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Investing abroad from the bottom of the productivity ladder – BRICS multinationals in Europe

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Abstract

This paper analyses differences in total factor productivity and other competitiveness indicators of emerging multinationals (EMNEs) from Brazil, Russia, India, China and South Africa (BRICS) against their counterparts from developed countries and domestic MNEs. The current literature suggests that early internationalisation strategies by EMNEs are characterised by a lack of experience in diverse economic and cultural contexts and are explicitly driven by asset-exploration strategies. If true, this should translate into significant differences in performance, especially when they invest in developed countries. Based on a large database on foreign affiliates in Europe, results find EMNEs at the bottom of the productivity ladder, with a productivity gap around 20-30 percentage points compared to more established competitors. Moreover, the paper points to high heterogeneity among EMNEs that affects their relative performance according to their current levels of productivity or to differences in their sectorial and geographic patterns.

Keywords: emerging market multinationals, total factor productivity, foreign direct investment.
JEL Codes: F21; F23

Marco Sanfilippo, European University Institute, Via delle Fontanelle, 19 – 50014 S.Domenico di Fiesole (FI), Tel. +39 055 4685 718. Email: marco.sanfilippo@eui.eu

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1 Introduction

The literature on the internationalisation strategies of Multinational Enterprises (MNEs) has, to date, been built on the idea that such firms invest abroad on the basis of the possession of a superior set of assets compared to domestic firms. This view was initially supported by studies largely based on the "internalisation" theory (Hymer, 1976; Caves, 1996) and on the so-called Ownership-Location-Internalisation (OLI) paradigm (Dunning, 1993). The latter theory assumes that the decision of firms to invest abroad depends, among other factors, on the ownership of firm-specific resources which can be exploited externally. Such competitive advantages have been defined as unique capabilities proprietary to the organisation, which can be built upon product or process technology, marketing or distributional skills. Given the fact that, for the most part, they are intangible in their very nature, such competitive advantages are more easily transferred through internalisation between parents and affiliates, rather than through arms' length transactions. This characteristic generally makes foreign affiliates more productive and profitable when compared to domestic firms.

Such theories have influenced a strand of theoretical literature which tries to modelling the behaviour of MNEs based on their specific advantages and to the proximity-concentration trade-off that they face before deciding to invest abroad (Helpman, 1984; Markusen, 2002). More recent literature on heterogeneous firms further emphasises the relevance of company-specific endowments in determining their internationalisation strategies. These studies theoretically and empirically support the existence of a productivity-sorting among firms, and that the most productive firms are those with foreign affiliates abroad (Melitz, 2003; Helpman *et al*., 2003; Antras and Yeaple, 2013).

A recent body of empirical research has followed with the aim of measuring the productivity premium and the performance of foreign affiliates. To date, this literature has focused on the role of MNEs from developed countries, which, generally speaking, show results which are consistent with the theory. A number of analyses go somewhat further and note the productivity leadership of US MNEs compared to other firms (Criscuolo and Martin, 2005; Benfratello and Sembenelli, 2006; Bloom *et al*., 2012). Bloom *et al*., (2012) attribute the US advantage to superior capacity in "IT intensive" industries and better management. Criscuolo and Martin (2005), in contrast, argue that US leadership reflects a tendency of US MNEs to "cherry pick" the best plants in host countries. While many other

studies back this up with samples that include other foreign MNEs (Gelübke, 2013; Arndt and Spies, 2012; Fons-Rosen *et al*., 2013), a few cast doubt on the foreign-ownership premium, especially when comparing foreign affiliates against domestic MNEs (parent companies) rather than other local firms (e.g. Benfratello and Sembenelli, 2006; Temouri *et al*., 2008).

Strikingly, no analysis checks the provisions of existing theories on the group of the Emerging Multinationals (EMNEs)[i], despite FDI flows from emerging and developing economies have risen steadily over the past decade (and actually accelerating during the financial crisis) and represent now 23 per cent of the global FDI stock (UNCTAD, 2012). The recent rise of EMNEs has attracted a great deal of attention in the literature because of their "unconventional" patterns, which are characterised by early internationalisation strategies which are driven by the need to develop, rather than exploit, the firm's resources. Some of the literature on EMNEs has pointed out that, as latecomers in international markets, they often invest abroad with little or no prior experience, lacking internal-management capacities and a deep knowledge of Western-style managerial practices and the social and economic aspects of the host country markets. Traditional theories of international business have long highlighted how the process of internationalisation relies strongly on knowledge of foreign markets, accumulated experience of foreign business operations and an understanding of how cultural distance with a host country can affect firm performance (Vernon, 1966; Johanson and Vahlne, 1977). More recent approaches stress the importance of superior management and organisational practices in fostering firm performance. They demonstrate how the relative backwardness of the main emerging economies in such areas contributes to their low productivity (Bloom and Van Reenen, 2010; Bloom *et al*., 2010).

The unconventional traits of EMNEs usually get mentioned when an investment is directed at a developed country, i.e. where *asset-exploring* strategies are more likely to be undertaken than traditional *asset-exploiting* strategies (Mathews, 2002; Amighini *et al*., 2010). These investments, aimed at sourcing assets not fully developed at home, are changing the traditional direction of knowledge flows (Narula, 2010), giving rise to a "reverse positive spillover" from the affiliate to the parent (Chen *et al*., 2012).

Recent case-study based evidence and cross-country regression analyses confirm the relevance of asset-augmenting motivations (Luo and Tung, 2007), and highlights that a common objective of these firms is to invest overseas in order to accelerate their catching-

up process with the established competitors from advanced countries (Chen *et al.*, 2012). Moreover, empirical analyses and the detailed case studies reveal strong market-seeking motives of EMNEs, independent of whether they are investing in developed or developing countries (Amighini *et al.*, 2010).

One of the key characteristics of EMNEs has to do with the nature of their competitive advantage. While MNEs from developed countries are most likely to possess advantages based on the ownership of key assets, such as technologies, brands and other intellectual properties, which give them an edge on productivity, EMNEs seem to rely much more on advantages related to production capabilities, networks and relationships and their organisational structure (UNCTAD, 2006). In addition, country-specific factors that give rise to idiosyncratic competitive advantages play a role in the internationalisation strategies of these firms. Nevertheless, the evidence shows that a group of global EMNEs, and especially those from the larger emerging countries, can be already considered to be as competitive as "traditional" MNEs (Goldstein, 2013).

In the light of the above discussion, and based on a large dataset of foreign affiliates in Europe, this paper aims at measuring differences in total factor productivity (TFP) and other indicators of the competitiveness of EMNEs from Brazil, Russia, India, China and South Africa (BRICS) against their counterparts from developed countries and domestic-owned MNEs. Empirically, this is done by means of different approaches, including cross-company regressions, quantile analysis and semi-parametric tests, based on propensity score matching and difference-in-difference estimators, an approach which is particularly useful in this context since it allows the building of a comparison group which reflects the characteristics of EMNEs investing in Europe. If, as suggested by the literature, the early internationalisation strategies of EMNEs are characterised by a lack of experience in diverse economic and cultural contexts, and it is explicitly driven by asset-exploration strategies, this should translate into significant differences in their performance, especially when the investments are directed to more developed markets. The results of this paper confirm this hypothesis showing that EMNEs investing in Europe are still at the bottom of the productivity ladder, registering a productivity gap around 20-30 percentage points with more established competitors, including domestic MNEs.

