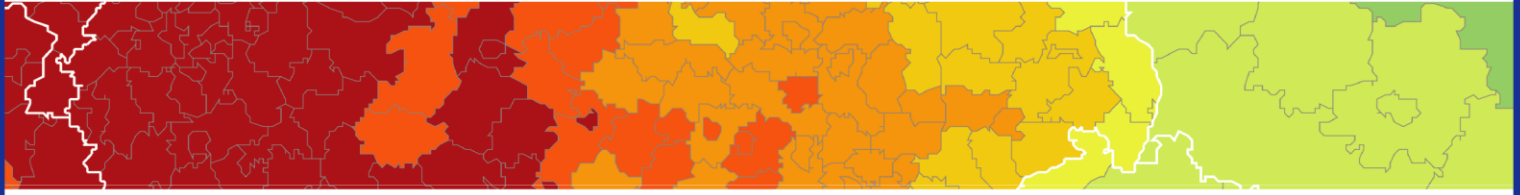


Inspire policy making by territorial evidence



The World in Europe, global FDI flows towards Europe

Drivers and impacts of intra-European FDI

Applied Research

Scientific Report

March 2018

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The World in Europe,
global FDI flows towards Europe

Drivers and impacts
of intra-European FDI

Scope and introduction to the study

This report is part of the study, *The World in Europe, global FDI flows towards Europe*. The study casts new light on three topics related to the integration of Europe in the world economy:

1. Extra-European FDI towards Europe
2. Intra-European FDI
3. FDI by European SMEs

Key conclusions and recommendations related to each of these questions can be found in three stand-alone reports. Each report is supported by a number of scientific reports that contain detailed methodological descriptions and results. The insights gained from the study are summarised in a synthesis report that cuts across the three topics.

This scientific report *Drivers and impacts of intra-European FDI* includes background information and documentation for the conclusions and recommendations brought forward in the main report on intra-European FDI.

In this report, we extend the analyses undertaken for extra-European FDI to intra-European FDI. The report should therefore be read as a complement to the corresponding scientific reports on drivers and impacts of extra-European FDI towards Europe.

Overview of the study

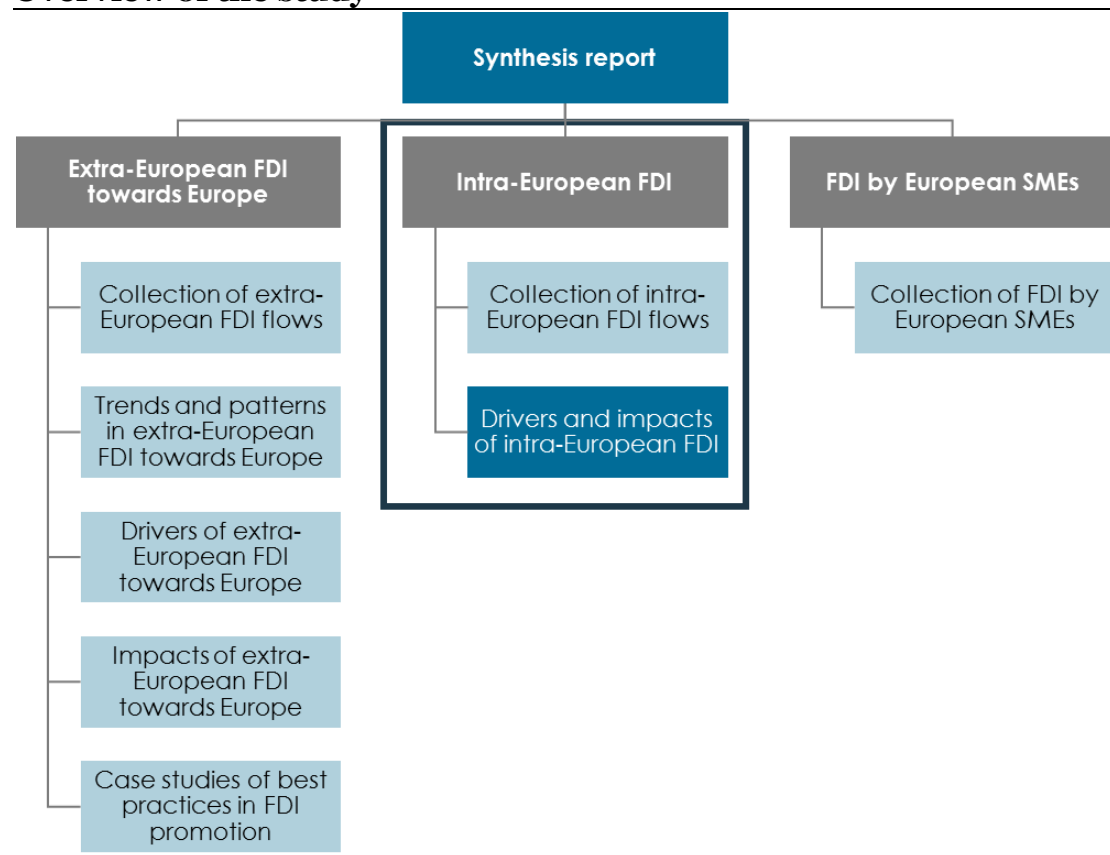


Table of contents

List of Maps	6
List of Tables	6
List of Boxes	6
1 Drivers of intra-European FDI: Methodology	9
1.1 Identifying potential FDI drivers.....	9
1.2 Collecting data on potential FDI drivers and the location of European owned firms	10
1.2.1 Data on the NUTS3 location of foreign owned firms in Europe	11
1.2.2 Data on the regional drivers	11
1.2.3 The final dataset.....	12
1.3 Testing the impact of regional drivers on the location of European owned firms	13
2 Drivers of intra-European FDI: Results	15
2.1 Drivers of FDI across all regions and sectors	15
2.2 Drivers of FDI across sectors and types of investments.....	17
2.3 Drivers of FDI across urban-rural regions.....	19
2.4 Drivers of FDI across metropolitan regions.....	22
2.5 Drivers of FDI across regions with different levels of development	24
3 Spillovers from intra-European FDI: Methodology	27
3.1 Empirical Methodology.....	27
3.1.1 Productivity spillovers.....	27
3.1.2 Employment effects.....	29
3.2 Data	32
4 Spillovers intra-European FDI: Results across all regions.....	33
4.1 Spillovers from non-European owned firms to local firms across all regions	33
4.1.1 Results: Intra-industry productivity spillovers.....	33
4.1.2 Results: Broader regional productivity spillovers	34
4.1.3 Results: Employment effects	35
5 Spillovers intra-European FDI: Results across different types of regions.....	38
5.1 Spillovers from European owned firms to local firms across urban-rural regions.....	38
5.1.1 Results: Intra-industry productivity spillovers.....	38
5.1.2 Results: Broader regional productivity spillovers	38
5.2 Spillovers from European owned firms to local firms across metropolitan regions	39
5.2.1 Results: Intra-industry productivity spillovers.....	39
5.2.2 Results: Broader regional productivity spillovers	40
5.3 Spillovers from European owned firms to local firms across regions with different levels of development.....	41
5.3.1 Results: Intra-industry productivity spillovers.....	41
5.3.2 Results: Broader regional productivity spillovers	42
References	44
A. Appendix	45

List of Maps

Map 1 The predicted attractiveness of European regions towards intra-European investments	17
Map 2 The predicted attractiveness of urban-rural regions towards intra-European investments	22
Map 3 The predicted attractiveness of metropolitan regions towards intra-European investments	24
Map 4 The predicted attractiveness of regions with different levels of economic development towards intra-European investments.....	26

List of Tables

Table 1 Regional drivers used in the econometric model	12
Table 2 Country coverage of the final data set	13
Table 3 Drivers of FDI across all regions	16
Table 4 Drivers of FDI across sectors and types of investment.....	18
Table 5 Drivers of FDI across urban-rural regions	20
Table 6 Drivers of FDI across metropolitan regions	23
Table 7 Drivers of FDI across regions with different levels of development	25
Table 8 Variables used in the productivity spillover model	29
Table 9 Variables used in the employment models	31
Table 10 Country coverage of the spillover and employment analyses.....	32
Table 11 Intra-industry productivity spillovers: Results across all regions.....	33
Table 12 Broader regional productivity spillovers: Results across all regions	35
Table 13 Intra-industry employment effects: Results across all regions	36
Table 14 Broader regional employment effects: Results across all regions	37
Table 15 Intra-industry productivity spillovers across urban-rural regions.....	38
Table 16 Broader regional productivity spillovers across urban-rural regions	39
Table 17 Intra-industry productivity spillovers by metropolitan regions	40
Table 18 Broader regional productivity spillovers by metropolitan regions.....	41
Table 19 Intra-industry productivity spillovers by regions with different levels of development.....	42
Table 20 Broader regional productivity spillovers by regions with different levels of development	43

List of Boxes

Box 1 Selected econometric studies of regional FDI determinants	10
Box 2 Conditional logit model used to estimate drivers of FDI	13
Box 3 Intra-industry spillover model	28
Box 4 Employment effects.....	30

Abbreviations

EC	European Commission
ESPON	European Territorial Observatory Network
EU	European Union
FDI	Foreign Direct Investment
FT database	fDi Markets database offered by the Financial Times
M&A	Mergers and acquisitions
NUTS	Nomenclature of Territorial Units for Statistics

1 Drivers of intra-European FDI: Methodology

In this chapter, we describe the methodology used to estimate the drivers of intra-European FDI. The methodology consists of the following three steps:

1. Identifying potential drivers of FDI
2. Collecting data on potential FDI drivers and the location of European owned firms
3. Testing the impact of regional drivers on the location of European owned firms

Each of these steps are explained briefly below. A detailed description of each step is provided in the scientific report *Drivers of extra-European FDI towards Europe*.

1.1 Identifying potential FDI drivers

A wide range of factors go into the decision of investing abroad, some of which will be specific to the company and thus difficult to have general expectations about. However, studies across a large number of sectors and countries over time have provided a knowledge base about common factors that have a positive and significant impact on the attraction of FDI and which can help explain the location pattern of foreign firms. These factors may be determined at the national, supra-national (in this context meaning mainly at the EU level), bilateral or regional level.

At the **national** level a number of drivers have been found to be of importance (e.g. demand, quality of institutions, concentration of firms, global cities, tax rates, wage levels, physical infrastructure, human capital, clusters and cost of location).¹ In our analysis, we control for such national attraction factors by including country dummies, which control for factors that only vary at the national level. Thus, if foreign investors in general are more attracted to all types of regions in countries with a larger domestic market, with lower corporate tax rates, better infrastructure or educational policies, this will be controlled for via the inclusion of country dummies.

At the **supra-national** level a country's membership of regional trade agreements or a customs union can be an attraction factor for investors as they gain access to larger markets with low trade friction. The Internal Market has dismantled a number of investment barriers, and may thus be a significant attraction factor for European investors. We implicitly control for the Internal Market as a driver of intra-European FDI as we undertake specifications of the analysis, in which we include only EU Member States.

¹ For a discussion of each of these drivers, see the scientific report *Drivers of extra-European FDI towards Europe*.

