Firms' characteristics and their international location strategy: Micro-level evidence from European countries

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Abstract

This paper takes micro-level evidence as the basis on which to investigate to what extent firms' heterogeneity is relevant in the internationalization strategy and location choice of European multinational enterprises. We present a model that illustrates how the firm's decision to enter a specific destination to serve all markets globally will depend on the firm attributes related to its efficiency, given the characteristics of the host countries. Our empirical results from a set of multinomial and sequential logistic models confirm that (i) European firms investing in third markets outside Europe are more productive than those that only produce at home and export. For some regions and sectors, they are also more R&D intensive and innovative, and have higher labor skills. In addition, our estimates reveal that (ii) the location choice of their affiliates is mainly defined by differences in productivity and, in some cases, in R&D intensity and innovation.

Key words: Multinational firms; Firm heterogeneity; Location choice; European FDI

JEL classification: F14; F21; F23; D24

1. Introduction

One striking feature of the world economy in recent decades has been the drastic reduction in transportation and communication costs, which has laid the foundation for a marked expansion of international production and trade by multinational enterprises (MNEs). According to 2013 data from UNCTAD, about a third of the total world exports are accounted for by the sales of MNEs that engage in foreign direct investment (FDI). This massive growth of FDI has also altered the location strategies of these firms in their attempt to achieve greater market sizes and lower costs.

The location of foreign affiliates and the effects on the countries involved has been a central topic in the current economic policy debate. This is particularly so in developed economies, where the weight of FDI inflow in the overall FDI has dropped significantly in recent years (UNCTAD, 2018). Conversely, inflows to developing and transition economies continue to grow, accounting for around 50 per cent of the total FDI in 2017 (UNCTAD, 2018). Consequently, the economic agents from developed countries are concerned that a significant part of their capital goes abroad and has negative effects on domestic employment, production, investment, and income distribution. In this context, understanding how multinational firms with different attributes select where to locate their affiliates becomes of great relevance. This is precisely the focus of our paper.

Initially, most studies related to the location choice of FDI by multinational enterprises are centered on the influence of host country factors, such as potential market, production cost, labor price, trade barriers, infrastructures and institutional backgrounds. A review of these studies can be seen in Nielsen et al. (2017).[1] However, this literature has paid far less attention to analyzing the extent to which the location decision of MNEs' affiliates depends on the micro-level characteristics of the firm itself. As pointed out by Ye et al. (2019), firms are heterogeneous and therefore the same location factors may have different influences on their internationalization strategies and location choices.

The workhorse model developed by Helpman et al. (2004) stresses the relevance of firms' productivity to explain both their decision to operate abroad and the mode of entry to a foreign market, that is, exports versus horizontal FDI. According to that work, increasing the complexity of the internationalization strategies, such as moving from domestic sales

[1] See also the works by Crozet et al. (2004); Head and Mayer (2004); Baltagi et al. (2007); Basile et al. (2008); Mayer et al. (2010), Martí et al. (2017) and Davies and Killeen (2018).

to foreign selling or from exports to FDI, will entail higher costs. Thus, only those firms that can afford these higher costs will be able to engage in more complex internationalization strategies. A similar result is found by Nishiyama and Yamaguchi (2010) in an asymmetric (North-South) model with reimporting firms. According to these authors, firms can be sorted from higher to lower productivity levels in four different organizational forms: domestic firm, export firm, FDI firm and reimport firm.

The role of firms' characteristics in the location choice of FDI is analyzed as an extension of previous models. Specifically, building on Helpman et al. (2004), Yeaple (2009) relates firm heterogeneity to the cross-country structure of multinational activity. In his model, country characteristics determine the level of productivity that guarantees that an MNE will obtain benefits from its investments. This minimum productivity level, which is specific to each host country, is also known in the literature as productivity cutoff or multinational cutoff, since only those MNEs whose productivity exceeds this threshold will open an affiliate in that country (Chang and Marrewijk, 2013).

Probably limited by the lack of homogeneous datasets, the few works that have analyzed this issue empirically are country- or region-specific. Chen and Moore (2010) and Mayer et al. (2010), for instance, examine how firm and country characteristics at the destination explain French firms' investment decisions. In particular, by considering the productivity of French firms in the destination country, together with other local characteristics, these authors explore how differences in total factor productivity (TFP) influence: i) the firm's decision to invest abroad instead of at home (Mayer et al., 2010), or ii) the likelihood of locating across diverse foreign production countries (Chen and Moore, 2010).[2] Moreover, building on the studies of Helpman et al. (2004) and Grossman et al. (2006),[3] Aw and Lee (2008) provide evidence of the links between firm characteristics and FDI location choices for the case of Taiwanese multinational firms investing in China and/or United States in two electronics subsectors.[4] More recently, Shao and Shang (2016) show how the total factor productivity (TFP) distribution of Chinese multinational firms varies

[2] To do so, these authors use conditional logistic models, which implies that the effect of productivity across countries is estimated either as a vector of country dummies or as a function of specific host-country characteristics, and not as a covariate of the firm itself.
[3] As an extension of the complex models by Yeaple (2003) and Ekholm et al. (2007), Grossman et al. (2006) examined the links between firms' heterogeneity and the different strategies of multinational firms, including vertical and export-platform FDI.
[4] They show that Taiwanese firms investing in both the USA and China are the most productive, but also that firms investing only in the USA are more productive than those investing only in China.

across the host country. In particular, their results suggest that a firm's TFP reduces the relevance of the host country's market potential in the likelihood of the firm entering a host country. Likewise, based on micro-evidence from manufacturing firms in the Pearl River Delta (China), Ye et al. (2019) conclude that firm heterogeneity attributes affect spatial agglomeration and FDI location decisions in this region. For Tang (2017), labor productivity and TFP have significant explanatory power in Taiwanese MNEs' location choices.

Here we analyze how the internal determinants of firms might affect the European MNEs' internationalization position and location choice. Our paper contributes to the previous literature in several ways:

- First, as a novelty, we investigate the empirical connections between the micro-level characteristics of firms and their internationalization strategy and location decision based on a range of developed European countries. To do so, we make use of unique representative sample of surveyed European firms (the EFIGE dataset).[5] This survey contains homogeneous and consistent information on all the international activities for manufacturing firms, combined with detailed data about their characteristics, thus allowing us to fill a gap in the literature.[6]

- Second, as discriminatory characteristics, we consider an extensive group of firm attributes related to its efficiency, such as TFP, capital labor ratio, exports and R&D intensity, innovation, size, the years of establishment (age), and the role of human capital. By doing so, we attempt both to obtain a broader view of the issue at hand and to control for the potential endogeneity bias that results from the omission of relevant variables.

- Third, we do this for several sectors with different technology intensity (low and medium technology intensive industries). This allows us to consider the fact that some

[5] The EFIGE dataset consists of a representative sample of surveyed European firms covering the period 2007 to 2009, which was collected in 2010. The information in this dataset is mostly obtained as a cross-section for the last available budget (year 2008), although some questions refer to the period 2007–2009. See Altomonte and Aquilante (2012), page 4.
[6] Bruegel has recently presented an update of the EFIGE dataset, by extending the balance sheet data until the year 2014 for some variables and certain firms from the original sample that remains in the Amadeus dataset. However, given the lack of information on key study variables and the problems associated with poor representativeness and small sample size we believe it is more convenient to carry out the empirical study with the original data that contains information that is far more complete about the internationalization strategies of the European firms.

unobservable characteristics of the industries in which firms operate may affect the links between firms' specific factors and location choices.