The analysis goes further, however. Exploiting the richness of the data and employing different estimation techniques, it is shown that this effect is not homogeneously distributed and that it varies in terms of sectorial distribution and technology intensity of

activities performed, as well as by geographic destination. Moreover, firms' heterogeneity plays a key role given that productivity differentials are largely accounted for the least productive firms, while those at the top of the distribution tend to reach similar performances than their more established competitors, especially in services.

The remaining sections of the paper are structured as follows. Section 1 presents the data used for the analysis and some descriptive evidence of the presence of EMNEs in Europe. Section 2 describes the methodology adopted to calculate the different indicators of firm-level performance, with particular attention to TFP. The methods adopted for the empirical analysis and the results are discussed in Section 3. Section 4 concludes.

2 Data and descriptive statistics

The data used for this work come from Amadeus, a firm-level database published by Bureau van Dijk. Amadeus has been used in economic literature for multiple purposes, including the analysis of MNE performance (see, among the others, Helpman *et al*., 2003; Temouri *et al*., 2008; Bloom *et al*., 2012). The database tracks a wide range of balance-sheet information for firms located in all European countries, including those outside the European Union (EU).[ii] Europe provides an ideal benchmark for analysing the relative performance of EMNEs. It offers these firms access to a large market, as well as advanced technologies and know-how for their asset-seeking investments.

A further advantage of the Amadeus dataset here is that it provides full information on the ownership structure of each company, including the degree of domestic and foreign ownership. This is important in constructing groups with clear-cut definitions of the nationality of MNEs. For the purpose of this study, foreign affiliates are classified according to the nationality of their global ultimate owner (GUO), defined as the corporate entity holding a controlling stake greater than 50 per cent. Similarly, domestic MNEs are considered to be companies that are the GUO of at least one affiliate abroad. Unfortunately, the dataset does not provide information on the year of entry of the foreign investor, thus limiting the scope for running panel-data analyses. Thus, any foreign ownership status can be attributed to the firm only for the last year for which data are available (2011 in most cases), thing that in any case has a significant implication on the analysis, since it allows to compare firms' performance in the aftermath of the financial crisis.

Given the focus of the research on the structure and performance of firms, the key indicators extracted from Amadeus are number of employees, turnover, value added, total assets, cost of inputs, as well as selected indicators of profitability, i.e. Return on Equity (ROE), Return on Assets (ROA) and Earnings Before Interest and Taxes (EBIT). As additional controls (only available for a smaller number of firms), indicators of sales, exports and innovation activities are included.

Though widely adopted in the literature, the term "EMNEs" has no clear-cut boundaries. Most of the studies adopting this label refers more generally to firms from middle and low income countries (UNCTAD, 2006; Chen *et al*., 2012) or to the bigger emerging economies, especially China and India (Athreye and Kapur, 2009), while others have included also companies from higher income countries such as South Korea, Taiwan and Hong Kong (Mathews, 2002) or, still, from Eastern Europe (Svetlicic, 2004) and Turkey (Bonaglia *et al*., 2007). For the purpose of this analysis, only the group of EMNEs from the so-called BRICS countries are included, considering that they are the largest sources of OFDI from non-developed countries and that some of the most relevant cases of such new MNEs originate from these countries (UNCTAD, 2012).

Our database includes about 2,000 BRICSEMNEs that control European affiliates. Indian firms are the most represented (over 39 per cent of the sample), and Brazilian companies the least (below 10 per cent). China, Russia and South Africa share the remaining in almost equal parts. FDI from BRICS EMNEs are concentrated at both the geographic and the sectorial levels. More than half of the foreign affiliates are located in the UK, the Netherlands and Germany. The top ten destinations (which includes all the major Western countries and Ukraine) account for almost 81 per cent of the total. As for the sectorial distribution, services (including financial services and trade) prevail over manufacturing activities, which are more concentrated in medium-technology industries such as machinery, chemicals and metals.

In the following discussion, EMNEs are compared against other firms grouped into the following categories:[iii]

- ***US MNEs*:** including all affiliates of US MNEs;
- ***OECD MNEs*:** including the affiliates of traditional high-income OECD countries (excluding US) MNEs;[iv]
- ***Other EMNEs*:** including affiliates from countries not in the previous categories;
- ***Domestic MNEs*:** including parent MNEs based in the European countries in the sample.

Table 1 summarises some of the structural characteristics of the different groups of firms, showing that – on average – no significant differences are to be found between the group of EMNEs from the BRICS and other MNEs, except, perhaps, for the higher assets held by the US affiliates or for the larger number of employees by domestic MNEs.

Table 1 Descriptive statistics of MNE activities in Europe

Origin	No.	Turnover	Total assets	Sales	Employees	Cost of employees	Exports
US	11,585	166	516	162	286	23	70
OECD	53,760	127	245	122	292	15	33
Domestic	28,893	208	358	204	507	28	59
BRICS	1,986	179	249	184	331	15	73
Other	4,424	102	166	114	235	33	42

Source: Author's elaboration of Amadeus data.
Note: All variables, except number of employees, are in millions of euros.

3 Measuring a firm's productivity

As is standard for this type of analysis, the performance of the different MNE groups considered is compared using indicators of productivity, generally understood as the ability of a firm to transform inputs into outputs.

The literature provides several measures of firm productivity. Easy-to-compute measures include Unit Labour Cost (ULC) and Labour Productivity (LP). ULC, calculated as the ratio between the cost of employees and value added, can be interpreted as the capacity to produce a given output at a given cost. LP is computed as a ratio between value added and the number of employees. Here, a relatively productive firm is one that produces more output with fewer workers.

Although these two measures provide insightful indications, the rest of the paper will focus on measures of Total Factor Productivity (TFP), a more precise indicator of productivity. TFP is widely used in studies of heterogeneous firms (Helpman *et al*., 2003; Melitz, 2003), as well as in the literature on foreign performance of MNEs (Benfratello and Sembenelli, 2006; Criscuolo and Martin, 2005; Temouri *et al*., 2008).

The production function is assumed to take the form of a standard Cobb-Douglas production function:

$$Y_{it} = A_{it} L_{it}^{\alpha_L} K_{it}^{\alpha_K} M_{it}^{\alpha_M}, \qquad \alpha_L, \alpha_K, \alpha_M > 0\,, \tag{1}$$

where Y_{it} represents the output, L_{it}, K_{it}, M_{it} the inputs in the form of labour, capital and intermediate inputs, and A_{it} is the Hicks-neutral efficiency level that represents the TFP of firms. At the firm level, *A* includes difficult-to-measure factors such as R&D stocks, technology, quality and marginal efficiency (del Gatto *et al*., 2009).