A common finding in the literature is also that **bilateral** factors, i.e. factors that characterise the relationship between the host (where the investment takes place) and the home country (the origin of the investor), are important FDI determinants.² In the current analysis, we do not explicitly account for bilateral FDI drivers but as we focus only on FDI within Europe, we expect these would be of smaller importance than in the case of FDI from outside of Europe, as physical, cultural and educational differences are smaller.

At the **regional** level, we select the set of drivers to be included in the econometric model based on insights from existing studies that have examined the FDI location in Europe from a regional perspective. We have surveyed both academic studies published in peer-reviewed journals as well as policy reports. In total, we have identified six studies, which fulfil these criteria and which in combination cover regions in a large number of European countries, cf. Box 1. All studies include FDI originating from both within and outside of Europe.³

Box 1 Selected econometric studies of regional FDI determinants

- **Gauselmann and Marek (2012):** The study analyses the determinants of the location choice of MNEs across 33 NUTS2 regions in East Germany, the Czech Republic and Poland.
- **Spies (2010):** The study analyses the determinants of the location choices of foreign multinational firms at the level of German federal states.
- **Basile et al. (2008):** The study analyses the determinants of the location choice of multinational enterprises across 50 NUTS1 regions across Germany, France, Italy, Sweden, UK, Spain, Ireland and Portugal.
- **Copenhagen Economics (2007):** The study analyses the determinants of the location choice of foreign investors across 268 NUTS2 regions across the EU27.
- **Barrios et al. (2006):** The study analyses the determinants of the location choice of MNEs across 28 regions in Ireland (Irish counties).
- **Crozet et al. (2004):** The study analyses the determinants of the location choice by foreign investors across 92 NUTS3 regions in France (French départements).

Note: All academic studies listed in the box are published in peer-reviewed journals. Copenhagen Economics (2007) is a policy report and was prepared for DG Regio at the European Commission. In terms of geographical coverage, Copenhagen Economics (2007) is the most comprehensive of the studies and is based on data covering the location of approximately 100,000 foreign firms across NUTS2 regions in the EU27.

Source: ESPON FDI (2018) based on a literature survey

1.2 Collecting data on potential FDI drivers and the location of European owned firms

In order to analyse the regional factors that influence the location pattern of European owned firms across Europe, we combine two sets of data:

- Data on the NUTS3 location of approximately 299,000 European owned firms in Europe. This data is obtained from the Amadeus database owned by Bureau van Dijk. Data is from 2015 and thus reflects

² Based on bilateral data on FDI stocks across OECD countries, Blonigen and Piger (2014) test the robustness of a large number of FDI determinants frequently included in empirical studies of FDI location determinants. They find that physical distance, common language, colonial relationships and the (squared) skill difference between the home and host country are among the most robust FDI determinants.

³ For a detailed discussion of the findings of these studies, see the scientific report *Drivers of extra-European FDI towards Europe*.

the stock of European owned companies that has been accumulated over the years, i.e. the companies that have chosen to invest and stay in a given region.

- Data on the regional attraction factors. This data is obtained from multiple public data bases and the specific measures have been selected based on the literature listed in Box 1.

Each of these two sets of data are commented upon below.

1.2.1 Data on the NUTS3 location of foreign owned firms in Europe

We treat a firm as being European owned if a single non-national European shareholder (e.g. a German shareholder of a French firm) owns at least 10 per cent of the firm⁴ and no non-European shareholder also owns at least 10 per cent of the firm. This means that if both a German and a US investor has an ownership stake of at least 10 per cent in a French firm, the French firm is considered to be non-European owned. However, if no non-European investor has an ownership stake of 10 per cent or more, the French firm is considered European owned.

Our definition of European foreign owned firms includes direct ownership linkages only and does not take into account indirect foreign ownership, e.g. via a domestic holding company. This means that if a German firm owns a French firm, which in turn owns another French firm, only the former French firm is considered European owned. Appendix A contains a description of the extensive data cleaning process that was required to undertake the analysis.

1.2.2 Data on the regional drivers

The regional drivers included in the analysis are contained in Table 1. For further details of the data, please see the scientific report *Drivers of extra-European FDI towards Europe*.

⁴ The OECD also employs this threshold in their definition of FDI (<https://www.oecd.org/daf/inv/investment-policy/2487495.pdf>).

Table 1 Regional drivers used in the econometric model

Variable	Definition	Year	Level	Source	Expected impact
Level of innovation	Number of patent applications to the European patent office, per million inhabitants	2012	NUTS2	Eurostat	+
Accessibility	European potential accessibility index for freight*	2011	NUTS3	TRACC (2015)	+
Tertiary education	Percent of 25-64 year olds with a tertiary education	2015	NUTS2	Eurostat	+
Labour abundance	Unemployment rate (per cent)	2015	NUTS3	Amadeus database	+
Investment incentives allowed	Dummy variable equal to one if investment incentives are permitted period 2014-2017 and zero otherwise (see Box 2)	2014	NUTS3	Eurostat	+
Strength of industry clusters	The share of a region's employment in a given sector (2-digit NACE) relative to the country's employment in that sector	2015	NUTS3	Amadeus database	+
Dominance of incumbent firms	Herfindahl index	2015	National	Amadeus database	-
Border region	Variable equal to one if the region's population lives within a 25km buffer zone along a land border**		NUTS3	EU Commission DG Regio	+/-
Market size	GDP (EUR)	2013	NUTS2	Eurostat	+
Population density	The sum of the population in 1 km ² grid cells within a circle of 100 km radius, averaged by NUTS3 regions and weighted by the population of each grid cell located in the region.		NUTS3	EU Commission DG Regio	+/-
FDI concentration	The regional share of a sector's (2-digit NACE) employees employed in European owned firms	2015	NUTS3	Amadeus database	+

Note: Industry clusters, FDI concentration and the Herfindahl index are calculated by Copenhagen Economics using data from the Amadeus database. * Accessibility is measured using the European potential accessibility index for freight, obtained from TRACC (2015). For each NUTS3 region, the index value is computed as the sum of GDP in all other European regions weighted by the generalised travel cost by multimodal (non-unitised), road, rail, air and/or water to go there. **The typology used to identify border regions cover EU28 countries. Border regions in non-EU countries are therefore identified using a border typology from Eurostat and include both land and maritime border regions.

Source: ESPON FDI (2018) based on the sources listed in the table

1.2.3 The final dataset

In total, the final dataset covers 1,108 NUTS3 regions across 31 European countries cf. Table 2. The country coverage of the data means that the conclusions drawn cannot be generalised to the accession countries without further analysis.

Table 2 Country coverage of the final data set

Austria	Finland	Luxembourg	Slovakia
Belgium	France	Latvia	
Bulgaria	United Kingdom	Malta	
Switzerland	Greece	Netherlands	
Cyprus	Croatia	Norway	
The Czech Republic	Hungary	Poland	
Germany	Ireland	Portugal	
Denmark	Island	Romania	
Estonia	Italy	Sweden	
Spain	Lithuania	Slovenia	

Note: The tables lists the countries included in the final dataset.

Source: ESPON FDI (2018)

1.3 Testing the impact of regional drivers on the location of European owned firms

In order to examine whether the location of non-European owned firms can be explained by the selected regional characteristics, we use a so-called conditional logit model in which we estimate the likelihood of a given foreign firm to locate in a given NUTS3 region given the different regional characteristics and the national characteristics, controlled for via the inclusion of national dummies, cf. Box 2.

As we do not have data for the allowance of investment incentives for all 31 countries, we start by estimating a baseline model, in which we exclude this variable, and which therefore covers all 31 countries listed in Box 2. We then estimate an extended model including investment incentives covering 28 countries.⁵ As the estimated impacts of the variables included in both specifications change very little across the two specifications, we are confident that the results pertaining to investment incentives, which we obtain based on the smaller sample covering 28 countries can be generalised to all 31 countries.

Box 2 Conditional logit model used to estimate drivers of FDI

The baseline model we use looks as follows:

$$pr(reg^k = i | X_{ji}) = f(X_{ji} = (Level\ of\ innovation_i, Accessibility_i, Tertiary\ education_i, Labour\ abundance_i, Strength\ of\ industry\ clusters_{ij}, Dominance\ of\ incumbent\ firms_j, Border\ region_i, Market\ size_i, Population\ density_i, Regional\ FDI\ concentration_{ij}))$$

Where the probability that firm k decides to locate in region i in sector j is the dependent variable, and the regional factors are measured using the specific variables listed in Table 1, where GDP (used to proxy for market size) and population density are measured in logs. The model furthermore includes a full set of country dummies.

Source: ESPON FDI (2018) based on literature survey

⁵ The countries for which there is no data on the allowance of investment incentives are Switzerland, Island and Norway.

A detailed description of the model and guidance on how to interpret the results are provided in the scientific report *Drivers of extra-European FDI towards Europe*.

2 Drivers of intra-European FDI: Results

A detailed discussion of the reasons underlying the different splits of the data across sectors, types of FDI and regions, is contained in the scientific report *Drivers of extra-European FDI towards Europe*.

2.1 Drivers of FDI across all regions and sectors

Column (1) in Table 3 contains the results for the full sample of European owned firms (approximately 299,000 firms) across all regions and sectors.

Due to the large number of location choices (NUTS3 regions) covered by the data, the coefficients approximate the magnitude of the average probability elasticities.⁶ This means that the coefficients can be interpreted as the change in the probability of a European owned firm being located in a given region, when the value of the respective explanatory variable is increased by one per cent.

The results show that the factors that increase the probability of hosting intra-European FDI include: Strong industry clusters, a greater labour abundance, a higher level of education, greater accessibility, a higher level of innovation, a higher concentration of European owned firms (FDI concentration), a greater population density and a larger market size. The factors that lower the probability are being a border regions and a strong dominance of incumbent firms.

⁶ See the scientific report, *Drivers of extra-European FDI towards Europe*, for further details.