- Fourth, to guide the interpretation of our empirical work, we base it on a partial equilibrium model of monopolistic competition built on Helpman et al. (2004) and Head and Mayer (2004). This model allows us to relate the profitability of a location to that location's access to demand (market-seeking or horizontal FDI). In particular, it illustrates that, given the characteristics of host countries; the decision to enter a specific country in order to serve all markets globally (and not exclusively the host market) depends on all the sources of the firm's heterogeneity related to its efficiency.

- Fifth, to deal empirically with the firm's location decision, we estimate a set of multinomial logit models (MNL). This regression method makes it possible to investigate the location choice as a function of the features of the firm itself; thus eliminating the restriction of estimating the effects of firms' productivity in terms of explicit characteristics of the destination country or considering it as a country-specific factor. This last empirical strategy has been used in other related papers such as Mayer et al. (2010), Chen and Moore (2010) or Ye et al. (2019).

- Finally, we present for the first time in this strand of the literature the results of a sequential logistic regression, as an element of robustness. This is carried out under the reasonable hypothesis that the firm's selection process involves a series of sequential decisions. In particular, we assume here that the choice of the internationalization mode (exports vs. FDI) is an independent decision taken prior to the firm's subsequent choice of where to locate its international activity.

In line with the previous evidence for specific countries or regions, in the aggregate regressions, we obtain that European firms investing in third markets outside Europe are more productive and intensive in R&D and innovation activities than those that only produce at home and export. Furthermore, the empirical analysis suggests that differences in firms' TFP are the main key determinant~~s~~ in the location decision of European MNEs. These outcomes remain even when we control for other factors related to firms' efficiency (such as human capital, age, and innovation). Additionally, we find that the productivity premium is greater for firms with affiliates in Latin America than in Asia (China and

India). This result is robust to the estimation of a sequential logistic model, where we relax the assumption of simultaneous choices.

Our estimates at the sector level confirm that only the most productive firms invest abroad, this being especially true for those industries with high fixed costs and technology intensity. Productivity also appears as one of the main factors explaining the location decision of firms at the sectoral level. In addition, our findings reveal that the location decisions in some industries are also related to R&D or innovative activities (basic metals and fabricated metal products industry) or human capital intensity (food products, beverages and tobacco, and transport equipment industries).

The rest of the paper is organized as follows. The next section presents the data and key stylized facts. Section 3 describes the underlying theoretical framework and the empirical strategy. Section 4 presents the estimation results, and the final section concludes.

2. Data and Stylized Facts

This paper employs firm-level data from Austria, France, Germany, Italy, Spain, and United Kingdom (EFIGE dataset).[7] Specifically, we focus on manufacturing firms with foreign activities during the period 2007–2009 in one of the following areas: USA and Canada (US&Ca), China and India (Ch&Ind), and Latin America (Lat. Am.).[8] These three broad areas are the main destinations of non-European FDI by European MNEs, representing 81% of total non-European investments (Eurostat database, 2015).[9]

Table 1 shows the relative weight of each of these areas in terms of number of affiliates, distinguishing among the six different home countries considered in our sample. According to these figures, contrary to the export behavior of European firms,[10] for

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[7] In this study, we have considered only the six countries (of the seven included in the EFIGE dataset) that were classified by the World Bank as high-income countries during the period of study (World Bank, 2013). We have excluded Hungary because non Hungarian firms made FDI in any of the destination areas considered during the analyzed period. Moreover, in this period the World Bank did not include this country on the list of high-income countries.

[8] All firms considered are exporters and some of them have affiliates outside Europe.

[9] These broad areas concerning the non-European destination markets are based on the data disaggregation available in the EFIGE database. This dataset considers five global export and FDI destination areas outside Europe: (1) China & India, (2) other Asian countries, (3) USA & Canada, (4) Central & South America, and (5) other areas. In this paper, we have focused on three clearly delimited regions, namely, China & India, USA & Canada, and Latin America (Central & South America).

[10] According to the EFIGE dataset, more than 52% of total EU exports (excluding intra-EU trade) were sent to North America, while China and India represented only 31% during the sample period. These

European MNEs, the most frequent production locations outside European countries are China and India, followed by USA and Canada. This might reflect the fact that, through FDI, most European firms try to take advantage of producing in the market with the lowest production costs, as is the case of China and India. Other investors also try to benefit from operating in the greatest potential market in the world, as is the case of USA and Canada. As shown in Tables A.1 and A.2 in Appendix I, the costs of producing in China and India are three times lower than in Latin America, while the market potential is greater in Lat. Am. and US&Ca than in Ch&Ind.

Looking now at the relative weight that the different home countries have in these areas, we observe that Germany and UK represent the main investors in these two areas. However, the greater weight of Spanish MNEs in Latin America reflects the existence of certain historical and cultural ties that allows them to lower their sunk costs.

Table 1. Geographical distribution of European firm investments in US&Ca, Ch&Ind and Lat. Am. (%)

Area of destination	US&Ca	Ch&Ind	Lat. Am.
Total	**25.93**	**64.44**	**9.63**
Country of origin			
Germany	31.43	25.29	30.77
France	8.57	11.49	0.00
Italy	17.14	22.99	23.08
Spain	14.29	13.79	38.46
UK	28.57	25.29	7.69
Austria	0.00	1.15	0.00

Source: Authors' calculations based on the EFIGE dataset.

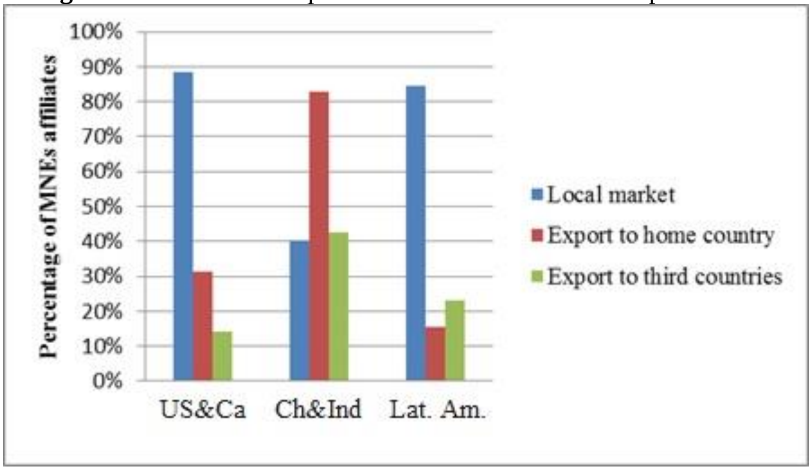
Another point worth noting refers to the fact that most of the European firms investing abroad locate in only one of these broad regions. As we can see in Figure A.1 from Appendix II, the share of European MNEs that invest in North America, China and India, and Latin America decreases dramatically with the number of host market destinations. Similar behavior was found by Yeaple (2009) and Tanaka (2012) for US and Japanese firms, respectively, and by Alguacil et al. (2017) for European firms operating abroad.

However, whereas European MNEs investing outside Europe tend to locate mainly in a single destination, their affiliates seem to serve markets globally. As can be appreciated

percentages are very similar to those obtained from the Eurostat dataset, when intra-European trade is excluded.

in Figure 1,[11] the vast majority of European firms investing in Ch&Ind export their production either partially or totally back to Europe. Conversely, most European firms locating in US&Ca and Lat. Am. sell their production to the local market.[12] This fact reinforces the idea that the European firms investing in different markets pursue different geographical strategies. Most of the European firms that invest in China and India probably try to benefit from the lower production costs of these countries in order to serve mainly the European and even North American markets. Conversely, those firms that invest in Lat. Am. and US&Ca probably adopt a more market-seeking strategy looking to sell their foreign production domestically.

Figure 1. Where do European MNEs' affiliates sell their production?



Source: Authors' calculations based on the EFIGE dataset.