Transforming (1) into logarithms allows to introduce a linear estimation of the production function (small letters represent logs):

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + v_{it} + \varepsilon_{it} \tag{2}$$

where the error term has two components, v_{it}, which represents the level of productivity of the firm, and ε_{it}, the i.i.d. component that is uncorrelated with input choices. v_{it} represents the key variable to be computed after having estimated (2) and solved for $\widehat{\omega}_{it}$ as the standard Solow residual:

$$\widehat{\omega}_{it} = \hat{v}_{it} + \hat{\beta}_0 = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_m m_{it} \tag{3}$$

Considering that $\widehat{\omega}$ is observed by the firms and influences their choice of inputs, making the error term correlated with the dependent variables in (2) and thus the coefficients of a standard OLS model, alternative methods to estimate TFP have been proposed in the literature (for review, see del Gatto *et al*., 2009 and van Beveren, 2012), including fixed effects and system GMM (Wooldridge, 2009). More consistent approaches include adopting semi-parametric estimators using proxies to correct for the unobservable productivity shocks and input levels. Olley and Pakes (1996) use investments decisions, while Levinsohn and Petrin (LP) (2003) adopt intermediate inputs as proxies. The latter approach improves on the former in two ways. The first is that investment (given its lumpy nature) is a proxy that

can only adjust smoothly to productivity shocks (Petrin *et al*., 2004). The second issue is computational feasibility. Firms often report more regularly on the usage of intermediate inputs rather than on investments. Methodologically, this approach assumes the demand for intermediate inputs to be dependent on the capital and productivity of the firm ($m_{it} = m_{it}(k_{it}, \widehat{\omega}_{it})$), and monotonically increasing in productivity. This gives us the opportunity to invert the demand function, allowing the productivity function to be dependent on two observables factors, so that (3) can be now written as:

$$y_{it=}\beta_0 + \beta_l l_{it} + g_{it}(k_{it}, m_{it}) + \varepsilon_{it} \quad (4)$$

where

$$g_{it}(k_{it}, m_{it}) = \beta_0 + \beta_k k_{it} + \beta_m m_{it} + \widehat{\omega}_{it}(k_{it}, m_{it}) \quad (5)$$

is estimated by a two-stage approach using third-level polynomial of *k* and *m* to proxy *g(.)* and bootstrapping methods to obtain standard errors (Petrin *et al*., 2004).

Instead of this two-step approach, Wooldrige (2009) recently proposed a GMM framework with two equations using the same dependent variable, but different sets of instruments. As affirmed by the same proponents of the LP estimator in a more recent work (Levinsohn and Petrin, 2012), this approach improves on the former in a number of ways, including the simultaneous determination of inputs and technical efficiency, as well as eliminating problems of over-identification of the parameters for labour and intermediate inputs in the first-stage equation. Moreover, it produces more robust standard errors (Wooldridge, 2009). Wooldridge's modified LP approach (WLP hereinafter) specifies the productivity function $\widehat{\omega}_{it}(k_{it}, m_{it})$ as including all polynomials of order three and lower. The second-stage function is approximated by a polynomial in $\widehat{\omega}_{it}$ so that the instruments adopted include either the lagged values of inputs or the non-linear functions.

For the above reasons, WLP is used as the main specification for the empirical analysis. Estimates of TFP functions have been run separately for each industry identified by its 2-digit NACE (Rev. 2) code.[v] Output is measured by value added, labour by the number of employees, capital by total assets,[vi] and intermediate inputs are proxied by the cost of materials. Variables reported in monetary terms are deflated with Eurostat industry price indexes.

Table 2 reports the results of the different estimators described above, showing that their correlation is high and statistically significant.

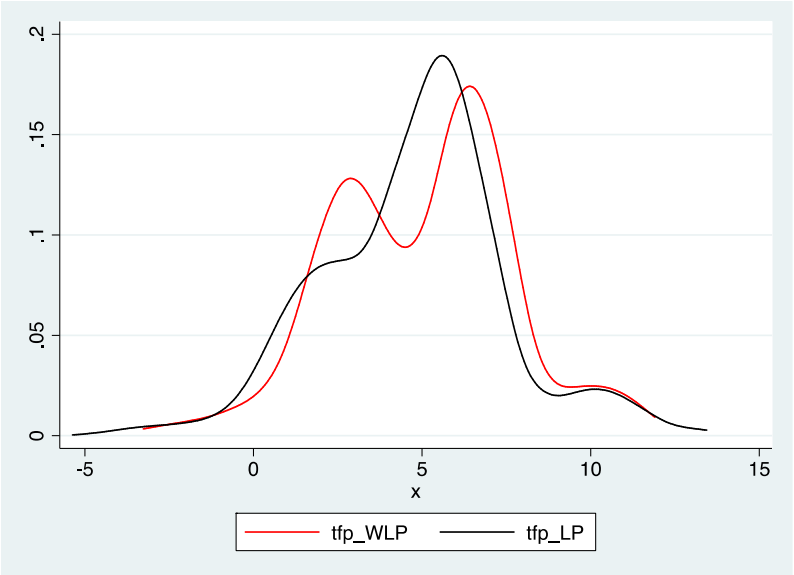
Table 2 Pairwise correlation between different measures of TFP

	TFP_LP	TFP_WLP
	1	
TFP_WLP	0.8682*	1

Note: * represents significance at 1 per cent

Figure 1 plots the results obtained through the LP and the WLP approaches. Besides the similarity of patterns, the distribution of productivity is characterised by peaks at lower levels and around the average. This peculiar form of the distribution deserves more attention since it may reflect the high heterogeneity of the firms represented in the sample, which includes MNEs operating in different sectors, including many low-productivity services. Indeed, when observing the distribution of productivity by main sectors (Figure 1A in Appendix), this peculiar form seems largely due to the performance of the firms operating in the service sector.

Figure 1 Distribution of MNE productivity



Source: Author's elaboration using STATA

4 Results

Testing for the existence of a productivity ranking among MNEs has mainly been done with non-parametric tests of stochastic dominance (Gelübcke, 2013) or through traditional regression analyses that include dummies related to the nationality of MNEs (Criscuolo and Martin, 2005; Temouri *et al*., 2008; Arndt and Spies, 2012; Bloom *et al*., 2012). The following discussion presents alternative approaches, including quantile regression analysis, propensity-score-matching and difference-in-difference estimators, to obtain a more precise assessment of the performance of EMNEs and compare them with restricted groups of competitors.

4.1 Results: regression analysis

Table 3 reports the results of an OLS estimator on TFP values according to the following equation:

$$\widehat{\omega}_{i,x} = \beta_1 \text{Controls} + \beta_2 FO + \tau_x + \delta_j + \varepsilon_{i,x} , \quad (6)$$

where $\widehat{\omega}_{i,x}$ refers to TFP computed at firm *i* and sector *x* level. Controls include both firm specific variables, i.e. the size of the investors, according to three different classes (1-49; 50-249; >250) and their relative capital endowments, and the bilateral distance between the investor's country of origin and the host country. FO is a set of dummy variables representing the different groups of MNEs, while τ_x and δ_j are two-digit sector and host country dummies, respectively. Besides running the model on the sample as a whole, additional columns of Table 3 report the results by disaggregating the data at sector and geographic levels.