Table 3 Drivers of FDI across all regions

	All (1)	Extended model (2)
Strength of industry clusters	1.839*** (0.0198)	1.849*** (0.0203)
Labour abundance	0.104*** (0.00101)	0.0969*** (0.00104)
Tertiary education	0.0932*** (0.000430)	0.0936*** (0.000466)
Accessibility	0.0356*** (0.000311)	0.0374*** (0.000331)
Level of innovation	0.000318*** (1.63e-05)	0.000356*** (1.69e-05)
FDI concentration	1.357*** (0.0211)	1.355*** (0.0215)
Population density	0.250*** (0.00552)	0.225*** (0.00561)
Market size	0.115*** (0.00497)	0.144*** (0.00507)
Border region	-0.0778*** (0.00498)	-0.0914*** (0.00515)
Dominance of incumbent firms	-2.943*** (0.0294)	-2.994*** (0.0299)
Investment incentives allowed		0.116*** (0.00656)
Observations	331,049,348	303,744,744
Number of firms	298,781	286,012
Number of regions	1,108	1,062
Pseudo R2	0.160	0.166

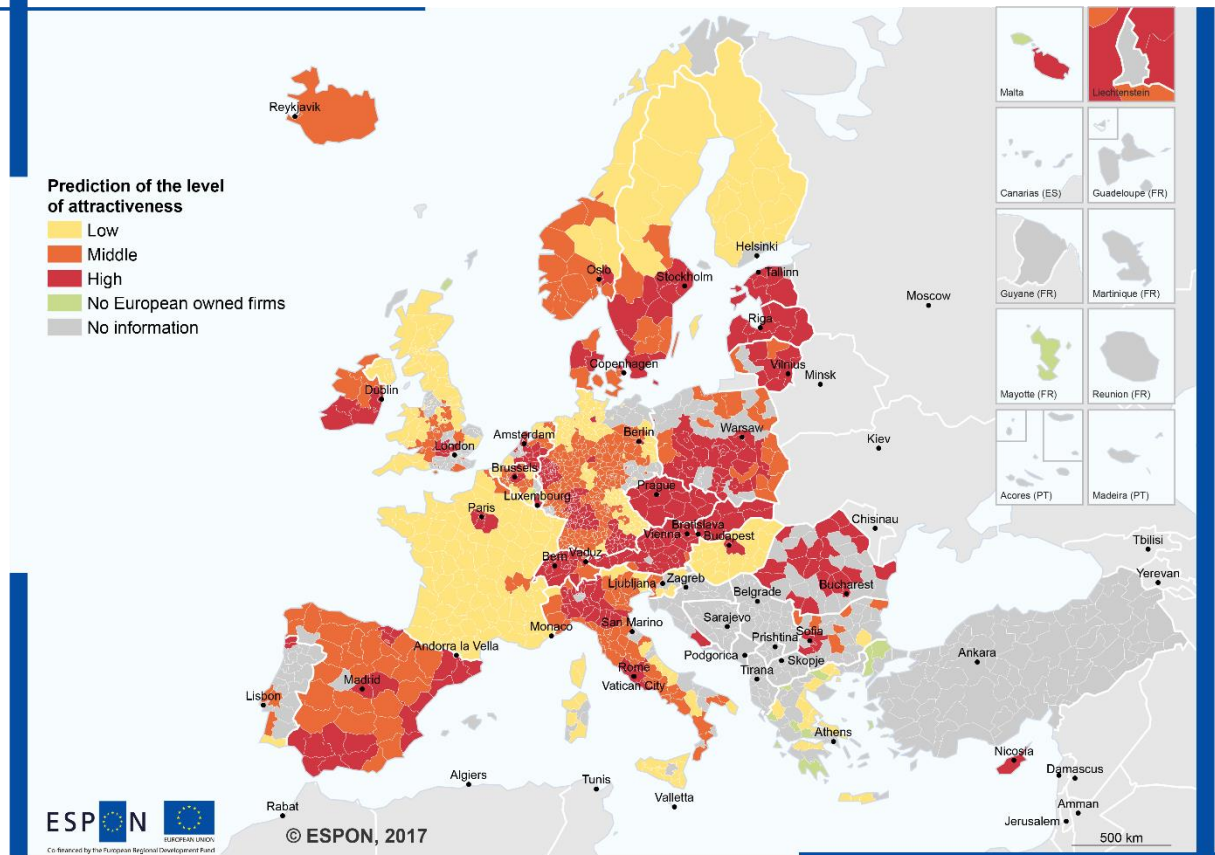
Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The number of observations is the number of European owned firms times the number of NUTS3 regions. All regressions include a full set of country dummies.

Source: ESPON FDI (2018) based on data described in Chapter 1

Based on the same model used to generate the results shown in column (1) in Table 3, the predicted attractiveness of all NUTS3 regions included in the data, are calculated. Based on these predicted values of attractiveness, each region is then divided into one of three categories: 'High', 'Middle' and 'Low', where the category 'High' includes the third most attractive regions, the category 'Low' includes the third least attractive regions and the category 'Middle' includes the remaining regions. The results show that especially regions in which the national capital is located, and the surrounding regions tend to be 'High' attractiveness regions, cf. Map 1.

Map 1 The predicted attractiveness of European regions towards intra-European investments

Predicted attractiveness by region in 2015



Regional level: NUTS 3 (2013)
 Source: The World in Europe, global FDI flows towards Europe, 2017
 Origin of data: Copenhagen Economics based on BvD's Amadeus, 2016
 © UMS RIATE for administrative boundaries

Note: The category 'High' attractiveness includes the third most attractive regions, and the category 'Low' includes the third least attractive regions. The category 'Middle' includes the remaining regions.

Source: ESPON FDI (2018) based on data described in Chapter 1

The results for the extended model that covers the subset of regions in the 28 countries for which we have data on the allowance of investment incentives, show that regions that allow for the use of investment incentives are more likely to host foreign firms than regions where such incentives are not allowed, cf. Column (2) in Table 3. The results are, however, only indicative as we do not know to what extent such investment incentives are actually being used in the regions. Also, we do not know if this is an efficient and sustainable way of increasing FDI into these regions, particularly since the impact is relatively small.

2.2 Drivers of FDI across sectors and types of investments

The majority of the European owned firms in our data are found in the service sector. Of the 299,000 firms included in the analysis, 77 per cent are thus in services while 12 per cent are in manufacturing. The remaining 11 per cent are either in other sectors (e.g. agriculture, water and electricity supply), construction or do not have any information on sector affiliation.

Columns (1) and (2) in Table 4 contain the results obtained when we allow the FDI drivers to differ for firms in the manufacturing and service sectors, respectively.

The results show that European investors in the service sector place more emphasis on:

- Labour abundance
- Tertiary education
- Market size
- Border region (negative)
- Dominance of incumbent firms (negative)

The results show that European investors in the manufacturing sector place more emphasis on:

- Strength of industry clusters
- FDI concentration
- Population density

Table 4 Drivers of FDI across sectors and types of investment

	Manufacturing (1)	Services (2)	M&A (3)	Others (4)
Strength of industry clusters	2.824*** (0.0730)	1.285*** (0.0251)	2.302*** (0.143)	1.827*** (0.0200)
Labour abundance	0.0194*** (0.00313)	0.124*** (0.00115)	0.0440*** (0.00787)	0.105*** (0.00102)
Tertiary education	0.0499*** (0.00127)	0.107*** (0.000528)	0.0747*** (0.00356)	0.0936*** (0.000433)
Accessibility	0.0257*** (0.000845)	0.0405*** (0.000368)	0.0181*** (0.00220)	0.0360*** (0.000315)
Level of innovation	0.000696*** (4.66e-05)	0.000262*** (1.82e-05)	0.000878*** (9.82e-05)	0.000305*** (1.65e-05)
FDI concentration	1.803*** (0.0441)	0.768*** (0.0278)	2.328*** (0.143)	1.350*** (0.0214)
Population density	0.317*** (0.0162)	0.269*** (0.00645)	0.354*** (0.0402)	0.248*** (0.00557)
Market size	-0.0638*** (0.0143)	0.192*** (0.00582)	0.170*** (0.0379)	0.114*** (0.00501)
Border region	0.0963*** (0.0138)	-0.137*** (0.00576)	-0.0984*** (0.0371)	-0.0778*** (0.00503)
Dominance of incumbent firms	-1.305*** (0.0706)	-3.638*** (0.0404)	-1.814*** (0.184)	-2.969*** (0.0298)
Observations	38,204,948	254,719,228	5,255,244	325,794,104
Number of firms	34,481	229,891	4,743	294,038
Number of regions	1,108	1,108	1,108	1,108
Pseudo R2	0.104	0.171	0.133	0.162

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The number of observations is the number of European owned firms times the number of NUTS3 regions. All regressions include a full set of country dummies.

Source: ESPON FDI (2018) based on data described in Chapter 1

Of the total number of European owned firms included in the analysis, we can identify a small share of firms, which we know for certain that European investors have acquired via M&As (4743 firms). Due to a number of data limitations it has not been possible to identify the type of investment for the remaining firms, which can thus be greenfield investments, reinvestments or M&As, which we have not been able to identify. Thus, while we do split the data into M&As and other investments based on this information, the results should be compared with caution and no conclusions regarding greenfield investments can be made.

The results displayed in column (3) show that M&As place more emphasis on:

- Strength of industry clusters
- FDI concentration
- Population density
- Market size

2.3 Drivers of FDI across urban-rural regions

The impacts of the different drivers on FDI location in rural, intermediate and urban regions are displayed in Table 5.

Table 5 Drivers of FDI across urban-rural regions

	Urban regions (1)	Intermediate regions (2)	Rural regions (3)
Strength of industry clusters	1.204*** (0.0298)	1.956*** (0.0466)	1.819*** (0.0669)
Labour abundance	0.134*** (0.00156)	-0.0448*** (0.00228)	-0.103*** (0.00376)
Tertiary education	0.142*** (0.000816)	0.0244*** (0.00113)	0.0221*** (0.00207)
Accessibility	0.0438*** (0.000551)	0.0190*** (0.000644)	0.0273*** (0.00115)
Level of innovation	-0.000484*** (2.38e-05)	0.000490*** (3.68e-05)	0.00111*** (9.11e-05)
FDI concentration	0.581*** (0.0347)	1.671*** (0.0320)	1.963*** (0.0625)
Population density	-0.751*** (0.0129)	0.145*** (0.0125)	0.208*** (0.0169)
Market size	0.430*** (0.00947)	-0.00561 (0.00948)	-0.282*** (0.0148)
Border region	0.000999 (0.00963)	0.304*** (0.00888)	0.0520*** (0.0175)
Dominance of incumbent firms	-3.242*** (0.0462)	-2.395*** (0.0407)	-3.569*** (0.114)
Observations	50,676,486	45,500,144	10,814,724
Number of firms	172,369	93,238	33,174
Number of regions	294	488	326
Pseudo R2	0.194	0.163	0.176

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The number of observations is the number of European owned firms times the number of NUTS3 regions. All regressions include a full set of country dummies.

Source: ESPON FDI (2018) based on data described in Chapter 1

The results show that in urban regions, investors place special emphasis on:

- Labour abundance
- Tertiary education
- Population density (negative)
- Market size
- Dominance of incumbent firms (negative)

The results show that in intermediate regions, investors place special emphasis on:

- Strength of industry clusters
- FDI concentration
- Border region

The results show that in rural regions, investors place special emphasis on:

