Estimating the Scope Elasticity of Multinational Firms: An Empirical Assessment

Fariñas, José C. and Martín-Marcos, Ana and Velázquez, Francisco J.

Universidad Complutense Madrid, UNED, Universidad Complutense Madrid

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José C. Fariñas (Universidad Complutense Madrid)
Ana Martín-Marcos (UNED)
Francisco J. Velázquez (Universidad Complutense Madrid)

Abstract:

This paper offers an empirical assessment of the scope elasticity of multinational activity at the world level. By scope elasticity, we refer to the relationship between the productivity of the parent firm and the probability of operating in a given foreign market through subsidiaries with the same main activity. Elasticities are estimated for a baseline cross-section of 36 countries that represent 74% of total outward FDI investment at the world level. At the aggregate level, results indicate quite consistently, through various estimation methods, that a 10% increase in productivity of the parent firm increases the probability in a range between 0.8-1.5%. Elasticities for manufacturing more than double the elasticities for the service sector. The paper also explores the heterogeneity of scope elasticities across home countries and sectors. This heterogeneity is related to differences across bilateral home-host country characteristics such as the size of the potential host market, bilateral distance, average tariff, institutional quality of host countries and other factors. The signs attached to these factors are in general consistent with the predictions of models of firm heterogeneity and FDI activity. Once heterogeneity and survey biases are controlled, scope elasticities reduce somewhat.

JEL codes: F23, L25, M16

Keywords: Foreign Direct Investment, Scope Elasticity of Multinational Corporations, Productivity.

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1. Introduction

This paper offers an empirical assessment of multinational firms (MNCs) at the world level. The analysis concentrates on the estimation of scope elasticities of MNCs for a baseline cross-section of 36 countries. Scope elasticities refer to the relationship between the productivity of the parent firm and the probability of operating in a given foreign market through subsidiaries with the same main activity as the parent firm. The paper also explores the relationship between these elasticities and host country characteristics where the subsidiaries are located. Models of firm heterogeneity and FDI activity motivate this analysis. This literature, originated in the seminal work of Helpman, Melitz and Yeaple (2004) (see Antràs and Yeaple, 2014 for a recent review article), is the reference to organize our empirical work.

The data used is based on ORBIS, which is a Bureau van Dijck database. From this information, a sample of MNCs is obtained by selecting data of parent-affiliate pairs of firms. The baseline sample contains 19,216 parent MNCs that are ultimate owners (directly and indirectly) of 112,545 affiliate firms operating in 170 host countries. The sample of parent firms comes from a group of home countries that represents 73.7% of total outward FDI investment at the world level, according to UNCTAD (2018).

The sample of parent firms we take as a reference in this research is representative of a large fraction of world MNCs. There are two reasons for this. Firstly, in a previous paper (Fariñas, Martín-Marcos and Velázquez, 2018), we have shown that the ORBIS database has a good coverage of large firms for a broad set of countries. Secondly, large firms play a crucial role in the population of MNCs (Barba Navaretti and Venables, 2004). Both reasons lead us to point out that the sample of parent firms used in this empirical research is representative of the world population of MNCs. Therefore, the paper offers a general profile on several aspects of MNCs at the world level that have been recently highlighted by models of heterogeneity and FDI activity.

The analysis considers parent firms that control one or more subsidiaries abroad to be MNCs. Both parent and subsidiary have to have the same main activity. The set of parent-subsidiary pairs of firms has to fulfill this condition to be included in the sample. We try to proxy horizontal FDI with this condition. This is consistent with the literature which combines two approaches and is used as our reference: the proximity-concentration model of Brainard (1993, 1997), with parent MNCs facing a trade-off between exporting or localizing similar production abroad through subsidiaries, and the heterogeneity model of Melitz (2003), with firms differing in their levels of productivity.

The previous empirical literature on heterogeneity and FDI activity has extensively documented the sorting of firms between purely domestic firms, exporters and MNCs. The list of papers that document this feature includes Girma, Görg and Strobl (2004), Girma, Kneller and Pisu (2005), Tomiura (2007), Geishecker, Görg and Taglioni (2009), Arnold and Hussinger (2010), Castellani and Giovanetti (2010), Fariñas and Martín-Marcos (2010), Gullstrand, Olofsdotter and Thede (2016), Borin and Mancini (2016), Engel and Procher (2012) and a literature review by Greenaway and Kneller (2007), among others.

Yeaple (2009) has addressed an additional aspect of this literature on heterogeneous MNCs. The selection mechanism that refers to domestic firms, exporters and MNCs, predicted by Helpman, Melitz and Yeaple (2004), also applies to the scope and scale of multinational firms. This question has been documented by Aw and Lee (2008), Geishecker, Görg and Taglione (2009), Chen and Moore (2010), Tanaka (2012, 2015), Nishiyama and Tamaguchi (2013), Damijan, Kostevc and Rojec (2016), Shao and Shang (2016) and Fariñas, Martín-Marcos and Velázquez (2018), among others. Most of these papers refer to individual countries (Taiwan, the USA, France, etc.) and to the manufacturing sector.

The paper covers two features. First, we measure scope elasticities for a large set of individual countries. These elasticities refer to the relationship between the productivity of the parent firm and the probability of owning a subsidiary in a foreign market. We contribute to the recent empirical literature on MNCs and heterogeneity by providing, for the first time, estimates of elasticities for a large set of countries that represents almost 75% of total world outward FDI investment. An additional contribution is the distinction between manufacturing and services, which has hardly been considered in previous papers, at least not with the extension that it is done here. We provide estimates of scope elasticities for both sectors and countries. Furthermore, concerning the estimation of scope elasticities, we provide two alternatives. The first one is based on the estimation of the standard probability 0/1 that a parent firm operates in a given foreign market. The second one uses count models to estimate the probability associated with the number of affiliates a parent firm owns in a given foreign market. This second alternative provides a different measure of scope elasticities as interesting as the previous one. The comparison of both measures provides the opportunity to conduct some robustness checks.

The second feature the paper examines is the relationship, across countries and sectors, between home country elasticities and the characteristics of host countries where parent firms invest abroad. The objective is to examine the relationship between a set of bilateral home-

host country characteristics and the values of home country scope elasticities. Previous literature has performed this analysis using either gravity equations of bilateral FDI flows between countries, as in the case of Yeaple (2009), or regression analysis that combines firm-level information and host country characteristics in the same equation, as in the cases of Chen and More (2010), Hyun and Hur (2013) and Tanaka (2015). Our approach is based on the use of scope elasticities estimated in a first stage and, then, they are related to a set of host country characteristics in a second stage. In the context of this literature, it is the first time this approach is applied to test basic predictions of models of multinationals and heterogeneity.

Another characteristic of our analysis is that we follow the methodology known as Meta-Regression Analysis (MRA) (see Stanley and Doucouliagos, 2012), applied, in this context, internally to the set of elasticities estimated across countries.

The paper is organized as follows. Section 2 presents the empirical approach. Section 3 reports the characteristics of the dataset used in the analysis. Section 4 presents the main results. Section 5 reports some sensitivity analysis concerning the degree of aggregation of market destinations. Section 6 concludes.

2. Empirical approach

This section explains the bases of the theoretical approach we use to organize our empirical work. As mentioned in the introduction, we take as a reference the literature of heterogeneous multinationals introduced by Helpman, Melitz and Yeaple (2004). We consider two elements from this approach.

The first element was developed by Yeaple (2009) and Chen and More (2010), among others. It postulates the existence of a relationship between the productivity of parent firms and the scope of their affiliates in foreign markets. In particular, more productive parent firms operate in a higher number of foreign countries, i.e., their scope of operations is higher.

The second element that previous models introduced in the literature on multinational firms is that for each host country there is a productivity cutoff that drives the entry investment decision of parent firms in foreign markets. Host countries can be associated with a critical level of productivity, which is determined by country characteristics such as the level of fixed costs associated with starting a business, the level of countries' marginal cost of production, and the size of the market potential, among others. Furthermore, bilateral features between the home and the host country like distance or sharing common features like language are also

relevant factors. All these country characteristics determine a critical level of productivity that parent firms have to reach to enter the host country. Differences across host countries in this set of characteristics have an impact on the structure of multinational activity from the perspective of parent MNCs located in different home countries.

One important prediction that derives from the link between country characteristics and the existence of productivity cutoffs is that those country characteristics that positively (negatively) affect the scope of multinational activity should be negatively (positively) related to the average level of productivity of parent firms that go abroad. This prediction derives from the model of Yeaple (2009). Let us take as a reference the market potential (size) of host countries, which many papers (see, for example, Blonigen and Piger, 2014) document as positively affecting the scope of multinational activity, i.e., it raises the probability of observing a parent firm investing in a given foreign market. Then, this characteristic will negatively influence the average productivity of firms that enter markets with a high market potential. The higher ~~is~~ the market potential of the host country is, the lower the critical level of productivity required to enter that market. The consequence of this is that the average productivity of firms that enter countries with a higher market potential is lower than the average productivity of firms that enter countries of less market potential.

In a previous paper, Fariñas, Martín-Marcos and Velázquez (2018) confirm these predictions for a large sample of European manufacturing firms. Host country characteristics that positively affect the level of multinational activity are negatively associated with the average level of parent firms' productivity. Conversely, those host country characteristics that are negatively associated with MNC activity tend to be positively associated with parent firms' productivity. In fact, observed differences in the distribution of parent firms' productivity are consistent with these expected signs. This happens when we compare groups of multinational firms that differ in the size of the host market where they invest, the distance to the host country, the existence of contiguity between the home and the host markets and the condition of sharing common features like the language, a currency or past colonial links.

This prediction, the "asymmetric effect hypothesis," indicates that host country characteristics that encourage a greater scope of multinational activity induce the entry of successively less productive firms, so the average productivity is lower relative to firms that enter more difficult markets. The opposite is true for countries with characteristics that discourage MNCs.

Summing up what has been said so far, there are two main types of predictions in the literature on heterogeneity and multinationals. The first one refers to the existence of a

positive link between firm productivity and the scope of the firm's multinational activity. The positive elasticities of scope with respect to a parent firm's productivity summarizes this relationship. The second element, the "asymmetric effect hypothesis," refers to the relationship between host country characteristics and the average level of productivity of parent firms operating abroad.

The empirical literature interested in simultaneously testing both types of hypotheses is rather scarce and can be grouped into two categories. First, Yeaple (2009) offers evidence for US manufacturing MNCs, estimating the relationship between the probability of operating in a foreign market and the productivity of parent companies. On the other hand, the analysis is completed with the estimation of gravity equations that relate the number of MNCs that invest in host countries and the characteristics of these destinations. Fariñas, Martín-Marcos and Velázquez (2018), in a less structural context, follow a similar approach for a large sample of European manufacturing firms. The second approach estimates the relationship between the probability of MNCs investing in foreign markets and both the productivity of parent firms and host country characteristics. Chen and Moore (2010) offer evidence for French manufacturing firms, Hyun and Hur (2013) for Korean firms and Tanaka (2015) for Japanese firms in the distribution service industry.

This paper follows a slightly different approach to examine the empirical consequences of the two hypotheses previously described. We distinguish between two stages. In the first one, we estimate the elasticities of scope for a large set of countries. They summarize the strength of the relationship between firm productivity and the scope activity of parent multinationals from the home country. We explore the magnitude of the average elasticity and the heterogeneity of elasticities across countries. In the second stage, we explore the relationship between the estimated elasticities and the average host country's characteristics.

