owned by Japanese companies and promote their global expansion (OECD, 2017[1]). For inward FDI the use of Special Economic Zones (SEZs) is widespread across the OECD, e.g. Polish SEZs provide a mix of financial and non-financial incentives with public infrastructure investment to attract investors and businesses in specific sectors (OECD, 2016[2]).

Both knowledge diffusion and access to global networks affect not only the productivity of foreign-owned firms, but also productivity of domestic companies and ultimately aggregate productivity in a region or country. There is a direct effect as multinational enterprises (MNEs) tend to be more productive,[2] hence workers leaving less productive local firms and entering the MNE's workforce can raise their productivity (and wages), as well as aggregate productivity. However, beyond the direct impact associated with the reallocation of resources, there is also the hope that FDI creates positive spillovers on other firms in the local area. Evidence from Norwegian manufacturing firms suggests that workers who moved from MNEs to domestic firms retain part of their knowledge and that they contribute 20% more to the productivity of their plant than workers without MNE experience (Balsvik, 2011[17]).

Multinational firm locating in the region increases demand for local intermediate inputs, i.e. goods and services provided by local firms. Higher demand for locally sourced inputs can create employment growth and set incentives for investment, resulting in productivity benefits. In a survey of domestic firms supplying foreign-owned mines in Chile, the initial relationship with a foreign-owned firm was for many suppliers critical in opening new markets and engaging with other foreign-owned customers. The volume of sales to foreign customers increased significantly by a factor of about 12 since the start of trading with foreign-owned firms.[3] This increase has different sources, but tends to be related to

[2] See e.g. Criscuolo, Haskel and Slaughter (2010[58]).

[3] Despite the rapid growth experienced by domestic suppliers, they accounted for only about 1/6th of total sales (Farole and Winkler, 2014[18]).

suppliers being able to access larger contracts, move their production towards higher value goods, or the expansion of their customer base (Farole and Winkler, 2014[18]).

In addition to demand links, local firms can gain knowledge about different technologies and production processes from foreign-owned firms. The availability of new technologies and new ideas that FDI brings can stimulate productivity growth in local sectors. These knowledge spillovers can be within the same sector where the investment takes place (so-called Marshall-Arrow-Romer externalities),[4] but they can also take the form of cross-fertilisation by stimulating innovation and productivity growth in sectors other than the one where FDI took place (Jacobs externalities).[5] Even if the technologies and processes are not necessarily better, but simply different from those prevailing locally, the combination of new and existing capabilities can result in more efficient production processes.

Vertical spillovers, those affecting suppliers of foreign-owned companies and horizontal spillovers, affecting domestic competitors in the same sector, often show different results with vertical spillovers being positive, i.e. the case where knowledge and demand spillovers dominate, and horizontal spillovers taking negative value with competition creating stronger adverse effects for the performance of domestic firms than the opportunities from knowledge spillovers. Competition for market shares can also create positive spillovers for domestic firms. Recent evidence indicates that absorbing the innovations and technologies from FDI requires sufficient capacity in domestic firms, which is facilitated if the technologies are similar to those already in use (Fons-Rosen et al., 2017[5]).

FDI can create potential downsides for the local economy, in addition to its potential benefits.[6] In regions with less-diversified economies, a strong reliance on single sectors or even single firms can also create risks through higher exposure to shocks to this sector or company (OECD, 2018[10]). Furthermore, potential positive knowledge diffusion and demand effects are balanced by an increase in competition from foreign firms. Evidence from Portugal and Sweden suggest that brownfield FDI “cherry picks” domestic firms with only small effects on human capital or wages (Almeida (2007[19]); Heyman, Sjöholm and Tingvall (2007[20])). Competition for the best workers makes it harder for domestic companies to attract talent, which can stymie the development in local entrepreneurship. FDI might also reduce the market share of domestic firms and in turn productivity.[7] With fixed costs of production and imperfect competition, FDI can lead to a cut in production in domestic firms, with the fixed costs then spread across fewer units and therefore higher costs per unit and lower productivity (Aitken and Harrison, 1999[21]).

Realisation of the possible benefits from FDI depends on the relational interactions with the multinational enterprise and its (global) value chain, and in particular the power relationships between different firms. Evidence from Romanian FDI suggests that joint domestic and foreign ownership can reduce the cost of firms to link with local suppliers

[4] Named for the contributions by Alfred Marshall (1890[59]), Kenneth G. Arrow (1962[60]) and Paul Romer (1986[61]).

[5] Named for Jane Jacob’s contribution (Jacobs, 1969[62]).

[6] FDI is no panacea, especially regions in low-income countries can struggle to turn FDI into aggregate growth, especially when institutions are poor or when capital flows are strong enough to affect a country's exchange rate (Rajan, Prasad and Subramanian, 2007[63]).

[7] The presence of more productive firms on the domestic market may encourage domestic firms to be more efficient, but higher competition implies fewer options for exploiting economies of scale.

and at the same time facilitate the knowledge diffusion in the local economy. However, joint ownership comes at the cost of less sophisticated knowledge being transferred to the local firm by the multinational enterprise than in a fully-owned subsidiary (Javorcik and Spatareanu, 2008[22]).

3. Data description

The data for this study comes from a commercial database that includes firms' annual balance sheets ("Orbis"). The advantage of using this firm-level dataset comes from its large cross-country coverage, inclusion of millions of listed and unlisted firms and the harmonisation of accounts data that allows comparing firms across countries. Moreover, the data makes it possible to determine the ownership of firms, and therefore possible to identify foreign ownership across countries. Since the data also includes unlisted companies, it not only covers large and medium-sized firms, but also a large number of small and micro firms.

The data, however, does have its limitations. The coverage does not represent the universe of all firms. Larger firms are overrepresented compared to small and medium-sized firms and medium-sized firms are overrepresented compared to small firms. The sample is also not a random sample but depends on the available data sources in the different countries and the efforts made by the commercial provider in extending the coverage. This means that some part of the firm-distribution are not adequately covered, in particular "laggard" firms with low levels of productivity seem to be underrepresented (DSTI/CIIE/WPIA(2017)5). Additionally, balance sheet information is at times reported for consolidated accounts, i.e. for a company as a whole, rather than as unconsolidated accounts for each establishment within the company. This is particularly problematic when matching firms with the regional economic base.

The data in this study uses a version of the Orbis database that has undergone data cleaning and harmonisation to allow the estimation of firm-level productivity following the same data cleaning procedures as in Gal (2013[23]). The resulting database covers the years between 2006 and 2015. Data for 2006 is used to construct lagged control variables with the main sample starting in 2007. The choice of the starting year of 2007 is due to ownership information only being available from 2007 onwards. Only countries with at least 1 000 firms that include sufficient information to calculate (multi-factor) productivity are kept in the sample. This leaves around 8.5 million firm-year observations for firms from Austria, Belgium, Finland, France, Germany, Great Britain, Hungary, Italy, South Korea, Portugal, Slovenia, Spain, and Sweden in the sample. However, the uneven availability of data means that 92% of the observations used in the estimations come from France, Italy, Portugal, Spain and Sweden.

3.1. Key variables

3.1.1. Foreign exposure

To estimate the spillovers of changes in the FDI-environment on the performance of incumbent SMEs, a measure of "exposure" to foreign-owned firms is required.[8] Three measures are calculated using the ownership links in the Orbis database. Both the number of foreign-owned firms and employment within foreign-owned firms are aggregated for the TL3 region and 1-letter sector in which a firm operates (with manufacturing separated into high-/medium-sized-high-tech and low/medium-sized-low-tech sectors). The second

[8]It is not possible to consider entry or exit using the Orbis database that is provided by Bureau van Dijk and used by the OECD to create a dataset on productivity and its growth in firms.

measure of exposure aggregates the number of foreign-owned firms and their employment within the same region but in other sectors. Lastly, third foreign ownership measure aggregates the foreign firms in the same sector, but elsewhere in the country, and represents industrial exposure measurement. Foreign ownership is defined using the information on ownership links, made available starting form 2007 in the Orbis database. Any firm that is fully owned (global ownership of minimum of 50.01% of the firm) by an entity located outside the firm's own country is considered as foreign. The definition of foreign ownership restricted to majority foreign ownership ensures that the estimates show the impact from the foreign ownership with a decision power within the foreign-owned firm, not ownership initiated for investment purposes. For robustness check, a less stringent definition that considers firm with any share of foreign ownership as "foreign" is used.

Exposure to FDI varies widely across regions and sectors. In most of the 1 089 TL3 regions there is at least one foreign-owned firm (less than 4% of the regions have no foreign-ownership at all). However, in more than 40% of the region-sector combinations there is no foreign-owned company identified (in 2012). The average region and sector has about six foreign firms, the median of one and the standard deviation of 32 indicates significant heterogeneity across sectors and regions. An average TL3 region hosts 59 foreign-owned firms with, on average, 9 289 employees (Table 3.1). Comparison with country-aggregate data on foreign ownership shows that the Orbis estimates are remarkably close to statistics from the OECD database on "Activity of Multinational Enterprises" (AMNE) foreign employment reports, with exception for most of the sectors in Hungary and some in Slovenia. Manufacturing sectors (Section C of Nace 2 Rev. 2), as well as Section J (Information and Communication) and in Section H (Transportation and Storage) have well-reported foreign ownership in Orbis across countries.[9]

[9] The country-sector aggregation is the closest comparison to the data used in this analysis. Any regional statistics on foreign ownership is yet to be constructed. The Activity of Multinational Enterprises (AMNE) database provides the statistics on the industry level disaggregation ISIC Rev 3 or Rev 4 between years 2008 and 2014 by country and various economic indicators, including number of affiliates and employment in foreign affiliates. Comparison with national-level aggregates can be problematic, as foreign ownership definition is not harmonised across countries, and sometimes differs even within the country over years. For example, AMNE contains data for Japan, where the definition of foreign until 2009 includes both majority and minority owners, while starting from 2010, only firms whose majority stake is owned by a foreign investor are considered as foreign. The data often depends on survey data, which is the case for Japan with the response rate of about two-thirds of firms. Germany's foreign-affiliates statistics rely on survey of firms with 20 and more employees. In other countries, the statistics are collected via national surveys or country's official statistics, but there is no single consensus on how countries define the foreign ownership.