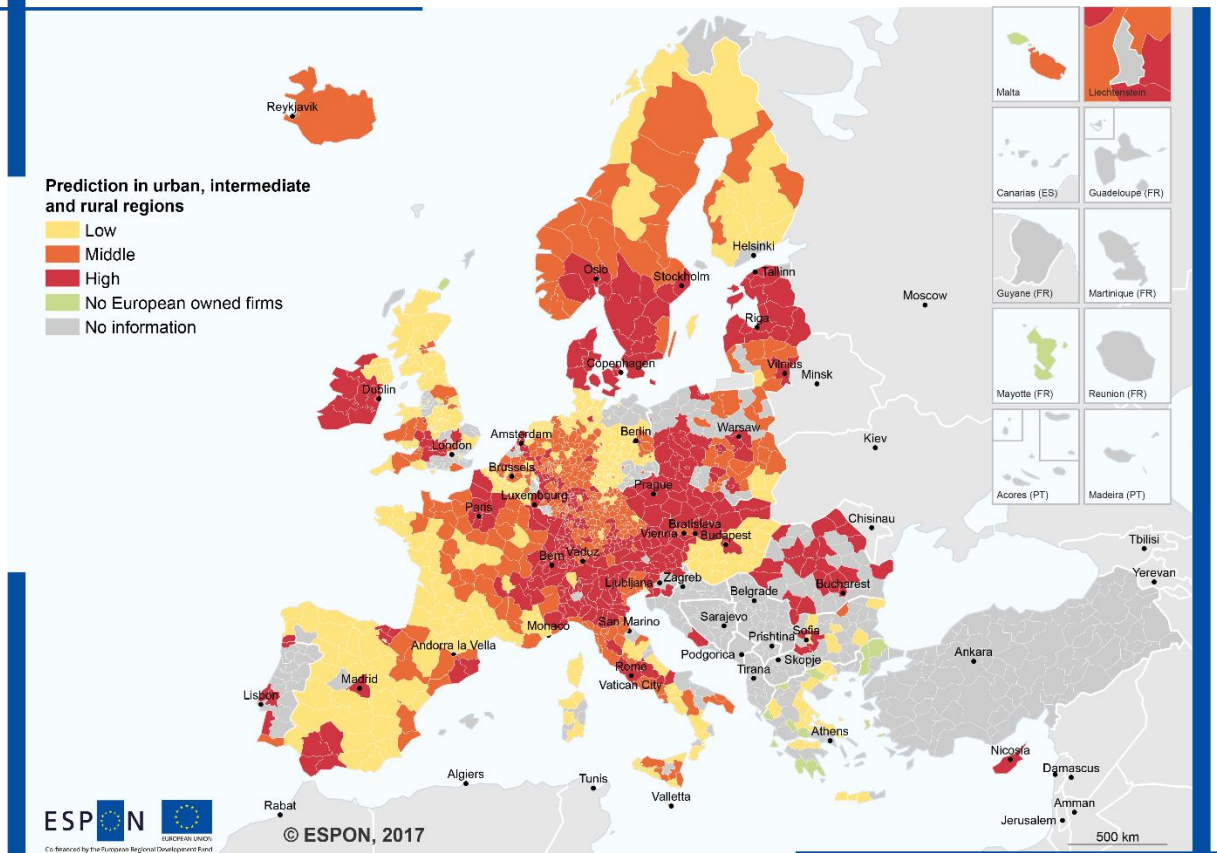
- Strength of industry clusters
- FDI concentration
- Market size (negative)
- Dominance of incumbent firms (negative)

As the importance of the various drivers and the potential for attracting intra-European FDI differ across the three types of regions, we predict the attractiveness of individual NUTS3 regions in each type of region separately. Each NUTS3 region is then classified as 'High', 'Middle' or 'Low', where the category 'High' includes the third most attractive regions *within each type of region*, the category 'Low' includes the third least attractive regions *within each type of region* and the category 'Middle' includes the remaining regions. Each region is thus classified into categories of attractiveness, based on a comparison with other regions of the same type.⁷ The results are displayed in the map in Map 2. Peer-to-peer comparisons change the relative attractiveness of regions significantly from the equivalent map shown in Map 1, where the classification of attractiveness was determined relative to all regions, regardless of type.

⁷ This means that the attractiveness of a given rural region is determined relative to other rural regions only, and similarly for intermediate and urban regions.

Map 2 The predicted attractiveness of urban-rural regions towards intra-European investments

Predicted attractiveness by region in 2015



Note: The category 'High' attractiveness includes the third most attractive regions, for each type of region, and the category 'Low' includes the third least attractive regions, for each type of region. The category 'Middle' includes the remaining regions.

Source: ESPON FDI (2018) based on data described in Chapter 1

2.4 Drivers of FDI across metropolitan regions

The impacts of the different drivers on intra-European FDI location in capital metropolitan regions, other metropolitan regions and non-metropolitan regions are displayed in Table 6.

Table 6 Drivers of FDI across metropolitan regions

	Capital metropolitan regions (1)	Other metropolitan regions (2)	Non-metropolitan regions (3)
Strength of industry clusters	1.153*** (0.0300)	4.635*** (0.0654)	1.841*** (0.0550)
Labour abundance	0.136*** (0.00384)	0.112*** (0.00211)	-0.0170*** (0.00227)
Tertiary education	0.108*** (0.00170)	0.0846*** (0.00114)	0.0101*** (0.00132)
Accessibility	0.220*** (0.00191)	0.0637*** (0.000624)	0.0294*** (0.000692)
Level of innovation	0.00186*** (0.000121)	7.89e-05*** (2.18e-05)	0.000860*** (3.86e-05)
FDI concentration	0.562*** (0.0355)	2.219*** (0.0385)	1.689*** (0.0395)
Population density	0.666*** (0.126)	-0.732*** (0.0134)	0.345*** (0.0116)
Market size	0.0703** (0.0275)	0.297*** (0.0103)	-0.132*** (0.00915)
Border region	0.307*** (0.0203)	0.266*** (0.00912)	0.410*** (0.00974)
Dominance of incumbent firms	-2.557*** (0.0373)	-2.892*** (0.0676)	-3.714*** (0.0747)
Observations	8,681,097	36,322,300	50,995,397
Number of firms	125,813	95,585	77,383
Number of regions	69	380	659
Pseudo R2	0.205	0.0999	0.130

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The number of observations is the number of European owned firms times the number of NUTS3 regions. All regressions include a full set of country dummies.

Source: ESPON FDI (2018) based on data described in Chapter 1

The results show that in capital metropolitan regions, investors place special emphasis on:

- Labour abundance
- Tertiary education
- Accessibility
- Population density

The results show that in other metropolitan regions, investors place special emphasis on:

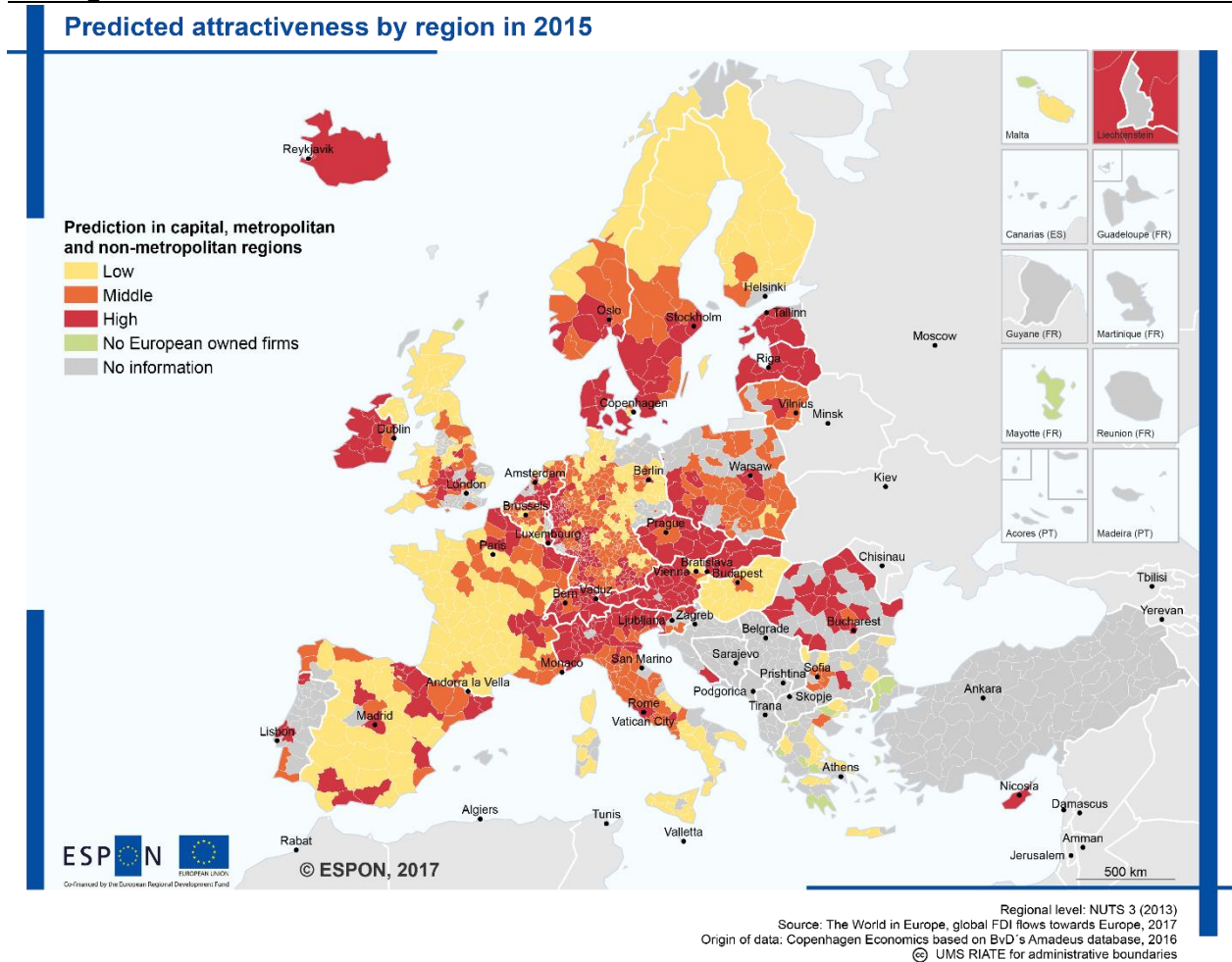
- Strength of industry clusters
- Labour abundance
- Tertiary education
- FDI concentration
- Population density (negative)
- Market size

The results show that in non-metropolitan regions, investors place special emphasis on:

- FDI concentration
- Border region
- dominance of incumbent firms (negative)

Again, as the importance of the various drivers and the potential for attracting intra-European FDI differ across the three types of metropolitan regions, we predict the attractiveness of individual NUTS3 regions relative to their peers in each type of metropolitan region separately. The results are displayed in the map in Map 3.

Map 3 The predicted attractiveness of metropolitan regions towards intra-European investments



Note: The category 'High' attractiveness includes the third most attractive regions, for each type of region, and the category 'Low' includes the third least attractive regions, for each type of region. The category 'Middle' includes the remaining regions.

Source: ESPON FDI (2018) based on data described in Chapter 1

2.5 Drivers of FDI across regions with different levels of development

The impacts of the different drivers on intra-European FDI location in more developed regions, transition regions and less developed regions are displayed in Table 7.

Table 7 Drivers of FDI across regions with different levels of development

	More developed regions (1)	Transition regions (2)	Less developed regions (3)
Strength of industry clusters	1.386*** (0.0244)	0.674*** (0.0862)	1.950*** (0.0686)
Labour abundance	0.234*** (0.00157)	0.0605*** (0.00486)	-0.0297*** (0.00266)
Tertiary education	0.113*** (0.000666)	0.0104*** (0.00261)	0.0612*** (0.00170)
Accessibility	0.0331*** (0.000475)	-0.00567*** (0.00105)	0.0397*** (0.000934)
Level of innovation	0.000276*** (1.85e-05)	0.00108*** (7.56e-05)	-0.00288*** (0.000242)
FDI concentration	0.878*** (0.0287)	1.823*** (0.0699)	1.987*** (0.0510)
Population density	-0.0512*** (0.00903)	0.531*** (0.0195)	0.449*** (0.0161)
Market size	0.142*** (0.00631)	0.156*** (0.0205)	0.0162 (0.0183)
Border region	0.0651*** (0.00671)	0.653*** (0.0225)	0.0636*** (0.0138)
Dominance of incumbent firms	-2.645*** (0.0316)	-2.744*** (0.115)	-4.261*** (0.130)
Observations	122,068,483	5,400,168	15,490,668
Number of firms	207,247	24,216	57,801
Number of regions	589	223	268
Pseudo R2	0.190	0.209	0.214

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The number of observations is the number of European owned firms times the number of NUTS3 regions. All regressions include a full set of country dummies.