For the second stage, the two predictions summarized above allow us to establish the direction, positive or negative, for the relationship between the elasticities of home countries and the average characteristics of host countries where parent multinationals locate their subsidiary firms. A host-country characteristic that positively (negatively) affects the probability of investing abroad has the same positive (negative) relationship with scope elasticities. In the case of a variable with a positive influence on the probability of investing abroad, the asymmetric hypothesis implies that the same variable has a negative influence on the average productivity of parent firms that invest abroad. Hence, a positive influence of the variable on the probability (numerator) combined with a negative influence on the average

productivity (denominator) implies a positive relationship between the variable and the elasticity. A variable with a negative effect on the probability (numerator) combines with a positive effect on the productivity (denominator) and, therefore, the overall effect is negative. This rule means that the asymmetric effect hypothesis always reinforces the direction of the variable on the probability of investing abroad. If positive, it is positive in terms of the elasticity, and if negative, the effect is also negative for the elasticity.

The paper takes as a reference the framework provided by the two predictions summarized in this section to organize the empirical work.

3. Data

The data used are taken from the Bureau van Dijck ORBIS database. This dataset provides information about the balance sheets and income statements of more than 250 million firms around the world. These financial statements are complemented with information on the ownership structure of companies from both the perspective of shareholders in the capital structure of the company and shares of the company in the capital of other companies (subsidiaries). This information on the ownership structure of the company refers to the end of the year 2015.

The sample of MNCs selected from ORBIS includes parent firms from a given country *i* that control one or more subsidiaries in the rest of the world. The sample considers only parents and subsidiaries that have the same main activity defined as Bureau van Dijck major sectors[1]. This condition approximates horizontal FDI that is consistent with the theoretical literature that we take as a reference to organize this empirical work.

Even though ORBIS is a collection of business records that does not include the whole population of firms, it has a good coverage of the set of the largest firms in OECD countries. Fariñas, Martín-Marcos and Velázquez (2018) assess the representativeness of the ORBIS dataset for a large set of European countries**.** They take as a reference the proportion between the number of manufacturing firms available in ORBIS and the number of large firms reported in the OECD Structural and Demographic Business Statistics. The analysis concludes that the representativeness of ORBIS is quite high, so we consider our analysis in this paper to be

[1] We start from the 19 Bureau van Dijck major sectors but we group the six manufacturing sectors into one to maximize the volume of information available.

representative of the population of MNCs at the world level. For more details on the representativeness of ORBIS, see Pinto-Ribeiro, Menghinello and Baker (2010).

To identify the parent-subsidiary firms link, we use the criterion of "ultimate control" (OECD, 2005). The goal of introducing this criterion is to ensure that the subsidiary is effectively under the control of a parent firm from country *i*. Under this criterion, we consider both direct and indirect participation in the capital of the subsidiary. The condition that we use for completing the path linking parent and subsidiary firms requires that, at every step of participation in the capital, the parent firm owns more than 50% of the capital of the subsidiary. The notion of ultimate control ensures that the nationality that we attribute to each company is correctly imputed. We consider this criterion more precise than the alternative notion of "immediate property."

An additional condition that we impose on the information that is extracted from ORBIS is that the parent firms have unconsolidated information. This requirement implies that the financial statement of the subsidiary is not combined with the information of parent firms. Although this reduces the number of firms in the sample, we minimize the existence of financial flows from parent and subsidiaries, which is suitable for mitigating the problems of reverse causality in the estimation of scope elasticities.

Table 1 summarizes the number of firms in the sample. The initial sample identifies 41,109 parent firms that are ultimate owners of 196,538 subsidiaries with the same main activity. Parent firms are of 145 different nationalities and subsidiaries are located in 195 different countries. The sample in column (2) imposes the condition that parent firms have unconsolidated information available. This condition reduces the number of firms in the sample to 28,427 parent companies and 170,582 subsidiaries. From these numbers, the final sample is reduced to what appears in column (3). This is our baseline sample. It includes a sample of parent firms from a set of 36 home countries where the coverage permits the estimation of scope elasticities. One of the objectives of this paper is to estimate elasticities at the country level, distinguishing between manufacturing and services. Given that the ORBIS coverage across countries is very heterogeneous, the final sample of home countries is reduced to 36.

The baseline sample takes as a reference multinational firms from the following 36 countries: Austria, Australia, Belgium, Canada, Chile, Cyprus, Czechia, Germany, Denmark, Estonia, Spain, Finland, France, Greece, Hong Kong, Croatia, Hungary, Ireland, Iceland, Italy, Japan, the

Republic of Korea, Lithuania, Luxembourg, Latvia, Malaysia, the Netherlands, Norway, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia, Taiwan, and the United States of America[2].

In the sample of home countries, we have a large number of European countries (28) plus a list of 8 countries: Australia, Canada, Chile, Hong Kong, the Republic of Korea, Malaysia, Taiwan and the United States of America. The list of host countries where subsidiaries are located includes almost all the countries in the world. As we mention in the introduction, this sample of parent firms is from a group of home countries that represents 73.7% of total outward FDI investment at the world level, according to UNCTAD (2018).

The very large number of host countries in the sample prevents the application of some estimation procedures used in the paper. For this reason, we take as our baseline definition of host markets the Classification of Geographic Regions defined by the United Nations. This classification distinguishes 22 geographic regions at the world level. According to the last *Standard Country or Area Codes for Statistical Use* (United Nations, 1999), "these geographic regions are based on continental regions, which are further subdivided into sub-regions and intermediary regions drawn to obtain greater homogeneity in sizes of population, demographic circumstances and accuracy of demographic statistics." Section 5 presents some sensitivity analysis that refers to the use of individual countries instead of geographic regions as destination markets. We compare estimated scope elasticities estimated using both definitions of destination markets: geographic regions and countries.

Concerning the variables used in the analysis, there are two types of information. The first one refers to firms. The source for this information is ORBIS. These variables are gross output (measured by operating revenue turnover), employment (total number of employees) and labor productivity (gross output/employment). Limitations in the available information prevent us from using total factor productivity as the measure of parent firm productivity. The use of this alternative measure would substantially reduce the baseline sample of home countries with information available for estimating scope elasticities. This would substantially limit the number of observations for the second stage of our analysis.

Concerning the variables used to measure host country characteristics, the basic variables come from four sources. Home and host basic economic indicators come from the World Bank. Country institutional measures come from two sources: the Worldwide Governance Indicators of the World Bank (see Kaufmann, Kraay and Mastruzzi, 2010) and the Global Competitiveness

[2] For Canada, Chile, Croatia, Malaysia and the United States of America, most of the information is non-consolidated with a few exceptions for some firms.

Index from the World Economic Forum (see World Economic Forum, 2011). Finally, gravity type variables come from the GeoDist database from CEPII (Mayer and Zignago, 2011). The set of these variables includes GDP and per capita GDP of home and host countries, bilateral distance between home and host country, existence of a common language, degree of cultural closeness, average tariff of the host country and seven institutional quality indicators of the host countries. Section 4 gives details about how these variables are calculated. Table 2 shows some descriptive statistics of explanatory variables.

4. Results

The first part of this section presents the estimates of scope elasticities obtained by considering two alternative dependent variables. In Subsection 4.1, we define a standard 0/1 variable corresponding to the decision of a parent firm to invest in a given foreign market. In Subsection 4.2, count data models are used to estimate an equation containing the number of subsidiaries a parent firm has in a given foreign market as a dependent variable. In the last subsection, we use meta-regression analysis toolboxes to examine the heterogeneity of estimated scope elasticities across countries. In this second stage, we control for a set of bilateral home/host country characteristics that the literature of FDI has considered as factors affecting the decision to invest abroad.

4.1 Scope elasticities: the probability of investing in a foreign market.

First, we provide estimates of scope elasticities across countries. These elasticities measure how the probability of investing in a given foreign market changes with the level of productivity of the parent firms. The specification is as follows:

$$FDI_{fijt} = \alpha lnLP_{fit-1} + \sum_g \beta_g dindustry_g + \sum_i \beta_i dhome_i + \sum_j \beta_j dhost\_region_{\ j} + \varepsilon_{fij} \quad (1)$$

where FDI_{fijt} is a variable equal to one if parent firm *f* from home country *i* has one or more subsidiaries in host geographical region *j* at time period *t* and LP_{fit-1} is parent labor productivity at time *t-1*. A complete set of industry (two-digit level), $dindustry_g$, home country, $dhome_i$, and host geographical region, $dhost\_region_j$, fixed effects are included in equation (1).

The reason for making investment decisions by firms at time period *t* and measuring labor productivity of parent firms lagged at *t-1* is to mitigate the consequences of reverse causality

between past investment decisions abroad and current productivity. To further minimize the effect of investment decisions abroad and the income statement of parent firm, the estimates of labor parent productivity are based on unconsolidated information. We impose this restriction on the information used to minimize the impact of economic flows between parent and subsidiary firms in measuring parent firm productivity.

The upper part of Table 3 reports coefficients estimated from equation (1) for the whole sample of multinational firms. The first column corresponds to the total economy (the sample includes manufacturing and services plus the primary sector, construction and energy). The second and third columns correspond to the sample of manufacturing and service firms, respectively. The coefficient 0.0066 for the total economy means that a 1% increase in productivity increases the probability of opening a subsidiary in a given foreign market by 0.000066. Given that in the whole sample of firms the average probability of observing a parent multinational in a foreign market is 8.1%, an increase of 10% in parent firms' productivity raises the probability by 0.8. % (0.00066/0.081).

Table 3 also reports the estimated elasticities for both manufacturing and services. Notice that for manufacturing firms, it is 1.4, which more than doubles the elasticity for services, 0.6. To our knowledge, this is one of the first attempts to systematically measure scope elasticities by distinguishing between manufacturing and services. The elasticity is systematically larger for manufacturing than for services. The null hypothesis that both coefficients for manufacturing and services are equal can be rejected at any significant level. One possible reason that explains this difference is associated with the fact that the trade-off between proximity and concentration (Brainard, 1997) is more relevant for manufacturing than for services.

Trade in services accounts for 23% of total trade in goods and services at the world level, according to the WTO (2018). From 2005, the rate of participation of services in total trade has rapidly increased in part because of the expansion of digitally enabled services. According to UNCTAD (2015), finance, insurance, telecommunication and information services, and the large set of professional and business services are in the group of most intensive digital deliverable services. Even though new ICT technologies relax constraints on cross-border trade in services, obstacles remain, e.g., cultural and language differences, etc., (see WTO, 2018), and FDI investment in services abroad is an alternative to trade. Therefore, the trade-off proximity-concentration, which is a key ingredient of models of heterogeneity and multinational activity, is relevant for services as well as for manufacturing. However, the nature of this trade-off is surely different for both types of activities, as it is stricter for

manufacturing firms than for services. In turn, this translates into systematic differences in scope elasticities across both manufacturing and services activities, with elasticities much higher for manufacturing than for services.

Our objective is to estimate scope elasticities not only at the aggregate level but also for individual countries. Table 4 reports estimated scope elasticities across individual countries for the total economy. Tables A1 and A2, in the Appendix, reproduce the estimates at the country level for the subset of manufacturing and service sectors. The bottom part of Table 3 summarizes these individual countries´ estimates. Our baseline sample takes 36 countries as a reference. We also reach this number of estimates/countries for the sample of firms from the service sector, but it is inferior for manufacturing, where we are able to estimate the elasticity for 34 countries. This happens because there is a lack of information for Cyprus and Iceland.