Table 3.1. Descriptive evidence: Foreign presence in regions and sectors

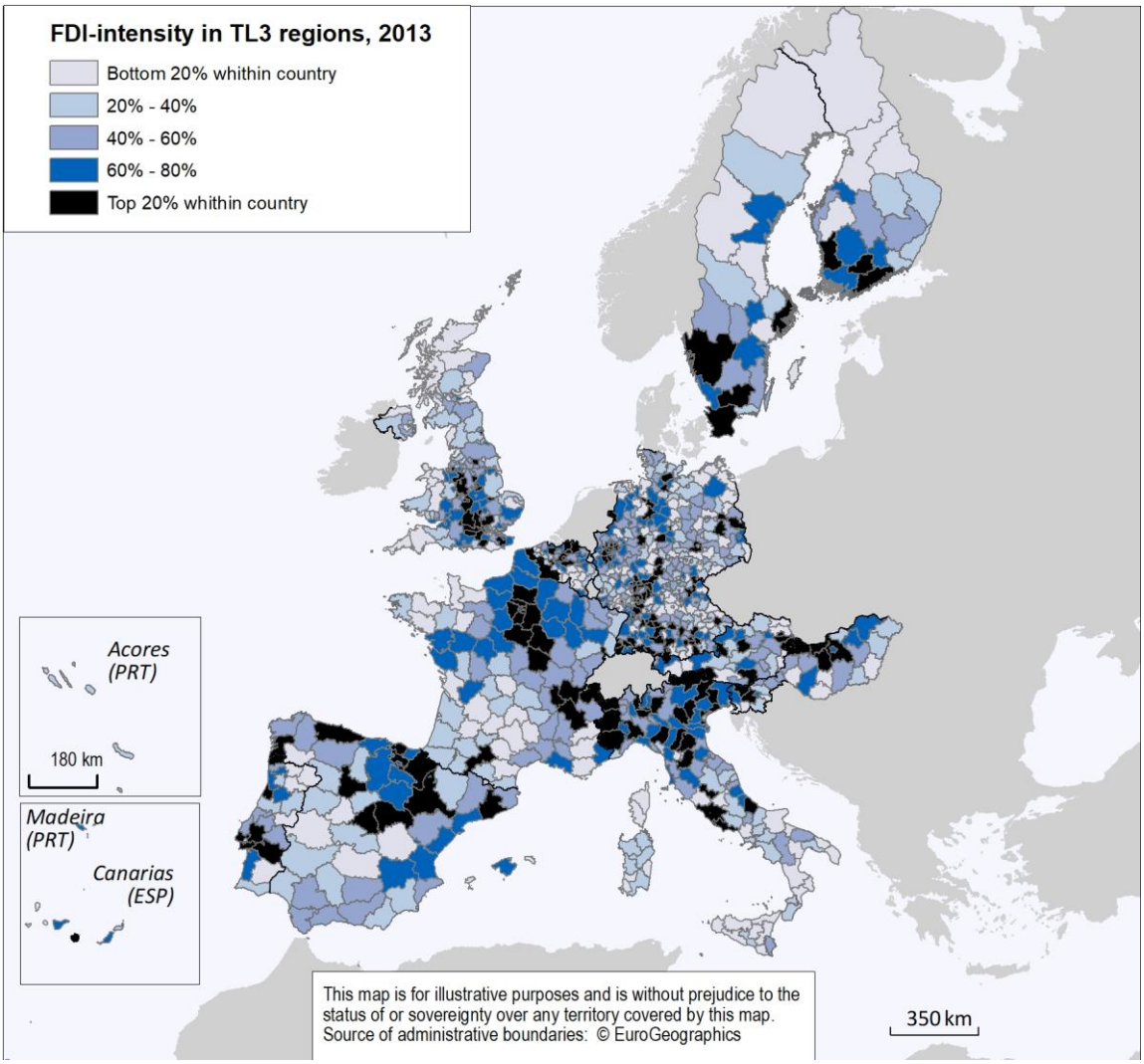
Year	2012		
	Mean	Median	St. dev
Foreign, region-sector	5.9	1	(31.7)
Foreign, region	59.3	17	(205.6)
Foreign, sector	841.4	522	(856.5)
Employment in foreign, region-sector	1 027.7	8	(5 893.8)
Employment in foreign, region	9 289.0	2056	(35 119.1)
Employment in foreign, sector	164 675.1	65486	(202 306.5)
Zero foreign presence in region-sector	0.4	0	(.5)
Zero foreign presence in region	0.04	0	(.2)
Number of region-sector combinations		11 829	

Note: The mean, median and standard deviation of the variable display the absolute number of firms or employees. However, the estimations employ log values.
Source: Calculations based on Orbis database.

Capital regions belong to the top 20% of regions with the highest concentration of foreign ownership in all studied countries. Other regions have also high foreign presence within their respective countries. In Hungary, Sweden, Finland and the UK, the foreign presence remains concentrated around the capital region. North of Italy hosts more foreign firms than the southern Italian regions. In France, regions bordering with Belgium, Switzerland and Italy are among the top hosts of foreign-owned firms. Northern Spanish regions and province of Barcelona have the highest share of foreign-owned firms in Spain, along capital region of Madrid. Finally, in Germany, Austria, and in Portugal, foreign ownership is dispersed throughout the country (Figure 1). Differences in the foreign ownership across and within countries demonstrate regional attractiveness to foreign entities.

Figure 1. FDI intensity varies across regions

Ranking of TL3 regions within countries (quantiles) for share of employment in foreign firms among total employment, 2013



Note: The darkest areas represent regions with highest foreign ownership within the country. The average FDI intensity in TL3 region is generated as a 3-year moving average of share of foreign employment in the TL3 region to smooth out large changes in foreign ownership.
Source: Calculations based on Orbis database.

3.1.2. Productivity calculations

The productivity measure used throughout the paper is multi-factor productivity calculated using a variant of the Generalised Methods of Moments (GMM) estimator proposed by Wooldridge (2009[24]). Multi-factor productivity (MFP) captures the overall efficiency of using labour and capital in the production process. Estimating productivity is difficult as unobservable characteristics of firms and its workforce affect both input choices and the productivity of the firm. The GMM estimator can account for a range of endogeneity issues including endogenous choice of intermediate inputs and labour and represents the

state-of-the-art in a long literature on best practices in estimating MFP.[10] Changes in MFP reflect a variety of underlying changes, e.g. shifts in management practices, organisational changes, general knowledge in the workforce, network effects, spillovers from production factors, adjustment costs, economies of scale, or the effects of imperfect competition. Productivity is therefore a measure that gives a concrete idea about progress of firms, accounting for their input use.

3.1.3. Firm size

The paper considers firms by their size in order to understand the robust impact on small and medium-sized enterprises (SMEs). Small firms are establishments with less than 50 employees in a given year. A medium-sized firm has between 50 and 249 employees, and large firms have 250 employees and more. Small firms can be further divided into micro firms that have less than 10 employees.

The full sample displays a substantial variation of foreign ownership between size groups. While only 2% of micro firms and 6% of small firms are majority foreign-owned, the share increases to 27% for large firms (Table 3.2). Once the foreign ownership in the regions and sectors is determined, foreign-owned firms are excluded from the analysis to examine the spillovers on domestic firms. With this further restriction, the final sample in the regression analysis contains 70% micro enterprises and 24% small firms. About 5% of the sample are medium-sized firms, and 1% of the available observations are large firms. Besides excluding the foreign-owned firms, the firms with incomplete information on the variables used in regression and singleton observations are not included in the econometric analysis.

[10] The proposed method extends the seminal contributions by Lenvinsohn and Petrin (2003[54]) and Olley and Pakes (1996[55]), and addresses issues relating the intermediate inputs in the estimation process (Ackerberg, Caves and Frazer, 2015[45]). Details on productivity calculations can be found in Gal (2013[23]) or the Annex E in Andrews, Criscuolo, and Gal (2016[46]). The Orbis database has been updated by Francesco Gerotto.

Table 3.2. Descriptive evidence by firm size

Size	Micro (<10)	Small (10-49)	Medium-sized (50-249)	Large (250+)
Sample used in estimations (2012)				
Gross output	797 166.5	5 011 348	28 383 469	2.88E+08
	(8 451 353)	(2.9E+07)	(1.7E+08)	(2.09E+09)
Employment	3.60	20.02	101.11	1089.18
	(2.36)	(10.05)	(48.69)	(5037.93)
Value added	158 970	969 313.1	561 4257	67 587 406
	(3 560 708)	(3 132 536)	(2.1E+07)	(3.42E+08)
MFP	9.82	10.48	10.98	11.41
	(0.95)	(0.72)	(0.78)	(0.96)
Manufacturing share	0.143	0.303	0.387	0.309
Share of firms facing 0 foreign firms in reg-sect	0.068	0.056	0.059	0.058
Share of observations in total	0.70	0.24	0.05	0.01
Number of observations in 2012	783 799	260 915	55 175	11 235
Number of observations 2007-2015	6 159 410	2 137 412	466 289	95 724
Total sample (2007-2015)				
Manufacturing share in full sample	0.12	0.26	0.36	0.34
Foreign share (broad definition of ownership)	0.04	0.08	0.22	0.40
Majority foreign-owned, share	0.02	0.06	0.17	0.27
Foreign employment share (broad foreign)	0.02	0.06	0.19	0.45
Majority-owned foreign employment share	0.01	0.05	0.14	0.21

Note: The first subsample lists the observations used in empirical estimations. These observations exclude the foreign-owned firms as the impact of foreign ownership for these firms is not exogenous. The second sample, listing foreign shares, is based on all available observations.
Source: OECD calculations based on Orbis database.

4. Empirical framework

The estimation uses multivariate regression to capture spillovers from FDI on domestic firms' productivity and employment. The estimates focus on "within-firm" effects that account for all characteristics of firms that are time-invariant by using firm-level fixed effects. The estimation follows the strategy adopted in previous research (Javorcik (2004[25]); Fons-Rosen et al. (2017[5])).

Regressions employ a measure of multi-factor productivity in logarithmic form and the natural logarithm of employment in the firm as dependent variables and include both firm-level fixed effects γ_i, and country-year fixed effects, α_{ct}. Firm fixed effects control for all unobservable characteristics of the firm that are time-invariant such as product characteristics or firm long-term strategies. Firm fixed effect also account for regional characteristics. Country-time fixed effects are included to control for any time-variant factors that are common to all firms in a given country, e.g. business cycles, exchange rate changes or the national policy framework. The estimates therefore reflect the change in MFP or employment in the firm that is associated with a change in the FDI exposure this firm faces. The following equation is estimated:

$$\begin{aligned} y_{i,r,s,t} = \beta_0 &+ \beta_1 \text{F_EXPO_regsec}_{r,s,t} + \beta_2 \text{F_EXPO_reg}_{r,t} + \beta_3 \text{ F_EXPO_sec}_{s,t} \\ &+ \beta_4 \text{F_L_regsec}_{r,s,t} + \beta_5 \text{ F_L_reg}_{r,t} + \beta_6 \text{ F_L_sec}_{s,t} \\ &+ \beta_7 \text{ firm controls}_{it} + \beta_8 \text{ region controls}_t^r + \alpha_{ct} + \gamma_i + \varepsilon_{it}^{rs} \end{aligned}$$

Where $y_{i,r,s,t}$ takes a value of firm's i MFP or a log value of its employment. Firm i is observed at time t, performs its activity in sector s, and is located in region r. The variable $\text{F_EXPO_regsec}_{r,s,t}$ represents the exposure to foreign-owned (majority ownership) firms, and $\text{F_L_regsec}_{r,s,t}$is the equivalent of the exposure in terms of number of employees working in foreign-owned firms. Both foreign ownership variables are defined for the firm's region and sector, and for the same region, but other sectors and finally for the same sector but country's regions other than the firm's location.

Table 4.1. Dependent variables

	In the same region and sector	In the same region, but other sectors	In the same sector, but other regions of the country
Number of foreign firms (log)	$\text{F_EXPO_regsec}_{r,s,t}$	$\text{F_EXPO_reg}_{r,t}$	$\text{F_EXPO_sec}_{s,t}$
Number of employees in foreign firms (log)	$\text{F_L_regsec}_{r,s,t}$	$\text{F_L_reg}_{r,t}$	$\text{F_L_sec}_{s,t}$:
Number of domestic firms (log)	$\text{DOM_EXPO_regsec}_{r,s,t}$	$\text{DOM_EXPO_reg}_{r,t}$	$\text{DOM_EXPO_sec}_{s,t}$
Number of employees in foreign firms (log)	$\text{DOM_L_regsec}_{r,s,t}$	$\text{DOM_L_reg}_{r,t}$	$\text{DOM_L_sec}_{s,t}$:

Furthermore, the estimations include control variables for firm characteristics of profit or loss and capital-labour ratio as well as age and age squared of the firm. Set of region controls_t^r, including the total number of firms and employees in the firm's i region and sector, in the same region, but other sectors, and the same sector, but outside of the region, control for the changing domestic firms' dynamics within and outside region. The errors are clustered at country-industry level.