Source: ESPON FDI (2018) based on data described in Chapter 1

The results show that in more developed regions, investors place special emphasis on:

- Labour abundance
- Tertiary education
- Market size

The results show that in transition regions, investors place special emphasis on:

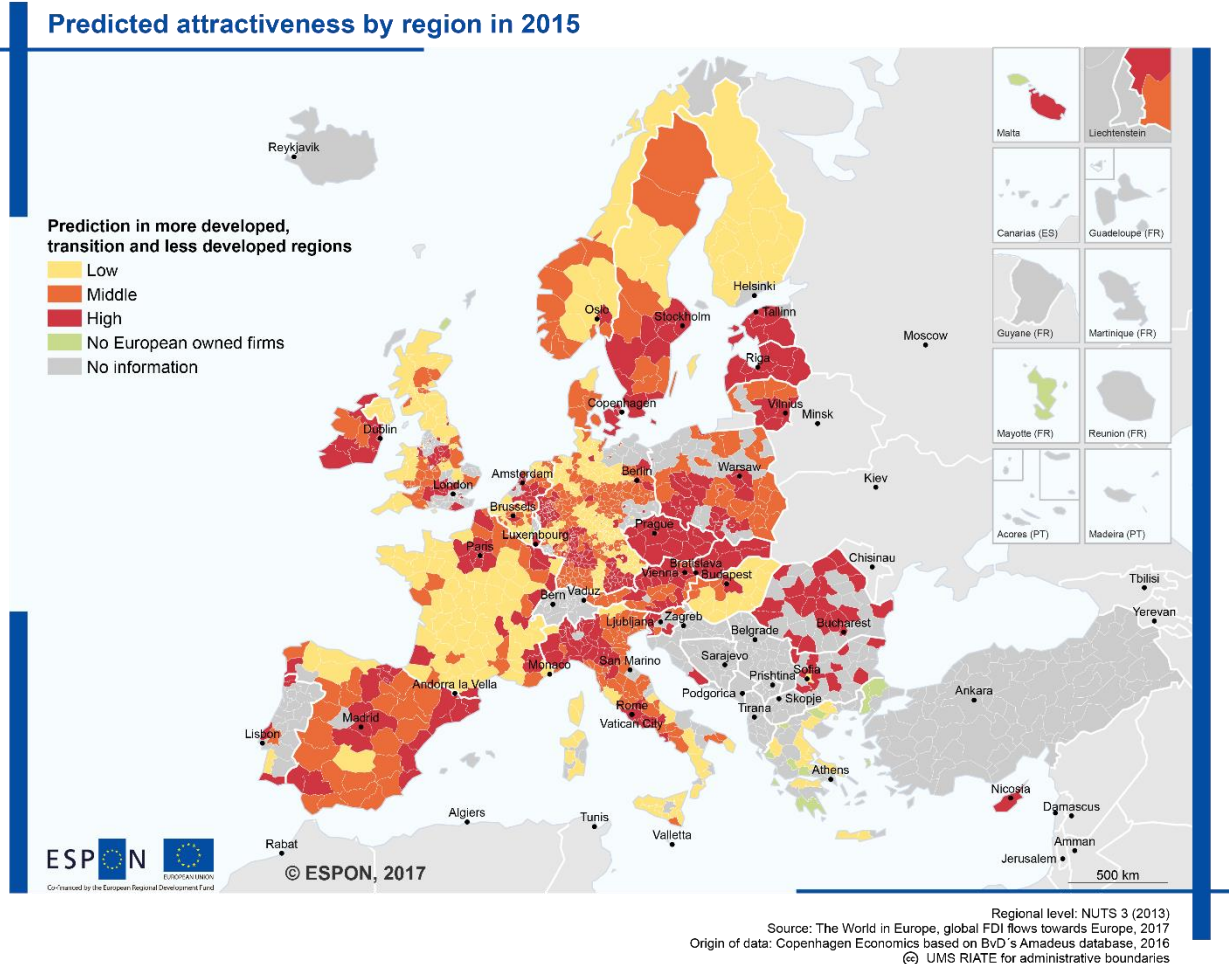
- FDI concentration
- Population density
- Market size
- Border region

The results show that in less developed regions, investors place special emphasis on:

- Strength of industry clusters
- FDI concentration
- Population density
- Dominance of incumbent firms (negative)

The predicted attractiveness of individual NUTS3 regions relative to their peers with similar level of development is shown in Map 4.

Map 4 The predicted attractiveness of regions with different levels of economic development towards intra-European investments



Note: The category 'High' attractiveness includes the third most attractive regions, for each type of region, and the category 'Low' includes the third least attractive regions, for each type of region. The category 'Middle' includes the remaining regions.

Source: ESPON FDI (2018) based on data described in Chapter 1

3 Spillovers from intra-European FDI: Methodology

In this chapter, we describe the methodology used to estimate the spillovers arising from European FDI. A detailed discussion of how spillovers arise is provided in the scientific report *Impacts of extra-European FDI towards Europe*.

3.1 Empirical Methodology

As research shows that geographical proximity between foreign and local firms is expected to facilitate spillovers, we conduct the analysis of spillovers at the regional level. More specifically, we examine the extent of spillovers from European owned firms to local firms (i.e. domestically owned firms) within NUTS3 regions in Europe. All non-European owned firms are dropped from the analysis.

As European owned firms may impact local competitors differently than other local firms, including local buyers and suppliers, we conduct the analysis at two levels. *First*, we examine spillovers arising from European owned firms to local firms within the same industry in a given NUTS3 region (i.e. intra-industry spillovers). *Second*, we examine spillovers arising from European owned firms to local firms across all industries within a given NUTS3 region (i.e. broader regional spillovers).⁸

The methodology used to estimate productivity and employment spillovers is briefly explained below. A more detailed account can be found in the scientific report, *Impacts of extra-European FDI towards Europe*.

3.1.1 Productivity spillovers

In order to test how European owned firms affect the productivity of local firms, we follow the standard approach in the literature. We set up a model in which we regress a measure of firm-level productivity on a number of control variables and a measure of the concentration of European owned firms. When we look for intra-industry spillovers, the latter term varies at the industry and regional level. When we look for broader regional spillovers, the term varies at the regional level only.

Box 3 contains an overview of the model we use to estimate intra-industry spillovers.

⁸ As the analysis is undertaken at the NUTS3 level, we use a fairly aggregated industry classification (2-digit NACE) to ensure that we have a sufficient number of firms across the different region/industry combinations to undertake the analysis. This means that the analysis conducted at the intra-industry level will pick up spillovers arising from foreign firms to their local competitors as well as to local buyers and suppliers within the same 2-digit industry. The broader analysis will in addition pick up spillovers to local firms in other industries, including local buyers and suppliers outside of the same 2-digit NACE industry.

Box 3 Intra-industry spillover model

The model we use to estimate *intra-industry* spillovers looks as follows:

$$\ln \text{labour productivity}_{ijk} = f(\text{FDI concentration}_{ji}, \ln \text{capital intensity}_{ijk}, \text{age}_{ijk}, \text{age}_{ijk}^2, \text{region/industry size}_{ij}, \text{growth GDP per capita}_i)$$

Where the log of labour productivity of a given firm (*k*) in a given 2-digit NACE industry (*j*) in a given NUTS3 region (*i*) is modelled as a function of *FDI concentration* in the given 2-digit NACE industry and NUTS3 region and a number of firm-, industry- and regional level control variables. The model includes NACE 2 and country dummies.

Note: The model is slightly augmented version of the model used in Copenhagen Economics (2007).

Source: ESPON FDI (2018)

We follow the standard approach in the literature and measure *FDI concentration* by the per cent of employment by European owned firms among all other firms than firm *k*, within a given 2-digit NACE industry in a given NUTS3 region.

Table 8 contains an overview of all variables used in each of the two models.

Table 8 Variables used in the productivity spillover model

Variable	Definition	Intra-industry spillover model	Broader regional spillover model	Expected impact
Labour productivity (dependent variable)	Operating revenue per employee (log)	x	x	
FDI concentration (industry/region)	The sum of employees among European foreign owned firms in a given NACE 2 industry and NUTS3 region, as a percent of total employment by all European and domestically owned firms (less firm k) in a given NACE 2 industry and NUTS3 region	x		+/-
FDI concentration (region)	The sum of employees among European foreign owned firms in a given NUTS3 region as a percent of total employment by all European and domestically owned firms (less firm k) in a given NUTS3 region		x	+/-
Capital intensity	Tangible fixed assets per employee (log)	x	x	+
Age	The firm's age	x	x	+
Age squared	The square of the firm's age	x	x	-
Region/industry size	Per cent of total operating revenue across all firms in a given country, which is generated within a given NUTS3 region and NACE 4 industry	x		+
Region size	Per cent of total operating revenue across all firms in a given country, which is generated within a given NUTS3 region		x	+
Industry size	Per cent of total operating revenue across all firms in a given country, which is generated within a given NACE 4 industry		x	+
Growth GDP per capita	The average annual growth in regional (NUTS3) GDP per capita over the period 2010-2013	x	x	+

Note: Country and industry (NACE 2) dummies are also included in both models. Region/industry size varies at the NUTS3 region and NACE 4 industry level (as opposed to the NUTS3 regions and NACE 2 industry level). These variables have been included to control for selection driven by a narrow industry specialisation and to avoid a high correlation with our measure of FDI concentration. The measure is calculated as the per cent of the country's total operating revenue by *all firms* (as opposed to foreign firms only).

Source: ESPON FDI (2018). All variables, except growth in GDP per capita, are based on data from the Amadeus database. Data on regional GDP per capita are obtained from Eurostat's regional statistics

3.1.2 Employment effects

Box 4 contains an overview of the model we use to estimate employment effects, illustrated in the case of intra-industry effects.

Box 4 Employment effects

The model, we use to estimate intra-industry employment effects look as follows:

$$\ln \text{ employment}_{ijk} = f(\text{FDI concentration}_{ij}, \ln \text{ operating revenue}, \ln \text{ wage}_{ijk}, \ln \text{ capital intensity}_{ijk}, \text{age}_{ijk}, \text{age}_{ijk}^2, \text{region/industry size}_{ij}, \text{growth GDP per capita}_i)$$

Where the log of employment of a given firm (k) in a given NACE 2 industry (j) in a given NUTS3 region (I) is modelled as a function of a measure of *FDI concentration* and a number of firm-, industry-, and regional level control variables. The model includes NACE 2 and NUTS 2 dummies.

Note: The model is slightly augmented version of the model used in Copenhagen Economics (2007).

Source: ESPON FDI (2018)

As in the productivity models, we measure *FDI concentration* by the percent of employment by European owned firms among all other firms than firm *k*, within a given NACE 2 industry in a given NUTS3 region.

Table 9 contains an overview of all variables used in each of the two models.