Coefficients representing size and relative capital endowments have a systematic positive impact on productivity, confirming previous literature on heterogeneous firms (Melitz, 2003). The introduction of a coefficient measuring the distance between the host and home countries of the MNEs shows a negative relation. The latter result, in line with findings of earlier studies (Helpman *et al*., 2003; Arndt and Spies, 2012), suggests that the productivity premium reduces as MNEs move to more geographically and culturally distant markets as it makes it harder to transfer resources from parents to affiliates. In the case of EMNEs, it appears they invest in more distant markets to obtain access to strategic

resources not available in nearby countries. Indeed, contrary to the provisions of sequential internationalisation models based on the concept of "psychic" distance (Johansonn and Vahlne, 1977), many EMNEs appear to follow a "leapfrogging" strategy, whereby acquisition of resources is part of the internationalisation process, rather than a prerequisite. This is particularly the case for investments directed to more advanced countries such as countries of Western Europe (Mathews, 2006).

Moving to the other variables, the results confirm existing literature (Bloom *et al*., 2012; Criscuolo and Martin, 2005; Benfratello and Sembenelli, 2006) in that they show a superior performance of US MNEs, whose premium is constantly above the average of domestic MNEs, and larger compared to the other groups. Somewhat in line with the findings by Bloom *et al*. (2012), US MNEs show a higher performance in technology-intensive industries (Columns II-III). A similar pattern is observed when looking at the performance of MNEs of other high-income OECD countries, whose premia are nonetheless consistently smaller compared to their US counterparts.

When looking at the performance of EMNEs, the results reveal that that on average they are less productive than their competitors and domestic MNEs. Notably, BRICS EMNEs show a significant productivity gap in the manufacturing sector. This gap increases when more technology-intensive sectors are taken into account, while the results are not significant in lower technology industries and in the services. Taken together, these results seem to give preliminary support to the research hypotheses that EMNEs:

(i) pay for their lack of a set of sound ownership advantages; and
(ii) tend to invest more in those advanced contexts and industries where they can gain access to the resources necessary to fill their gap with competitors.

Indeed, only EMNEs investing in Western European countries report a significant productivity gap (Column VIII). This is consistent with other evidence that supports the asset-augmenting nature of EMNEs' investments in richer countries such as the UK, France, Germany and Italy, or in R&D-intensive sectors in the sub-continent (Di Minin *et al*., 2012; Carvalho *et al*., 2010). Eastern European countries, on the other hand, which are, for most part, middle-income countries, provide EMNEs with a less complex context to explore, and are thus approached for different motivations.

Table 3 Regression results, TFP (Reference group: Domestic MNEs)

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)
	Total s	Manufacturing					Services	European countries		Total
		All	high-tech	mid-high-tech	mid-low-tech	low- tech		Western Europe	Eastern Europe	
size	0.0883***	0.1327***	0.0147	0.2261***	0.0027	0.1705***	0.0708***	0.0909***	0.0878***	0.0881***
	[0.004]	[0.007]	[0.023]	[0.011]	[0.012]	[0.013]	[0.006]	[0.005]	[0.015]	[0.004]
ldist	-0.0114***	-0.0296***	-0.0650***	-0.0383***	-0.0184*	-0.0043	-0.0024	-0.0109***	-0.0173	-0.0113***
	[0.003]	[0.005]	[0.018]	[0.008]	[0.010]	[0.010]	[0.005]	[0.004]	[0.011]	[0.003]
k_e2	0.0314***	0.0198*	0.0265	0.0343	0.0154	0.0119	0.0301***	0.0318***	0.0389***	0.0314***
	[0.003]	[0.011]	[0.027]	[0.028]	[0.016]	[0.024]	[0.003]	[0.003]	[0.009]	[0.003]
US	0.1833***	0.1713***	0.2338***	0.1946***	0.0852*	0.1459***	0.1957***	0.1741***	0.5093***	0.1830***
	[0.015]	[0.022]	[0.071]	[0.035]	[0.045]	[0.043]	[0.021]	[0.016]	[0.141]	[0.015]
oecd	0.0864***	0.0871***	0.1188***	0.0942***	0.0593***	0.0448*	0.0868***	0.0779***	0.2260***	0.0863***
	[0.008]	[0.012]	[0.043]	[0.019]	[0.021]	[0.023]	[0.011]	[0.009]	[0.038]	[0.008]
brics	-0.0735***	-0.0887**	-0.2093*	-0.1150*	-0.0705	-0.0459	-0.0571	-0.0688**	-0.0116	
	[0.028]	[0.039]	[0.111]	[0.064]	[0.067]	[0.093]	[0.038]	[0.031]	[0.077]	
other	-0.0981***	-0.0656**	-0.0875	0.0326	-0.1695***	-0.1019*	-0.1151***	-0.0909***	0.0122	-0.0982***
	[0.021]	[0.032]	[0.146]	[0.052]	[0.062]	[0.055]	[0.027]	[0.025]	[0.048]	[0.021]
china										-0.1357**
										[0.063]
india										-0.1030***
										[0.036]
brazil										0.0812
										[0.098]
s.africa										-0.0242
										[0.075]
russia										-0.0437
										[0.072]
Constant	-2.2564***	2.9779***	8.0128***	4.7739***	3.8682***	2.7853***	1.4647***	-2.3896***	-2.9411***	-2.2562***
	[0.050]	[0.040]	[0.133]	[0.060]	[0.074]	[0.074]	[0.049]	[0.054]	[0.118]	[0.050]
Sector effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	49,868	18,253	1,711	6,777	5,043	4,722	31,180	43,938	5,930	49,868
R-squared	0.949	0.955	0.962	0.912	0.959	0.929	0.945	0.951	0.943	0.949

Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

Finally, an interesting finding is that of Column (X), where BRICS countries are presented in the analysis separately. Chinese and Indian EMNEs report a significant productivity gap with a coefficient larger than the average of the BRICS group.

4.2 Quantile regression analysis

While previous results provide a fairly clear picture of the differences in the average productivity among various groups of MNEs, this section tries to move further to examine the shape of the distribution of TFP, which, as reported in Figure 1, presents a dispersion of firms at various levels of productivity, especially within the service sector.