In Figure 2, we also observe that firms with different internationalization strategies and location decisions present some dissimilarities in terms of their productivity distributions.[13] Particularly, we observe, on the one hand, that an FDI firm is likely to be more productive (with a higher TFP) than an exporter firm (see Figure 2.a). On the other hand, we find that, on average, i) European firms investing in China and India are the least productive, ii) medium-productive firms invest in USA and Canada, and iii) the most productive firms engage in FDI in Latin American countries (see Figure 2.b). These results confirm our starting hypothesis that MNEs with different levels of productivity

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[11] Each affiliate can sell the foreign production to three different destinations: local, home, or third country markets, or any combination of them.

[12] The greater importance of exports to third countries in Latin America (with respect to exports to the home country) is probably due to the foreign affiliates located in Mexico with an important export activity toward the USA. World Investment Report, UNCTAD (2009), United Nations, New York.

[13] We use firms' TFP as reported in the EFIGE database. As explained in Altomonte and Aquilante (2012), this dataset employs the Levinsohn and Petrin (2003) procedure to measure TFP. See also Table A.3 in the Appendix.

choose different internationalization channels and locations. However, these conclusions should be interpreted with caution, as they refer to the aggregate. Given their own peculiarity, the connections between productivity and the location choice may differ between industries.[14] However, this does not seem to be the case when we look at the internationalization strategy chosen. A first comparison between exporting firms and those that carry out foreign investment reveals a clear productivity premium in all sectors for FDI firms (see Figure A.2 in the Appendix IV).

Fig. 2.a. Density of TFP for export and FDI firms

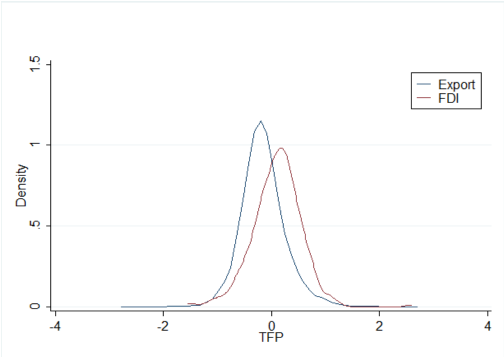
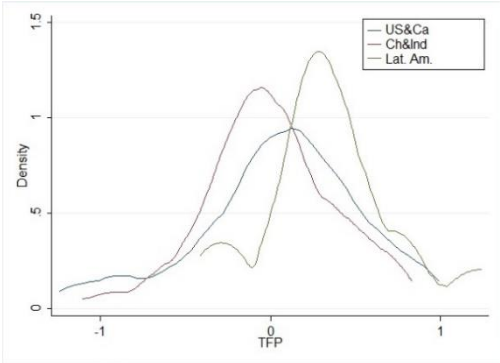


Fig. 2.b. Density of TFP for FDI firms, by location



Source: Authors' calculations based on the EFIGE dataset.

Moreover, to obtain a robust causal relationship between the internationalization strategy and firm's productivity we also need to control for other characteristics of the European firms that may be relevant in this regard. Particularly, in this paper, together with TFP, we add several factors related to firms' efficiency such as size, capital-labor ratio (K/L), human capital, export intensity, innovation, and R&D activities. In Table A.3 in Appendix III, we show the average values of these variables for European manufacturing firms by different internationalization strategies and investment locations.[15]

3. The empirical strategy

3.1 The location decision: A theoretical background

In line with the pioneering works by Helpman et al. (2004) and Yeaple (2009),[16] we present here a simple partial equilibrium model to illustrate the role played by firms'

[14] We thank an anonymous referee for pointing out this nuance.
[15] See Tables A.4 and A.5 in Appendix II for a description and the source of the variables and their main descriptive statistics, respectively.
[16] In addition to these works, authors such Head and Mayer (2004), Redding and Venables (2004), Aw and Lee (2008), Yeaple (2009), Chen and Moore (2010), Mayer et al. (2010), or Alguacil et al. (2017), to mention but a few, use similar modeling to highlight different aspects of the internationalization strategies followed by firms.

attributes (firm heterogeneity) in the probability of them entering a given market. As in Head and Mayer (2004) or Redding and Venables (2004), in this model each firm in an industry produces a variety of differentiated goods, which can be used as either consumer or intermediate goods. Once the firm has chosen the location of its affiliate in a specific market, it can be used as a platform to serve third markets.[17]

In this model, each firm that decides to enter an industry is endowed with a set of characteristics that determine its efficiency, $\vartheta(x)$. This level of efficiency "is a catch-all that includes all sources of heterogeneity… including differences in technical efficiency, management practice, firm organization, and product quality".[18] Furthermore, we assume that to establish a new plant in a country i, firms have to incur in a fixed cost, $f_{i.}$, that is invariant across firms. Once the fixed cost has been paid, the firm can duplicate the same production activities in country i (incurring in the variable costs associated with producing in this country), and sell goods globally through its new plant.

On the demand side, we rely on CES functions to aggregate varieties in the utility function (with elasticity of substitution across varieties equal to σ >1). We denote as E_j country j's total expenditure across different varieties of a representative industry. Given that in this monopolistic competition framework firms are atomistic, each firm treats the elasticity of substitution, σ, as its own price elasticity of demand.

In this context, the delivery price set by a representative firm producing in country i and selling in j is $p_{ij} = \frac{\sigma}{\sigma-1}\frac{\tau_{ij}w_i}{\vartheta(x)}$. The marginal cost of serving country j by a firm producing in country i, $\frac{\tau_{ij}w_i}{\vartheta(x)}$, depends on: 1) the different characteristics shaping firm heterogeneity x, collected by firm's efficiency, $\vartheta(x)$; 2) on the composite input cost required to produce the representative variety in country i, w_i; and 3) and on the transaction/transport costs associated with serving country j from a firm located in country i, τ_{ij} (where τ_{ij} is the iceberg transaction cost factor, with τ_{ij}> 1 for all $i \neq j$, and τ_{ij} = 1 for all $i= j$).

Under these assumptions, the net profit earned in each destination market j by a representative firm producing in country i is:

[17] This global structure of production and sales in the international markets is the same as that used by Aw and Lee (2008), among others.

[18] Melitz and Redding (2015), p. 8.

$$\pi_{ij} = -f_i + \frac{1}{\sigma}\left(\frac{\tau_{ij} w_i}{\vartheta(x)}\right)^{1-\sigma} \frac{E_j}{P_j} \tag{1}$$

where P_j is the price index for varieties sold in j. Accordingly, the aggregate profits earned by a firm producing in country i and selling to all potential countries j (j= 1,…, N), π_i, are given by:

$$\pi_i = -f_i + \sum_{j=1}^{N} \pi_{ij} = -f_i + \frac{1}{\sigma}\frac{MP_i}{w_i^{\sigma-1}}\vartheta(x)^{\sigma-1} \tag{2}$$

where $MP_i = \sum_{j=1}^{N} \frac{(\tau_{ij})^{1-\sigma} E_j}{P_j}$ is the market potential of country i.[19]

Thus, the aggregate profit earned by a firm depends on the own-firm efficiency, $\vartheta(x)$, but is conditional on the firm location strategy. For the sake of simplicity, we can rewrite the previous expression (2) as,

$$\pi_i = -f_i + B_i\,\vartheta(x)^{\sigma-1} \tag{3}$$

where x includes all firm characteristics related to its own efficiency and $B_i = \frac{1}{\sigma}\frac{MP_i}{w_i^{\sigma-1}}$ captures the influence of the host country's market potential and production cost on the connection between a firm's efficiency and its revenues.