Table 9 Variables used in the employment models

Variable	Definition	Intra industry model	Broader regional model	Expected impact
Employment (log) (dependent variable)	The number of employees	x	x	
FDI concentration (industry/region)	The sum of employees among European foreign owned firms in a given NACE 2 industry and NUTS3 region as a percent of total employment by all European and domestically owned firms (less firm k) in a given NACE 2 industry and NUTS3 region	x		+/-
FDI concentration (region)	The sum of employees among European foreign owned firms in a given NUTS3 region as a percent of total employment by all European and domestically owned firms (less firm k) in a given NUTS3 region		x	+/-
Operational revenue	Operational revenues (log)	x	x	+
Wage costs	The average cost per employee (log)	x	x	-
Capital intensity	Tangible fixed assets per employee (log)	x	x	-
Age	The firms age	x	x	+
Age squared	The square of the age of the firm	x	x	-
Region/industry size	Per cent of total operating revenue across all firms in a given country, which is generated within a given NUTS3 region and NACE 4 industry	x		+
Region size	Per cent of total operating revenue across all firms in a given country, which is generated within a given NUTS3 region		x	+
Industry size	Per cent of total operating revenue across all firms in a given country, which is generated within a given NACE 4 industry		x	+
Growth GDP per capita	The average annual growth in regional (NUTS3) GDP per capita over the period 2010-2013	x	x	+

Note: NUTS2 and industry (NACE 2) dummies are also included in both models.

Source: ESPON FDI (2018). All variables, except growth in GDP per capita, is based on data from the Amadeus database. Data on regional GDP per capita is obtained from Eurostat's regional statistics

3.2 Data

The firm-level data used is cross-section data for 2015 obtained from Bureau van Dijk's Amadeus database. A description of this data source can be found in the scientific report *Impacts of extra-European FDI towards Europe*.

The productivity analysis includes 34 European countries, whereas only 30 European countries are included in the employment analysis. This is so because the Amadeus database applied in this study does not include employment data for Cyprus, Greece, Lithuania and Turkey.

Table 10 Country coverage of the spillover and employment analyses

Austria	Hungary	Poland
Belgium	Ireland	Portugal
Bulgaria	Iceland	Romania
Croatia	Italy	Switzerland
Cyprus*	Latvia	Slovakia
Czech Republic	Lichtenstein	Slovenia
Denmark	Lithuania*	Spain
Estonia	Luxembourg	Sweden
Finland	The former Yugoslav Republic of Macedonia (FYROM)	Turkey*
France	Malta	United Kingdom
Germany	Netherlands	
Greece*	Norway	

Note: The table contains a list of all 34 countries, which are included in the data used for the spillover analyses. Observations from all 30 countries are included in the productivity spillover analyses. No observations from countries with an (*) are included in the employment models, due to missing information on wage costs.

Source: ESPON FDI (2018)

4 Spillovers intra-European FDI: Results across all regions

4.1 Spillovers from non-European owned firms to local firms across all regions

In order to test for spillovers from European owned firms to local firms, we first conduct the spillover analyses across all regions.

4.1.1 Results: Intra-industry productivity spillovers

The results show that a one percentage point increase in the FDI concentration, within a given region and industry, is on average associated with a 0.3 per cent increase in labour productivity among local firms within the same region and industry, cf. Table 11.

Table 11 Intra-industry productivity spillovers: Results across all regions

	All firms	Manufacturing	Services
	(1)	(2)	(3)
FDI concentration	0.00320*** (0.000282)	0.000886*** (0.000198)	0.00475*** (0.000429)
Capital intensity (log)	0.186*** (0.00143)	0.205*** (0.00272)	0.179*** (0.00168)
Age	0.00195*** (0.000145)	0.00243*** (0.000202)	0.00182*** (0.000216)
Age squared	-6.31e-06*** (9.49e-07)	-5.55e-06*** (9.92e-07)	-7.16e-06*** (1.64e-06)
Region/industry size	0.138*** (0.0417)	0.275** (0.140)	0.127*** (0.0438)
GDP per capita growth	0.000769 (0.00194)	0.00199 (0.00230)	0.00132 (0.00230)
Constant	4.126*** (0.0306)	3.931*** (0.0306)	4.586*** (0.0247)
Observations	1,632,596	243,108	1,098,697
R-squared	0.429	0.468	0.439

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3/2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Positive labour productivity spillovers are found in both manufacturing and services.

Table A.1 – Table A.3 in Appendix A contain results for subsectors in both manufacturing and services.

The results indicate that there are positive intra-industry spillovers within the manufacturing of:

- Food, beverages and tobacco
- Chemicals, pharmaceutical and plastics
- Mineral and metal products

- Computer and electronic equipment
- Other products

While no evidence of intra-industry productivity spillovers are found within the manufacturing of:

- Textiles, apparel and leather products
- Wood, paper products and printing
- Machinery
- Motor vehicles and transport equipment

Within services, we find evidence of intra-industry productivity spillovers in all sub-sectors.

Table A.4 in Appendix A contains results for local firms of different sizes. The results show that local firms of all sizes benefit from intra-industry productivity spillovers, but that spillovers accruing to micro firms and SMEs exceed spillovers accruing to larger firms.⁹

Finally, Table A.5 in Appendix A contains the results for different types of FDI and show that the subset of M&As, we have been able to identify, are associated with spillovers of a similar size as all other FDI projects.¹⁰

4.1.2 Results: Broader regional productivity spillovers

As in the case of intra-industry spillovers, the results on broader regional productivity also indicate a presence of positive productivity spillovers cf. Table 12.

⁹ We define a firm as being an SME if it has between 10 and 250 employees, operating revenue between 2 and EUR 50 million or total assets between 2 and EUR 43 million. Firms that have more than 250 employees, operating revenues in excess of EUR 50 million or total assets exceeding EUR 43 million are classified as large. All remaining firms (i.e. less than 10 employees or with operating revenue or total assets less than EUR 2 million) are classified as micro firms.

¹⁰ See the scientific report, *Impacts of extra-European FDI towards Europe* for a more detailed explanation of the data limitations that make it impossible to track how the existing non-European firms located in Europe were originally established. The same limitations apply to European owned firms.

Table 12 Broader regional productivity spillovers: Results across all regions

	All firms (1)	Manufacturing (2)	Services (3)
FDI concentration	0.00901*** (0.00105)	0.00621*** (0.000963)	0.00912*** (0.00110)
Capital intensity	0.185*** (0.00327)	0.206*** (0.00420)	0.178*** (0.00329)
Age	0.00184*** (0.000262)	0.00237*** (0.000263)	0.00165*** (0.000330)
Age squared	-6.45e-06*** (1.19e-06)	-5.79e-06*** (1.21e-06)	-6.97e-06*** (1.81e-06)
Industry size	0.0588*** (0.00791)	0.0409*** (0.0128)	0.0630*** (0.00888)
Regional size	0.00382*** (0.000532)	0.00409*** (0.000485)	0.00397*** (0.000561)
GDP per capita growth	0.00281 (0.00257)	0.00465 (0.00304)	0.00297 (0.00281)
Constant	4.042*** (0.0369)	3.842*** (0.0409)	4.466*** (0.0289)
Observations	1,642,084	244,569	1,100,355
R-squared	0.434	0.469	0.442

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Broader productivity spillovers arise from investments in both manufacturing and services.

Both within manufacturing and services, we find evidence of broader regional productivity spillovers arising from all sub-sectors.

Table A.9 in Appendix A contains results for local firms of different sizes. The results show that local firms of all sizes benefit from broader regional productivity spillovers, but that spillovers accruing to micro firms and SMEs exceed spillovers accruing to larger firms.

Finally, Table A.10 in Appendix A contains the results for different types of FDI and show that the subset of M&As, we have been able to identify, are associated with broader regional spillovers of a similar size as all other FDI projects

4.1.3 Results: Employment effects

Table 13 shows the results for intra-industry employment effects. Overall, we find no evidence of any employment effect. This result holds when we test the impact of FDI on labour demand among local firms across different regional typologies. In services there is a very small negative effect, significant at the 1 per cent level. As this effect is very small, we conclude that overall there are no strong evidence of any intra-industry effects. For broader regional employment effects, we do find a very small negative effect for all firms but do not find any evidence in manufacturing or services, cf. Table 14.

Table 13 Intra-industry employment effects: Results across all regions

	All firms (1)	Manufacturing (2)	Services (3)
FDI concentration	-8.65e-05 (0.000198)	0.000127 (0.000163)	-0.000833*** (0.000318)
Operational revenue	0.670*** (0.00297)	0.740*** (0.00221)	0.656*** (0.00396)
Wage costs	-0.338*** (0.00401)	-0.385*** (0.00609)	-0.337*** (0.00512)
Capital intensity	-0.127*** (0.00116)	-0.118*** (0.00209)	-0.123*** (0.00146)
GDP per capita growth	0.00165 (0.00158)	-5.33e-05 (0.00206)	0.00146 (0.00201)
Age	0.0119*** (0.000270)	0.00800*** (0.000250)	0.0125*** (0.000443)
Age squared	-2.22e-05*** (2.98e-06)	-1.23e-05*** (1.88e-06)	-2.50e-05*** (5.60e-06)
Region/industry size	-0.0367 (0.0236)	-0.00578 (0.0293)	-0.0424 (0.0268)
Constant	0.196 (0.149)	-0.203 (0.225)	0.260 (0.197)
Observations	1,345,436	199,827	909,925
R-squared	0.777	0.824	0.759

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of employment. All regressions include NUTS2 and NACE 2 dummies. Standard errors are clustered at the NUTS3/ 2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Table 14 Broader regional employment effects: Results across all regions

	All firms (1)	Manufacturing (2)	Services (3)
FDI concentration	-0.000952* (0.000575)	0.000356 (0.000741)	-0.000694 (0.000606)
Operational revenue	0.671*** (0.00737)	0.739*** (0.00473)	0.658*** (0.00876)
Wage costs	-0.339*** (0.0121)	-0.383*** (0.0116)	-0.339*** (0.0135)
Capital intensity	-0.126*** (0.00195)	-0.118*** (0.00309)	-0.122*** (0.00202)
GDP per capita growth	0.00244** (0.00118)	0.00157 (0.00158)	0.00181 (0.00112)
Age	0.0119*** (0.000476)	0.00803*** (0.000329)	0.0125*** (0.000612)
Age squared	-2.21e-05*** (3.23e-06)	-1.24e-05*** (1.92e-06)	-2.49e-05*** (5.67e-06)
Industry size	-0.0170*** (0.00417)	0.0842*** (0.0147)	-0.0225*** (0.00457)
Regional size	-0.00175*** (0.000298)	-0.00399*** (0.000469)	-0.00114*** (0.000382)
Constant	0.209 (0.145)	-0.261* (0.156)	0.275** (0.124)
Observations	1,351,468	200,862	911,109
R-squared	0.777	0.825	0.759

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of employment. All regressions include NUTS2 and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

Source: ESPON FDI (2018) based on data from the Amadeus database

5 Spillovers intra-European FDI: Results across different types of regions

5.1 Spillovers from European owned firms to local firms across urban-rural regions

In order to test whether productivity spillovers from foreign to local firms differ between the three types of regions, we conduct the spillover analysis separately for each type of region.