This section presents results based on a quantile regression approach to examine the partial effects of the explanatory variables across the different segments of productivity distribution. Technically, this is done by minimising the sum of the squared deviation of the dependent variable from the respective mean of the deciles of the series, i.e. by modifying (6) as follows:

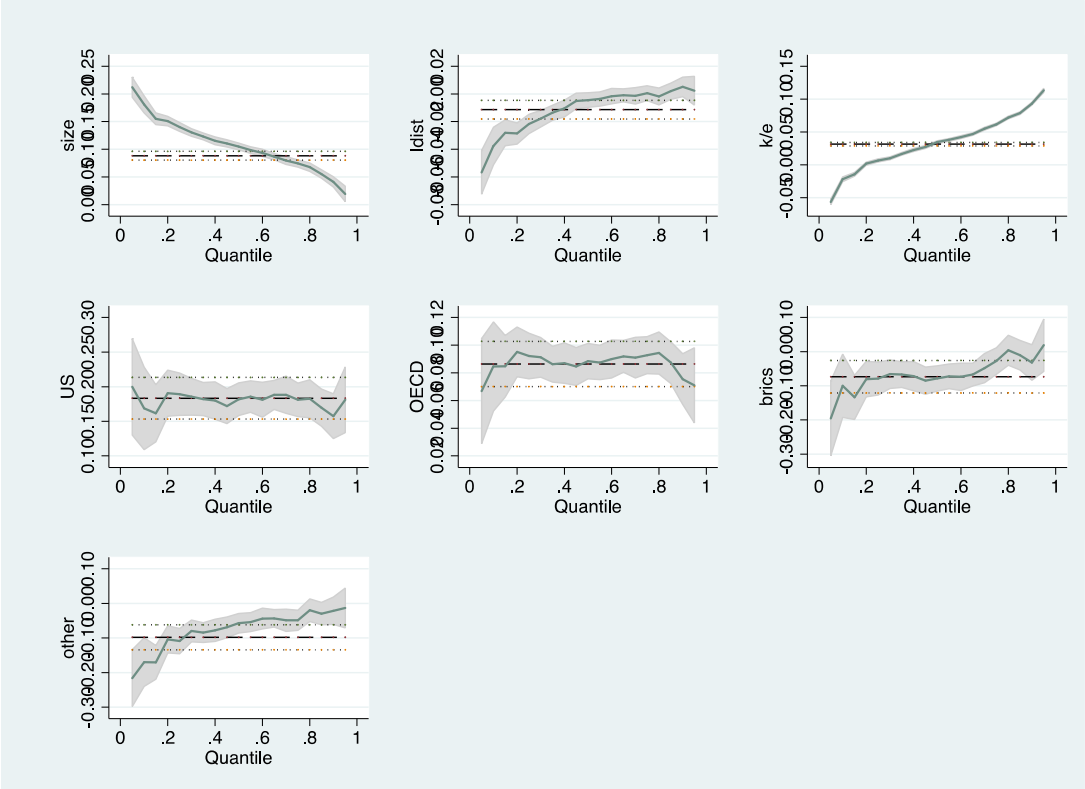
$$\mathrm{Quant}\left(\hat{\omega}_{i,x}\middle|\mathrm{X_i}\right) = \beta_\theta \mathrm{Controls} + \beta_\theta \mathrm{FO} + \tau_x + \delta_j + \varepsilon_{i,x} \qquad (7)$$

where X_i is the vector of exogenous variables affecting the distribution of the dependent variable, and β is the vector of parameters to be estimated corresponding to the θ^{th} conditional decile of the productivity of the firms. Compared to a standard OLS estimator, quantile regression is robust to the presence of outliers and sample heterogeneity, and more flexible with regard to assumptions about the parametric distribution of the errors (Wooldridge, 2010).

The results of (7), reported in Table A1 in the Appendix are plotted in Figure 2 for the overall sample and in Figures 2A and 3A for the manufacturing and the services, respectively. Overall, size and the relative capital endowments generally keep their positive sign, but nonetheless follow two distinct trends. While the importance of company size tends to be reduced in correspondence to higher levels of productivity, the opposite is true for capital endowments. The latter are more relevant predictors of productivity only when firms at the top of the distribution are duly taken into account, meaning that the more productive firms (and especially those in the services) are those using a larger share of assets compared to labour. Interestingly, the coefficient representing the distance also shows an upward trend, meaning that more productive firms are only marginally (if at all) affected

by the higher costs related to investing in geographically and culturally distant markets, and thus that the distance matters more for least productive firms.

Figure 2 Coefficients of quantile regression analysis



Source: Author's elaboration using the STATA command grqreg.

Looking at the foreign ownership of firms, the results suggest stability in developed-country MNE behaviour. Both US and other OECD MNEs report rather stable productivity premium compared to domestic MNEs, given that their coefficients are very close to the average values reported in Table 3. Conversely, the behaviour of EMNEs (both from the BRICS and other countries) vary according to the level of productivity, showing a progressive reduction of the gap with domestic MNEs as the productivity distribution moves to upper levels. In the case of BRICS EMNEs, the gap reduces progressively for those at the top of the distribution, and even disappears or becomes not significant in the latter two deciles. When considering the main sectors separately, this pattern seems to become more evident for firms involved in the services (not surprisingly, given the heterogeneous distribution plotted in figure 1A) while on the other hand a larger group of EMNEs (including the most productive) lie around the OLS value in the manufacturing sector. This suggests that the group of EMNEs investing in Europe is quite heterogeneous. It includes firms that are

already at similar levels of productivity compared to domestic MNEs. This is in line with the existing evidence, which shows how some of the most successful cases of EMNEs, including those based in Europe, are already as competitive as traditional MNEs. Examples of EMNEs fitting this description include Haier and Huawei from China, Tata and AcelorMittal from India, Embraier from Brazil, Gazprom from Russia and Sab Miller from South Africa. These companies are generally considered established players globally in their sectors of specialisation (Atrheye and Kapur, 2009; Goldstein, 2013).

4.3 Comparing firm-performance through matching estimators

Having proven the existence of significant productivity differentials between groups of MNEs investing in Europe, the objective of this section is to "quantify" the gap between EMNEs and their competitors, by looking at the TFP and other performance indicators taken from balance-sheet information.

To isolate the performance differentials of EMNEs against their counterparts, given the heterogeneity between the different groups considered, propensity-score-matching and difference-in-difference estimators are used. These methods have traditionally been used to estimate policy impacts. More recently, they have also been used to compare the performance of exporters against non-exporters in heterogeneous-firm models (e.g. Kneller, 2007 and Greenaway *et al*., 2008).

Propensity scores are first computed to select from other sample firms as close as possible to EMNEs in terms of structure (measured by turnover and the total number of employees), legal form (public, private, other), sector (according to 2-digit NACE rev. 2) and destination country. The nearest neighbour matching without replacement is then used to compare EMNEs with a control group of firms that share similar characteristics with the exception of origin, on the basis of their propensity scores. The average treatment effect (ATT) that results from this match is equal to the differences in the average outcomes for the firms included in the treated and those in the control group (Imbens and Wooldridge, 2009):

$$\hat{\alpha} = \mathrm{E}(\mathrm{y}^{\mathrm{t}} - \mathrm{y}^{\mathrm{c}}|\mathrm{D} = 1) = \mathrm{E}(\mathrm{y}^{\mathrm{t}}|\mathrm{D} = 1) - \mathrm{E}(\mathrm{y}^{\mathrm{c}}|\mathrm{D} = 1)\ , \qquad (8)$$

where y^t and y^c are the outcomes of the treated and the control groups, respectively, and D is a dummy equal to 1 if the firm is treated.