The estimates show the direction of the shift in the firm's performance associated to a change of number or the size of the foreign-owned establishments in the proximity of the firm and the significance of this change. The interpretation of the β_1 to β_6 coefficients is as follows: doubling the exposure of domestic firms to foreign-owned firms in a given sectoral or regional proximity is associated with β_1 to β_6 change in MFP or employment of firm i.

The analysis compares the effect on firms of different sizes by introducing an interaction term of the variables of foreign exposure with identifier of small and medium-sized firms. Beyond the main specification, robustness checks in the annex include a broader definition of FDI based on any share of foreign ownership. Additional robustness check include restrictions to the sample that exclude earlier years with less data coverage and exclusion of the region with the largest number of firms in each country.

5. Empirical results

The baseline specification is estimated using OLS fixed effects regressions. This specification estimates shifts associated to foreign exposure on firms in manufacturing, followed by a separate estimation for firms in non-financial service sectors. By excluding foreign-owned firms, the analysis determines the outcomes of domestic firms. The results on the variables of interest are listed in Table 5.1. The results are presented as marginal effects of the respective indicator of foreign ownership in given size class and can be interpreted as elasticities as all variables are in natural logarithms.

5.1. Productivity changes in small and medium-sized firms with higher FDI

The estimation cannot distinguish between the different channels outlined in Section 2, but identifies the net impact of FDI on domestic firms. Positive spillovers to domestic firms from higher demand and the possible knowledge diffusion are balanced out by higher competition for the market shares and productive or more skilled employees when the domestic firm is exposed to FDI in the same region. The results show that FDI locating in the region can increase productivity of local firms by a small margin, especially in form of Jacobs (cross-sector) externalities. These gains from FDI in the same region might be small, but if FDI locates beyond boundaries of the region, it is associated with negative outcomes on productivity of local firms. This geographically differentiated impact shows that possible positive knowledge spillovers tend to be transferred locally, whereas competition from foreign-owned firms and loss of market shares happens on a larger scale.

The overall impact on small and medium-sized firm differs for manufacturing and service-sector firms. Service-sector firms tend to improve in terms of productivity when facing more foreign firms in their proximity. For an average manufacturing SME, horizontal externalities (and Marshall-Arrow-Romer knowledge spillovers) have small to no association with increasing presence of FDI. But, Jacobs externalities from other sectors can have small, but robust impact on productivity of SMEs in manufacturing.

Small or statistically insignificant coefficients from estimating spillovers from FDI operating in the same sector and locating in the same region as domestic SMEs demonstrate that possible horizontal spillovers from foreign-owned firms balance out the lower market shares of domestic firms. Productivity in manufacturing SMEs displays no statistically significant shift associated with an increase in foreign-ownership in the firm's region and sector (Table 5.1, (1)). Small firms in service sectors are associated with small positive productivity growth as 10% increase in the number of foreign-owned competitors is associated with an increase in average productivity of 0.05% (at 10% significance level) (Table 5.1, (2)).

FDI outside firm's own industry and in the same region is associated with productivity gains, suggesting the presence of Jacob's externalities and vertical spillovers. However, these positive spillovers dominate only for firms that are sufficiently large, which shows that possible channel of transmission might be supplier relationships for firms that are able to provide products or services to a multinational production. The positive increase is evident for medium-sized and large firms operating in non-financial service sectors as well as for medium-sized manufacturers. A 10% increase in foreign firms in the region is associated with an average increase in productivity in medium-sized service firms of 0.39%, in manufacturing 0.26%, and in large firms in services of 0.51% (Table 5.1). In

addition, productivity in firms in service sectors grows by additional 1.3% if the new FDI is large in terms of number of employees or if the employment in foreign-owned firms in the same region, but different sectors increases by 10%.

Regions have still an incentive to attract foreign investments. When FDI increases elsewhere in the country, productivity of domestic firms in the region falls. A 10% increase in number of foreign firms in the same service sector elsewhere in the country is associated with a productivity drop of 1.18% (Table 5.1, (2)). Small manufacturing firms respond with the shifts of similar magnitude to the employment increases in foreign firms elsewhere in the country (associated fall of productivity of 1.28%). The same pattern, albeit with a slightly smaller impact, is mirrored by medium-sized firms in services (0.86%). It is difficult for SMEs to benefit from the opportunities created by FDI, but if the investment takes place outside of their own region, the adverse competition effects seem to dominate.

Productivity in large firms remains unchanged with increasing FDI at the highest level of disaggregation of sector, in line with the results on SMEs that show balancing-out of positive and negative spillovers from foreign investment (Table 5.1). Baseline results for large firms confirm only the prevailing impact of Jacobs externalities. Productivity of large firms in service sectors increases by 5% if other sectors in the same region increase the foreign ownership by 10% from previous year. Large firms might have better capacity to deal with negative spillovers from competition by better retention of their customers and employees as the productivity remains unchanged with FDI increasing in other part of the country, in contrast with SMEs outcomes.

5.2. Employment in domestic SMEs and FDI

Employment in domestic SMEs falls with greater exposure to FDI in the same region. The attraction of multinational firms for local workers might drain employment from domestic firms. Multinationals tend to pay higher wages and thereby attract talented workforce from domestic firms.[11] Another possibility is that FDI reduces the market share and forces domestic firms to reduce employment. FDI outside the region does, however, not create positive benefits. As for productivity, FDI in a firm's sector that arises in other regions tends to be associated with lower employment, especially in small firms.

Analogous to the productivity gains, FDI is associated with employment gains in small firms indicating that foreign presence can induce limited positive spillovers. Firms might respond to the larger market by learning about and joining GVC, which might require hiring additional workforce. Despite being positive and significant, the benefits are very small. A 10% increase in the number of foreign-owned firms is associated with a 0.08% increase in employment in small firms in non-financial service sectors (roughly an increase of one job in one out of every 170th small firm) (Table 5.1, (4)). Small manufacturing firms have even smaller increase associated to FDI increase, by 0.04% with a 10% increase in foreign employment (significant at 10% level) (Table 5.1, (3), (4)).

As only surviving firms are monitored, the positive employment (and productivity) spillovers found especially in small firms might not provide a full picture. Another channel of employment growth might be re-allocation of employment from those small firms that are pushed out of the market to relatively more productive, surviving, small firms. This is one of the data limitations that needs to be taken into account. Small surviving firms,

[11] Multinational firms tend to be larger, more productive, pay higher wages, employ more skilled employees and have higher capital intensity (Mayer and Ottaviano, 2007[67]).

however, seem to benefit from foreign presence, whether it is from larger market potential or from re-allocation of resources to more productive entities.

Medium-sized manufacturing firms, however, experience employment decline of much larger magnitude than the increase in small firms when exposed to more foreign manufacturers in the same region. A 10% increase in number of foreign-owned firms is associated with a 0.24% decline in employment in medium-sized manufacturing firms if the FDI takes place in the same sector. This decline means that medium-sized firms offset increases in small firm by losing about one job in every 4th firm on average in manufacturing sector. As medium-sized firms are less likely to leave the market immediately following the increase in foreign competition, they might first downsize, and this effect dominates.

A rise in foreign employment in other sectors in the same regions tends to have a negative impact on the employment in local firms. The negative impact is largely associated with employment in foreign firms, and not with the number of foreign firms. Entry of large foreign firm or an increase in employment in foreign-owned firms is associated with domestic employment decline indicating fiercer competition for employment if the foreign investment needs more employees. Firms in non-financial services, both medium-sized and large, when facing an increase of 10% in foreign employment, experience a decline of employment of 0.27% for medium-sized firms, which this translates to about one employee in every fourth firm). For large firms, the drop is 0.2%, representing about two jobs lost in every large firms.

FDI in other parts of the country also reduces employment in firms that are operating in the same industry. Employment in small manufacturing firms is negatively associated with an increase in FDI in the firm's sector that takes place in other parts of the country. The estimated impact is a 1.6% employment decline when the number of foreign-owned firms increases by 10% in other parts of the country. As an average small firm in the estimation sample has 7.9 employees, the effect corresponds to one lost job in about every 8th small manufacturing firm.

Table 5.1. Baseline: Impact of FDI on productivity and employment in domestic firms

	(1)	(2)	(3)	(4)
VARIABLES	MFP		Employment, log	
Small firm; foreign employment in tl3xsector, in log	-0.002	0.002	**0.004***	0.000
	[0.223]	[0.198]	[0.069]	[0.847]
Small firm; foreign employment in tl3, in log	-0.001	-0.001	**-0.004***	0.003
	[0.551]	[0.665]	[0.085]	[0.105]
Small firm; foreign employment in sector, in log	**-0.128****	0.017	0.047	-0.006
	[0.047]	[0.125]	[0.199]	[0.669]
Medium-sized firm; foreign employment in tl3xsector, in log	-0.003	0.000	**0.004***	-0.001
	[0.264]	[0.868]	[0.087]	[0.728]
Medium-sized firm; foreign employment in tl3, in log	-0.002	**0.013****	-0.002	**-0.027*****
	[0.590]	[0.028]	[0.567]	[0.000]
Medium-sized firm; foreign employment in sector, in log	-0.057	-0.003	-0.026	-0.016
	[0.319]	[0.818]	[0.419]	[0.509]
Large firm; foreign employment in tl3xsector, in log	0.001	-0.003	-0.001	**0.008****
	[0.754]	[0.249]	[0.805]	[0.039]
Large firm; foreign employment in tl3, in log	0.005	**0.022*****	0.006	**-0.020***
	[0.362]	[0.003]	[0.393]	[0.055]
Large firm; foreign employment in sector, in log	-0.038	-0.006	-0.067	0.024
	[0.560]	[0.767]	[0.167]	[0.508]
Small firm; foreign firms tl3xsector, in log	-0.005	**0.005***	0.005	**0.006****
	[0.174]	[0.060]	[0.338]	[0.011]
Small firm; foreign firms tl3, in log	0.003	-0.003	-0.001	-0.004
	[0.705]	[0.526]	[0.925]	[0.524]
Small firm; foreign firms sector, in log	-0.071	**-0.118*****	**-0.164****	-0.015
	[0.626]	[0.006]	[0.029]	[0.470]
Medium-sized firm; foreign firms tl3xsector, in log	-0.002	-0.002	**-0.024*****	-0.004
	[0.815]	[0.753]	[0.001]	[0.643]
Medium-sized firm; foreign firms tl3, in log	**0.026*****	**0.039*****	0.016	0.000
	[0.002]	[0.002]	[0.123]	[0.988]
Medium-sized firm; foreign firms sector, in log	-0.125	**-0.086****	-0.065	0.029
	[0.365]	[0.050]	[0.384]	[0.343]
Large firm; foreign firms tl3xsector, in log	0.005	0.005	0.000	0.000
	[0.701]	[0.465]	[0.988]	[0.981]
Large firm; foreign firms tl3, in log	0.019	**0.051****	0.026	0.015
	[0.142]	[0.012]	[0.182]	[0.622]
Large firm; foreign firms sector, in log	-0.160	-0.068	-0.068	0.020
	[0.252]	[0.144]	[0.412]	[0.637]
Observations	1 643 210	6 512 543	1 727 735	7 096 965
R-squared	0.821	0.797	0.954	0.936
Sector	**Manufacturing**	**Services**	**Manufacturing**	**Services**
Year-Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Note: Results of baseline regression where the outcome is computed as the sum of baseline effect on large firms and the specific interaction term. The values in brackets report p-value, with low value (under 0.01) implying 99% significance, value between 0.01 to 0.05 representing 95% significance, and finally, p-values between 0.1 and 0.05 imply 10% significance.
Source: OECD calculations based on Orbis database.