We find significant differences in the elasticities across countries. For the total economy, the country with the highest elasticity, Japan, indicates that an increase of 10% in the productivity of Japanese parent firms raises the probability to have of having a subsidiary in a given foreign market by 3.4%. For the lowest positive and statistically significant elasticity, Austria and Canada, an increase of 10% in productivity raises the probability by 0.3%. A big proportion of estimated elasticities are statistically significant and positive, 52.8% of the countries in the sample for the total economy. We do not estimate negative elasticities that are statistically significant different from zero. These results confirm that the positive relationship between productivity and the scope of multinational activity, i.e., the probability of opening subsidiaries in foreign markets that have the same main activity as the parents, is a relevant characteristic of multinational activity.

Concerning the ranking of countries according to their scope elasticities, Japan, the Republic of Korea, France, Ireland and Chile are the countries with the highest elasticities. Hong Kong, Poland, the Netherlands, Estonia and Romania are at the bottom of the ranking with elasticities not significantly different from zero.

The existence of differences in elasticities between manufacturing and services, mentioned before at the aggregate level, is also confirmed when the comparison is across countries. In general terms, elasticity in manufacturing is higher relative to services across countries. However, the ranking of countries differs somewhat when comparing manufacturing and services. This is especially true at the top of the classification: Germany has the highest level in manufacturing while Japan occupies the first position in services. France is the only country that remains in the top five group in both classifications. At the bottom of the classification, for

low elasticities, the ranking of countries varies greatly. According to the coefficient of variation, the variability of scope elasticities across countries is higher in the service sector than in the manufacturing sector.

To complete this description about the magnitude of scope elasticities, we compute their values at the aggregate level, taking the 36 elasticities estimated at the country level as a reference. We weight the value for each country by its relative participation in the total number of parent firms. The weighted average elasticities are also reported in Table 3. The value for the total economy is 1.2, slightly higher than the 0.8 we obtain when pooling all the observations in the same regression. This implies the existence of a positive correlation at the country level between the number of multinationals and the value of the estimated coefficient. For manufacturing and services there is a similar pattern, and for manufacturing the elasticity remains higher with respect to services.

Subsection 4.3 will go into detail in the analysis of this degree of heterogeneity across countries, taking advantage of the fact that every estimated elasticity has a standard error attached to it.

4.2 Scope elasticities based on count data models

This section presents an alternative measure of scope elasticities based on the complete information available in the dataset. Figure 1 shows the distribution of the number of subsidiary firms owned by parent firms in a given market. The total number of observations, considering geographical regions as destinations, is 345,928. Of these observations, 92% are zeros, i.e., there is no subsidiary from a given parent firm, 5% are ones, i.e., the parent firm has one subsidiary, and the rest of the observations, 3.1%, correspond to parent firms with two or more subsidiaries in the same market. This last possibility is more frequent in manufacturing than in services.

The response variable is discrete, as in the linear probability model estimated in the previous subsection, but we also observe a few small, discrete, non-negative integer values that correspond to the number of subsidiaries that parent MNCs have in each market. Given this property of the response variable, it seems appropriate to use count data models for the

estimation of scope elasticities. In this subsection, we estimate scope elasticities taking into consideration this approach.

The basic specification is the classical Poisson model:

$$N_{fijt} = \exp[\lambda lnLP_{fit-1} + \sum_g \mu_g dindustry_g + \sum_i \mu_i dhome_i + \sum_j \mu_j dhost\_region_j] + \varepsilon_{fij} \quad (2)$$

where N_{fijt} is the number of subsidiary firms owned by parent firm *f* from home country *i* in host geographical region *j* at period *t*, and LP_{fit-1} and the set of right-hand control variables are as in previous equation (1).

Two issues related to the estimation of equation (2) are addressed (see Cameron and Trivedi, 2005). The first one refers to the assumption of equal mean and variance the Poisson model makes, a feature called over-dispersion. We modify the Poisson model, also estimating the negative binomial. The second issue is the "excess zeros problem," which refers to situations where there are more zeros in the data than the Poisson or the Negative Binominal predicts. In this case**,** a modified model is called the zero-inflated model in the Poisson version (ZIP) and the zero-inflated in the negative binomial version (ZINB). These latter models complement a count density with a binary process. If the binary process takes the value 0, then our count variable is *N* = 0, and if the binary process takes the value 1, then variable N is equal to 1, 2, 3…. Both models, ZIP and ZIBN, are estimated in two stages. In the first one, a binary logit model is estimated with the decision to open a subsidiary abroad or not. In the second stage, the discrete variable is examined, taking into account only the zeros that are the consequence of a do/not-to-do decision. This stage is modeled by a Poisson in the ZIP model and by a negative binomial in the ZINB model. Coefficients are interpreted directly as elasticities when the variable is continuous in logarithms, as is the case for labor productivity.

Table 5 reports the main results at the aggregate level. Only negative binomial models are reported because over-dispersion tests always reject Poisson versions. With respect to zero-inflated versions, Wilson (2015) has recently criticized the misuse of Vuong's test to test zero-inflated models against non-zero inflated versions. Table 5 reports both, and given the high number of zeros in the sample, we prefer zero-inflated negative binomial maximum likelihood estimates (ZINBML).

Scope elasticities, at the aggregate level, indicate that a 10% increase in labor productivity raises the probability of controlling a subsidiary in a foreign market and/or of operating an

additional subsidiary by 1.5% (second column of Table 5). The estimated elasticity in Table 3, which takes the discrete 1/0 decision as a dependent variable, is between 0.8-1.2%. We confirm a similar pattern between manufacturing and services, higher elasticities in the first ones than in the second ones.

We interpret that the disparity between both elasticities reflects differences in the way the scope elasticity is measured. The elasticity based on count models measures the increase in the number of subsidiaries in those cases where the parent firm is already present in a given foreign market. This latter aspect is not captured when the elasticity corresponds to the decision variable to have/not-to-have a subsidiary in a foreign market.

Table A3 in the Appendix reproduces the elasticities estimated for the entire sample of countries. For the total economy, the estimates for Czechia and Hungary do not converge and the sample is reduced from 36 to 34 countries. The ranking of scope elasticities across countries is very similar for both count models and standard ones. The Spearman's rank correlation coefficient gives a value of 0.748, and the null hypothesis that both rankings are statistically independent can be rejected at any significant level. The rank correlation across countries is lower for manufacturing firms but still statistically significant.

In the next section, we examine the heterogeneity of these elasticity measures across countries taking into account the correlation between them and bilateral home-host country characteristics. This analysis would be performed for both elasticities, the more standard measure defined in terms of a 0/1 probability of investing abroad and the elasticity based on count models.

4.3 Scope elasticities and heterogeneity: a meta-regression analysis.

This section deals with the issue of heterogeneity of scope elasticities across countries and sectors. The objective is to examine the relationship between a set of bilateral home-host country characteristics and the values of home countries' scope elasticities. To perform this analysis, we follow the methodology known as Meta-Regression Analysis (MRA) (see Stanley and Doucouliagos, 2012, for a general presentation), which involves analyzing the distribution of estimated coefficients and identifying elements that drive heterogeneity in scope elasticities. Specifically, we perform an internal meta-analysis given that we exclusively use the results obtained from our research, which applies the same methodology, but where the

sample is modified, in our case by sectors and countries. Note that sectors are the aggregates: total economy, manufacturing and services.

Figure 1 presents the funnel plot of the distribution of coefficients attached to scope elasticities for a given country and sector. The scatter of points illustrates the relationship between the coefficients and their precision. Precision is measured as the inverse of the standard error associated with each coefficient. The solid line corresponds to the average of all coefficients weighted by the inverse of their variance. According to this weight, the more precise the estimated coefficient is, the higher the weight attached to that value in the average.

The existence of asymmetry in the magnitude of scope elasticities across countries and sectors cannot be ruled out from a visual examination of the funnel plot. The extreme values in the lower right corner correspond to Germany, Finland, France, Norway, Malaysia for manufacturing, and Japan for both manufacturing and services.

Our standard MRA model is given by the following specification, which corresponds to a cross-section of observations for a set of home countries *i* with parent multinationals operating in sector *s*:

$$\hat{\alpha}_{is} = \alpha_0 + \gamma_0 se_{is} + \sum_s \gamma_s ds_s + \sum_k \gamma_k Z_{kis} + \varepsilon_{is} \qquad (3)$$

where $\hat{\alpha}_{is}$ denotes the estimated coefficients for country *i* in sector *s*. The standard error of these coefficients is represented by se_{is}, Z_{kis} represents k regressors capturing factors that explain heterogeneity in elasticities across countries, and ds_s is a set of sector dummies that correspond to the aggregate of total economy, manufacturing and services.

The MRA approach applies Weighted Least Squares (WLS) to the estimation of equation (3), using the inverse of the variance of estimated coefficients as weights $\left(\frac{1}{se^2}\right)$. In standard MRA, the $\gamma_0 se_{is}$ term captures the impact of the so-called publication selection bias. A test of $\gamma_0 = 0$ (also known as the Funnel Asymmetry Test because of its relation to funnel graphs) is a test of the existence of both asymmetry in the estimates and publication bias (see Stanley, 2005). In our case, as the meta-analysis is internal, i.e., it applies to the same dataset using the same estimation procedure, the bias arises because of differences in the way in which home country parent firms were surveyed. ORBIS combines information from different statistical sources that differ by country, so we identify this source of heterogeneity with a survey bias.

The magnitude of effects beyond the survey bias are captured in equation (3) by $(\alpha_0 + \sum_s \gamma_s ds_s + \sum_k \gamma_k Z_{kis})$. In this framework, α_0 is the average estimated value of all estimated α´s corrected for survey bias and for modelled heterogeneity. A test of $\alpha_0 = 0$ has been called the Precision-Effect Test and is a test of the existence of an underlying effect after correcting for the indicated elements. The estimation of equation (3) is based on the use of WLS estimates with robust standard errors and clustered corrected standard errors (see Stanley and Doucouliagos 2017, and Oczkowski and Doucouliagos, 2015).

Concerning the set of regressors (Z_{kis}) to be included in equation (3), section 3 states that models of multinational activity and heterogeneity predict that the country average scope elasticity at the country level is influenced by the composition of host country characteristics where parent firms invest abroad. Factors that affect both the level of multinational activity, i.e., the probability of operating in a given foreign market, and the average productivity of parent firms that invest in a given host country, are candidates to be included as regressors.

The literature on MNCs has suggested a list of factors that determine multinationals' location choices (see Greenaway and Kneller, 2007; Faeth, 2009; Blonigen and Piger, 2014; Head and Meyer, 2014; Görg, 2016 and Kano and Verveke, 2019 for general presentations). The first element to be included in this list is the size of the host country (Blonigen, 2005, Chen and Moore, 2010). Concerning the measurement of host country market size, Head and Mayer (2004) suggest that the market potential of host countries should include both their domestic market and other potential export markets. Second, traditional gravity equation variables, like distance and home and host GDP, have been extensively used in the empirical literature on determinants of FDI (Kleynert and Toubal, 2010; Head and Meyer, 2014). Third, host country business production costs have also been considered (Blonigen and Piger, 2014), also including differences of corporate tax rates between the home and the host countries in this category (Barrios, Huizinga, Laeven and Nicodème, 2009). The fourth is fixed cost of investment associated with the cost of starting a business in the host country, and host countries' regulatory and governance quality associated with various forms of fixed cost of investment (Berden, Bergstrand and van Etten, 2014). Fifth, bilateral cultural links, i.e., sharing a common language, and past colonial links have also been widely considered determinants of FDI (Blonigen and Piger, 2014). Finally, several aspects of trade costs, e.g., bilateral distance, contiguity and the average tariff rate, have also been included as controls (Chen and More, 2010), along with the existence of various forms of bilateral trade agreements (Blonigen and Piger, 2014).