Propensity score matching estimators rely on the so-called balancing hypothesis, which means that observations with the same score need to have the same distribution of the observable characteristics independently of the treatment. This hypothesis has been tested both before and after the matching, showing that the two samples are well-balanced, considering that the bias is generally minor or around the 5 per cent threshold, and that the t-tests on the selected variables are not significant (Rosenbaum and Rubin, 1985).[vii]

Average differences in the TFP between the treatment and the control groups are used to measure of the impact of the nationality of MNEs on productivity. Table 4 reports the results, which confirms the overall trends depicted in Table 3. The added insight here is that when company groups are compared in a way that accounted only for similar characteristics, the gap is greater with domestic MNEs, followed by US and other high-income OECD MNEs.

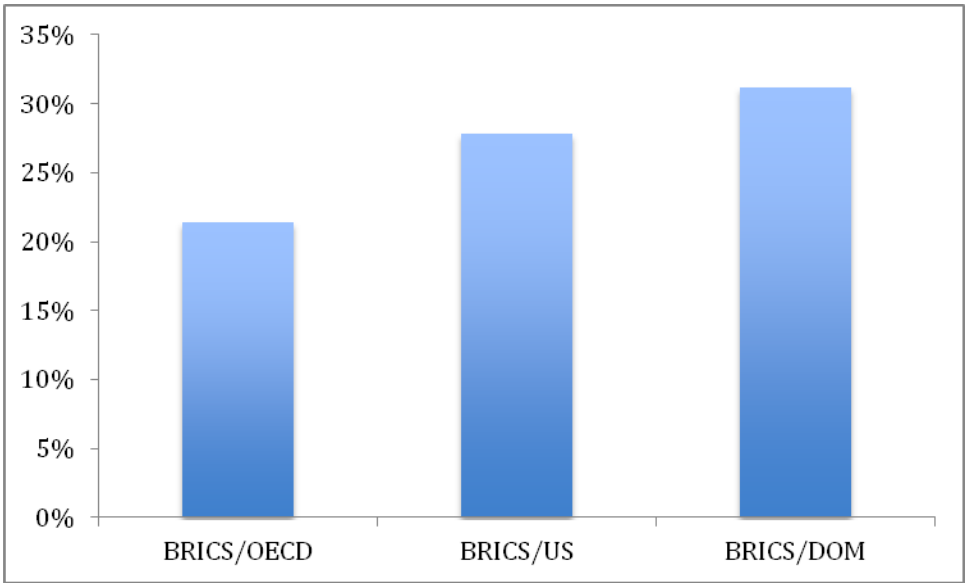
Table 4 Difference-in-difference estimators on TFP

	Treated	Controls	Difference	Std. err.	T-stat
BRICS/total	4.81737	4.90960	-0.09223	0.13833	-0.67
BRICS/US	5.01051	5.33672	-0.32621**	0.14012	-2.33
BRICS/OECD	4.81694	5.05833	-0.24138*	0.13640	-1.77
BRICS/DOM	4.82853	5.20219	-0.37366***	0.13555	-2.76
BRICS/OTHER	4.86499	4.73087	0.13412	0.13276	1.01

*** p<0.01, ** p<0.05, * p<0.1

Recalling that the difference between the logs reported in the fourth column of Table 4 represents the log of the ratio between the ATT of treated and controls, the exponential of the value shows that BRICS EMNEs average less than 80 per cent of the productivity level of other MNEs from developed countries. Thus, based on such calculations, the average productivity gap of BRICS EMNEs ranges between 21.8 percentage points with OECD MNEs to 31.2 points with domestic ones (Figure 3).

Figure 3 The productivity gap of EMNEs with other groups (percentage points)



Source: Author's elaboration

Conversely, when compared to the residual group that includes EMNEs from other countries, the results report a slight (but not significant) advantage for BRICS companies.

In what follows, a similar exercise is performed to compare the relative performance of BRICS EMNEs in Europe, using some additional indicators of performance (Table 5). As briefly described in Section 2, alternative indicators of a firm's ability to use inputs in an efficient way include labour productivity and the unit labour cost. In line with previous findings, the results report a gap between BRICS EMNEs and others in both indicators. ULC, in particular, shows a statistically significant difference. Recall that ULC refers to the ability of firms to increase their value added while keeping employee costs under control, even if it can be criticised for not taking upgrading in the production into account. Considering that, on average, the costs of employees are lower for EMNEs (see Table 1), this means that these firms still lag behind in terms of their capacity to generate value added.

On the other hand, additional results that measure the propensity of firms to market their products show that total sales and exports by EMNEs are both significantly higher than the same flows by other firms. This is a relevant finding. It confirms that EMNEs are attracted by European countries not solely for strategic assets but also other important motivations such as market-seeking. Indeed, both empirical analysis and case studies highlight that access to new markets and the need to establish export platforms from which to serve

both European and other countries are important motivations for EMNEs (Fontagné and Py, 2010). Finally, no significant difference is found in terms of total expenditures on R&D.

Table 5 Difference-in-difference estimators on competitiveness indicators

	Treated	Controls	Difference	Std. err.	T-stat
LP	11.07440	11.10490	-0.03050	0.06163	-0.49
ULC	0.77012	0.68587	0.08425**	0.03331	2.53
Sales (ln)	17.45889	17.28352	0.17536*	0.09799	1.79
Export (ln)	16.33803	15.7849	0.55308***	0.196766	2.81
R&D (ln)	13.40353	14.37825	-0.97573	0.659144	-1.48

*** p<0.01, ** p<0.05, * p<0.1

Finally, Table 6 reports the results by comparing EMNEs in terms of their main indicators of profitability.[viii] The results are straightforward in that they indicate that the affiliates of EMNEs in Europe are still consistently behind other MNEs in terms of their capacity to generate profits and financial sustainability.

This last result comes as no surprise and is in line with previous findings. As late-comers in international markets, EMNEs need more time to generate profitability. In some cases, their poor international experience also translates into poor economic performance of their early investments, especially the takeovers in some advanced countries (Goldstein, 2013). Moreover, if the main driver of their investment is an asset-augmenting strategy, the objective is to pursue long-term objectives at the expense of short-term gains.

Table 6 Difference-in-difference estimators on profitability indicators

	Treated	Controls	Difference	Std. err.	T-stat
Profit	2.8816	4.6829	-1.8013**	0.7252	-2.48
Roe	7.8861	15.4752	-7.5891**	3.8362	-1.98
Roa	3.5046	5.0438	-1.5392***	0.5569	-2.76
Ebit	3.8020	6.3580	-2.5560***	0.7820	-3.27

*** p<0.01, ** p<0.05, * p<0.1

5 Conclusions

Recent research has emphasised the unconventional nature of FDI from emerging market multinational enterprises. Rather than investing to exploit their existing assets, many EMNEs invest abroad at an early stage of their internationalisation process, despite the fact that they still lack sound ownership advantages, including managerial capacities. This behaviour challenges existing theory on multinational investment strategies.