5.3. Importance of regional or sectoral proximity

Local exposure to FDI matters for SMEs

Positive spillovers from FDI to local SMEs are larger in the geographical vicinity of the foreign investment. When the investment is located further away, the negative spillovers prevail. For firms of all sizes, negative productivity spillovers are larger when the foreign investment outside a firm's own large (TL2) region is considered than the estimated spillovers that arise outside a firm's own small (TL3) region, i.e. in the baseline estimates. Employment in local firms does not change in either case.

When measuring the impact of FDI in a large (TL2) region, the negative spillovers that arise for domestic firms operating in the same sector prevail for an average small firm. Productivity in small manufacturing firms is lower when facing higher foreign activity in the same large region. When they are exposed to more foreign firms in other sectors, productivity also falls (Table 5.2). Both coefficients were not significant when measuring the presence of foreign firms in TL3 region. Service sector SMEs have almost identical productivity outcomes within the larger region as in the baseline, suggesting that the location is binding mostly for positive productivity spillovers in manufacturing firms.

The impact of FDI on employment in SMEs follows the same pattern in large (TL2) region as in the small (TL3) region, with shifts extended to both small and medium-sized firms. Columns 3-4 in Table 5.2 confirm that employment of small domestic firms changes with local concentration of foreign-owned firms, but the small positive impact is attenuated if the foreign firms are large. While most shifts are in line with the baseline results, employment medium-sized service-sector firms is, on average, 0.18% higher when the number of foreign firms and foreign employment increase by 10%, which is similar to the outcome for small firms. The increase of employment in medium-sized service sector firms is in contrast to employment declines in the manufacturing sector.

FDI in the same sector but outside a firm's large (TL2) region is associated with fall in productivity across firms of all sizes. This result contrasts with the insignificant baseline outcomes on a smaller regional scale for medium-sized and large manufacturing firms. In addition, the productivity loss is larger than any other productivity gain from foreign presence in the region. A 10% increase of foreign manufacturing firms in other TL2 regions is associated with a 1.24% productivity decline is small manufacturing firms, 2.05% in medium-sized and 2.88% in large firms (Table 5.2, (1)). Productivity in small manufacturers falls by another 0.8% when employment in foreign-owned firms in other TL2 regions increases by 10%.

Table 5.2. Enlarging the geographical unit: TL2 region and 1-letter sector.

	(1)	(2)	(3)	(4)
VARIABLES	MFP		Employment, log	
Small firm; foreign employment in tl2xsector, in log	**-0.015*** **	-0.003	**-0.008** **	**-0.004** **
	[0.001]	[0.183]	[0.031]	[0.044]
Small firm; foreign employment in tl2, in log	**0.009** **	-0.002	**0.011*** **	**0.013** **
	[0.039]	[0.565]	[0.003]	[0.011]
Small firm; foreign employment in sector, in log	**-0.079* **	-0.003	0.027	-0.028
	[0.052]	[0.844]	[0.301]	[0.143]
Medium-sized firm; foreign employment in tl2xsector, in log	-0.008	**-0.006* **	**-0.015** **	**-0.010* **
	[0.300]	[0.090]	[0.046]	[0.065]
Medium-sized firm; foreign employment in tl2, in log	0.005	**0.029** **	0.005	**-0.058*** **
	[0.594]	[0.037]	[0.583]	[0.000]
Medium-sized firm; foreign employment in sector, in log	0.014	-0.022	-0.029	-0.031
	[0.722]	[0.118]	[0.231]	[0.157]
Large firm; foreign employment in tl2xsector, in log	0.000	-0.001	-0.005	0.010
	[0.995]	[0.910]	[0.784]	[0.335]
Large firm; foreign employment in tl2, in log	0.021	**0.060*** **	-0.031	**-0.088*** **
	[0.158]	[0.003]	[0.146]	[0.001]
Large firm; foreign employment in sector, in log	0.060	-0.019	-0.052	-0.029
	[0.189]	[0.264]	[0.244]	[0.260]
Small firm; foreign firms tl2xsector, in log	-0.001	**0.006* **	**0.010*** **	**0.010*** **
	[0.744]	[0.064]	[0.012]	[0.001]
Small firm; foreign firms tl2, in log	**-0.044*** **	-0.010	**-0.034** **	**-0.022**
	[0.002]	[0.435]	[0.038]	[0.098]
Small firm; foreign firms sector, in log	**-0.124* **	**-0.105*** **	**-0.127** **	-0.026
	[0.061]	[0.003]	[0.021]	[0.204]
Medium-sized firm; foreign firms tl2xsector, in log	-0.005	-0.003	**-0.017*** **	**0.028*** **
	[0.384]	[0.569]	[0.006]	[0.001]
Medium-sized firm; foreign firms tl2, in log	0.002	**0.049** **	-0.010	0.008
	[0.894]	[0.026]	[0.597]	[0.773]
Medium-sized firm; foreign firms sector, in log	**-0.205*** **	**-0.069** **	-0.034	-0.010
	[0.001]	[0.042]	[0.528]	[0.748]
Large firm; foreign firms tl2xsector, in log	-0.010	-0.006	-0.028	0.012
	[0.397]	[0.410]	[0.108]	[0.490]
Large firm; foreign firms tl2, in log	0.030	0.048	**0.075** **	0.052
	[0.224]	[0.165]	[0.019]	[0.250]
Large firm; foreign firms sector, in log	**-0.288*** **	-0.052	-0.079	-0.002
	[0.000]	[0.130]	[0.249]	[0.966]
Observations	1 623 406	6 474 937	1 707 614	7 060 402
R-squared	0.817	0.793	0.952	0.932
Sector	**Manufacturing**	**Services**	**Manufacturing**	**Services**
Year-Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Note: Results of baseline regression where the outcome is computed as the sum of baseline effect on large firms and the specific interaction term. The values in brackets report p-value, with low value (under 0.01) implying 99% significance, value between 0.01 to 0.05 representing 95% significance, and finally, p-values between 0.1 and 0.05 imply 10% significance.
Source: OECD calculations based on Orbis database.

FDI in a firm's own sector

The broad-based industrial classification (section of NACE classification identified by an alphabetical code) might lead to estimates mixing Jacobs and MAR externalities, especially in the manufacturing sector. The classification of firms in the sample allows for further disaggregation. The challenge is that even with a sample as large as the ORBIS database the breakdown of industry x region x year results in an increasing number of empty (or sparsely populated) cells. To balance the benefit of more fine-grained analysis and the demands on the data, the breakdown of firms by divisions of NACE classification (2-digit numerical codes) within large (TL2) regions is considered in this subsection. The main benefit of the exercise will be an increase in the detail for the manufacturing sector, which includes more 2-digit industries than any of the service sectors.

For SMEs in manufacturing, an increase in FDI in their own division of the sector and within their own region is associated with productivity decline. For FDI in other parts of the manufacturing sector the picture is less clear.[12] For small firms an increase in the number of firms is associated with lower productivity, whereas an increase in the size (or entrants of large firms) results in productivity gains. For medium-sized manufacturing firms neither channel is statistically significant. An explanation for this pattern is that estimates capture higher competition for the same market. I.e. for small manufacturers, FDI in similar-sized firms crowds out their own (local) market share. Larger firms are less likely to be direct competitors and more likely to provide complementary products that create the potential of supply-chain driven gains. Knowledge and technology transfer are facilitated by supply chain links as foreign-owned companies often require higher product quality and are therefore willing to exchange on technological advancements (Javorcik, 2004[25]). The more detailed sector disaggregation does not change the outcomes for the firms in service sectors (Table 5.3).

Large manufacturing firms are, on average, better capable of capturing positive Jacobs productivity spillovers from FDI in other sectors than SMEs. A 10% increase in employment in foreign-owned firms in the region that operate outside the firm's own sector is, on average, associated with 0.5% higher productivity (Table 5.3). For medium-sized manufacturing firms the estimated impact is half the size and for small firms the estimate is statistically indistinguishable from zero. Larger firms have often more capacity to invest in complementary innovation as compared to small firms, helping them leverage opportunities from cross-fertilisation. Large firms also tend to be more productive and can dedicate more resources towards research activities (Table 3.2).

For service sector firms the detailed sectoral breakdown does not change the main results on spillovers within the firm's own sector. Spillovers are statistically insignificant, except for an increase in number of foreign-owned firms in the same division of NACE sector. For employment, the detailed industry breakdown shows that employment gains in service-sector SMEs from FDI within their own sector and region are driven by firms that are close (within the same NACE division, i.e same 2-digit numerical code) to the firm itself.

[12] The baseline results measure the net spillovers in the same section of the industry. For example, productivity of firms in *Manufacture of machinery and equipment* (NACE section C – Manufacturing) in relation to firms in *Manufacture of motor vehicles, trailers and semi-trailers* (also in NACE section C). The sectoral precision considers division of NACE code, which implies that it measures spillovers from FDI within 2-digit numerical code such as NACE code division 29: *Manufacture of motor vehicles, trailers and semi-trailers*.

Table 5.3. Detailed industrial breakdown: NACE division (2-digit code) and TL2 regions