Taking this list of factors as a reference, we include the following set of variables as regressors in equation (3). First, the variable *market size (host)* is a dummy variables equal to 1 if the average size of all host countries with affiliates from parent firms of home country *i* operating in sector *s* is higher than average and 0 if it is lower than average. Second, the variable *distance* is the natural logarithm of average distance between home country *i* and all host countries with affiliates from country *i* in sector *s*.

Third, to proxy bilateral cultural links that might favor FDI activity, two variables are considered. The variable *common language* is the proportion of host countries with affiliates in sector *s* that share with home country *i* either an official language or languages spoken by at least 20% of the population, on one hand, or languages (mother tongue, lingua franca or second languages) spoken by between 9% and 20% of the population, on the other hand. The variable *common language* is an aggregate of both variables obtained by applying weights extracted from the use of factor analysis techniques. The second variable is *cultural closeness*. It is based on a common factor obtained from three weighted variables indicating: 1) whether the home and host countries have had a common colonizer after 1945; 2) whether both countries have ever had a colonial link; and 3) whether they have had a colonial relationship after 1945. The information used to estimate both variables is based on the GeoDist database (see Mayer and Zignago, 2011).

Fourth, to proxy institutional factors associated with various forms of fixed costs of investment, we consider four variables obtained from Global Governance Indicators of the World Bank (see Kaufmann, Kraay and Mastruzzi, 2010). These variables measure average quality of host countries with affiliates from a given home country in sector *s*. The four variables refer to the regulatory quality of host countries, government effectiveness, the quality of rule of law (contract enforcement, property rights, etc.) and control of corruption. Three additional variables that also measure the quality of institutions come from the Global Competitiveness Index of the World Economic Forum (see World Economic Forum, 2011). The three variables are the quality of both public and private institutions, and the business impact of rules on FDI. This latter indicator refers to the extent to which rules and regulations encourage or discourage FDI. Interestingly, applying a factor analysis to these seven variables produces two factors. The first one groups together the four World Bank variables and we call this factor *institutional quality_WB.* The second factor correlates strongly with the three WEF variables and we call this factor the *institutional quality_WEF*.

Fifth, the variable *tariffs* is the natural logarithm of the average tariff rate of host countries with affiliates from home country *i.*

Finally, we include two control variables to capture the size of the home country and its per-capita income, GDP (home) and per capita GDP (home), both in natural logarithms.

With the purpose of illustrating the way in which host-country characteristics for each home country *i* have been calculated, we give some additional details. These measures correspond to weighted averages of host country variables. For example, the variables *market size (host)* and *tariffs* weight, at the firm level, the existence of subsidiaries in the host country, i.e., 0/1 weight. An identical procedure applies to bilateral characteristics between home and host countries (i.e., *distance*, *common language*, etc.) Figure3 illustrates, for each home country *i*, the average distance from this country to host countries where parent firms have subsidiaries. There is a high variability in average bilateral distances across countries. The average distance across all countries is 3,087 Km. The range goes from 10,986 Km (Australia) to 431 Km. (Croatia). Given the set of countries included in the sample, Australia, the USA, and western Asian countries (Japan, the Republic of Korea) are the countries with the greatest distance, and central European countries (Hungary, Croatia, the Czech Republic, etc.) are the countries with the shortest average distance. Table A4 in the Appendix offers the average value of host country characteristics for a selection of variables and for each home country.

Concerning this set of country characteristics, we expect that those that positively affect the level of multinational activity, *market size (host)*, *common language*, *cultural closeness*, *institutional quality (World Bank and WEF versions)* and *tariffs*, should be positively associated with the scope elasticities of home countries. In the case of *tariffs*, the positive association is based on the expectation that the higher the tariff rate of the host country is, the more incentive the parent firm from a home country has to produce within the boundaries of the host market (Chen and Moore, 2010). The variable *distance* to the host country is considered to be negatively associated with the level of multinational activity. In this case, we expect that affiliates located in markets that are more distant are likely to incur higher fixed entry and monitoring costs, thereby discouraging multinational activity. At the same time, a greater distance gives more room to FDI on the basis that proximity to consumers saves transport costs. The effect for this variable goes in both directions and the expected sign in equation (3) is ambiguous, although, in most cases, the literature reports negative signs, so we expect a negative sign.

Table 6 reports the estimation results of equation (3). The dependent variable corresponds to estimated coefficients of equation (1) (summarized in Table 3). Baseline OLS results and WLS using robust and cluster-robust standard errors by the set of home countries are reported.

The funnel plot (Figure 1) displays heterogeneity that can be due to survey bias (heterogeneity in the survey process) and heterogeneity across bilateral home-host country characteristics that influence elasticity size. The coefficient associated with the standard error provides a basis for testing the existence of survey bias ($\gamma_0 = 0$). As the coefficient is statistically significant for all WLS-estimated models, the null hypothesis cannot be rejected. Hence, we conclude that asymmetry in the funnel plot can be attributed to both survey bias and heterogeneity in elasticities across countries.

The constant term (α_0) for WLS-estimated models is 0.0044. This coefficient implies, for an average probability of 0.08, an elasticity of 0.6% (0.00044/0.08=0.0055). Therefore, an increase of 10% in parent firm productivity raises the probability of operating in a given foreign market by 0.6%. Hence, once heterogeneity and publication bias are controlled, the elasticity reduces somewhat. Results for the set of sector dummies indicate that there are significant differences between elasticities for manufacturing and for services, as we mention in previous sections.

Five of the variables included in equation (3) to control for heterogeneity across bilateral home-host country characteristics are significant explanatory variables: *market size* of the host country, *distance*, *common language*, *institutional quality* of host countries (measured with variables obtained from the Global Governance Indicators of the World Bank) and *tariffs*. The WLS estimates for each of these variables are statistically significant and all of them, except *common language*, have the expected sign.

The market size of the host country that we expect to be positively associated with the entry of affiliates and therefore with scope elasticities is significant at the 10% confidence interval for WLS that uses robust standard errors. We expect the coefficient of average tariffs of the host country to be positive as tariff barriers create incentives to locate production in the host country. The coefficient is positive and significant at the 1-5% level for all WLS estimates.

Sharing a common language and cultural closeness (existence of past colonial links) might reduce the fixed cost of entry in foreign markets and stimulate FDI. Therefore, we expect both characteristics to be positively associated with the elasticity of scope. Coefficients reported in Table 6 indicate a negative and significant effect for common language and no significant impact from cultural closeness.

Finally, variables that capture the level of institutional quality of the host countries are positively related to scope elasticities when the quality of institutions is measured using Global Governance Indicators of the World Bank but not the WEF variables from the World Competitiveness Index.

Overall, we observe that a group of bilateral home-host country characteristics is related in a systematic way to the size of scope elasticities across home countries.

Two additional variables that capture characteristics of the home country, its GDP and per capita GDP, are included to control for heterogeneity. The level of GDP is positively associated with scope elasticities: larger countries have greater elasticities. The relationship is not statistically significant for per capita income of the home country.

Table 7 reports the estimates that correspond to equation (3) when the dependent variable is the coefficients estimated using count models. Results are very similar to those presented in Table 6. Despite this general coincidence, three qualifications should be mentioned. First, the standard error variable is not statistically significant for all WLS-estimated models. This implies that there is no survey bias once variables that capture general home-host country heterogeneity are included in equation (3). This probably means that asymmetry is lower for count elasticities than for standard elasticities. Second, modifications in the significance of variables are concentrated in two variables, *market size (host)* and *GDP (home)*. Neither is statistically significant different from zero. The rest of the variables present the same pattern as in table 6. Third, *institutional quality (host)* is included as a single variable because the factor analysis summarizes the seven variables considered in a single factor (not two). This is because the sample of countries is slightly different in the two tables. The variable *institutional quality (host)* has the expected positive sign and is statistically significant across all WLS-estimated models.

Concerning the magnitude of the average elasticity, the constant term for WLS-estimated models is 0.1296. This implies that the count elasticity is 1.3% when parent firm productivity increases by 10%, which, if compared with the average elasticity estimated in Subsection 4.2, 1.5%, is quite close in size. It is slightly lower once heterogeneity is controlled.

5. The level of aggregation of geographical destinations: sensitivity of results

In this section, we address the issue of the level of aggregation of market destinations. In the previous section, results were obtained using the definition of geographical regions as they

have been set by the United Nations at the world level. According to this criterion, the location of subsidiaries has been assigned to 22 different geographical regions. In this section, we examine the robustness of results based on the use of countries as the effective location decision for subsidiaries instead of geographical regions.

The use of geographical regions has two advantages. The first one is of practical order: limiting the number of destinations permits the estimation of elasticities, especially when using count models with dependent variables that are zero inflated. The second one is more theoretical in nature. Multinationals' location choices are influenced by host market size considerations. Head and Mayer (2004) suggest that not only the size of the host country, i.e., subsidiaries' locations, is important, but also the export potential offered by surrounding countries. From this perspective, using geographical regions, as we do in the previous section, is a good proxy for examining the location decision as it considers the market size of both the domestic and surrounding potential export markets. In this section, we check for robustness using the country where the subsidiary is located instead of the geographical region as the choice variable for the firm.

The specification is as follows:

$$FDI_{fijt} = \alpha lnLP_{fit-1} + \sum_g \beta_g dindustry_g + \sum_i \beta_i dhome_i + \sum_j \beta_j dhost\_country_j + \varepsilon_{fij} \quad (4)$$

where all variables are the same as in equation (1) with the exception of FDI_{fijt}, which is equal to one if parent firm *f* from country *i* has one or more subsidiaries in host country *j* at time period t and $dhost\_country_j$ is a set of host country dummies.

Table 8 summarizes the scope elasticities estimated using destination countries as the choice variable by the MNCs for the whole sample of 36 countries of origin of the FDI. The coefficients for scope elasticities are smaller than those obtained with geographical regions. However, since the probability of investing abroad is lower when taking individual countries as targets than when taking geographical regions as targets, the estimated elasticity around the mean is very similar. Taking the elasticities of scope for the total economy as a reference, the estimated coefficient is 0.0038 (0.0066 for geographical regions) and the average probability of observing FDI in a given country is 3.2% (8.1% with geographical regions). The elasticity evaluated in the average indicates that a 10% increase in productivity increases the probability of operating a subsidiary by 1.2% (0.8% with geographical regions). Results are similar for manufacturing and services. The elasticity for manufacturing is 1.7% and 1.4%, using countries

and regions, respectively; for services it is 1.0% and 0.6%. Given the values of average probabilities of investing abroad, the elasticities obtained with both definitions of destination markets are of the same order of magnitude.

The ranking of countries for the value of their elasticities according to both market definitions is also very similar. Figure 4 reproduces the scatter for scope elasticities, taking estimates that use both countries and geographical regions as destinations as our reference. The figure draws a bisector of 45 degrees and takes into account only non-negative country elasticities. The countries are located around the bisector and shifted slightly to the right. This displacement reflects the lower elasticity values when they are estimated with country data. The calculation of Spearman's rank correlation coefficient for the elasticity of scope gives a value of 0.945, and the null hypothesis that both rankings are statistically independent can be rejected at any significant level.

The application of a second stage which is similar to the estimation of equation (3) and uses elasticities with country destinations gives a pattern of signs attached to the host country characteristics that are very similar to those shown in Tables 6. We do not reproduce this information.

Overall, elasticities estimated with countries as destinations are slightly higher than those estimated using geographical regions. The ranking of elasticities across home countries is very similar for both geographical regions and countries. This makes the second stage, which examines the relationship between estimated elasticities and host country characteristics, produce results very similar to those which use geographical destinations, presented in section 4.