If it is true that the competitive advantages transferred from parent companies to affiliates are inferior or only equal to those of other firms in the host countries and that EMNEs lack the international experience and organisational practices that would enhance their competitive advantage, and that the motivation for their investments, especially in advanced countries, is to gain access to new assets and capabilities, one would reasonably expect such firms to invest from the bottom of the international productivity ladder.

Based on a large database on foreign affiliates and domestic MNEs in Europe, this paper tested this hypothesis, measuring the relative performance of BRICS EMNEs and MNEs from more developed countries using several methodologies.

In line with the expectations, the results show that EMNEs investing in Europe are still at the bottom of the productivity ladder. In addition, they show that the productivity gap between EMNEs and others is significantly larger in higher-technology industries within manufacturing and, geographically, only for investments directed to Western Europe.

When the performance of EMNEs is compared over the different deciles of productivity by means of quantile regression analysis, the results show that the productivity gap is significantly lower for those at the top of the distribution, especially in the services. Again, this is in line with the existing evidence that shows how some of the most successful EMNEs, including those based in Europe, have achieved levels of competitiveness already comparable to traditional MNEs.

The results from semi-parametric tests based on matching estimators show that the productivity gap of BRICS EMNEs can be still set around 20-30 percentage points of that of MNEs sharing similar characteristics (with the exception of country of origin). Consistent differences are also found when comparing firms according to other performance indicators than TFP, especially those measuring profitability. Conversely, EMNEs show a greater propensity than other MNEs to sell their products both in host markets and abroad

by exporting, a finding that supports their market-seeking motivation when investing in Europe.

Overall, these results seem to confirm the view that early internationalisation is a strategy adopted to fill the gap with well-established competitors. However, further research is needed to understand the causes of the productivity gap better, as well as the exact nature of the assets transferred to the parent firms and, more generally, the overall benefits of the investments to the home country. All these questions could be more properly addressed in future work that includes more information on the parent/affiliate relation, the exact motivation of the investment and a panel dimension of the data.

That said, the discussion of these results lead, in any case, to important policy implications for European recipient countries. As investment attraction policies are usually designed to maximise the spillover potential and the externalities stemming from FDI, attracting EMNEs or traditional MNEs can result in different impacts for the host economies. Looking at the overall performance of the economy, the results seem to indicate that attracting EMNEs leads to a reduction in the average productivity levels of the industries where they operate. In addition, the scope for technology- and knowledge-spillovers may be marginal while the motivations for EMNE investment is to obtain access to such strategic assets, rather than transfer them to the host country. In this regard, European countries seem to be concerned about losing their competitive edge in the manufacturing and, to a lesser extent, of intellectual property-rights violations in strategic sectors. On the other hand, investment flows from emerging economies are increasingly welcomed, especially in the aftermath the global financial crisis, for their capacity to bring in fresh capital and jobs, and to revitalise static sectors of the economy where the role of traditional investors has begun to shrink. Balancing risks with opportunities will be an increasingly delicate task to face for European policy-makers in the years to come.

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Appendix

Table A1 Quantile regression analysis

	q10	q20	q30	q40	q50	q60	q70	q80	q90
size	0.1811***	0.1509***	0.1304***	0.1152***	0.1050***	0.0936***	0.0797***	0.0677***	0.0411***
	[0.008]	[0.004]	[0.004]	[0.004]	[0.003]	[0.003]	[0.004]	[0.004]	[0.005]
ldist	-0.0377***	-0.0286***	-0.0179***	-0.0105***	-0.0045*	-0.0016	-0.0014	-0.0018	0.0051
	[0.007]	[0.004]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]
k_e2	-0.0221***	0.0017	0.0100***	0.0224***	0.0345***	0.0420***	0.0550***	0.0718***	0.0930***
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
US	0.1686***	0.1907***	0.1855***	0.1799***	0.1819***	0.1811***	0.1884***	0.1825***	0.1574***
	[0.030]	[0.017]	[0.014]	[0.014]	[0.012]	[0.013]	[0.014]	[0.014]	[0.017]
trad_oecd2	0.0846***	0.0951***	0.0912***	0.0870***	0.0885***	0.0900***	0.0910***	0.0944***	0.0755***
	[0.016]	[0.009]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.008]	[0.009]
brics	-0.0999**	-0.0805***	-0.0657***	-0.0718***	-0.0786***	-0.0736***	-0.0483**	0.0040	-0.0317
	[0.047]	[0.027]	[0.021]	[0.022]	[0.019]	[0.020]	[0.022]	[0.022]	[0.027]
other	-0.1698***	-0.1042***	-0.0797***	-0.0779***	-0.0574***	-0.0439***	-0.0488***	-0.0196	-0.0214
	[0.036]	[0.020]	[0.016]	[0.016]	[0.014]	[0.015]	[0.016]	[0.017]	[0.020]
Constant	-2.6779***	-2.4855***	-2.5154***	-2.3017***	-2.1550***	-2.1474***	-2.0241***	-2.0102***	-1.0733***
	[0.179]	[0.247]	[0.180]	[0.203]	[0.178]	[0.191]	[0.186]	[0.212]	[0.103]
Obs.	49,868	49,868	49,868	49,868	49,868	49,868	49,868	49,868	49,868

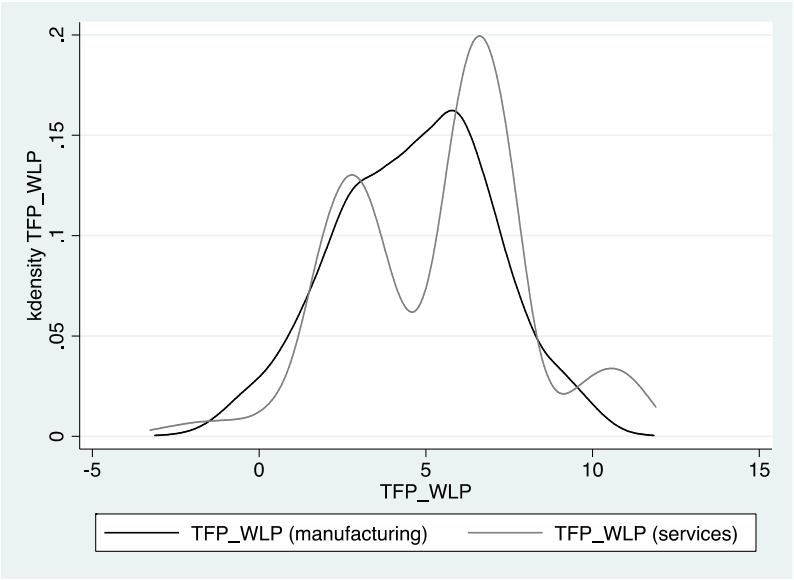
Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2 Sample bias distribution, before and after marching

Sample	Pseudo R2	LR chi2	p>chi2	MeanBias	MedBias
Raw	0.067	560.62	0.000	6.3	3.7
Matched	0.011	25.35	1.000	2.3	2.2