	(1)	(2)	(3)	(4)
VARIABLES	MFP		Employment, log	
Small firm; foreign employment in tl2xNACE division, in log	**-0.005****	0.000	-0.002	-0.001
	[0.030]	[0.828]	[0.349]	[0.603]
Small firm; foreign employment in tl2xother division in the section, in log	**-0.016*****	0.001	**-0.010*****	**-0.003***
	[0.001]	[0.758]	[0.001]	[0.071]
Small firm; foreign employment in tl2 in other sections, in log	0.000	0.000	**0.015*****	**0.015*****
	[0.885]	[0.885]	[0.000]	[0.000]
Small firm; foreign employment in NACE division, in log	-0.012	0.008	-0.011	-0.007
	[0.189]	[0.324]	[0.208]	[0.143]
Medium-sized firm; foreign employment in tl2xNACE division, in log	0.002	-0.002	-0.001	-0.004
	[0.555]	[0.290]	[0.723]	[0.224]
Medium-sized firm; foreign employment in tl2xother division in the section, in log	-0.002	-0.001	**-0.021*****	0.005
	[0.731]	[0.827]	[0.005]	[0.220]
Medium-sized firm; foreign employment in tl2 in other sections, in log	**0.026*****	**0.026*****	**-0.021***	**-0.021***
	[0.001]	[0.001]	[0.058]	[0.058]
Medium-sized firm; foreign in NACE division, in log	0.008	-0.010	-0.001	-0.014
	[0.286]	[0.261]	[0.941]	[0.281]
Large firm; foreign employment in tl2xNACE division, in log	**0.010***	-0.002	**0.049*****	**0.043*****
	[0.066]	[0.478]	[0.000]	[0.000]
Large firm; foreign employment in tl2xother division in the section1, in log	0.001	0.005	-0.022	0.002
	[0.937]	[0.440]	[0.223]	[0.820]
Large firm; foreign employment in tl2 in other sections, in log	**0.054*****	**0.049****	**-0.061****	**-0.116*****
	[0.002]	[0.011]	[0.018]	[0.000]
Large firm; foreign employment in NACE division, in log	**0.037****	**-0.016***	-0.016	0.001
	[0.015]	[0.090]	[0.362]	[0.940]
Small firm; foreign firms tl2xNACE division, in log	**-0.007***	**0.007****	0.004	**0.009*****
	[0.095]	[0.016]	[0.308]	[0.000]
Small firm; foreign firms tl2xnace1, in log	**0.027****	-0.018	0.016	0.006
	[0.013]	[0.142]	[0.110]	[0.314]
Small firm; foreign firms tl2 in other sections, in log	-0.002	-0.002	**-0.025*****	**-0.025*****
	[0.792]	[0.792]	[0.010]	[0.010]
Small firm; foreign firms NACE division, in log	**-0.046*****	**-0.066*****	-0.019	**-0.029****
	[0.003]	[0.002]	[0.109]	[0.026]
Medium-sized firm; foreign firms tl2xNACE division, in log	**-0.013****	-0.001	**-0.015***	**0.019***
	[0.030]	[0.776]	[0.054]	[0.053]
Medium-sized firm; foreign firms in tl2xother division in the section, in log	0.001	-0.008	0.017	-0.004
	[0.936]	[0.544]	[0.279]	[0.817]
Medium-sized firm; foreign firms tl2 in other sections, in log	**0.027***	**0.027***	0.029	0.029
	[0.078]	[0.078]	[0.106]	[0.106]
Medium-sized firm; foreign firms NACE division, in log	**-0.056*****	**-0.045****	-0.015	-0.010
	[0.001]	[0.024]	[0.423]	[0.633]
Large firm; foreign firms tl2xNACE division, in log	-0.016	-0.002	-0.019	-0.014
	[0.123]	[0.830]	[0.288]	[0.407]
Large firm; foreign firms in tl2xother division in the section, in log	0.007	-0.007	0.004	0.041
	[0.853]	[0.758]	[0.930]	[0.118]
Large firm; foreign firms tl2 in other sections, in log	-0.032	**0.078*****	**0.095****	**0.048***
	[0.250]	[0.004]	[0.014]	[0.097]
Large firm; foreign firms NACE division, in log	**-0.102*****	**-0.036***	-0.038	-0.045
	[0.000]	[0.066]	[0.226]	[0.116]
Observations	1,613,341	6,448,235	1,696,394	7,030,294
R-squared	0.817	0.792	0.953	0.932
Sector	**Manufacturing**	**Services**	**Manufacturing**	**Services**
Year-Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Note: Results of baseline regression where the outcome is computed as the sum of baseline effect on large firms and the specific interaction term. The values in brackets report p-value, with low value (under 0.01) implying 99% significance, value between 0.01 to 0.05 representing 95% significance, and finally, p-values between 0.1 and 0.05 imply 10%.significance.
Source: OECD calculations based on Orbis database.

5.4. Robustness checks

The baseline results rely on a set of specific assumptions on representativeness of data and on foreign ownership definitions. Several robustness checks verify that the results are not driven by irregularities in the data or by the degree of aggregation in two types of estimations. Robustness checks include estimations on restricted samples, which include a sample without the largest region of each country and restricting the sample to the years with the largest number of firms in the sample. Second, the robustness checks consider the sensitivity of estimates to the chosen definition of foreign ownership. This robustness check uses a broader definition of foreign ownership (instead of only firms that are majority foreign-owned). The key results remain consistent across the different robustness checks. In some instances, the statistical significance changes but these differences are more likely due to a lack of variation in the data (conditional on firm fixed effects) rather than due to a lack of robustness.

Registration bias arises when firms report their location at their place of incorporation, which might often be in the capital city region, and not at their main place of production. In this case, foreign firms registered in the capital city region, but operating in another region, would increase the foreign exposure variables in the capital city, while the local foreign exposure variables would be lower than in reality. On the flipside, local firms registered in the capital region, but operating elsewhere, would be considered as being exposed to the capital region foreign firms. The estimations are replicated leaving out the TL2 region in each country with the largest number of firms (Table A.2). Registration bias does not seem to affect the estimates as exclusion of the most attractive region leaves the baseline results virtually unchanged.

The coverage of Orbis data improves over time, which can possibly bias outcomes from foreign exposure. Ownership changes used to identify FDI exposure might be spurious due to increasing coverage. In 2007, it is possible to identify the ownership of 656 000 out of 1 919 000 firm observations, while in 2009, the number rises to 1 126 000 out of 2 170 000, which represents a coverage increase from 34% to 52%. Coverage of ownership links improves after 2009, with a peak in number of observations of ownership links of 1 671 000 in 2014. Along with improved information on ownership links, the number of observations of firms with valid balance sheet data also rises. Presence of foreign firms might be under-reported in earlier years and bias can come from foreign ownership appearing in the sample later than its actual entry on the local market. In an additional robustness check, the estimations are restricted to observations between years 2010 and 2014 (Table A.3). The results confirm the lack of net Marshall-Arrow-Romer productivity spillovers (as in the baseline only small service sector firms show positive results). Jacobs externalities are evident in services (in line with the baseline) but no longer statistically significant in the manufacturing sector. The negative impact of investment in the same sector in other regions remains statistically significant and is even more pronounced than in the baseline results.[13]

[13] For manufacturing the impact of increasing the number of firms and increasing the number of employees in foreign-owned firms are associated with opposite signs. The two indicators are, of course, not independent and the negative spillovers dominate for the average region. The strong

FDI, as defined in the baseline regressions, considers only firms that are majority-owned by a foreign company. A robustness check employs a broader definition of FDI that considers firms with any share of foreign ownership as FDI (Table A.4). Firms with minority foreign ownership might also affect the domestic firms despite foreign entity not holding the controlling interest. Minority foreign ownership is more prevalent among large firms, with 40% of large firms being at least partially foreign-owned and 27% have a majority foreign owner. Among medium-sized firms and small firms the shares are small, 22% among medium-sized and 8% among small firms have any share of foreign ownership, with majority ownership in 17% and 6% of firms respectively. Results are similar to the baseline estimates, with some deviations. For firms in services the direction of the estimates is in line with those in the baseline, but the size of the coefficients tends to be smaller. This is in line with an increase in the (random) noise of the variable (with majority ownership being the actual signal). For manufacturing firms, some estimated coefficients that were statistically significant in the baseline are estimated less precisely, whereas the negative spillovers on small manufacturers that were statistically insignificant in the baseline are now statistically significant.

balancing effect does, however, indicate that there might be a “small sample” issue in the data. This might seems surprising given that the result are based on more than 900 000 observations, but given the inclusion of firm fixed-effects the actual variation in the data is significantly less.

6. Policy conclusions

Attracting foreign direct investment (FDI) is on the agenda of virtually all governments worldwide (OECD, 2018[26]). There are many reasons why foreign investments are attractive to national and local policy makers. They tend to be relatively large investments that create a sizeable number of jobs in a country and particularly in a local area. Volkswagen, the German car manufacturer announced in 2008 the opening of a production site in Chattanooga in the United States, a city in Tennessee that is part of the Hamilton metropolitan area. By 2010, the 1000th employee had been hired at the plant and 10 years after the announcement about 3 800 employees are working at the site.[14] Beyond job creation, there are additional direct benefits to attracting FDI. Multinational enterprises tend to be more productive than an average domestic competitor in the same place and same industry. This is reflected in the wages of workers in multinationals, which are, on average, higher than those paid by domestic competitors. Part of the better performance comes through using more skill-intensive modes of production and technologically more advanced production processes.[15]

Spillovers from multinational firms to the domestic economy are an additional, indirect, channel and often an important justification for policies aiming to attract FDI. The transfer of technology or knowledge (and its impact on innovation) are, with job creation, among the main priorities for investment promotion agencies that are used by countries and regions to promote FDI (OECD, 2018[26]; UNCTAD, 2014[27]).[16] Links to multinational enterprises can also facilitate access to international markets. Multinationals and their foreign affiliates account for half of global exports (Cadestin et al., 2018[28]), whereas few domestic small- or medium-sized enterprises (SMEs) are directly exporting. The contribution of SMEs to exports is instead indirect, i.e. as suppliers of goods or services to exporting firms (Miao and Fortanier, 2018[29]). Having local (or at least domestic) access to foreign affiliates can therefore create opportunities for firms to access international markets. Links with multinationals also create the potential for local firms to upgrade their technological capacity as multinational enterprises have incentives to invest into upgrading the capacity of firms within their supply chain.

Given the potential benefits of FDI, it is unsurprising that policy makers have developed a long list of options to support the attraction of FDI. Incentives to attract investment typically cover regulatory, financial and fiscal incentives. Derogations from regulatory practices are typically related to easing the environmental, social and labour-market related requirements for investors. Financial incentives can be direct subsidies (e.g. for capital investment or wages), support measures (e.g. infrastructure investment or training) or implicit support (e.g. administrative assistance). Fiscal incentives can be direct relieve on

[14] http://www.volkswagengroupofamerica.com/chattanooga-facts (accessed 25 May 2019).

[15] Foreign-controlled firms are shown to be more productive than average domestic-controlled firm (Barba Navaretti, Venables and Barry, 2004[64]). Research has produced ample evidence on global firms being larger, paying higher wages, exhibiting higher value added and skill intensity (see Bernard et al. (2018[65]) for American firms, Mayer and Ottaviano (2007[67]) for FDI and exporting premium of European firms).

[16] FDI attraction is, of course, not the only measure to promote technology transfer (Kowalski, Rabaioli and Vallejo, 2017[66]).

corporate taxes, but also cover a range of other allowances, tax credits or other exemptions (OECD, 2003[30]). In practice, incentives, and in particular tax breaks, can represent a significant cost for countries, regions and local governments, but can fail to produce the desired benefits. Instead, an approach which targets to award tax incentives on the basis of creating supplier engagement appears to be an effective policy choice if accompanied by skills and capabilities development of workers in local firms (OECD and UNIDO, 2019[8]).

Aligning the benefits that policies try to create with the objectives pursued by multinational enterprises is far from straightforward. Investing abroad incurs additional direct and indirect costs compared to domestic investments. The returns from foreign investment therefore need to be higher as well. For the creation of jobs in the host economy this rarely poses a conflict, but when it comes to the objective of supporting wider regional development the incentives are often incongruent. The returns from stimulating technological adoption or productivity growth in local firms do not accrue to the investing firm. This has two important implications. The first is that investment might be below socially optimal levels, which could justify public support for FDI. The second is that FDI policy should not just focus on attracting FDI but consider complementary measures that support domestic firms in exploiting the opportunities that FDI brings.

The results in this paper suggest that beyond attracting FDI, policy should consider strategies to better leverage the potential for wider gains from investment. Local productivity spillovers from FDI in a firm's own sector are, in most configurations, non-negative but in very few instances actually positive. However, spillovers are negative if the investment takes place in other regions within the country. This does not mean that every region should try to maximise its own FDI attraction efforts (to avoid potential losses) but rather calls for strong co-ordination of attraction strategies across regions. Building on local strengths is one of the key tenets of regional development policy that applies for FDI as well. Foreign investors might target places with the greatest potential in a sector and thereby create a virtuous local cycle. The jobs offered by the multinational might attract workers with the right skills for the sector, which in turn creates opportunities for local firms. It might also lead to creation of new firms or the relocation of domestic firms towards a region, but the limitations of the data used in this study do not allow assessing whether this takes place.