6. Conclusions

This paper offers an empirical assessment of scope elasticities of MNCs at the world level. It explores this relationship for a sample of parent multinational firms that is representative of the world population of MNCs. The paper takes predictions of models of heterogeneous firms and FDI activity as a reference. The dataset used in the paper is based on the linking of information by ORBIS of parent firms that are ultimate owners of affiliate firms operating in foreign markets. The link requires both parent and affiliates to have the same main activity.

Our results confirm a positive relationship between parent firms' productivity and the scope of MNCs. The average of scope elasticities indicates that an increase of 10% of parent firms' productivity raises the probability of owning an affiliate in a given foreign market by 0.8%. Across countries, we confirm this positive relationship between productivity and scope of multinationals. Aggregate scope elasticities across countries are in the range of values from 3.4% (Japan) to 0.3% (Austria and Canada). A large proportion of estimated elasticities are statistically significant positive, 52.8%. Negative elasticities, statistically significant different from zero, have not been estimated for the sample of countries with available information.

The paper offers a complete set of results for an alternative measure of scope elasticities based on the number of subsidiaries that parent firms have in foreign markets. Count data models are used to estimate this set of elasticities. Although conceptually different, at the aggregate level they are relatively similar to the estimated elasticities that use a 0/1 variable. The alternative measure does not make a significant difference as it indicates that a 10% increase in the productivity of the parent firm raises the probability of controlling a subsidiary in a foreign market and/or of operating an additional subsidiary by 1.5%. Across countries, the ranking of scope elasticities is very similar for both approaches, those based on count models and the standard ones.

An additional set of results refers to the comparison between manufacturing and services. Scope elasticities for manufacturing are larger than for the service sector. On average, scope elasticities for manufacturing MNCs more than double elasticities in the service sector. This difference between manufacturing and services also holds across countries. To our knowledge, this is one of the first attempts to systematically measure scope elasticities by distinguishing between manufacturing and services. We associate this result with the fact that the proximity-concentration trade-off is relevant for many services. However, it is likely that the trade-off is stricter for manufacturing than for services and therefore this dissimilarity across both sectors translates into systematic differences in scope elasticities for both groups of activities.

An entire section of the paper is devoted to the issue of heterogeneity of scope elasticities across countries and sectors. To perform this analysis, the paper follows the methodology known as Meta-Regression Analysis, which considers the distribution of estimated coefficients at the country and sector level, identifying those factors that drive heterogeneity in elasticities. The paper takes the literature of heterogeneous MNCs as a reference to identify the sign the relationship between elasticities and host country bilateral characteristics.

Two main results emerge from the MRA. First, once heterogeneity and publication biases are controlled, scope elasticities reduce somewhat. For the average elasticity that uses a 0/1 variable, the estimated value reduces from 0.8 (without controls) to 0.6 (controlling for heterogeneity). Second, heterogeneity across elasticities from home countries is systematically related to differences across bilateral home-host characteristics. The list of variables includes the size of the potential host market, the bilateral distance, average tariffs of host countries, institutional quality of host countries and other factors. The signs attached to these factors are in general consistent with the predictions of models of multinational activity and heterogeneous firms**.**

A final question refers to the sensitivity of estimated elasticities with respect to the level of aggregation used to define the geographical location of subsidiary firms. The results summarized so far refer to destinations defined for geographical regions as they have been set by the United Nations. The final section of the paper examines the sensitivity of results to the use of countries as final destinations instead of geographical regions. Elasticities estimated with countries are of the same order of magnitude. For the aggregate we obtain an elasticity of 1.2 instead of 0.8, values which seem to be very close given the average probabilities of the phenomenon being examined.

Our final comment is policy-oriented and derives from the relationship between host country characteristics and scope elasticities. Host country characteristics will affect not only the scope of MNCs but also the productivity distribution of parent firms that enter host countries (asymmetric effect hypothesis). From this perspective, host country characteristics have an impact on the productivity distribution of firms that enter foreign markets**.** This, in turn, affects host countries themselves, as productivity spillovers from MNCs to domestic firms are an important feature of FDI activity. Our results uncover this circularity in the relationship between host country characteristics and the productivity distribution of parent firms that invest abroad, which has some policy consequences from the perspective of MNCs.

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Table 1
Sample of firms

Number of:	(1)	(2)	(3)
Parent firms	41,109	28,427	19,216
Subsidiary firms	196,538	170,582	112,545
Home countries (origin of FDI)	145	127	36
Host countries	195	193	170

Notes:

(1) Initial sample

(2) Requiring that the variable Sales of parent firm is available (unconsolidated data).

(3) Requiring that the variable Sales of parent firm is available for the selected home countries.

Table 2
Descriptive statistics

	Total Economy		Manufacturing		Services	
	mean	sd	mean	sd	mean	sd
Probability FDI	0.081	0.272	0.106	0.308	0.070	0.256
Number of subsidiary firms in a given market (only if FDI=1)	3.3	10.7	3.6	12.3	3.0	9.5
Parent labor productivity (ln)	3.531	3.675	3.539	3.679	3.458	3.686
GDP (host country, billion $)	1,166.2	1,523.5	1,427.0	1,710.4	990.6	1,340.7
Distance (Km)	4,854	4,216	6,182	4,246	4,037	3,989
Tariff rate (host country, %)	3.45	3.37	4.16	3.77	2.98	2.99
Common language (proportion of countries)	0.166	0.249	0.166	0.257	0.163	0.243
Colonial links (proportion of countries)	0.054	0.118	0.050	0.112	0.056	0.120
Rule of law (host country, index 0-100)	71.7	21.4	68.1	21.5	74.3	20.8

Table 3

The scope of multinational activity: propensity to invest in a foreign market (DN_{fijt}) as a function of parent firm's labor productivity.

	Total economy	Manufacturing	Services
Results at the aggregate level:			
Parent labor productivity ($\ln LP_{fit-1}$)	0.0066*** (0.0003)	0.0149*** (0.0007)	0.0044*** (0.0003)
Average Probability	0.081	0.106	0.070
Estimated elasticity (%)[1]	0.8	1.4	0.6
R-Squared	0.143	0.167	0.159
N. of observations	345,928	113,322	212,41 0
Results at the country level:			
Number of countries	36	34	36
Weighted average coefficient	0.0098	0.0232	0.0058
Weighted average probability	0.083	0.108	0.072
Estimated elasticities (%)[1]:			
Weighted average	1.2	2.1	0.8
Maximum	3.4	5.1	3.6
Minimum	-0.3	-50.8	-0.3
% countries with elasticity positive and statistically significant	52.8	55.2	33.3

Notes:

- In parentheses are standard errors robust to heteroskedasticity of OLS-estimated coefficients.
- Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.
- [1] Elasticity estimated at the average probability; it indicates the increase in the probability of investing abroad in a given market when the parent's productivity increases 10%.

Table 4

Estimated scope elasticities across countries (Total economy)

Country	Coefficient	Std. Error	Average probability	Estimated elasticity
Austria	0.0018*	0.0010	6.6	0.3*
Australia	0.0045*	0.0024	8.3	0.5*
Belgium	0.0058***	0.0017	6.9	0.9***
Canada	0.0017**	0.0008	6.4	0.3**
Chile	0.0124*	0.0075	6.3	2.0*
Cyprus	0.0020	0.0060	6.4	0.3
Czechia	0.0032**	0.0014	4.8	0.7**
Germany	0.0108***	0.0015	9.3	1.2***
Denmark	0.0056*	0.0029	7.7	0.7*
Estonia	-0.0005	0.0035	4.8	-0.1
Spain	0.0098***	0.0012	6.6	1.5***
Finland	0.0112***	0.0018	6.9	1.6***
France	0.0156***	0.0017	9.9	1.6***
Greece	0.0020	0.0093	5.4	0.4
Hong Kong	-0.0018	0.0012	6.6	-0.3
Croatia	0.0015	0.0021	4.9	0.3
Hungary	0.0005	0.0015	5.0	0.1
Ireland	0.0148***	0.0050	12.5	1.2***
Iceland	0.0013	0.0053	5.3	0.2
Italy	0.0011	0.0013	6.2	0.2
Japan	0.0413***	0.0021	12.0	3.4***
Republic of Korea	0.0156***	0.0041	8.2	1.9***
Lithuania	0.0046	0.0032	5.0	0.9
Luxembourg	0.0056***	0.0021	7.0	0.8***
Latvia	0.0069	0.0054	4.9	1.4
Malaysia	0.0008	0.0073	6.8	0.1
Netherlands	-0.0009	0.0027	7.0	-0.1
Norway	0.0022	0.0021	6.0	0.4
Poland	-0.0013	0.0042	5.6	-0.2
Portugal	0.0029*	0.0018	6.0	0.5*
Romania	-0.0003	0.0078	4.6	-0.1
Sweden	0.0059***	0.0012	6.8	0.9***
Slovenia	0.0006	0.0025	5.0	0.1
Slovakia	0.0017	0.0018	4.9	0.3
Taiwan	0.0119***	0.0024	7.6	1.6***
United States of America	0.0066***	0.0005	10.9	0.6***
Total	**0.0066*** **	**0.0003**	**8.1**	0.8***

Notes: Standard errors are robust to heteroskedasticity of OLS-estimated coefficients. Average probability is expressed as a percentage. The elasticity is estimated at the average probability; it indicates the increase in the probability of investing abroad in a given market when the parent's productivity increases 10%. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.

Table 5

The scope of multinational activity: the number of subsidiary firms (N_{fijt}) as a function of parent firms' productivity. Count model estimators.

	Total		Manufacturing		Services	
	NBML	ZINBML	NBML	ZINBML	NBML	ZINBML
Parent labor productivity ($\ln LP_{fit-1}$)	0.2016***	0.1540***	0.3249***	0.2317***	0.1524***	0.1230***
	(0.0086)	(0.0088)	(0.0123)	(0.0132)	(0.0090)	(0.0090)
Constant	-6.9989***	-5.3973***	-8.0933***	-6.2421***	8.1864***	-6.4903***
	(0.3359)	(0.3604)	(0.6911)	(0.4199)	(0.1537)	(0.0125)
Home country FE	Yes	Yes	Yes	Yes	Yes	Yes
Host country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Model predicting zeros:						
Total number of subsidiaries		-0.3132***		-0.3553***		-0.2953***
		(0.0084)		(0.0124)		(0.0125)
Ln(GDP host country)		-0.1878***		-0.3182***		-0.1794***
		(0.0204)		(0.0197)		(0.0450)
Ln(Distance)		2.1781***		1.4564***		2.4226***
		(0.0288)		0.0344		(0.0489)
Home country FE		Yes		No		Yes
Industry FE		Yes		No		Yes
Overdispersion (α)	6.9972***	2.2667***	4.9629***	1.6811***	7.2360***	2.5225***
	(0.0993)	(0.0395)	(0.0905)	(0.0397)	(0.1536)	(0.0646)
N. of observations	345,928	345,928	111,322	111,322	212,410	212,410
Log-likelihood	-125,431	-111,156	-49,744	-44,622	-66,720	-33,690

Notes: in parentheses are standard errors robust to heteroskedasticity of estimated coefficients. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively. NBPML, negative binomial maximum likelihood; ZINBML, zero-inflated negative binomial maximum likelihood.

Table 6

Meta-regression analysis of estimated coefficients (scope elasticities).
Dependent variable: estimated coefficients in equation (1) by sectors and home countries.