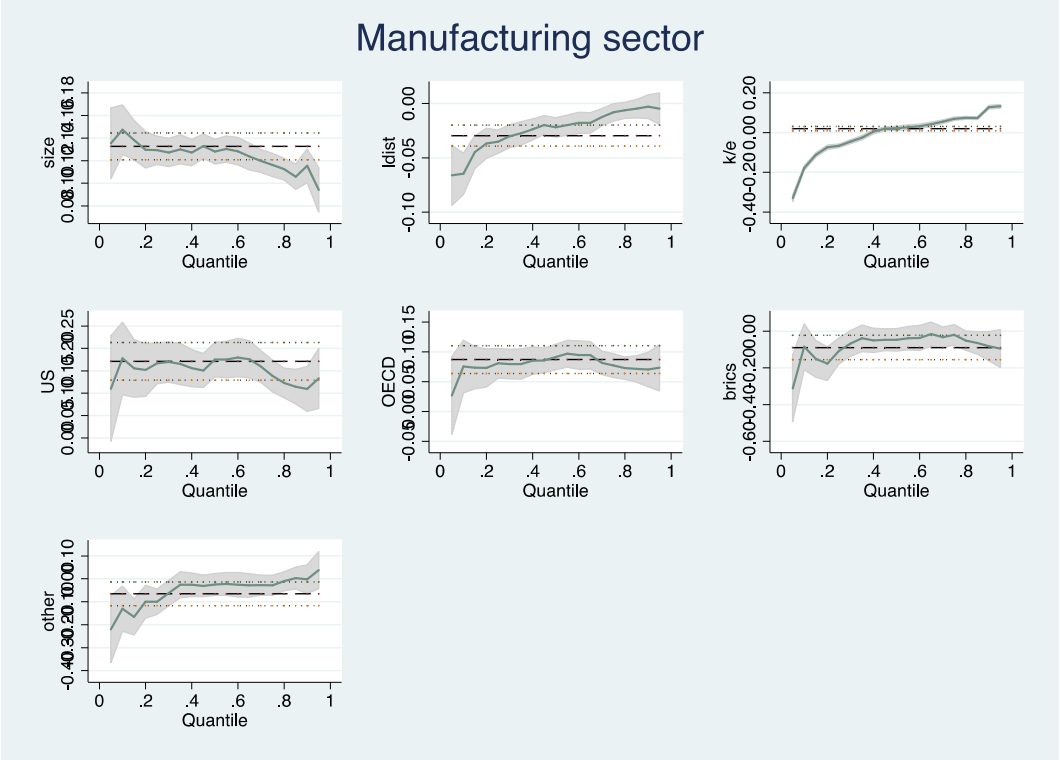
Source: Author's elaboration using the pstest command from STATA

Figure 1A Distribution of MNE productivity by main sectors



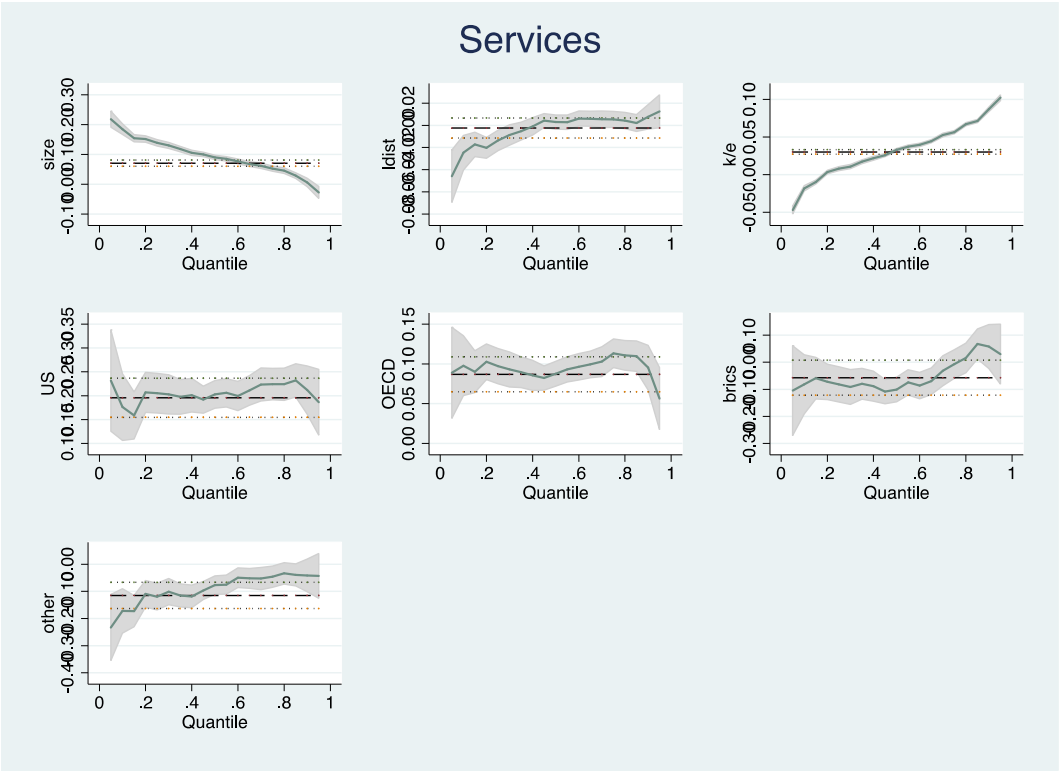
Source: Author's elaboration using STATA

Figure 2A Coefficients of quantile regression analysis



Source: Author's elaboration using STATA

Figure 3A Coefficients of quantile regression analysis



Source: Author's elaboration using STATA

Endnotes

[i] A partial exception is represented by Arndt and Spies (2012), whose analysis covers MNEs based on the institutional characteristic of the country of origin, but does not look specifically at the case of EMNEs.

[ii] The version of Amadeus used for this paper gives access to information for companies defined as "Large" and "Very Large," i.e. those with operating revenues greater than €10 million and total assets greater than €20 million.

[iii] When cleaning the data, firms belonging to those countries included by international organisations such as the OECD in their lists of fiscal havens have been dropped from the sample due to uncertanty regarding the country of origin of their ultimate owners.

[iv] This includes all OECD members classified as high-income by the World Bank and that joined the organisation before 1990. This excludes Korea and middle-income countries such as Mexico and Turkey, as well as certain eastern European countries, which are considered as homes to EMNEs in some studies.

[v] For the purpose of estimating TFP functions, data have been used for the last three years available, covering the period 2009–2011.

[vi] Total assets are used instead of fixed assets given the presence of a large number of firms operating in the service sectors, where intangibles are relevant.

[vii] Test results are reported in Table A2 in the Appendix.

[viii] These balance-sheet indices reflect a company's ability to make profits, a firm's efficiency at generating profits from every unit of shareholders' equity (ROE) and to how efficient the management is at using its assets to generate earnings (ROA).

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