A co-ordinated strategy for FDI attraction does not mean centralisation of efforts but rather calls for strong multi-level governance arrangements. It is often more effective to build on subnational policy makers' knowledge of their regional strength and weaknesses and their ability to engage local stakeholders. Using these local capacities helps create strategies to attract the "right" kind of investments that would create supply chain relationships on the domestic market and give a chance to local firms to absorb new technologies. For national-level policies, the challenge is therefore to ensure that plans do not overlap and that priorities of different efforts align with national priorities. Using diagnostic tools, such as those developed for value chain analysis and mapping can support regional or local efforts on where the region stands and where a place has its greatest development potential (Crescenzi and Harman, 2018[32]). The Policy Framework for Investment (PFI), an OECD instrument adopted by OECD council in 2015, helps countries evaluate their progress and identify priorities in several policy areas in order to improve investment conditions (OECD, 2015[31]).

A robust result across specifications are positive Jacobian productivity spillovers, i.e. productivity improvements in domestic firms operating in sectors that are different than the one in which the investing multinational operates. Productivity in service-sector SMEs, in

particular, appears to increase with investment of multinationals that produce goods or other services. Sectoral diversity is often associated with higher growth (OECD, 2018[10]), but identifying investment that complements existing economic structures is a challenging task. An easier task is to target the channels that can help cross-sectoral spillovers. The first is a focus on managerial capacity. Productivity gains can require changing production processes or developing new ways of working within and across firms. The capacity to identify opportunities and implement changes in deep-rooted processes requires managerial skills that are not necessarily abundant among SMEs. The second channel is supply chain links within the local area. Local content requirements or tax incentives to buy a locally sourced input are a tool that many countries try to use to create links with domestic suppliers. These requirements might create jobs and demand for local output in the short-term, but also stymie investment of domestic firms into technological upgrading and come at the expense of longer-term competitiveness (Stone, Messent and Flaig, 2015[33]). Positive incentives (e.g. tax breaks for local inputs) might be more preferable from the investor's point of view than stringent local content requirements and help retain incentives for local firms to invest into upgrading. Policy can also focus on reducing information barriers between multinationals and domestic firms (e.g. through networking events) and facilitate worker mobility between different types of firms, support direct measures to upgrade the technological capacity of SMEs, and the development of new – complementary – activities in the region.

Strategies to embed foreign direct investment in a region need to complement attraction policies. Local benefits do not arise automatically, but the opportunities that FDI provides require firms and policy to take concrete steps to seize them. What these concrete steps are differs in each place. It might involve building capacity of local suppliers to achieve quality, performance, or other standards required to become a supplier to the multinational production (OECD and UNIDO, 2019[8]). Engaging local universities or research centres and enforcing a regulatory framework that allows academic institutions to benefit from commercialisation of research belongs to other concrete measures that policy makers can support. Alternatively, maximising benefits from FDI might involve reforms to the (vocational) education system or strategic networking with other regions (Labory and Bianchi, 2018[34]).

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Annex A. Indicators, data and robustness

Calculation of foreign exposure

The formal definitions of three types of exposure to foreign firms in the region and/or sector are given as follows. First, exposure to foreign firms within the firm's sector and region is defined as

$$\text{For_exposure_regsec}_{\text{r,s,t}} = \ln\left(1 + \sum_{i=1}^{N} binaryforeign_{i,r,s,t}\right)$$

Where $binaryforeign_{i,r,s,t}$ is the binary variable taking a value 1 if the firm i has a majority owner that is located in country different from the country where firm i operates. Then, variable $\text{For_exposure_regsec}_{\text{r,s,t}}$ represents a foreign exposure identified as sum of all foreign firms within the TL3 region r, NACE 2 1-letter sector s, and year t, where N is the total number of firms in a given sector and region. Two additional, complementary, definitions of foreign exposure monitor the total number of foreign firms in the same sector and remaining regions within the country and within the same region and all remaining sectors, such that:

$$\text{For_exposure_sec}_{\text{st}} = \ln\left(1 + \sum_{i=1}^{M} binaryforeign_{i,s,t} - \sum_{i=1}^{N} binaryforeign_{i,r,s,t}\right)$$

Where $binaryforeign_{ft}^{s}$ is again an indicator of foreign ownership in firm i, and it is aggregated for all firms, M, in sector s in a country where firm i is located. The foreign exposure in the region of firm i is excluded from the variable of total sectoral foreign exposure. Lastly, $\text{For_exposure_reg}_{\text{rt}}$ defines total regional exposure to foreign firms across sectors as

$$\text{For_exposure_reg}_{\text{rt}} = \ln\left(1 + \sum_{i=1}^{L} binaryforeign_{i,r,t} - \sum_{i=1}^{N} binaryforeign_{i,r,s,t}\right)$$

by adding all foreign firms across all firms L in given TL3 region r, excluding those that are in the same sector of activity as the firm i. As it is possible that the foreign ownership within region is zero, an indicator of no foreign firm in the region-sector and region only controls for such instance and is included in regression analyses.

The definition of foreign exposure, $\text{For_exposure_regsec}_{\text{r,s,t}}$, in the sector and region where the incumbent domestic firm performs its activity approximates the effect of firms competing in the sectoral and regional proximity for the same market, but also having a potential to advance technologically from learning from practices of foreign firm as well as sharing the same labour market. Similarly, evaluating the number of foreign firms in the same region offers an insight into direction and size of the impact on domestic firms when their potential supplier or buyer is of foreign origin. These firms might also compete for the same labour force with foreign firms that might pay better wages. The last specification of foreign firms in the same sector, but locating in different region indicates the shifts which firm experience if the activity is elsewhere of its own sector.

The size effect of foreign exposure is defined as the number of the employees in foreign firms and is aggregated per each of the individual types of foreign exposure as defined for number of firms. Then, $\text{For_empl_exposure_regsec}_{r,s,t}$, defines the employment in all majority foreign-owned firms in the same region and sector; $\text{For_empl_exposure_regsec}_{s,t}$ represents the employment in the same sector, but different regions within the same country, and $\text{For_empl_exposure_regsec}_{r,t}$ stands for all employment in the foreign-owned firms in region r, except for the employment in the same sector and region. These variables of interest are defined for each year t and are in the form of natural log.

Data

The data used in study consist of compilation of three BvD data sources that are matched using a unique firm identifier. The identifier is created by BvD and is based on the national identifier of the firm. The data exclude agriculture and mining sectors (NACE 2, 1 letter sector A and B) as well as Public administration (codes 82.00 and above). Furthermore, the analysis excludes also the observations on financial services sector (NACE 2, 1 letter sector K).

Out of the list of the countries available in the data, only those countries are kept that have at least 1 000 observations for which it is possible to compute the productivity.[17] Observations from Austria, Belgium, Finland, France, Germany, Great Britain, Hungary, Italy, South Korea, Portugal, Slovenia, Spain, and Sweden remain in the sample used for estimations. Despite the fact that some countries have large number of observations, such as Russia with 412 041 firms in 2007 or China with 370 085 firms in 2007, the observations on these firms do not include the variables of interest. Therefore, it is not possible to compute the productivity measure for these firms, and therefore, a large percentage of initial observations is unused in estimations. With the selection of countries, the data has 27mil observations between 2007 and 2016. The measure of exposure and number of firms in regions and sectors uses also observations for which it is not possible to compute the productivity measure as well as observations with no additional information besides the ownership. Once the aggregated variables are computed, the observations with missing variables of interest are excluded from analyses. The final sample of the data employed in estimations includes slightly less than 9 million of year-firm observations. This drop is caused by availability of the control variables for each firm as well as the lagged values of capital-labour ratio and profit rate. Additionally, due to the use of firm fixed effects, all singleton observations do not enter the estimations.

Data processing and selection

Harmonising and cleaning procedures of the financial database include conversion of nominal balance sheet values to a common currency using purchasing power parity conversion (in US industry level PPP) and deflation by industry to create real values.[18] Outliers are excluded from the final dataset by winsorising the 0.5% bottom and top firms in the distribution of log of value added, capital and materials per employee. Additionally,

[17]The following countries are present in the raw data: AT AU BE BR CA CH CO CZ DE DK EE ES FI FR GB GR HU IT JP KR LT LV MX NL NO PL PT SE SI SK US LU IS NZ AR CL CN CR ID IE IL IN RU SA TN ZA.

[18] See Gal (2013[23]) and Andrews, Criscuolo and Gal (2016[46]) for details on the procedures.

cleaning of the data includes removing 1% of firms with the highest and lowest growth rates in terms of productivity and employment in at least one year in the sample. This ensures excluding firms that underwent acquisitions or similar shocks that are likely to disrupt reporting and book values and do not necessarily reflect real changes in the firms' fundamentals. The data cleaning also removes financial services (NACE Rev.2, Section K) and public administration sectors (NACE Rev.2: 84.00 and above). Finally, only firms in the Orbis database that can be localised within an OECD region (TL3 region) are kept.[19] TL3 regions are small regions in between the level of municipalities and large (TL2) regions, the latter being regions that correspond to the first subnational tier of government (e.g. French *regions*, German *Länder*, or US states).

Table A.1. Average employment and MFP values by country and year

Country	AT	BE	DE	ES	FI	FR	GB	HU	IT	KR	PT	SE	SI
Empl	189.0	65.0	192.8	13.0	28.6	39.6	400.9	82.3	18.9	63.7	9.9	10.8	26.2
	(421)	(222)	(1252)	(222)	(212)	(731)	(3784)	(568)	(233)	(267)	(89)	(80)	(128)
MFP	11.4	11.3	11.2	10.0	10.5	10.6	11.3	10.2	10.3	10.6	9.5	10.4	10.3
	(0.7)	(0.7)	(0.9)	(0.9)	(0.8)	(0.7)	(0.9)	(0.9)	(0.9)	(0.9)	(0.9)	(0.8)	(0.7)
Manuf	0.34	0.22	0.23	0.17	0.18	0.16	0.24	0.25	0.27	0.47	0.15	0.14	0.22
# firms	**8 883**	**53 557**	**125 541**	**3 278 554**	**118 460**	**559 605**	**91 089**	**29 060**	**2 148 888**	**198 800**	**1 569 719**	**620 737**	**54 216**
Empl	437.6	70.4	283.7	15.3	30.6	40.1	408.4	81.8	27.8	68.8	10.5	9.4	43.1
	(1206)	(224)	(1432)	(203)	(241)	(369)	(3597)	(130)	(223)	(243)	(83)	(47)	(215)
MFP	11.5	11.4	11.5	10.2	10.6	10.7	11.2	10.4	10.7	10.5	9.5	10.4	10.5
	(0.4)	(0.7)	(0.9)	(0.8)	(0.7)	(0.6)	(0.9)	(0.8)	(0.8)	(0.9)	(0.9)	(0.8)	(0.7)
Manuf	0.32	0.24	0.28	0.18	0.20	0.17	0.22	0.27	0.32	0.54	0.16	0.18	0.28
# firms	**28**	**5 286**	**7 420**	**349 834**	**13 063**	**70 308**	**8 054**	**600**	**136 625**	**16 845**	**175 996**	**60 803**	**3 882**
Empl	186.3	62.1	303.4	12.4	26.8	48.1	398.3	79.0	15.4	65.9	9.6	11.7	19.2
	(426)	(233)	(1812)	(252)	(204)	(1026)	(3447)	(532)	(115)	(320)	(78)	(79)	(96)
MFP	11.4	11.3	11.5	9.9	10.4	10.7	11.3	10.2	10.2	10.6	9.5	10.4	10.3
	(0.7)	(0.7)	(0.9)	(0.9)	(0.8)	(0.7)	(0.8)	(0.9)	(0.9)	(1.0)	(0.9)	(0.8)	(0.7)
Manuf	0.34	0.20	0.23	0.16	0.16	0.15	0.25	0.24	0.25	0.45	0.15	0.13	0.20
# firms	**2 181**	**6 584**	**9 701**	**351 531**	**14 967**	**55 200**	**11 616**	**4 283**	**352 382**	**24 100**	**162 807**	**63 896**	**8 033**

Note: The values of employment, MFP and Manufacturing indicator are averaged across firms that enter the econometric estimation. The variable Manuf takes value of 1 if the firm belongs to a manufacturing sector. Therefore, the value presented in the table can be interpreted as a share of firms in the sample with their main activity in manufacturing sector. Variable # firms aggregates all firms that enter the estimation.
Source: OECD calculations based on Orbis database.