5.1.1 Results: Intra-industry productivity spillovers

The results for rural, intermediate and urban regions are displayed in Table 15. The results show that there are intra-industry productivity spillovers in all regions but these are largest in urban regions.

Table 15 Intra-industry productivity spillovers across urban-rural regions

	Urban regions (1)	Intermediate regions (2)	Rural regions (3)
FDI concentration	0.00269*** (0.000474)	0.000937*** (0.000314)	0.00140*** (0.000371)
Capital intensity (log)	0.176*** (0.00240)	0.192*** (0.00198)	0.205*** (0.00277)
Age	0.00248*** (0.000289)	0.00195*** (0.000205)	0.000680*** (0.000234)
Age squared	-8.07e-06*** (2.38e-06)	-5.59e-06*** (1.52e-06)	-4.46e-06*** (1.21e-06)
Region/industry size	0.0729* (0.0387)	0.229*** (0.0771)	0.269*** (0.0792)
GDP per capita growth	-0.0104*** (0.00355)	0.00722*** (0.00255)	-0.00133 (0.00264)
Constant	4.125*** (0.0674)	4.163*** (0.0446)	4.090*** (0.0485)
Observations	665,359	586,790	380,445
R-squared	0.376	0.455	0.456

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3/2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

5.1.2 Results: Broader regional productivity spillovers

The results for rural, intermediate and urban regions are displayed in Table 16. The results show that there are broader regional productivity spillovers in all regions but these are largest in urban regions.

Table 16 Broader regional productivity spillovers across urban-rural regions

	Urban regions (1)	Intermediate regions (2)	Rural regions (3)
FDI concentration	0.0107*** (0.00200)	0.00742*** (0.00125)	0.00460*** (0.00133)
Capital intensity	0.176*** (0.00571)	0.190*** (0.00403)	0.203*** (0.00423)
Age	0.00234*** (0.000456)	0.00187*** (0.000370)	0.000662 (0.000429)
Age squared	-8.34e-06*** (3.00e-06)	-5.55e-06*** (1.91e-06)	-4.54e-06*** (1.24e-06)
Industry size	0.0414*** (0.0140)	0.0719*** (0.00953)	0.0668*** (0.0105)
Regional size	0.00282*** (0.000804)	0.00583*** (0.00202)	0.0106*** (0.00115)
GDP per capita growth	-0.00228 (0.00489)	0.00852** (0.00341)	-0.00119 (0.00252)
Constant	3.961*** (0.0710)	4.045*** (0.0505)	4.046*** (0.0600)
Observations	668,336	590,579	383,167
R-squared	0.378	0.460	0.460

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

Source: ESPON FDI (2018) based on data from the Amadeus database

5.2 Spillovers from European owned firms to local firms across metropolitan regions

In order to test whether productivity spillovers from foreign to local firms differ between the three types of regions, we conduct the spillover analysis separately for each type of region.

5.2.1 Results: Intra-industry productivity spillovers

The results for capital metropolitan, other metropolitan and non-metropolitan regions are displayed in Table 17. The results show that there are intra-industry productivity spillovers in all regions and that these are largest in other metropolitan regions.

Table 17 Intra-industry productivity spillovers by metropolitan regions

	Capital metropolitan regions (1)	Other metropolitan regions (2)	Non-metropolitan regions (3)
FDI concentration	0.00132** (0.000559)	0.00264*** (0.000384)	0.000973*** (0.000268)
Capital intensity (log)	0.171*** (0.00364)	0.185*** (0.00223)	0.198*** (0.00182)
Age	0.00200*** (0.000457)	0.00164*** (0.000204)	0.00194*** (0.000167)
Age squared	-6.22e-06** (2.92e-06)	-4.94e-06*** (1.47e-06)	-6.98e-06*** (1.08e-06)
Region/industry size	0.0421 (0.0271)	0.758*** (0.0791)	0.274*** (0.0585)
GDP per capita growth	-0.00645* (0.00381)	0.000276 (0.00363)	0.000413 (0.00215)
Constant	4.198*** (0.0943)	4.097*** (0.0602)	4.088*** (0.0366)
Observations	362,029	557,712	707,310
R-squared	0.367	0.412	0.465

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3/2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

5.2.2 Results: Broader regional productivity spillovers

The results for capital metropolitan, other metropolitan and non-metropolitan regions are displayed in Table 18. The results show that there are broader regional productivity spillovers in other metropolitan regions and non-metropolitan regions but no evidence of this is found in capital metropolitan regions. The productivity spillovers are largest in other metropolitan regions.

Table 18 Broader regional productivity spillovers by metropolitan regions

	Capital metropolitan regions (1)	Other metropolitan regions (2)	Non-metropolitan regions (3)
FDI concentration	0.00325 (0.00223)	0.00734*** (0.00149)	0.00722*** (0.000989)
Capital intensity	0.171*** (0.00851)	0.185*** (0.00519)	0.196*** (0.00365)
Age	0.00192** (0.000839)	0.00153*** (0.000358)	0.00186*** (0.000294)
Age squared	-6.25e-06** (3.04e-06)	-5.25e-06** (2.05e-06)	-7.00e-06*** (1.30e-06)
Industry size	0.0261 (0.0158)	0.0666*** (0.0110)	0.0775*** (0.00678)
Regional size	0.00482*** (0.00110)	0.0108*** (0.00224)	0.00708*** (0.000730)
GDP per capita growth	-0.00696 (0.00422)	0.00719 (0.00513)	0.00271 (0.00235)
Constant	4.077*** (0.109)	3.971*** (0.0691)	4.017*** (0.0456)
Observations	364,288	560,119	712,126
R-squared	0.370	0.414	0.469

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

Source: ESPON FDI (2018) based on data from the Amadeus database

5.3 Spillovers from European owned firms to local firms across regions with different levels of development

In order to test whether productivity spillovers from foreign to local firms differ between the three types of regions, we conduct the spillover analysis separately for each type of region.

5.3.1 Results: Intra-industry productivity spillovers

The results for more developed, transition and less developed regions are displayed in Table 19. The results show that there are intra-industry productivity spillovers in more developed regions and in less developed regions, while no evidence of this is found in transition regions. The productivity spillovers are largest in more developed regions.

Table 19 Intra-industry productivity spillovers by regions with different levels of development

	More developed regions (1)	Transition regions (2)	Less developed regions (3)
FDI concentration	0.00256*** (0.000367)	0.000330 (0.000487)	0.000930** (0.000368)
Capital intensity (log)	0.169*** (0.00185)	0.189*** (0.00247)	0.230*** (0.00279)
Age	0.00189*** (0.000174)	0.00211*** (0.000296)	0.000422 (0.000338)
Age squared	-6.55e-06*** (1.11e-06)	-7.01e-06*** (1.79e-06)	-3.91e-07 (1.53e-06)
Region/industry size	0.0860** (0.0366)	0.426** (0.172)	0.416*** (0.0864)
GDP per capita growth	-0.00285 (0.00253)	-0.000323 (0.00418)	0.00202 (0.00206)
Constant	4.098*** (0.0411)	3.828*** (0.0465)	4.018*** (0.0714)
Observations	945,721	194,882	486,987
R-squared	0.317	0.337	0.400

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3/2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

5.3.2 Results: Broader regional productivity spillovers

The results for more developed, transition and less developed regions are displayed in Table 19. The results show that there are broader regional productivity spillovers in all regions and these are largest in more developed regions.

Table 20 Broader regional productivity spillovers by regions with different levels of development

	More developed regions (1)	Transition regions (2)	Less developed regions (3)
FDI concentration	0.00781*** (0.00152)	0.00202* (0.00119)	0.00372*** (0.000830)
Capital intensity	0.169*** (0.00391)	0.188*** (0.00362)	0.229*** (0.00384)
Age	0.00183*** (0.000308)	0.00204*** (0.000449)	0.000345 (0.000669)
Age squared	-6.73e-06*** (1.38e-06)	-7.01e-06*** (2.17e-06)	-3.19e-07 (2.53e-06)
Industry size	0.0417*** (0.0109)	0.0625*** (0.0122)	0.0671*** (0.0112)
Regional size	0.00338*** (0.00121)	0.0173** (0.00771)	0.00769*** (0.000562)
GDP per capita growth	-0.000976 (0.00468)	-0.00175 (0.00628)	0.00121 (0.00233)
Constant	4.008*** (0.0513)	3.805*** (0.0533)	4.000*** (0.0459)
Observations	948,893	196,139	492,039
R-squared	0.319	0.338	0.403

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

Source: ESPON FDI (2018) based on data from the Amadeus database

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A. Appendix

Table A.1 Intra-industry productivity spillovers by manufacturing sub-sectors

	Food, beverages and tobacco	Textiles, apparel and leather prod.	Wood, paper and printing	Chemicals, pharma and plastics
	(1)	(2)	(3)	(4)
FDI concentration	0.00132** (0.000617)	0.000600 (0.000833)	0.000198 (0.000544)	0.000663* (0.000373)
Capital intensity (log)	0.326*** (0.00687)	0.206*** (0.0120)	0.197*** (0.00616)	0.200*** (0.00656)
Age	0.00787*** (0.000574)	0.00567*** (0.00116)	-0.000376 (0.000385)	0.000948** (0.000397)
Age squared	-1.41e-05*** (2.17e-06)	-4.42e-05*** (9.15e-06)	2.18e-06** (1.04e-06)	-2.70e-06** (1.05e-06)
Region/industry size	0.144*** (0.0542)	0.523* (0.304)	0.926*** (0.326)	0.991*** (0.291)
GDP per capita growth	0.00273 (0.00502)	0.00863 (0.00750)	0.000439 (0.00599)	-0.0104** (0.00516)
Constant	3.187*** (0.0821)	3.911*** (0.126)	4.009*** (0.0638)	4.405*** (0.119)
Observations	37,770	17,677	30,232	20,614
R-squared	0.519	0.557	0.499	0.483

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3/2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Table A.2 Intra-industry productivity spillovers by manufacturing sub-sectors

	Mineral and metal prod. (1)	Computer and electronic equipment (2)	Machinery (3)	Motor vehicles and transport equipment (4)	Other products (5)
FDI concentration	0.00103*** (0.000381)	0.00143*** (0.000432)	0.000704 (0.000527)	0.000737 (0.000530)	0.000968** (0.000464)
Capital intensity (log)	0.199*** (0.00473)	0.144*** (0.00736)	0.0945*** (0.00644)	0.156*** (0.0125)	0.163*** (0.00506)
Age	0.000757*** (0.000267)	0.000580 (0.000945)	-0.00173*** (0.000599)	0.00288** (0.00137)	0.00204*** (0.000688)
Age squared	-2.14e-06*** (7.74e-07)	-2.28e-06 (7.46e-06)	1.07e-05** (4.62e-06)	-2.98e-05*** (1.15e-05)	-1.55e-05** (6.83e-06)
Region/industry size	1.214*** (0.344)	1.236*** (0.212)	2.614*** (0.492)	0.372*** (0.143)	1.029*** (0.224)
GDP per capita growth	0.00105 (0.00381)	-0.0143** (0.00598)	-0.00791 (0.00590)	-0.0226** (0.00988)	0.0111** (0.00439)
Constant	4.039*** (0.0490)	4.199*** (0.105)	4.363*** (0.0895)	4.193*** (0.161)	4.100*** (0.0536)
Observations	62,034	14,693	20,209	5,870	34,009
R-squared	0.421	0.328	0.327	0.348	0.488