The firm's decision about whether to enter market i instead of market j, with $i, j \in N$ (a set of finite and mutually exclusive locations), relies on the probability that $\pi_i > \pi_j$ (for all $j \neq i$). That is,

$$\begin{aligned} \Pr(\pi_i > \pi_j) &= Pr\left\{\left[-f_i + B_i\,\vartheta(x)^{\sigma-1}\right] > \left[f_j + B_j\,\vartheta(x)^{\sigma-1}\right]\right\} \\ &= Pr\left\{\vartheta(x) > \left[\frac{f_i - f_j}{(B_i - B_j)}\right]^{\frac{1}{\sigma-1}}\right\} \end{aligned} \tag{4}$$

The above equation suggests a clear relationship between firms' efficiency and their location decisions in foreign markets, as the host country's market potential and production cost are exogenous location factors.

[19] The "Krugman market potential" in the words of Head and Mayer (2004).

Accordingly, given the characteristics of country j, only firms with efficiency levels higher than $\left[\frac{f_i - f_j}{(B_i - B_j)}\right]^{\frac{1}{\sigma-1}}$ can locate profitably in market i instead of in j. Thus, we expect countries with less attractive characteristics for foreign investors, in terms of size, fixed entry costs, production or trade costs (and therefore with higher productivity cutoff) to be the destination only of multinational firms with an average efficiency high enough to compensate for these relative disadvantages. This will imply the presence of a greater weight of more efficient MNEs in tougher markets in relation to those located in relatively more attractive markets (with lower productivity cutoff).

As previously mentioned, the goal of this paper is to analyze the relationship between the firm's characteristics and the location of its affiliates. According to the model presented above, a key element of this relationship is the self-selection process of firms in their location choice. Based on their own characteristics and the location choice they make, the model allows us to infer the connections between the features of firms and those of the destination markets, in terms of fixed entry costs, variable costs and market potential. Accordingly, in the next section we seek to empirically identify the vector of characteristics of the MNEs that choose to enter each of the markets considered.

3.2 Estimation methodology

To deal with the above location decision problem empirically, we estimate a set of multinomial logit models.[20] This methodology provides an adequate framework in which to analyse firm location decisions when a set of choices are considered and the choice among alternatives is modelled as a function of the characteristics of firms (rather than the characteristics of the alternatives).

Consistent with the random profit maximization framework (McFadden, 1974), the MNL assumes that each investor that faces a finite set of mutually exclusive locations, N, selects the location i that yields the highest expected profit (i.e., $\pi_i > \pi_j$ for all $j \neq i$). In our empirical model, the expected profit of a firm that invests in country i consists of two components: a deterministic part and an unobservable component. Based on Eq. 3, the deterministic part depends on a set of covariates that includes all firm characteristics related to its own efficiency. In this model, the location-specific parameters α_i and β_i are constant and capture the fixed entry cost and the influence of the host country's market potential and production cost on the firm's profits, respectively. The unobservable part is captured by a stochastic term, ε. That is:

$$\pi_i = \alpha_i + \beta_i x + \varepsilon \tag{5}$$

where x includes all the potential observed variables that take account of firms' heterogeneity. For Syverson (2011), the most plausible candidate to explain the widespread and persistent heterogeneity in firm efficiency is differences in productivity. Empirically, however, the literature has highlighted other sources of heterogeneity such as size, capital intensity, human capital, innovation capacity, etc. (see, for instance, Aw and Lee, 2008, Yeaple, 2009, Alguacil et al., 2017 and Tang, 2017).

Given that ε is unknown, the final choice is predicted in this model in terms of probability. More specifically, the probability of a firm selecting location i rather than another (denoted as j) can be defined as: $\Pr(y = i) = \Pr(\pi_i > \pi_j)$, where π_i and π_j are the profits earned in countries i and j, respectively.

In particular, if we assume that the error term is independently and identically distributed (iid) with type I extreme value distribution,[21] the probability of a firm choosing country i to locate an affiliate is given by,

$$\Pr(y = i) = \frac{exp[\alpha_i + \beta_i x]}{\sum_{h=1}^{N} exp[\alpha_h + \beta_h x]} \tag{6}$$

where $\Pr(y = i) = \Pr(\pi_i > \pi_j)$.

Since $\sum_h \Pr_h = 1$, the N sets of parameters (α, β) are not unique. Thus, to identify the parameters α_i and β_i, we need to fix the coefficients for one alternative, in this case location 1, the home country destination, to zero (that is, $\alpha_1 = 0$ and $\beta_1 = 0$).[22] In fitting such a model, the estimated MNL model becomes,

[21] The iid assumption on the error term imposes the property of independence of irrelevant alternatives (IIA).

[22] To identify parameters in this model, it is necessary to establish one of the possible strategies as the base strategy and to set its parameters to zero. Thus, the remaining coefficients would measure the relative change with respect to the base group or strategy.

$$\Pr(y=i)=\frac{exp[\alpha_i'+\beta_i'x]}{1+\sum_{l=1}^{N-1}exp[\alpha_l'+\beta_l'x]} \tag{7}$$

where, according to Eq. 5, the coefficients $\beta_i^{'}=(\beta_i-\beta_1)$ now represent the effect of the *x* covariate factors (firm characteristics) on the probability of choosing the i^{th} alternative rather than the first alternative (to serve the global market by exporting from the home country). Accordingly, a positive β_i' indicates that the firm's characteristic *x* considered has a positive influence on the probability of entering market *i* instead of the alternative.

Additionally, the constant term $\alpha_i^{'}=(\alpha_i-\alpha_1)$ depicts the country-wide characteristics that are invariant across firms. According to Aw and Lee (2008), this coefficient could be interpreted as the contribution to the probability of entering *i*, instead of the alternative, of the fixed investment costs for each foreign investment strategy. This coefficient is thus capturing both physical costs and informational barriers that are specific to each location. Predictably, these costs, and therefore α', will be greater in the case of moving in foreign markets than when the firm produces at home and exports, this being especially high for investment projects in faraway destinations.

4. Results

4.1 Multinomial model

For the estimation of the MNL model outlined above, we focus on the European MNEs that invest in one of the following three locations: US&Ca, Ch&Ind, and Lat. Am. As the aim of this paper is to make predictions about the probability of a firm (faced with a finite set of mutually exclusive locations) selecting a specific location for its affiliate, we leave out of our sample firms that invest in more than one of these three large areas. By doing this, we attempt to identify how the firm characteristics are related to a particular location choice.[23] Thus, we discern among investors that locate in a specific region. These firms represent more than 80% of all the FDI firms. Many empirical works that relate firms' heterogeneity with their location decision chose a single host country or region (such as Puig et al., 2019, or Ye et al., 2019).

[23] The exclusion of observations within a sample, when they are outside the goal of the research, is a common practice in the empirical literature on firms, as can be seen in Demirbag and Glaister (2010).

In Table 2, we show the results of a set of basic models, which include different firms' characteristics separately as the discriminatory variable of a firm's heterogeneity. Specifically, we consider TFP, size (in terms of both number of employees and turnover), capital–labor ratio, human capital, export intensity, and R&D and innovation activities.[24] The estimation of these univariate models provides an initial valuation of both: (i) the role played by the fixed cost that a firm must incur to enter a specific market i, f_i, and (ii) the importance of the firms' attributes (x), related to the efficiency gains, in the probability of choosing a given foreign location instead of producing only at home.[25]

Table 2. MNL regression of European firms' investment location decision, 2008 (Basic model).