Firms in the sample differ across countries in terms of size, productivity and manufacturing vs services representation. The countries with the largest number of firms in the sample are also those with the lowest employment averages (Table A.1). This implies that the large firms tend to be the first to be recorded and preserved in the sample. This, consequently, reflects on values of MFP. As the mean of productivity of small firms is smaller than for large firms, the countries with large number of firms in the sample are also less productive on average. In addition, a composition of sectors can play an important role in productivity shifts. Firms in services have a different productivity averages than manufacturing firms. By controlling for country-year, and firm fixed effects, trends common to all firms within

[19] Regionalisation is partly provided by BvD and benefitted from additional cleaning and geolocalisation efforts by Eric Gonnard. The main match is based on postal codes of the firms address of incorporation with missing postal codes imputed from the full address information.

the country in a given year, as well as those common for the same firm, and therefore a sector, are taken into account.

Individual datasets and merging

The dataset on financial information contains the variables necessary for productivity calculation: gross output, capital, employment levels, wage bill, profits, as well as variables of controls such as age of the firm, deducted from the incorporation date, as well as consolidation indicator, and sector of activity. If a firm has both a consolidated and unconsolidated account entry, the information on unconsolidated account is used. The individual datasets on financial attributes, location and ownership are matched using the first 12 signs of the BVD id.

Consolidated accounts represent an inconvenience for this study as the estimations rely on the location of individual firms. Consolidated accounts report all financial activity of the parent company and its subsidiaries in one statement, which would inflate the importance of this firm in its headquarter location, while disregard its presence in areas where subsidiaries are located. However, consolidated accounts represent a small percentage of firms in Orbis dataset. From the initial 0.68% of consolidated accounts in the total sample, only 0.58% of firms with a productivity calculation are reported as consolidated, further dropping to 0.35% by removing those consolidated accounts that also have an unconsolidated entry. Moreover, the consolidation accounts are concentrated in a handful of countries, especially those with a low number of observations, such as United States with close to 100% of consolidated accounts, as well as Israel, Czech Republic and Slovakia. Among observations from countries employed in this analysis, 5% of observations in Great Britain and 0.63% of observations in Germany are consolidated. Within the final group of observations, 0.18% of observations are consolidated. A validity check that removes consolidated firms ensures this is not the case.

The contact information, including postal code, is time invariant for each BvD ID, which means that the dataset provides the last recorded address and other contact information details. If firm moves its location, it is not possible to detect the change. However, for a lot of countries, firm moving from one location to another (especially changing regions) changes local identifier as well, and therefore, BvD ID would change. Therefore, firms moving from one location to another without changing the identifier is assumed not to have a sufficient weight in order to affect the analyses.

Finally, the financial-address dataset merged with postal code of the firm is also merged with information on shareholders, available for years 2007-2015. The raw data includes the subsidiary firm's identification number as well as the shareholder firm's ID. BvD calculates the global ultimate owner at 25.01% and 50.01%. For purposes of this study, the foreign ownership is identified using a binary indicator of foreign firm which takes value 1 if a 50.01% share is owned by stakeholder whose country of origin is not the same as origin of the subsidiary. Those observations for which we are not able to identify the country of origin of the owner, such WW, signify that the information is gathered from websites and individual ownership, and are considered as domestic firms in this study. For the robustness check purposes, the information of any foreign partial owner of stock of the firm is an alternative variable of interest. If the firm is identified as majority-owned by a foreign entity, it might happen that it is not identified as foreign as the intermediary owner might be domestic, as is the case for 6.5% of foreign-owned firms (about 55 000 firm-year observations).

Harmonizing and cleaning procedures include industry-level PPP conversion and deflation, as well as computing the productivity and capital stock variables. Data cleaning includes removing the firms of the 0.5% extremes of growth rate distribution of productivity measures, employment, capital, capital ratio, intermediates, value added and gross output at least once during their existence in the sample. This ensures excluding firms that underwent acquisitions or similar shocks that could under-determine the data analyses.

Validity of data: representativeness of foreign ownership

One of the central questions is the foreign ownership representativeness in the data sample employed in this analysis. If it is not possible to identify the foreign ownership correctly and the share of actual foreign owners is overestimated, then the results would be biased upwards. However, assuming that the best firms are well covered in the sample, and that foreign firms tend to be the best, the absolute number of foreign firms should be well recorded. At the same time, the sample size of the data is growing over time. If the number of domestic firms fluctuates due to entry to the sample, it will cause an unnatural drop in the share of foreign firms for higher number of unproductive domestic firms existing in reality, but entering the Orbis sample only at that point in time. Therefore, the employment in the foreign-owned firms, and equivalently – employment in majority-foreign-owned firms is compared with official statistics per country, and then robustness checks validate results.

To compare the size of foreign presence in the Orbis with actual foreign ownership, the firm employment is aggregated on Section level of NACE 2 Rev 2. sector definition, which is an aggregation equivalent to the ISIC 1-digit sectors used in available statistics on foreign-owned firms. OECD Stat databases provide statistics on foreign ownership for all countries in this analysis, except for Korea. The dataset “Inward Activity of Multinational Enterprises by industrial sector - ISIC Rev 4” (AMNE) records employment in each sector in foreign firm as well as total employment. This permits computing shares of employment in foreign firms, as well as comparing the absolute numbers with Orbis database.[20]

Coverage of the employment aggregates in Orbis, as compared to national statistics, varies across sectors, but for most cases remains above 70% for foreign firms. The average of shares of Orbis and OECD-AMNE employment in majority-owned foreign firms and total employment in 12 countries (with an exception of Korea for which the AMNE information is not available) tends to increase over years for different sectors. As expected, Orbis database records lower number of employees in domestic firms than reported in OECD AMNE database for most of the sectors, with foreign firms comparatively well covered.

Manufacturing sector is best represented in Orbis database, considering both domestic and foreign employment. In 2008, about 79% of all employees in manufacturing are recorded in Orbis database (average across countries), while in 2014, the Orbis records 6% more employees in the data than accounted for in National statistics databases.[21] The database also records 85% of foreign employment in Manufacturing Sector in 2014 (Figure 6.1)The over-representation of domestic manufacturers compared to national statistics can be due

[20]The AMNE statistics is available on the website:

http://stats.oecd.org/Index.aspx?DataSetCode=AMNE_IN#.

[21]The average is taken across aggregated employment values across 11 NACE 2 sections and across countries.

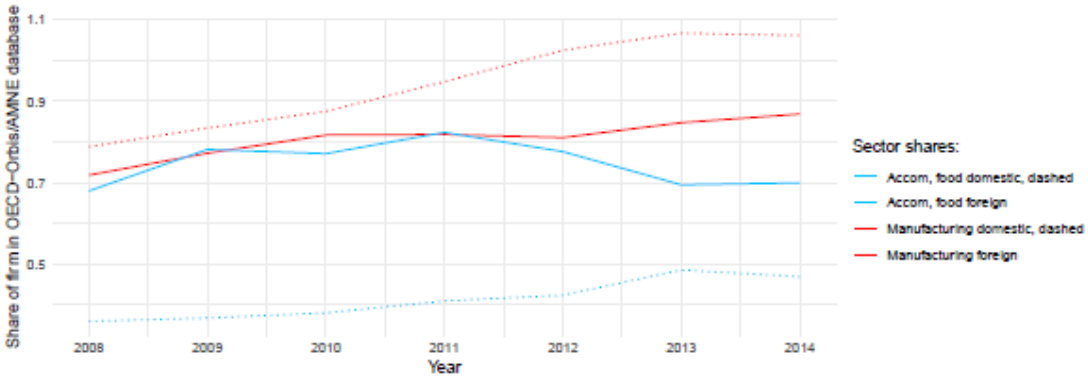
to some manufacturing firms in Orbis database not be identified as owned by foreign-majority.

For Accommodation and Food Service Sector, which is the largest sector in terms of total employment and also the least represented in Orbis database as compared to national statistics, the Orbis database records about 60% of foreign employment. Employment in firms in non-financial service sectors in Orbis data is more represented for foreign-owned than domestic firms. About 40% of domestic employment is captured by Orbis data compared to national statistics in 2014.

The coverage improves not only over time, but also for the most represented countries. Averaging representativeness in France, Italy, Spain and Sweden yields more stable outcomes for both domestic and foreign firms in Orbis in manufacturing, and increasing coverage of foreign firms for less represented sectors.

Using a broader definition of foreign-owned firm – not only by a firm that is majority foreign-owned, the coverage increases to about 1.5 foreign employees in Orbis database to 1 manufacturing employee in AMNE database in 2008, and 2 foreign employees identified in Orbis as compared to 1 in AMNE in 2014. In services sector, such as Accommodation and food services, the number of employees in at least partially-owned foreign firms is consistently about a double of the reported employment in the AMNE. The discrepancies might come from the definition of foreign-owned in OECD AMNE database. As the data is collected on per-country basis, the sources vary. Most of the data is collected from statistical offices and annual business surveys, which might have different response rate (for example, Japan's business response rate is 62%), or definition of foreign participation (some definitions include both minority and majority participation; in Germany, the survey covers only the firms with 20 and more employees and Finland does not consider multiple foreign ownership). Therefore, it is expected that some discrepancies between two data sources arise.

Figure 6.1. Data representativeness: Average share of Orbis foreign and domestic employment as compared to OECD, all countries



Robustness checks and supplementary results

Foreign-owned firms, dominance of large regions, and definition of region and sector

The validity of the baseline results is verified in multiple robustness checks as described in the main section. This section lists the tables for the following robustness checks: exclusion the most firm-populated region in the country (Table A.2), time period restriction to 2010-2014 (Table A.3), and broader definition of foreign ownership[22] (Table A.4). In addition, Table A.5 describes the foreign presence in TL2 region. This table is complementary to Table 3.1, where the region is defined on TL3 disaggregation. As the supplementary results exploit the concentration in TL2 region and Nace 2 rev. 2 1-letter sector, and TL2 region and Nace 2 rev. 2 2-digit sector, Table A.5 provides descriptive evidence on both aggregation types.

[22] In the dataset used for the estimations, 844 625 firm-year observations are identified as foreign-owned, with 63.5% of the observation having at least 50% (majority) foreign-ownership. About 6.5% of the total number of firm-year observations are not considered as FDI in this exercise as their direct owner is domestic, but the domestic intermediary in turn is foreign-owned (the global ultimate owner is foreign).