	OLS (Robust SE)	WLS (Robust SE)	WLS (Cluster home SE)
Constant	0.0140***	0.0044***	0.0044**
	(0.0025)	(0.0016)	(0.0022)
Standard error	-1.4537***	0.8435**	0.8435*
	(0.1347)	(0.4063)	(0.4660)
Per capita GDP (home)	0.0003	-0.0005	-0.0005
	(0.0008)	(0.0003)	(0.0005)
GDP (home)	-0.0000	0.0015***	0.0015**
	(0.0021)	(0.0006)	(0.0006)
Market size (host)	-0.0045	0.0037*	0.0037
	(0.0074)	(0.0022)	(0.0027)
Distance	0.0027	-0.0040**	-0.0040*
	(0.002)	(0.0018)	(0.0023)
Common language	-0.0027	-0.0039***	-0.0039**
	(0.0030)	(0.0013)	(0.0020)
Cultural closeness	0.0032	-0.0008	-0.0008
	(0.0028)	(0.0008)	(0.0012)
Institutional quality_WB (host)	-0.0047	0.0039**	0.0039*
	(0.0059)	(0.0018)	(0.0022)
Institutional quality_WEF (host)	0.0068**	0.0009	0.0009
	(0.0028)	(0.0009)	(0.0013)
Tariffs (host)	-0.0016	0.0068***	0.0068**
	(0.0056)	(0.0023)	(0.0031)
Industry dummies	yes	yes	yes
N. of observations	106	106	106
F-test	12.37	5.51	19.29
(P-value)	(0.000)	(0.000)	(0.000)
Adjusted R^2	0.565	0.547	0.547

Notes: Weighted least squares (WLS) using weights based on the inverse of the variance of the estimated coefficients with alternative standard error estimates: robust standard error or standard errors clustered at the home country level. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.

Table 7

Meta-regression analysis of estimated coefficients (scope elasticities, Count models).
Dependent variable: estimated coefficients in equation (2) by sectors and home countries.

	OLS (Robust SE)	WLS (Robust SE)	WLS (Cluster home SE)
Constant	0.1403***	0.1296***	0.1296***
	(0.0260)	(0.0355)	(0.0441)
Standard error	0.0233	0.3232	0.3232
	(0.1420)	(0.4488)	(0.5096)
Per capita GDP (home)	-0.0252***	-0.0089	-0.0089
	(0.0069)	(0.0053)	(0.0061)
GDP (home)	0.0130	0.0203	0.0203
	(0.0189)	(0.0138)	(0.0172)
Market size (host)	0.0572	0.0317	0.0317
	(0.0598)	(0.0392)	(0.0453)
Distance	-0.0537	-0.0858*	-0.0858
	(0.0536)	(0.0467)	(0.0568)
Common language	-0.0612**	-0.0791***	-0.0791***
	(0.0267)	(0.0188)	(0.0254)
Cultural closeness	-0.0099	-0.0037	-0.0037
	(0.0241)	(0.0229)	(0.0296)
Institutional quality (host)	0.0950***	0.0851**	0.0851*
	(0.0333)	(0.0356)	(0.0466)
Tariffs (host)	0.1124***	0.1248***	0.1248***
	(0.0327)	(0.0303)	(0.0353)
Industry dummies	yes	Yes	yes
N. of observations	99	99	99
F-test	3.86	14.90	10.29
(P-value)	(0.000)	(0.000)	(0.000)
Adjusted R^2	0.243	0.593	0.593

Notes: Weighted least squares (WLS) using weights based on the inverse of the variance of the estimated coefficients with alternative standard error estimates: robust standard error or standard errors clustered at the home country level. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.

Table 8

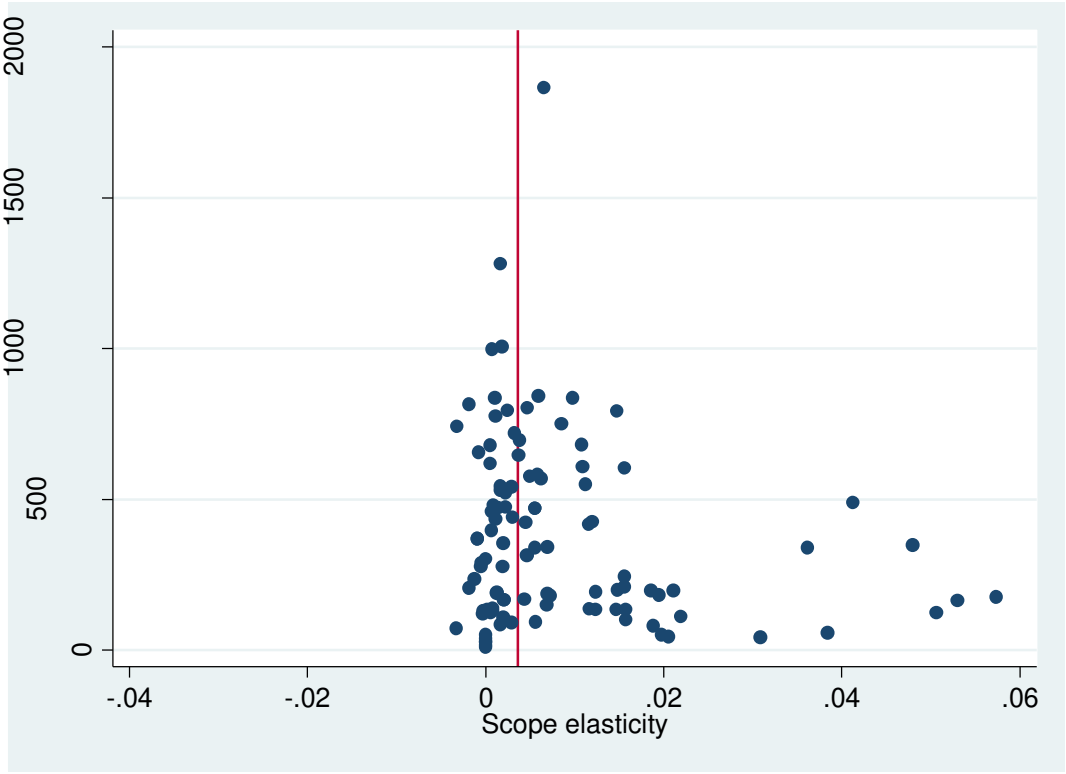
Sensitivity of results to different aggregation levels: estimated scope elasticities using countries as reference for destination markets.

	Total economy	Manufacturing	Services
Estimated coefficient	0.0038***	0.0074***	0.0028***
(robust standard error)	(0.0001)	(0.0002)	(0.0001)
Average Probability	0.032	0.042	0.029
Estimated elasticity (%)[1]	1.2	1.7	1.0
R-Squared	0.053	0.092	0.040
N. of observations	1,140,072	376,695	697,064

Note: [1] Scope elasticity estimated at the average probability; it indicates the increase in the probability of investing abroad in a given market when the parent's productivity increases 10%.

Figure 1

Funnel plot of the distribution of estimated coefficients (scope elasticities) and its precision



Note: The solid line shows the position of the precision weighted average of estimated coefficients (scope elasticities). The vertical axis measures the precision of coefficients calculated as the inverse of their standard errors. We removed the coefficient for Greek manufacturing for visual purposes.

Figure 2

Distribution of the number of subsidiary firms owned by a parent firm in a given market

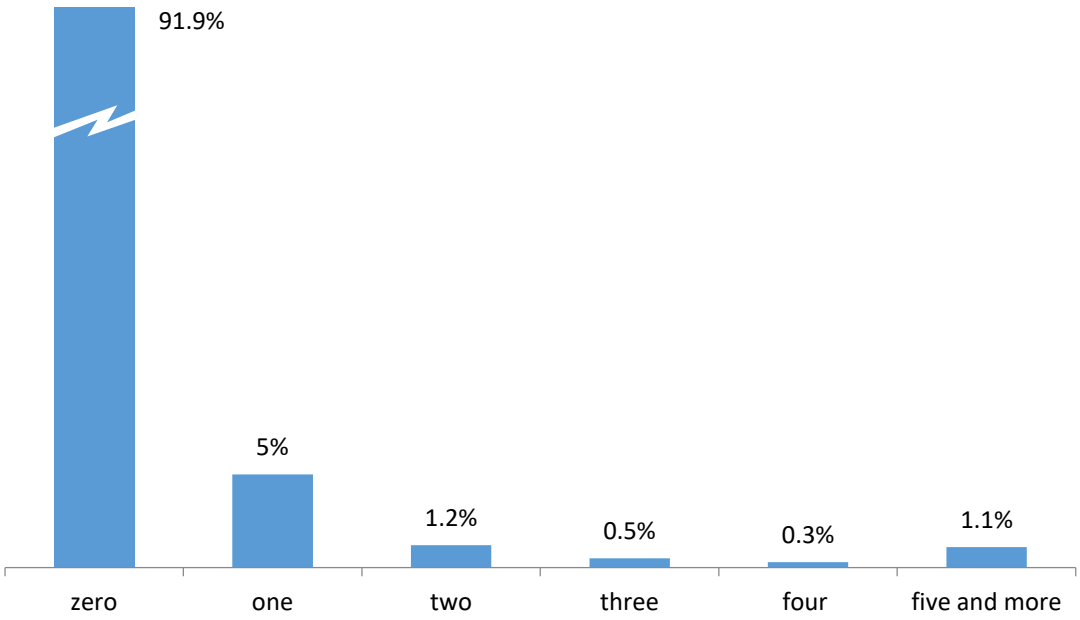
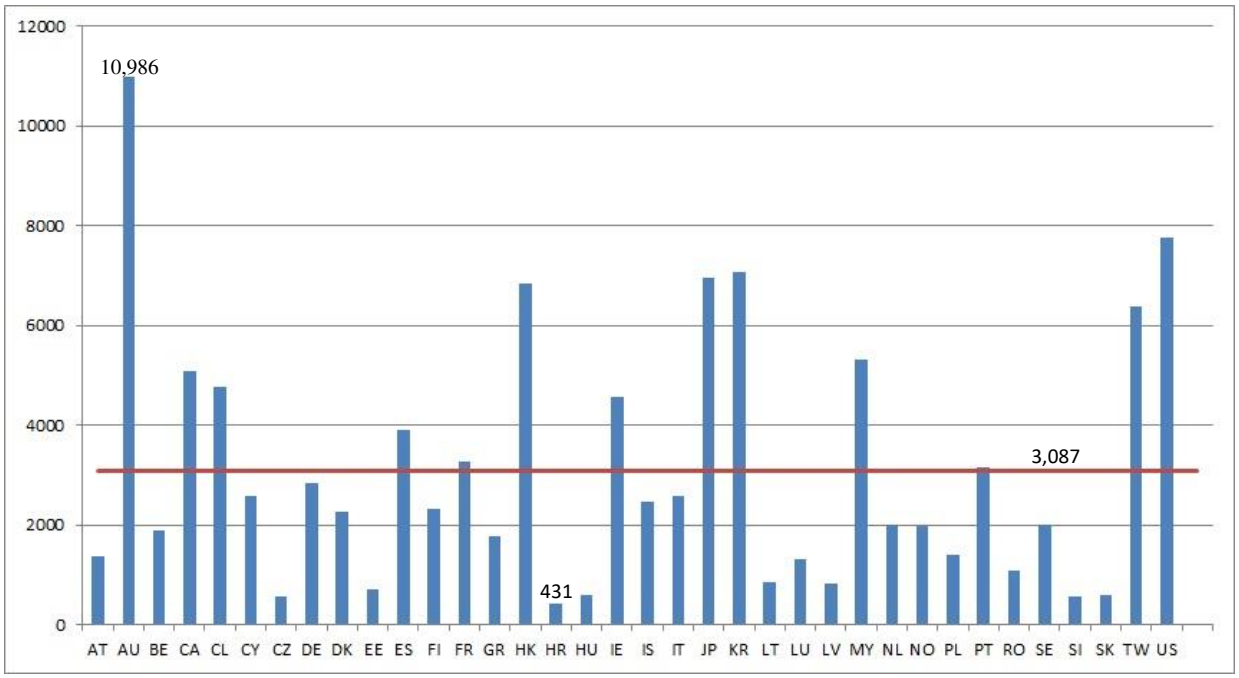