Independent Variables	USA and Canada (1)	China and India (2)	Latin America (3)	Ch&Ind vs. US&Ca (4)	Lat. Am. vs. US&Ca (5)	Lat. Am. vs. Ch&Ind (6)
Constant	-5.03 (0.15)[a]	-4.31 (0.10)[a]	-5.96 (0.23)[a]	0.71 (0.18)[a]	-0.92 (0.28)[a]	-1.64 (0.25)[b]
TFP	1.32 (0.21)[a]	0.70 (0.21)[a]	1.49 (0.23)[a]	-0.61 (0.29[b]	0.17 (0.29)	0.79 (0.31)[a]
Observations	7035					
Likelihood	-880.54					
Constant	-8.75 (0.58)[a]	-7.32 (0.36)[a]	-10.18 (1.02)[a]	1.43 (0.68)[b]	-1.42 (1.17)	-2.86 (1.08)[b]
No. employees	0.91 (0.11)[a]	0.72 (0.07)[a]	0.98 (0.20)[a]	-0.18 (0.14)	0.07 (0.23)	0.25 (0.22)
Observations	9385					
Likelihood	-1071.90					
Constant	-5.04 (0.12)[a]	-4.47 (0.09)[a]	-6.10 (0.21)[a]	0.57 (0.15)[a]	-1.06 (0.24)[a]	-1.63 (0.23)[a]
Turnover	0.05 (0.01)[a]	0.07 (0.01)[a]	0.05 (0.01)[a]	0.01 (0.01)	0.01 (0.01)	-0.01 (0.01)
Observations	9360					
Likelihood	-1149.27					
Constant	-6.91 (0.83)[a]	-5.96 (0.68)[a]	-7.64 (1.48)[a]	0.95 (1.15)	-0.72 (1.75)	1.68 (1.63)
K/L	0.40 (0.18)[b]	0.32 (0.13)[b]	0.34 (0.28)	-0.07 (0.22)	-0.05 (0.33)	0.01 (0.31)
Observations	5446					
Likelihood	-692.44					
Constant	-6.91 (0.42)[a]	-6.11 (0.28)[a]	-8.29 (0.64)[a]	0.80 (0.50)	-1.37 (0.76)[c]	-2.17 (0.70)[b]
HK[1]	0.68 (0.12)[a]	0.60 (0.08)[a]	0.73 (0.17)[a]	-0.07 (0.15)	0.04 (0.21)	0.12 (0.19)
Observations	7001					
Likelihood	-598.47					
Constant	-7.17 (0.55)[a]	-6.35 (0.27)[a]	-7.91 (0.77)[a]	0.82 (0.60)	-0.74 (0.94)	-1.56 (0.80)[b]
Exp. Intensity	0.73 (0.18)[a]	0.80 (0.08)[a]	0.71 (0.25)[a]	0.06 (0.19)	-0.01 (0.31)	-0.08 (0.26)
Observations	5423					
Likelihood	-513.67					
Constant	-6.11 (0.29)[a]	-5.19 (0.22)[a]	-7.43 (0.47)[a]	0.92 (0.36)[c]	-1.31 (0.53)[b]	-2.23 (0.51)[b]
R&D[1]	0.78 (0.12)[a]	0.52 (0.10)[a]	0.76 (0.16)[a]	-0.25 (0.15)[a]	-0.02 (0.18)	0.23 (0.18)
Observations	4850					
Likelihood	-540.76					
Constant	-5.66 (0.26)[a]	-5.00 (0.19)[a]	-6.51 (0.40)[a]	0.65 (0.32)[b]	-0.84 (0.48)[c]	-1.50 (0.45)[a]
Innovation	1.03 (0.30)[a]	0.94 (0.22)[a]	0.74 (0.47)	-0.09 (0.37)	-0.29 (0.56)	-0.20 (0.52)
Observations	9385					
Likelihood	-1139.13					

Note: Standard errors are in parentheses, where a, b and c denote significance at the 1%, 5% and 10% levels, respectively. The first three columns report the MNL estimations, taking the exporting firms from the home country as the base group (Export vs. FDI).

[24] The divergence in the number of observations in the different regressions is due to the fact that the EFIGE database presents empty cells that vary depending on the explanatory variable that is analyzed.

[25] The multinomial logit model assumes that the ratio of the probabilities of any pair of alternatives is independent from the remaining choices (IIA). The Hausman test statistics estimated take negative values in every estimation performed, which can be interpreted as strong evidence against rejecting the null hypothesis that the IIA assumption holds (see Hausman and McFadden, 1984, footnote 4). Results are available upon request.

In the first three columns of Table 2, the estimates report how variations in the different firms attributes influence the likelihood of a firm deciding to invest in US&Ca, Ch&Ind or Lat. Am., rather than locating in the home country and exporting globally. In the last three columns, we report the differences in these coefficients among the alternative destinations.

As shown in Section 3, the coefficients of the constant terms represent the country-wide characteristics that are invariant across firms, f_i. Thus, a negative and significant coefficient on this regressor in the first three columns reflects the expected higher fixed investment costs of a European firm that result from locating outside Europe. From the last three columns, we can clearly identify a ranking in terms of the negative influence of the fixed investment costs on the probability of entering each alternative location. Specifically, we find that fixed investment costs penalize Latin American countries more than US&Ca and Ch&Ind. We further obtain that the deterring influence of the sunk costs in USA and Canada is higher than in China and India.

According to the above estimates, we can also conclude that firms involved in FDI projects are more productive, larger, and more (physical and human) capital intensive, while they also have a higher export capacity and carry out more extensive R&D and innovation activities than firms that only produce at home and export (first three columns). However, results are different when we look at the relative location choice of investing firms (last three columns). Here, only TFP and, to some extent, R&D intensity seem to be important factors in the location of MNEs.

In Tables 3 and 4, we present the outcomes of the extended MNL model. These multivariate regressions include, together with productivity (proxied by TFP), other firm-specific characteristics that can affect the efficiency of a firm that invests in a foreign market, and therefore the decision to enter a particular market. Specifically, we add human capital, years of establishment of the parent firm, and R&D and innovation activities.[26] Including these firm-specific factors constitutes a robust test of the extent to

[26] Given the high collinearity between the variable that proxies the firm's participation in innovative activities, such as expenditure on R&D and the presence of product innovation, we include these variables separately in different regressions. We have also estimated the models with process innovation and the number of patents, as approximations of firms' innovation dynamics, obtaining similar outcomes. Results are available on request.

which firms' heterogeneity, in terms of productivity, may affect the internationalization modes and the location choices, once we control for other ownership advantages.

Table 3. MNL regression of European firms' investment location decision, 2008 (Extended model with R&D).

Independent Variables	USA and Canada (1)	China and India (2)	Latin America (3)	Ch&Ind vs. US&Ca (4)	Lat. Am. vs. US&Ca (5)	Lat. Am. vs. Ch&Ind (6)
Constant	-6.15 (0.51)[a]	-4.75 (0.27)[a]	-6.45 (0.61)[a]	1.39 (1.57)[b]	-0.30 (0.80)	-1.69 (0.33)[a]
TFP	1.26 (0.23)[a]	0.62 (0.21)[a]	1.46 (0.25)[a]	-0.64 (0.31)[b]	0.19 (0.32)	0.84 (0.33)[a]
HK[2]	0.19 (0.29)	-0.25 (0.24)	-0.10 (0.48)	-0.44 (0.38)	-0.29 (0.56)	0.15 (0.53)
R&D[2]	1.53 (0.52)[a]	0.88 (0.28)[a]	0.89 (0.62)	-0.65 (0.60)	-0.64 (0.81)	0.01 (0.68)
Age	-0.81 (0.39)[b]	-0.55 (0.26)[b]	-0.62 (0.55)	0.25 (0.46)	0.18 (0.67)	-0.06 (0.61)
Observations	7035					
Likelihood	-859.51					

Note: Standard errors are in parentheses, where a, b and c denote significance at the 1%, 5% and 10% levels, respectively. The first three columns report the MNL estimations taking the exporting firms from the home country as the base group (Export vs. FDI).

Table 4. MNL regression of European firms' investment location decision, 2008 (Extended model with innovation).