Table A.2. Subsample: exclusion of the most populated region in the country

	(1)	(2)	(3)	(4)
VARIABLES	MFP		Employment, log	
Small firm; foreign employment in tl3xsector, in log	-0.001	0.002	**0.005****	0.001
	[0.654]	[0.164]	[0.039]	[0.418]
Small firm; foreign employment in tl3, in log	0.000	0.000	-0.002	0.004
	[0.931]	[0.905]	[0.319]	[0.046]
Small firm; foreign employment in sector, in log	-0.084	0.018	0.065	-0.007
	[0.219]	[0.245]	[0.135]	[0.673]
Medium-sized firm; foreign employment in tl3xsector, in log	-0.002	-0.001	**0.005****	0.000
	[0.502]	[0.662]	[0.048]	[0.897]
Medium-sized firm; foreign employment in tl3, in log	-0.001	**0.009***	0.001	**-0.030*****
	[0.828]	[0.089]	[0.872]	[0.000]
Medium-sized firm; foreign employment in sector, in log	-0.014	-0.015	-0.036	-0.016
	[0.830]	[0.387]	[0.347]	[0.576]
Large firm; foreign employment in tl3xsector, in log	0.004	-0.004	-0.002	**0.015****
	[0.456]	[0.190]	[0.707]	[0.018]
Large firm; foreign employment in tl3, in log	0.003	**0.018****	0.008	-0.020
	[0.643]	[0.040]	[0.340]	[0.106]
Large firm; foreign employment in sector, in log	0.004	**-0.038***	**-0.109***	0.043
	[0.951]	[0.088]	[0.073]	[0.369]
Small firm; foreign firms tl3xsector, in log	-0.006	**0.005***	0.004	**0.006****
	[0.119]	[0.057]	[0.446]	[0.015]
Small firm; foreign firms tl3, in log	0.005	-0.001	0.002	-0.003
	[0.469]	[0.826]	[0.732]	[0.629]
Small firm; foreign firms sector, in log	-0.113	**-0.114*****	**-0.180****	-0.013
	[0.460]	[0.004]	[0.048]	[0.597]
Medium-sized firm; foreign firms tl3xsector, in log	-0.007	0.002	**-0.025*****	-0.005
	[0.435]	[0.759]	[0.004]	[0.569]
Medium-sized firm; foreign firms tl3, in log	**0.027*****	**0.049*****	0.013	-0.007
	[0.002]	[0.000]	[0.224]	[0.754]
Medium-sized firm; foreign firms sector, in log	-0.155	**-0.072***	-0.057	0.030
	[0.298]	[0.087]	[0.537]	[0.420]
Large firm; foreign firms tl3xsector, in log	0.009	0.012	0.006	0.003
	[0.495]	[0.132]	[0.761]	[0.883]
Large firm; foreign firms tl3, in log	**0.029****	**0.057*****	0.022	-0.004
	[0.026]	[0.003]	[0.328]	[0.910]
Large firm; foreign firms sector, in log	-0.205	-0.028	-0.048	0.030
	[0.173]	[0.552]	[0.633]	[0.550]
Observations	1 227 340	5 113 161	1 290 524	5 562 344
R-squared	0.816	0.789	0.952	0.931
Sector	**Manuf.**	**Services**	**Manuf.**	**Services**
Year-Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Note: Results of baseline regression where the outcome is computed as the sum of baseline effect on large firms and the specific interaction term. The values in brackets report p-value, with low value (under 0.01) implying 99% significance, value between 0.01 to 0.05 representing 95% significance, and finally, p-values between 0.1 and 0.05 imply 10%.significance.
Source: OECD calculations based on Orbis database.

Table A.3. Subsample with time period restriction: 2010-2014

	(1)	(2)	(3)	(4)
VARIABLES	MFP		Employment, log	
Small firm; foreign employment in tl3xsector, in log	-0.001	**0.002***	**0.003****	0.001
	[0.475]	[0.054]	[0.018]	[0.582]
Small firm; foreign employment in tl3, in log	0.000	-0.002	0.001	**0.003***
	[0.854]	[0.359]	[0.764]	[0.098]
Small firm; foreign employment in sector, in log	-0.002	0.012	**0.076****	-0.001
	[0.977]	[0.433]	[0.046]	[0.967]
Medium-sized firm; foreign employment in tl3xsector, in log	-0.002	0.001	0.003	-0.003
	[0.338]	[0.512]	[0.155]	[0.348]
Medium-sized firm; foreign employment in tl3, in log	0.003	**0.024*****	0.007	**-0.042*****
	[0.557]	[0.001]	[0.123]	[0.000]
Medium-sized firm; foreign employment in sector, in log	**0.165****	0.005	0.008	-0.028
	[0.021]	[0.762]	[0.835]	[0.351]
Large firm; foreign employment in tl3xsector, in log	0.000	-0.001	0.004	0.005
	[0.954]	[0.688]	[0.435]	[0.294]
Large firm; foreign employment in tl3, in log	0.009	**0.028*****	0.006	**-0.042*****
	[0.122]	[0.001]	[0.429]	[0.003]
Large firm; foreign employment in sector, in log	**0.240*****	-0.013	-0.057	-0.017
	[0.001]	[0.518]	[0.400]	[0.694]
Small firm; foreign firms tl3xsector, in log	0.005	0.001	**0.016*****	0.003
	[0.308]	[0.776]	[0.000]	[0.305]
Small firm; foreign firms tl3, in log	-0.005	0.001	-0.006	0.005
	[0.508]	[0.811]	[0.378]	[0.236]
Small firm; foreign firms sector, in log	-0.187	**-0.128***	**-0.181*****	0.010
	[0.103]	[0.074]	[0.007]	[0.736]
Medium-sized firm; foreign firms tl3xsector, in log	0.005	0.004	**-0.016****	-0.010
	[0.583]	[0.524]	[0.031]	[0.356]
Medium-sized firm; foreign firms tl3, in log	0.003	**0.023***	-0.010	0.007
	[0.786]	[0.063]	[0.346]	[0.649]
Medium-sized firm; foreign firms sector, in log	**-0.318*****	**-0.132***	-0.089	0.070
	[0.005]	[0.063]	[0.178]	[0.131]
Large firm; foreign firms tl3xsector, in log	0.021	0.013	0.010	0.004
	[0.213]	[0.169]	[0.634]	[0.835]
Large firm; foreign firms tl3, in log	0.018	0.028	-0.012	0.040
	[0.282]	[0.151]	[0.601]	[0.275]
Large firm; foreign firms sector, in log	**-0.421*****	**-0.115***	-0.020	0.082
	[0.000]	[0.097]	[0.802]	[0.227]
Observations	908 115	3 627 093	959 944	3 989 725
R-squared	0.864	0.838	0.970	0.956
Sector	**Manuf.**	**Services**	**Manuf.**	**Services**
Year-Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Note: Results of baseline regression where the outcome is computed as the sum of baseline effect on large firms and the specific interaction term. The values in brackets report p-value, with low value (under 0.01) implying 99% significance, value between 0.01 to 0.05 representing 95% significance, and finally, p-values between 0.1 and 0.05 imply 10%. significance.
Source: OECD calculations based on Orbis database.

Table A.4. Redefinition of foreign ownership: Firms with any foreign share.

	(1)	(2)	(3)	(4)
VARIABLES	MFP		Employment, log	
Small firm; foreign employment in tl3xsector, in log	**-0.005****	0.0007	**-0.006*****	**-0.004****
	[0.0279]	[0.6560]	[0.0090]	[0.0108]
Small firm; foreign employment in tl3, in log	-0.0005	-0.0011	0.0007	**0.006*****
	[0.7930]	[0.5570]	[0.6520]	[0.0042]
Small firm; foreign employment in sector, in log	-0.0496	0.0219	-0.0583	-0.0277
	[0.4680]	[0.1820]	[0.2240]	[0.2060]
Medium-sized firm; foreign employment in tl3xsector, in log	0.0014	**0.005****	0.0006	**-0.015*****
	[0.6610]	[0.0268]	[0.9080]	[0.0000]
Medium-sized firm; foreign employment in tl3, in log	-0.0004	0.0053	0.0052	**-0.022*****
	[0.9230]	[0.2970]	[0.1680]	[0.0007]
Medium-sized firm; foreign firms sector, in log	-0.0720	0.0119	0.0523	-0.0177
	[0.2760]	[0.4540]	[0.3090]	[0.5190]
Large firm; foreign employment in tl3xsector, in log	-0.0019	0.0032	**0.036*****	**0.029*****
	[0.7760]	[0.2620]	[0.0012]	[0.0000]
Large firm; foreign employment in tl3, in log	0.0010	**0.013***	0.0069	**-0.040*****
	[0.8610]	[0.0808]	[0.3850]	[0.0051]
Large firm; foreign employment in sector, in log	-0.0575	0.0060	-0.0366	**-0.062****
	[0.4070]	[0.7410]	[0.6170]	[0.0404]
Small firm; foreign firms tl3xsector, in log	**-0.0109***	-0.0003	0.0100	**0.012*****
	[0.0937]	[0.9640]	[0.1270]	[0.0000]
Small firm; foreign firms tl3, in log	-0.0019	-0.0037	**-0.013***	**-0.013*****
	[0.7270]	[0.4080]	[0.0730]	[0.0030]
Small firm; foreign firms sector, in log	-0.0313	**-0.105*****	-0.0834	**-0.047***
	[0.8320]	[0.0031]	[0.1180]	[0.0634]
Medium-sized firm; foreign firms tl3xsector, in log	0.0066	-0.0098	**-0.033*****	0.0096
	[0.4980]	[0.1280]	[0.0033]	[0.3260]
Medium-sized firm; foreign firms tl3, in log	0.0103	**0.050*****	**0.021***	-0.0092
	[0.2570]	[0.0000]	[0.0593]	[0.6150]
Medium-sized firm; foreign firms sector, in log	0.0214	**-0.072****	-0.0783	-0.0256
	[0.8830]	[0.0477]	[0.1960]	[0.4350]
Large firm; foreign firms tl3xsector, in log	**0.030***	0.0019	-0.0219	-0.0228
	[0.0733]	[0.8320]	[0.2840]	[0.2190]
Large firm; foreign firms tl3, in log	0.0078	**0.073*****	0.0150	0.0192
	[0.5660]	[0.0000]	[0.4680]	[0.5040]
Large firm; foreign firms sector, in log	0.0272	-0.0307	-0.0673	0.0071
	[0.8520]	[0.3560]	[0.3390]	[0.8400]
Observations	1 644 804	6 541 038	1 729 411	7 129 424
R-squared	0.821	0.797	0.954	0.936
Sector	**Manuf.**	**Services**	**Manuf.**	**Services**
Year-Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Note: Results of baseline regression where the outcome is computed as the sum of baseline effect on large firms and the specific interaction term. The values in brackets report p-value, with low value (under 0.01) implying 99% significance, value between 0.01 to 0.05 representing 95% significance, and finally, p-values between 0.1 and 0.05 imply 10%. significance.
Source: OECD calculations based on Orbis database.

Table A.5. Foreign presence in TL2 regions, in 2012

	1-letter Nace 2 rev. 2 sector			2-digit Nace 2 rev. 2 sector		
	Mean	Median	St. dev	Mean	Median	St. dev
Foreign, region-sector	36.9	7	(111.5)	5.76	1	(29.9)
Foreign, region	368.1	116	(699.0)	340.777	153	(612.6)
Foreign, sector	538.1	268	(714.4)	132.066	49	(290.3)
Employment in foreign, region-sector	5214.0	338	(15699.7)	995.753	19	(5630.9)
Employment in foreign, region	52140.2	15193	(102790.6)	58707.63	21408	(109872.9)
Employment in foreign, sector	78980.5	35764	(113045.2)	26534.99	7677	(67059.9)
Zero foreign presence in region-sector	0.179	0	(0.4)	0.424	0	(0.5)
Zero foreign presence in region	0.04	0	(0.2)	0.03	0	(0.2)
Number of region-sector combinations		1 539			12 209	

Note: The mean of the variable displays the absolute number. Log values are used in the estimations.
Source: OECD calculations based on Orbis database.