Figure 3

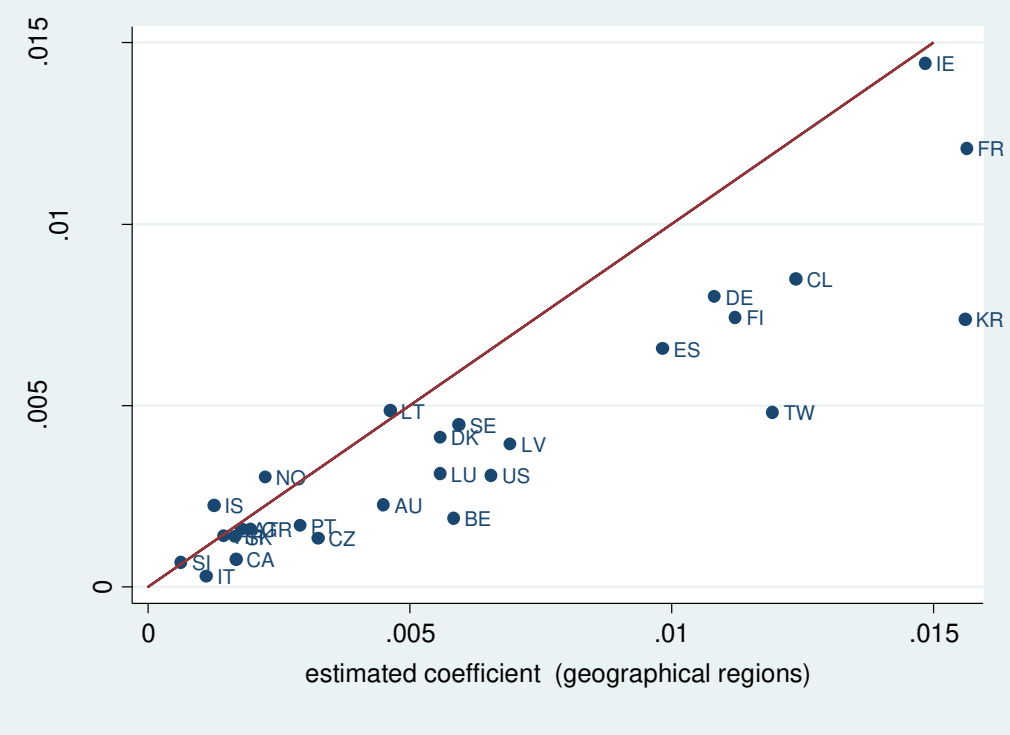
Average distance from parent firms of country *i* to host countries where they invest (in Km.)



Note: This measure corresponds to weighted averages of host country variables. This variable, *Distance*, weights, at the firm level, the existence of subsidiaries in the host country.

Figure 4

Scope elasticities: Sensitivity of results at different aggregation levels (Total Economy)



Note: we only draw non-negative country coefficients.

APPENDIX

Table A1
Estimated scope elasticities across countries (Manufacturing)

Country	Coefficient	Std. Error	Average probability	Estimated elasticity
Austria	0.0156***	0.0047	9.2	1.7***
Australia	0.0147**	0.0074	11.5	1.3**
Belgium	0.0157**	0.0074	11.2	1.4**
Canada	0.0025**	0.0013	6.4	0.4**
Chile	0.0206	0.0225	6.6	3.1
Cyprus	-	-	-	-
Czechia	0.0000	0.0033	4.5	0.0
Germany	0.0574***	0.0056	12.4	4.6***
Denmark	0.0220**	0.0091	12.9	1.7**
Estonia	0.0000	0.0256	4.5	0.0
Spain	0.0195***	0.0055	7.2	2.7***
Findland	0.0506***	0.0081	10.3	4.9***
France	0.0530***	0.0062	17.7	3.0***
Greece	-0.3337**	0.1629	6.6	-50.8
Hong Kong	-0.0032**	0.0014	6.0	-0.5
Croatia	0.0000	0.0198	4.9	0.0
Hungary	0.0001	0.0075	5.4	0.0
Ireland	0.0189	0.0125	23.8	0.8
Iceland	-	-	-	-
Italy	0.0069**	0.0029	6.6	1.0**
Japan	0.0479***	0.0029	13.1	3.7***
Republic of Korea	0.0211***	0.0051	7.9	2.7***
Lithuania	-0.0000	0.1242	5.5	0.0
Luxembourg	-0.0000	0.0358	9.8	0.0
Latvia	-0.0000	0.0671	5.0	0.0
Malaysia	0.0309	0.0237	6.1	5.1
Netherlands	0.0198	0.0198	6.8	2.9
Norway	0.0384**	0.0175	10.0	3.8**
Poland	0.0006	0.0082	5.5	0.1
Portugal	-0.0033	0.0140	4.8	-0.7
Romania	0.0000	0.0363	4.5	0.0
Sweden	0.0186***	0.0050	13.1	1.4***
Slovenia	0.0017	0.0120	4.9	0.3
Slovakia	0.0029	0.0111	4.7	0.6
Taiwan	0.0116***	0.0024	7.5	1.5***
United States of America	0.0147***	0.0013	13.7	1.1***
Total	**0.0148*** **	**0.0007**	**10.6**	**1.4*** **

Notes: Standard errors are robust to heteroskedasticity of OLS estimated coefficients. Average probability is expressed as a percentage. The elasticity is estimated at the average probability: it indicates the increase in the probability of investing abroad in a given market when the parent's productivity increases 10%. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.

Table A2

Estimated scope elasticities across countries (Services)

Country	Coefficient	Std. Error	Average probability	Estimated elasticity
Austria	0.0007	0.0010	6.0	0.1
Australia	0.0030	0.0023	7.2	0.4
Belgium	0.0050*	0.0017	6.1	0.8*
Canada	0.0010	0.0012	6.6	0.2
Chile	0.0117	0.0074	6.3	1.9
Cyprus	0.0020	0.0060	6.4	0.3
Czechia	0.0037**	0.0016	4.9	0.8**
Germany	0.0038***	0.0014	7.9	0.5***
Denmark	0.0019	0.0036	7.3	0.3
Estonia	-0.0005	0.0036	4.9	-0.1
Spain	0.0085***	0.0013	6.4	1.3***
Findland	0.0062***	0.0018	5.9	1.1***
France	0.0108***	0.0016	8.3	1.3***
Greece	0.0056	0.0107	5.2	1.1
Hong Kong	0.0011	0.0023	6.9	0.2
Croatia	0.0020	0.0028	4.9	0.4
Hungary	0.0005	0.0016	5.0	0.1
Ireland	0.0124**	0.0052	8.1	1.5**
Iceland	0.0013	0.0053	5.1	0.2
Italy	-0.0008	0.0015	5.9	-0.1
Japan	0.0362***	0.0029	10.1	3.6***
Republic of Korea	0.0068	0.0067	9.0	0.8
Lithuania	0.0046	0.0032	4.9	0.9
Luxembourg	0.0056***	0.0021	7.0	0.8***
Latvia	0.0073	0.0056	4.9	1.5
Malaysia	0.0008	0.0077	7.4	0.1
Netherlands	-0.0009	0.0027	7.1	-0.1
Norway	0.0007	0.0022	5.5	-0.1
Poland	-0.0019	0.0049	5.7	-0.3
Portugal	0.0023	0.0019	6.1	0.4
Romania	-0.0003	0.0084	4.7	-0.1
Sweden	0.0047***	0.0012	6.0	0.8***
Slovenia	0.0009	0.0021	1.8	0.2
Slovakia	0.0017	0.0019	4.9	0.3
Taiwan	0.0158*	0.0100	8.4	1.9*
United States of America	0.0044***	0.0006	9.6	0.5***
Total	**0.0044*** **	**0.0003**	**7.0**	**0.6*** **

Notes: Standard errors are robust to heteroskedasticity of OLS estimated coefficients. Average probability is expressed as a percentage. The elasticity is estimated at the average probability: it indicates the increase in the probability of investing abroad in a given market when the parent's productivity increases 10%. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.

Table A3

The scope of multinational activity: the number of subsidiary firms (N_{fijt}) as a function of parent firms' productivity. Count model estimators (ZINBML).

	Total Economy		Manufacturing		Services	
Country	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**
Austria	0.1091**	0.0429	0.2224***	0.0673	0.1070**	0.0527
Australia	-0.0860*	0.0503	-0.0546	0.0773	0.0984**	0.0463
Belgium	0.2103***	0.0621	0.8578***	0.1088	0.1076*	0.0573
Canada	0.0977***	0.0271	0.1651***	0.0373	0.0082	0.0408
Chile	0.2804***	0.0924	-0.0283	0.4555	0.3577***	0.0382
Cyprus	0.0890*	0.0487	-	-	0.0890*	0.4866
Czechia	-	-	-	-	0.1121**	0.0501
Germany	0.2996***	0.0348	0.5718***	0.0503	0.1440***	0.0387
Denmark	0.0637	0.0634	0.2112***	0.0760	0.0603*	0.0384
Estonia	0.0298	0.0829	-	-	0.0200	0.0783
Spain	0.3942***	0.0296	0.5996***	0.0861	0.2624***	0.0270
Finland	0.2468***	0.0651	0.4288***	0.0720	0.1176***	0.0728
France	0.2153***	0.0254	0.1809***	0.0345	0.2036***	0.0313
Greece	0.0157	0.1480	-0.1289	0.7451	0.0797	0.1540
Hong Kong	-0.1108***	0.0248	-0.1900***	0.7451	-0.0282	0.0459
Croatia	0.0803*	0.0461	-	-	0.1356*	0.0797
Hungary	-	-	0.0906	0.0890	-	-
Ireland	0.0832**	0.0345	0.5959*	0.3466	0.1492	0.1252
Iceland	0.0430	0.1625	-	-	0.0586	0.0777
Italy	0.0648*	0.0370	0.3233***	0.0772	-0.0047	0.0312
Japan	0.4403***	0.0306	0.5176***	0.0410	0.4565***	0.0379
Republic of Korea	0.2698***	0.0546	0.6315***	0.1112	0.0327	0.0887
Lithuania	0.1624**	0.0695	-	-	0.1730**	0.0734
Luxembourg	0.1739***	0.0563	0.8123	1.0219	0.1722***	0.0560
Latvia	0.1551	0.1176	0.2322	0.2880	0.1338	0.1267
Malaysia	0.0839	0.0654	0.0269	0.2246	0.0772	0.0649
Netherlands	-0.0187	0.0563	0.3017	0.2321	-0.0147	0.0573
Norway	0.1535***	0.0556	0.3157*	0.1868	0.1836**	0.9072
Poland	0.0168	0.0859	0.1951	0.1620	-0.0120	0.1005
Portugal	0.3286***	0.0459	0.0362	0.1673	0.1702***	0.0501
Romania	-0.1143	0.1275	-1.1834	0.5062	-0.2285	0.2170
Sweden	0.1735***	0.0457	0.2201***	0.0718	0.1638***	0.0546
Slovenia	0.0142	0.0614	0.2235	0.3656	0.0048	0.0737
Slovakia	0.0299	0.0392	-0.0899	0.1373	0.0354	0.0489
Taiwan	0.2354***	0.0407	0.2359***	0.4204	0.1245	0.1317
United States of America	0.1013***	0.0120	0.1552***	0.0171	0.1024***	0.0146
Total	0.1540***	0.0088	0.2548***	0.0133	0.1230***	0.0090

Notes: Standard errors are robust to heteroscedasticity. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.