Independent Variables	USA and Canada (1)	China and India (2)	Latin America (3)	Ch&Ind vs. US&Ca (4)	Lat. Am. vs. US&Ca (5)	Lat. Am. vs. Ch&Ind (6)
Constant	-5.70 (0.32)[a]	-4.92 (0.23)[a]	-6.46 (0.44)[a]	0.77 (0.39)[b]	-0.76 (0.55)	-1.54 (0.50)[a]
TFP	1.29 (0.22)[a]	0.64 (0.20)[a]	1.45 (0.23)[a]	-0.64 (0.29)[b]	0.16 (0.30)	0.80 (0.31)[a]
HK	0.21 (0.29)	-0.27 (0.23)	-0.09 (0.49)	-0.48 (0.37)	-0.31 (0.57)	0.17 (0.54)
Innovation	0.93 (0.34)[a]	1.05 (0.25)[a]	0.82 (0.53)	0.12 (0.42)	-0.10 (0.62)	-0.22 (0.58)
Age	-0.97 (1.02)	-0.43 (0.59)	-0.09 (1.01)	0.53 (1.17)	0.88 (1.42)	0.34 (1.16)
Observations	7035					
Likelihood	-853.55					

Note: Standard errors are in parentheses, where a, b and c denote significance at the 1%, 5% and 10% levels, respectively. The first three columns report the MNL estimations, taking the exporting firms from the home country as the base group (Export vs. FDI).

The outcomes of the extended models confirm our previous results: firms involved in FDI projects are more productive, R&D intensive and innovative than firms that only produce at home and export (first three columns). However, the impact of age on the location choice of European firms is unclear. Although the estimate coefficient is always negative, it is only significant in the model that includes R&D spending as a measure of innovation (Table 3), but not in the regression with innovation itself (Table 4). The fact that age is represented by a binary variable (with the loss of information that this may entail) might justify the lack of consistency of this result.[27]

Moreover, when we look at the location choice of firms outside Europe (last three columns), only TFP appears to be significant in the location choice of MNEs. Specifically, we find that, on the one hand, firms that decide to enter US&Ca are on

[27] This result could also be justified by the very definition of the variable age. This variable takes a value of 1 for firms that have been established <6 years, which are considered young innovative firms, 0 otherwise, which leads it to a high correlation with the innovation variable.

average more productive than firms that locate in Ch&Ind. On the other hand, we observe that only the most productive firms could engage in setting up a production plant in Latin America. These results are in line with those obtained previously in the single regressions (see Table 2).

As shown in Section 3, the relevance of firms' productivity in the different destinations depends on the diverse balance from their global market potential and production costs, which makes these home regions relatively more or less attractive for investors. According to Eq. 4 (in Section 3), the previous results are revealing that a combination of market access, and lower fixed and variable costs of production are probably the reason why China and India attract, marginally, firms with lower productivity relative to other regions. In contrast, for European firms entering Latin America, the great weight of productivity on the probability of entering (greater than in Ch&Ind) reflects the fact that despite the higher market potential in Latin America, the production cost is much lower in Asia (see figures in Tables A.1 and A.2 in Appendix I). This, together with the negative influence of pronounced entry costs, will imply that only firms with high productivity or those that have a special ability to operate in that market will choose to locate an affiliate there.[28] In the case of USA and Canada, the coefficient on TFP (higher than that obtained for China and India but lower than the one for Latin America) reveals that even with its huge market potential (the highest in the world), the costs of production are also very high.

Nevertheless, apart from the TFP, we do not find any significant discrepancy among firms that participate in internationalization activities in terms of location choice. However, this might be hiding the presence of dissimilar patterns for firms belonging to different industries (as each of them has different characteristics in terms of factor intensity and technological basis). To take this into account, we re-estimate our previous specifications for different industries separately. Particularly, we include a low-tech industry (food products, beverages and tobacco), a medium-low-tech industry (basic metals and fabricated metal products) and two high-medium-low industries (transport equipment and manufacture of machine and equipment).[29] Tables 5 and 6 depict the results of the

[28] This would be consistent with the idea of a component in the productivity or in the efficiency of firms associated with any mobile capability that is especially effective in this market (Nocke and Yeaple, 2007).
[29] Following the suggestions of an anonymous reviewer, we have also grouped these industries according to their technological intensity (medium high-tech and low-medium or low-tech intensive), without obtaining any conclusive results. This is not surprising if we consider the large differences in terms of fixed

extended models by different industries. As before, we consider R&D expenditure and product innovation separately, as a proxy of firm participation in technology improvement activities.[30]

Table 5. MNL regression of European firms' investment location decision by industries, 2008 (with R&D expenditure).

Independent Variables	USA and Canada (1)	China and India (2)	Latin America (3)	Ch&Ind vs. US&Ca (4)	Lat. Am. vs. US&Ca (5)	Lat. Am. vs. Ch&Ind (6)
Manufacture of food products, beverages and tobacco (Low-technology industry)						
Constant	-22.56 (0.48)[a]	-23.23 (0.03)[a]	-22.69 (0.04)[a]	-0.66 (0.48)	-0.12 (0.48)	0.54 (0.02)[b]
TFP	1.22 (0.91)	1.27 (0.20)[a]	2.95 (0.56)[a]	0.04 (0.90)	1.72(0.98)[c]	1.67 (0.40)[a]
HK[2]	0.88 (0.99)	-17.26 (1.00)[a]	-16.38 (1.05)[a]	-18.14 (1.40)[a]	-17.27 (1.42)[a]	0.87 (1.43)
R&D[2]	17.43 (0.51)[a]	17.40 (1.00)[a]	16.22 (0.98)[a]	-0.02 (1.12)	-1.20 (1.11)	-1.17(1.40)
Age	-16.41 (0.64)[a]	-15.75 (1.03)[a]	-14.25 (1.07) [a]	0.65 (1.20)	2.15 (1.22)[c]	1.49 (1.42)
Observations	1023					
Likelihood	-34.71					
Manufacture of basic metals and fabricated metal products (Medium-low-technology industry)						
Constant	-25.03 (0.52)[a]	-6.65 (0.69)[a]		15.37 (0.86)[a]		
TFP	0.55 (0.10)[a]	-0.74 (0.38)[b]		-1.30 (0.39)[a]		
HK[2]	0.79 (1.41)	0.67 (0.81)		-0.11 (1.63)		
R&D[2]	15.40 (0.73)[a]	0.79 (0.88)		-14.61 (1.14)[a]		
Age	-14.31 (0.71)[a]	-14.69 (0.40)[a]		-0.38 (0.81)		
Observations	2431					
Likelihood	-60.72					
Manufacture of transport equipment (Medium-high-technology industry)						
Constant	-21.19 (0.46)[a]	-21.19 (0.52)[a]		0.32 (0.52)		
TFP	3.37 (0.74)[a]	3.27 (0.57)[a]		-0.09 (0.52)		
HK[2]	-15.94 (1.08)[a]	0.99 (1.52)		16.94 (1.74)[a]		
R&D[2]	15.56 (1.06)[a]	15.29 (0.84)[a]		-0.26 (1.27)		
Age	-15.34 (1.39)[a]	-15.38 (1.07)[a]		-0.32 (1.34)[a]		
Observations	305					
Likelihood	-13.83					
Manufacture of machine and equipment n.e.c. (Medium-high-technology industry)						
Constant	-21.73 (0.65)[a]	-5.19 (0.65)[a]	-21.28 (0.34)[a]	16.53 (0.90)[a]	-0.44 (0.72)	-16.08 (0.74)[a]
TFP	2.95 (0.25)[a]	1.44 (0.51)[a]	2.12 (0.30)[a]	-1.51 (0.53)[a]	0.83 (0.30)[a]	0.67 (0.57)
HK[2]	0.51 (1.41)	0.37 (0.50)	-0.23 (1.23)	-0.13 (1.49)	0.74 (1.86)	-0.60 (1.32)[a]
R&D[2]	15.08 (0.72)[a]	0.82 (0.76)	15.61 (0.58)[a]	-14.25 (1.03)[a]	-0.53 (0.90)	14.78 (0.94)[a]
Age	-14.54 (0.76)	1.00 (0.75)	-15.08 (0.63)	15.55 (1.02)[a]	0.54 (0.93)	-16.09 (0.74)[a]
Observations	1139					
Likelihood	-111.05					

Note: Standard errors are in parentheses, where a, b and c denote significance at the 1%, 5% and 10% levels, respectively. The first three columns report the MNL estimations taking the exporting firms from the home country as the base group (Export vs. FDI).