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3/2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Table A.3 Intra-industry productivity spillovers by services sub-sectors

	Wholesale and retail (1)	Transportation and storage (2)	Accommodation and food services (3)	Information and communication (4)	Financial and insurance activities (5)
FDI concentration	0.00288*** (0.000779)	0.00231*** (0.000866)	0.00759*** (0.000611)	0.00974*** (0.00147)	0.00629*** (0.000538)
Capital intensity (log)	0.166*** (0.00302)	0.231*** (0.00655)	0.177*** (0.00563)	0.142*** (0.0113)	0.189*** (0.00233)
Age	0.00344*** (0.000517)	0.00542*** (0.000778)	0.00817*** (0.000929)	0.00398** (0.00185)	0.00141*** (0.000232)
Age squared	-2.85e-05*** (4.01e-06)	-6.38e-05*** (8.12e-06)	-7.44e-05*** (1.11e-05)	-1.19e-05 (1.32e-05)	-7.51e-07 (1.10e-06)
Region/industry size	0.139* (0.0829)	0.504*** (0.0515)	0.321*** (0.0706)	0.153*** (0.0318)	0.0771*** (0.0230)
GDP per capita growth	0.00479 (0.00400)	-0.0113*** (0.00377)	-0.00251 (0.00476)	-0.0180** (0.00859)	0.00205 (0.00296)
Constant	4.523*** (0.0297)	3.948*** (0.0511)	4.358*** (0.0469)	4.512*** (0.160)	4.017*** (0.0430)
Observations	406,189	101,559	56,420	13,080	418,785
R-squared	0.411	0.444	0.343	0.347	0.400

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3/2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Table A.4 Intra-industry productivity spillovers across SMEs and other firms

	Micro firms (1)	SMEs (2)	Large firms (3)
FDI concentration	0.00337*** (0.000398)	0.00234*** (0.000220)	0.00198*** (0.000399)
Capital intensity (log)	0.186*** (0.00165)	0.173*** (0.00158)	0.219*** (0.00551)
Age	0.000637*** (0.000207)	0.00140*** (0.000151)	0.000266 (0.000265)
Age squared	-1.49e-06 (1.18e-06)	-4.98e-06*** (1.15e-06)	-1.13e-06 (7.93e-07)
Region/industry size	0.141*** (0.0506)	0.149*** (0.0424)	0.0408 (0.0326)
GDP per capita growth	0.00227 (0.00224)	-0.00312* (0.00171)	-0.00324 (0.00413)
Constant	4.562*** (0.0317)	3.775*** (0.0358)	3.839*** (0.116)
Observations	1,098,183	507,142	27,271
R-squared	0.420	0.467	0.486

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3/2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Table A.5 Intra-industry productivity spillovers by type of investment

	All firms (1)
FDI concentration (M&As)	0.00150* (0.000800)
FDI concentration (Other)	0.00330*** (0.000296)
Capital intensity (log)	0.186*** (0.00143)
Age	0.00195*** (0.000145)
Age squared	-6.31e-06*** (9.49e-07)
Region/industry size	0.139*** (0.0415)
GDP per capita growth	0.000801 (0.00194)
Constant	4.126*** (0.0306)
Observations	1,632,596
R-squared	0.429

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3/2-digit NACE level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Table A.6 Broader regional productivity spillovers by manufacturing sub-sectors

	Food, beverages and tobacco (1)	Textiles, apparel and leather prod. (2)	Wood, paper and printing (3)	Chemicals, pharma and plastics (4)
FDI concentration	0.00387*** (0.00145)	0.00613* (0.00338)	0.00501*** (0.00181)	0.00812*** (0.00144)
Capital intensity	0.327*** (0.00684)	0.204*** (0.0137)	0.199*** (0.00644)	0.201*** (0.00715)
Age	0.00780*** (0.000598)	0.00566*** (0.00109)	-0.000562 (0.000419)	0.000925** (0.000432)
Age squared	-1.46e-05*** (2.44e-06)	-4.53e-05*** (8.77e-06)	2.63e-06** (1.07e-06)	-2.73e-06** (1.08e-06)
Industry size	0.0436 (0.0309)	-0.138*** (0.0364)	0.211*** (0.0528)	0.0149 (0.0294)
Regional size	0.000832 (0.000749)	0.00645*** (0.00124)	0.00568*** (0.000871)	0.00205*** (0.000766)
GDP per capita growth	0.00413 (0.00465)	0.0109 (0.00793)	0.00354 (0.00613)	-0.00525 (0.00512)
Constant	3.147*** (0.0883)	3.799*** (0.114)	3.881*** (0.0592)	4.356*** (0.119)
Observations	37,908	17,901	30,429	20,919
R-squared	0.518	0.558	0.500	0.482

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Table A.7 Broader regional productivity spillovers by manufacturing sub-sectors

	Mineral and metal products (1)	Computer and electronic equipment (2)	Machinery (3)	Motor vehicles and transport equipment (4)	Other products (5)
FDI concentration	0.00835*** (0.00127)	0.0110*** (0.00169)	0.00910*** (0.00179)	0.00812*** (0.00283)	0.00840*** (0.00158)
Capital intensity	0.202*** (0.00507)	0.146*** (0.00732)	0.0968*** (0.00660)	0.155*** (0.0131)	0.165*** (0.00550)
Age	0.000599** (0.000263)	0.000307 (0.000983)	-0.00174*** (0.000591)	0.00297** (0.00132)	0.00198*** (0.000709)
Age squared	-1.84e-06** (7.74e-07)	-8.71e-07 (7.69e-06)	1.09e-05** (4.61e-06)	-3.00e-05*** (1.15e-05)	-1.51e-05** (6.94e-06)
Industry size	0.0528*** (0.0203)	0.121*** (0.0436)	0.0472* (0.0284)	-0.0102 (0.0312)	0.0124 (0.0209)
Regional size	0.00433*** (0.000709)	0.00474*** (0.00111)	0.00215** (0.000912)	0.00483*** (0.00161)	0.00501*** (0.000829)
GDP per capita growth	0.00651* (0.00373)	-0.0116** (0.00590)	-0.00258 (0.00558)	-0.0200** (0.00914)	0.0140*** (0.00441)
Constant	3.938*** (0.0477)	4.067*** (0.101)	4.286*** (0.0852)	4.107*** (0.156)	3.999*** (0.0547)
Observations	62,208	14,783	20,245	6,043	34,133
R-squared	0.422	0.331	0.326	0.354	0.492

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Table A.8 Broader regional productivity spillovers by services sub-sectors

	Wholesale and retail (1)	Transportation and storage (2)	Accommodation and food services (3)	Information and communication (4)	Financial and insurance activities (5)
FDI concentration	0.00600*** (0.00109)	0.00753*** (0.00132)	0.0182*** (0.00186)	0.0115*** (0.00322)	0.0121*** (0.00172)
Capital intensity	0.165*** (0.00381)	0.221*** (0.00527)	0.180*** (0.00664)	0.144*** (0.0133)	0.190*** (0.00338)
Age	0.00301*** (0.000610)	0.00629*** (0.000797)	0.00791*** (0.00114)	0.00353 (0.00220)	0.00126*** (0.000302)
Age squared	-2.62e-05*** (4.49e-06)	-6.51e-05*** (8.09e-06)	-7.06e-05*** (1.29e-05)	-1.05e-05 (1.49e-05)	-4.79e-07 (1.20e-06)
Industry size	0.0674*** (0.0131)	0.220*** (0.00688)	0.0411* (0.0241)	0.0532 (0.0400)	0.00433 (0.00444)
Regional size	0.00336*** (0.000869)	0.00158*** (0.000585)	0.00705*** (0.00101)	0.0130*** (0.00158)	0.00514*** (0.000736)
GDP per capita growth	0.00545 (0.00334)	-0.00204 (0.00240)	-0.00111 (0.00785)	-0.0133 (0.0104)	0.00366 (0.00446)
Constant	4.423*** (0.0361)	3.553*** (0.0388)	4.171*** (0.0587)	4.301*** (0.146)	3.858*** (0.0422)
Observations	406,207	101,882	56,698	13,146	419,720
R-squared	0.414	0.471	0.348	0.351	0.405

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

Source: ESPON FDI (2018) based on data from the Amadeus database

Table A.9 Broader regional productivity spillovers across SMEs and other firms

	Micro firms (1)	SMEs (3)	Large firms (4)
FDI concentration	0.00929*** (0.00128)	0.00726*** (0.000813)	0.00565*** (0.00121)
Capital intensity (log)	0.186*** (0.00337)	0.173*** (0.00299)	0.219*** (0.00676)
Age	0.000607 (0.000387)	0.00139*** (0.000211)	0.000193 (0.000268)
Age squared	-2.62e-06 (1.86e-06)	-5.15e-06*** (1.25e-06)	-1.08e-06 (8.28e-07)
Region/industry size	0.0483*** (0.00895)	0.0761*** (0.00645)	0.0254*** (0.00968)
GDP per capita growth	0.00334*** (0.000593)	0.00574*** (0.000457)	0.00639*** (0.000822)
Constant	0.00418 (0.00283)	-0.000360 (0.00252)	-7.84e-05 (0.00553)
Observations	4.482***	3.676***	3.733***
R-squared	(0.0400)	(0.0403)	(0.110)

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

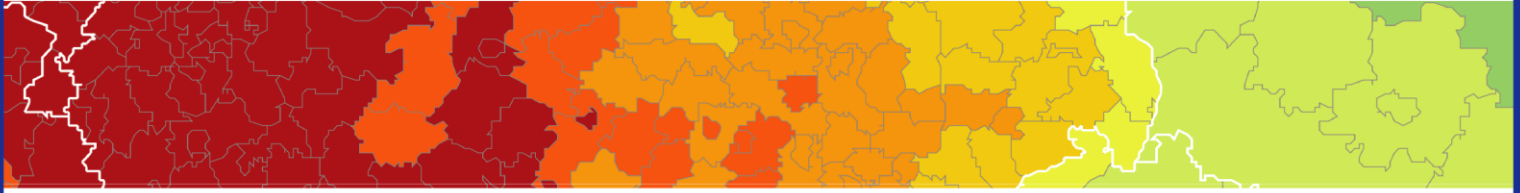
Source: ESPON FDI (2018) based on data from the Amadeus database

Table A.10 Broader regional productivity spillovers by type of investment

	All firms (1)
FDI concentration (M&As)	0.00796** (0.00348)
FDI concentration (Other)	0.00907*** (0.00109)
Capital intensity (log)	0.185*** (0.00327)
Age	0.00184*** (0.000262)
Age squared	-6.45e-06*** (1.19e-06)
Industry size	0.0588*** (0.00791)
Regional size	0.00382*** (0.000533)
GDP per capita growth	0.00284 (0.00258)
Constant	4.041*** (0.0370)
Observations	1,642,084
R-squared	0.434

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of operating revenue per employee. All regressions include country and NACE 2 dummies. Standard errors are clustered at the NUTS3 level.

Source: ESPON FDI (2018) based on data from the Amadeus database



ESPON 2020 – More information

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