Table A4

Average host country characteristics across countries (Total economy)

Country	Host country GDP (Thousands of millions of dollars)	Distance (kms.)	Trade tariffs (% duty)	Common language (proportion)	Colonial relationship (proportion)	Rule of law (standarized values)
Austria	1,672.4	1,358	1.837	0.293	0.232	0.422
Australia	2,716.3	10,986	2.846	0.643	0.144	0.887
Belgium	1,940.0	1,882	2.015	0.462	0.000	0.951
Canada	9,054.0	5,094	2.731	0.700	0.091	0.680
Chile	1,931.1	4,776	6.592	0.797	0.027	-2.763
Cyprus	1,231.3	2,586	2.463	0.054	0.151	-0.814
Czechia	572.7	569	1.464	0.000	0.023	-0.472
Germany	2,027.9	2,833	2.662	0.143	0.062	0.468
Denmark	1,894.1	2,265	2.168	0.000	0.002	1.067
Estonia	477.0	710	1.641	0.000	0.103	0.326
Spain	1,483.5	3,893	3.486	0.225	0.226	-0.298
Finland	1,675.2	2,319	2.420	0.000	0.228	0.622
France	1,837.1	3,275	3.030	0.176	0.116	0.231
Greece	1,177.5	1,786	1.921	0.034	0.086	-0.397
Hong Kong	5,889.1	6,848	5.244	0.829	0.069	-1.949
Croatia	194.5	431	3.768	0.619	0.031	-1.634
Hungary	547.7	588	1.016	0.548	0.000	-0.491
Ireland	2,384.0	4,567	2.985	0.370	0.112	0.577
Iceland	1,997.4	2,460	1.406	0.000	0.130	1.887
Italy	1,903.3	2,593	2.677	0.052	0.000	0.039
Japan	4,407.9	6,950	4.807	0.000	0.054	-0.436
Republic of Korea	4,898.3	7,082	4.571	0.335	0.008	-0.636
Lithuania	415.4	855	1.901	0.000	0.137	-0.359
Luxembourg	2,176.3	1,310	1.574	0.000	0.091	1.211
Latvia	698.4	831	1.711	0.000	0.096	0.438
Malaysia	2,567.6	5,320	3.981	0.424	0.083	-0.656
Netherlands	1,872.5	2,006	1.835	0.045	0.025	0.799
Norway	1,369.0	1,987	1.799	0.000	0.000	1.439
Poland	1,545.7	1,411	1.728	0.000	0.201	0.159
Portugal	1,343.3	3,168	3.895	0.245	0.245	-0.420
Romania	986.7	1,093	2.015	0.083	0.000	-0.333
Sweden	1,542.9	2,006	2.246	0.000	0.119	1.270
Slovenia	503.2	564	3.138	0.000	0.449	-1.384
Slovakia	574.0	594	1.424	0.046	0.084	0.640
Taiwan	7,696.5	6,394	5.542	0.396	0.010	-1.139
United States of America	1,653.6	7,752	3.302	0.528	0.191	0.588
Average	2,134.9	3,087	2.773	0.224	0.101	0.014

Note: These measures correspond to weighted averages of host country variables.

Table A5

Estimated scope elasticities across countries (Total economy)
(Host countries: countries which have at least 50 affiliate firms)

Country	Coefficient	Std. Error	Average probability	Estimated elasticity
Austria	0.0016***	0.0004	2.9	0.5***
Australia	0.0022***	0.0008	3.3	0.7***
Belgium	0.0019**	0.0009	2.9	0.6**
Canada	0.0008***	0.0002	1.8	0.4***
Chile	0.0084**	0.0033	2.3	3.7**
Cyprus	0.0013	0.0028	2.6	0.5
Czechia	0.0013**	0.0006	1.7	0.8**
Germany	0.0080***	0.0007	4.3	1.8***
Denmark	0.0041***	0.0014	3.7	1.1***
Estonia	0.0002	0.0013	1.7	0.1
Spain	0.0065***	0.0005	2.6	2.5***
Finland	0.0073***	0.0009	3.0	2.4***
France	0.0119***	0.0007	4.8	2.5***
Greece	0.0015	0.0035	2.0	0.7
Hong Kong	-0.0006	0.0003	1.9	-0.3
Croatia	0.0014	0.0011	1.9	0.7
Hungary	0.0000	0.0006	1.8	0.0
Ireland	0.0142***	0.0023	7.2	2.0***
Iceland	0.0023	0.0021	2.3	1.0
Italy	0.0003	0.0006	2.3	0.1
Japan	0.0257***	0.0009	5.4	4.8***
Republic of Korea	0.0073***	0.0015	3.1	2.4***
Lithuania	0.0048***	0.0018	1.9	2.6***
Luxembourg	0.0031***	0.0011	3.1	1.0***
Latvia	0.0039**	0.0022	1.9	2.1**
Malasia	-0.0011	0.0023	1.9	-0.6
Netherlands	-0.0015	0.0012	3.0	-0.5
Norway	0.0030***	0.0010	2.6	1.2***
Poland	-0.0013	0.0016	2.2	-0.6
Portugal	0.0017**	0.0007	1.9	0.9**
Romania	0.0008	0.0029	1.5	0.5
Sweden	0.0044***	0.0006	3.1	1.4***
Slovenia	0.0007	0.0011	1.9	0.4
Slovakia	0.0014*	0.0008	1.7	0.8*
Taiwan	0.0047***	0.0008	2.7	1.7***
United States of America	0.0030***	0.0002	4.0	0.8***
Total	**0.0038*** **	**0.0001**	**3.2**	**1.2*** **

Notes: Standard errors are robust to heteroskedasticity of OLS estimated coefficients. Average probability is expressed as a percentage. The elasticity is estimated at the average probability: it indicates the increase in the probability of investing abroad in a given market when the parent's productivity increases 10%. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.

Table A6

Estimated scope elasticities across countries (Manufacturing)
(Host countries: countries which have at least 50 affiliate firms)

Country	Coefficient	Std. Error	Average probability	Estimated elasticity
Austria	0.0088***	0.0020	4.6	1.9***
Australia	0.0085***	0.0027	5.1	1.7***
Belgium	0.0072**	0.0032	5.2	1.4**
Canada	0.0009***	0.0003	1.7	0.5***
Chile	0.0000	0.0090	1.9	0.0
Cyprus	-	-	-	-
Czechia	0.0002	0.0017	1.6	0.1
Germany	0.0378***	0.0027	5.7	6.6***
Denmark	0.0192***	0.0041	6.3	3.0***
Estonia	0.0000	0.0138	1.5	0.0
Spain	0.0113***	0.0022	2.7	4.3***
Finland	0.0317***	0.0039	4.9	6.4***
France	0.0394***	0.0037	9.5	4.1***
Greece	-0.1945	0.0730	2.8	-69.0
Hong Kong	-0.0011	0.0004	1.7	-0.7
Croatia	0.0132	0.0096	1.9	7.1
Hungary	0.0017	0.0032	1.9	0.9
Ireland	0.0114**	0.0051	14.0	0.8**
Iceland	-	-	-	-
Italy	0.0051***	0.0012	2.4	2.1***
Japan	0.0275***	0.0013	5.9	4.7***
Republic of Korea	0.0094***	0.0018	2.9	3.2***
Lithuania	0.0000	0.0456	1.8	0.0
Luxembourg	0.0000	0.0116	4.2	0.0
Latvia	-0.0022	0.0213	1.9	-1.1
Malaysia	0.0050	0.0101	1.7	3.0
Netherlands	0.0065	0.0065	2.2	2.9
Norway	0.0312***	0.0087	4.4	7.1***
Poland	-0.0002	0.0028	2.0	-0.1
Portugal	-0.0019	0.0045	1.5	-1.3
Romania	0.0000	0.0125	1.5	0.0
Sweden	0.0111***	0.0022	6.6	1.7***
Slovenia	0.0003	0.0052	1.7	0.1
Slovakia	0.0009	0.0058	1.7	0.6
Taiwan	0.0039***	0.0008	2.6	1.5***
United States of America	0.0061***	0.0004	5.0	1.2***
Total	**0.0074*** **	**0.0002**	**4.2**	**1.7*** **

Notes: Standard errors are robust to heteroskedasticity of OLS estimated coefficients. Average probability is expressed as a percentage. The elasticity is estimated at the average probability: it indicates the increase in the probability of investing abroad in a given market when the parent's productivity increases 10%. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.

Table A7

Estimated scope elasticities across countries (Services)
(host countries: countries which have at least 50 affiliate firms)

Country	Coefficient	Std. Error	Average probability	Estimated elasticity
Austria	0.0010**	0.0004	2.6	0.4**
Australia	0.0011	0.0008	2.6	0.4
Belgium	0.0014	0.0009	2.5	0.5
Canada	0.0007**	0.0003	2.0	0.3**
Chile	0.0091***	0.0034	2.5	3.6***
Cyprus	0.0013	0.0028	2.6	0.5
Czechia	0.0015**	0.0007	1.7	0.9**
Germany	0.0033***	0.0006	3.7	0.9***
Denmark	0.0007	0.0017	3.5	0.2
Estonia	0.0002	0.0013	1.8	0.1
Spain	0.0054***	0.0005	2.5	2.2***
Finland	0.0042***	0.0008	2.4	1.7***
France	0.0086***	0.0007	3.9	2.2***
Greece	0.0037	0.0039	1.8	2.0
Hong Kong	0.0006	0.0006	1.9	0.3
Croatia	0.0017	0.0014	1.9	0.9
Hungary	-0.0001	0.0007	1.8	0.0
Ireland	0.0135***	0.0026	4.7	2.9***
Iceland	0.0023	0.0021	2.1	1.1
Italy	-0.0011	0.0007	2.3	-0.5
Japan	0.0245***	0.0013	4.7	5.2***
Republic of Korea	0.0038	0.0026	3.4	1.1
Lithuania	0.0048***	0.0018	1.9	2.6***
Luxembourg	0.0031***	0.0011	3.1	1.0***
Latvia	0.0038*	0.0022	1.8	2.1*
Malaysia	-0.0010	0.0012	2.1	-0.5
Netherlands	-0.0015	0.0012	3.1	-0.5
Norway	0.0016	0.0010	2.3	0.7
Poland	-0.0015	0.0019	2.4	-0.6
Portugal	0.0015**	0.0007	1.9	0.8**
Romania	0.0008	0.0032	1.5	0.6
Sweden	0.0037***	0.0006	2.7	1.4***
Slovenia	0.0004	0.0013	1.9	0.2
Slovakia	0.0014*	0.0008	1.7	0.8*
Taiwan	0.0154***	0.0037	3.5	4.4***
United States of America	0.0023***	0.0002	3.6	0.6***
Total	**0.0028*** **	**0.0001**	**2.9**	**1.0*** **

Notes: Standard errors are robust to heteroskedasticity of OLS estimated coefficients. Average probability is expressed as a percentage. The elasticity is estimated at the average probability: it indicates the increase in the probability of investing abroad in a given market when the parent's productivity increases 10%. Superscripts ***, ** and * indicate significance at the 1, 5 and 10 percent confidence levels, respectively.