Table 6. MNL regression of European firms' investment location decision by industries, 2008 (with innovation).

Independent Variables	USA and Canada (1)	China and India (2)	Latin America (3)	Ch&Ind vs. US&Ca (4)	Lat. Am. vs. US&Ca (5)	Lat. Am. vs. Ch&Ind (6)
Manufacture of food products, beverages and tobacco (Low-technology industry)						
Constant	-5.74 (1.06)[a]	-30.36 (0.79)[a]	-63.84 (16.60)[a]	-24.61 (1.33)[a]	-58.09 (16.64)[a]	-33.47 (14.81)[a]
TFP	1.57 (0.96)[c]	1.81 (0.28)[a]	7.92 (3.07)[a]	0.23 (0.97)	6.34 (3.20)[b]	6.10 (1.95)[a]
HK[2]	0.92 (0.98)	-99.94 (10.47)[a]	-474.25 (167.82)[a]	-100.87 (10.52)[a]	-475.18 167.82)[a]	-374.30 (158.64)[a]
Product Innov.	-0.06 (0.96)	18.21 (1.00)[a]	17.50 (1.69)[a]	18.28 (1.39)[a]	17.56 (1.96)	-0.71 (1.49)
Age	0.05 (0.12)	4.24 (0.48)[a]	22.17 (8.01)[a]	4.18 (0.49)[a]	22.11 (8.01)[a]	17.93 (7.03)[a]
Observations	1032					
Likelihood	-81.32					
Manufacture of basic metals and fabricated metal products (Medium-low-technology industry)						
Constant	-21.81 (1.58)[a]	-5.67 (1.75)[a]		16.14 (2.36)[a]		
TFP	0.50 (0.19)[a]	-0.64 (0.35)[c]		-1.14 (0.40)[a]		
HK[2]	0.85 (1.44)	0.65 (0.74)		-0.19 (1.62)		

and variable cost observed among firms from different industries within the same technology category (see results in Tables 5 and 6).

[30] Results of the basic models by industries are available on request.

Innovation	13.60 (0.71)^{a}	1.52 (0.79)^{c}		-12.07 (1.07)^{a}		
Age	1.32 (1.45)	-0.97 (0.94)		-2.30 (1.73)		
Observations	2431					
Likelihood	-96.28					
Manufacture of transport equipment (Medium-high-technology industry)						
Constant	-62.87 (10.23)^{a}	-20.09 (5.43)^{a}		42.78 (11.56)^{a}		
TFP	8.09 (1.77)^{a}	3.83 (0.76)^{a}		-4.25 (1.49)^{a}		
HK^2	-16.79 (1.32)^{a}	1.42 (4.49)		18.21 (2.62)^{a}		
Innovation	21.61 (2.59)^{a}	16.93 (0.86)^{a}		-4.67 (2.62)^{c}		
Age	20.93 (4.78)^{a}	-2.12 (5.43)		-23.06 (5.84)^{a}		
Observations	312					
Likelihood	-46.40					
Manufacture of machine and equipment n.e.c. (Medium-high-technology industry)						
Constant	-4.98 (2.77)^{c}	-6.05 (1.07)^{a}	-17.25 (2.44)^{a}	-1.06 (2.97)	-12.26 (3.66)	-11.19 (2.67)^{a}
TFP	2.92 (0.52)^{a}	1.37 (0.52)^{a}	2.19 (0.41)^{a}	-1.54 (0.71)^{b}	-0.72 (0.63)	0.82 (0.61)
HK^2	0.56 (1.33)	0.30 (0.50)	-0.41 (1.23)	-0.25 (1.42)	-0.97 (1.81)	-0.71 (1.32)
Innovation	-0.62 (1.35)	2.20 (1.02)^{b}	15.29 (0.66)^{a}	2.83 (1.69)^{c}	15.91 (1.49)^{a}	13.08 (1.22)^{a}
Age	-1.15 (2.81)	-0.08 (0.10)	-2.56 (1.87)	1.06 (2.82)	-1.41 (3.37)	-2.48 (1.88)
Observations	1160					
Likelihood	-211.22					

Note: Standard errors are in parentheses, where a, b and c denote significance at the 1%, 5% and 10% levels, respectively. The first three columns report the MNL estimations taking the exporting firms from the home country as the base group (Export vs. FDI).

The analysis at industry level confirms our previous results, showing that in general only the most productive firms invest abroad. Moreover, the estimates reflect that this is especially true for industries with higher fixed costs, such as transport equipment and machine and equipment n.e.c., where the coefficients on TFP are greater and more significant. Furthermore, we identify different rankings according to firms' characteristics and entry investment costs across destinations.

Particularly, we find that firms that engage in FDI in US&Ca in manufacturing basic metals and fabricated metal products, transport equipment, and machine and equipment n.e.c. are more productive and R&D or innovation intensive than firms that invest in China and India in the same industry. This is not surprising if we consider that a higher efficiency will be required in order to compensate for the higher production costs in US&Ca than in Asia. Also, as Chung and Alcácer (2002) mentioned, we can expect that firms in research-intensive industries tend to locate in regions with high R&D intensities, as is the case of USA and Canada.

Moreover, our results suggest that in the industry devoted to the manufacture of food products, beverages and tobacco, the most productive firms locate in Latin America. The estimates also reveal that firms within this industry locating in China and India are more productive than those that invest in USA and Canada. In addition, we also find that the probability that a firm belonging to this sector with low-tech intensity will locate in a developing area (and specifically in Latin America, and China and India) decreases with its level of human capital and seems to increase with the years of establishment. This last finding is highly significant in estimation with innovation, but not in the model with

R&D.[31] Skills endowments are also relevant in the location strategy of firms in the medium-high-tech industries, that is, transport equipment and the manufacture of machine and equipment. Similarly, the years of establishment appear as an important aspect in the location choice of these firms, with the greatest weight of age found for firms that invest in US and Canada.

Overall, the estimates confirm the relevance of the firm's characteristics in the decision on where to locate abroad. When all industries are considered together, the location choice only seems to be defined by firms' productivity. However, the results of the sector analysis go a step further, showing that within the same sector the location decision will also depend on other characteristics of the MNEs (including R&D, innovative activity, years of establishment, and HK intensity).

4.2 Robustness analysis: Sequential model

We now present the results of a sequential logistic (SL) model. In these regressions, we relax the assumption of simultaneous choice. As is well known, MNL models are based on the idea that individual firms select their internationalization strategy taking all possibilities into account simultaneously: export, FDI in Lat. Am., FDI in US&Ca, and FDI in Ch&Ind. The SL model, however, is built under a probably more reasonable hypothesis that the firm's selection process responds to sequential choices.[32]

In particular, we consider here that the choice of the internationalization mode – to produce at home and export *vs.* foreign location – is a previous and independent decision. Firms that decide to invest abroad will later choose where to locate their international activity. Specifically, we define the SL as a process consisting of the following stages. In Stage 1, firms choose the way to operate abroad: exports *vs.* foreign production. In Stage 2, firms that decide to invest abroad select a region for foreign production. In this second stage, the firms' location choice occurs between only two alternative groups of destinations. Therefore, in this work, we estimate the model considering also a third stage (Stage 3) in order to discriminate between the two areas included within the same destination group as in the previous stage.

[31] The lack of robustness of this result is probably related to the binary nature of these variables.
[32] See, for instance, Monjon, S., and Waelbroeck, P. (2003).

In Tables 7 and 8, we present the estimates of the SL regressions for the extended model for all the possible scenarios, with R&D and innovation considered separately.[33] Results in Column (1) confirm that only firms with higher TFP and greater intensity in R&D activities or innovative operations will decide to invest abroad rather than to export, regardless of their final location decision. Furthermore, the estimates from Column (2) reveal that even less productive firms are in a good position to take advantage of the lower cost of producing in China and India, in comparison to firms producing in America. Nonetheless, we do not obtain any evidence of a relevant difference between firms investing in Lat. Am. relative to those locating in US&CA.

Table 7. Sequential Logit regression of European firms' investment location decision, 2008 (with R&D).

Independent Variables	FDI Vs. Exp. (1)	US&Ca and Lat. Am. vs. Ch&Ind (2)	US&Ca vs. Lat. Am. (3)	Lat. Am. and Ch&Ind vs. US&Ca (4)	Lat. Am. vs. Ch&Ind (5)	US&Ca and Ch&Ind vs. Lat. Am. (6)	Ch&Ind vs. US&Ca (7)
Constant	-4.57 (0.21)[a]	-0.94 (0.47)[b]	-0.34 (0.80)	1.66 (0.57)[a]	-1.72 (0.66)[a]	1.94 (0.64)[a]	1.49 (0.58)[a]
TFP	0.96 (0.14)[a]	0.84 (0.33)[a]	0.19 (0.92)	-0.53 (0.33)[c]	0.95 (0.46)[b]	-0.67 (0.42)	-0.68 (0.34)[b]
HK^2	-0.10 (0.17)	0.46 (0.35)	-0.19 (0.59)	-0.51 (0.37)	0.25 (0.56)	-0.03 (0.53)	-0.56 (0.39)
$R\&D^2$	1.08 (0.23)[a]	0.44 (0.49)	-0.62 (0.83)	-0.67 (0.58)	-0.04 (0.70)	0.19 (0.68)	-0.67 (0.60)
Age	-0.50 (0.46)	-0.22 (0.95)	0.86 (1.46)	0.67 (1.14)	0.21 (1.23)	-0.56 (1.16)	0.45 (1.19)
Observations	7036						
Likelihood	-863.74						

Note: Standard errors are in parentheses, where a, b and c denote significance at the 1%, 5% and 10% levels, respectively.

Table 8. Sequential Logit regression of European firms' investment location decision, 2008 (with innovation).

Independent Variables	FDI Vs. Exp. (1)	US&Ca and Lat. Am. vs. Ch&Ind (2)	US&Ca vs. Lat. Am. (3)	Lat. Am. and Ch&Ind vs. US&Ca (4)	Lat. Am. vs. Ch&Ind (5)	US&Ca and Ch&Ind vs. Lat. Am. (6)	Ch&Ind vs. US&Ca (7)
Constant	-4.39 (0.17)[a]	-0.45 (0.35)	-0.83 (0.60)	1.02 (0.38)[a]	-1.51 (0.54)[a]	1.98 (0.51)[a]	0.79 (0.39)[b]
TFP	0.98 (0.14)[a]	0.86 (0.33)[a]	0.21 (0.53)	-0.57 (0.33)[c]	0.98 (0.47)[b]	-0.66 (0.42)	-0.73 (0.34)[b]
HK^2	-0.09 (0.17)	0.49 (0.36)	-0.24 (0.59)	-0.54 (0.37)	0.25 (0.56)	-0.04 (0.53)	-0.59 (0.39)
Innovation	0.98 (0.19)[a]	-0.14 (0.39)	-0.05 (0.64)	0.08 (0.42)	-0.32 (0.59)	0.16 (0.56)	-0.16 (0.44)
Age	-0.51 (0.46)	-0.25 (0.95)	0.78 (1.47)	0.71 (1.14)	0.21 (1.22)	-0.58 (1.16)	0.54 (1.19)
Observations	7035						
Likelihood	-862.83						

Note: Standard errors are in parentheses, where a, b and c denote significance at the 1%, 5% and 10% levels, respectively.

When we differentiate between developing and developed destination areas, our estimates reflect no statistical differences among firms investing in USA and Canada compared to those that locate in Lat. Am. and Ch&Ind (Column 4). In the following stage, the two possible developing destinations, Lat. Am. and Ch&Ind, are compared. The results confirm, as previously from the MNL model, that European firms locating in Latin America are in a better position to overcome the higher costs required to invest in this

[33] Results from the basic model of the SL model are available on request.

region compared to China or India (Column 5). Finally, we observe that the coefficients on TFP are lower for firms investing in Ch&Ind than for US and Canada (Column 7). The results are, in general, in line with both our previous results from the multinomial model and the conclusions of Aw and Lee (2008).[34]

Conclusions

In this paper, we conduct a micro-level study on the links between firms' characteristics and their international location choice strategy for a set of European countries. In particular, we address two questions: Which European firms choose to serve markets globally by exports and which decide to serve overseas markets via FDI? And, what features of firms determine where they locate their affiliates?

We rely on a simple model to illustrate the relationship among the characteristics of individual firms and the internationalization and location choice of their affiliates, given the main features of the host regions. We based our empirical analysis on harmonized and detailed firm-level data about a large set of MNEs from six highly developed European countries, which locate their affiliates outside Europe. Other new contributions to the literature on firm heterogeneity and location choice are the estimation methods used in this study, the multinomial and sequential logistic models, and the sectoral analysis carried out in it.

The results concerning the European MNEs' decision as to where to locate their affiliates, although dissimilar to a certain extent, confirm the relevance of the firms' characteristics. When all industries are considered together, the location choice only seems to be defined by firms' productivity. However, the outcomes from the sectoral analysis go a step further, showing that within the same industry the location decision will also depend on other characteristics of the firm (including R&D, years of establishment, and HK intensity). The differences in fixed entry costs, production or transport costs, and even access to demand of each location for different industries may well be behind these discrepancies. However, what seems a constant throughout the analysis is that differences in productivity, as well as in activities that encourage efficiency improvements (such as R&D, innovation, human capital), are the main cause of the different location strategies.

[34] For Aw and Lee (2008), in both the Computer and Telecommunications and the Parts and Components industries, relative to firms that invest only in China, the coefficients on total factor productivity are higher for firms investing only in the USA.

The multinational activity and hence the integration in international production networks should be associated with productivity levels that are high enough to compensate for the relative disadvantage of the fact that operating in faraway markets is relatively less attractive.

These outcomes have important policy implications. First, although productivity slowdown is a global phenomenon, the relative decline of productivity in Europe could lead our multinational activity toward less “demanding” markets. In accordance with OECD, from 2001 to 2018, the average increase in labor productivity in the USA has been 1.56% per year, while in Europe it has been only 0.69%. Moreover, the decline in TFP growth after the last global financial crisis could be followed by similar patterns, which might be especially detrimental for the legacy of continental Europe. Therefore, it seems there is an urgent need to change this trend by articulating policies that stimulate incentives for firms to intensify those activities that increase their productivity and efficiency.

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Appendix I. Manufacturing production costs and market potential by locations

Table A.1. Manufacturing production costs per hour by locations, 2007.

Region	EU	North America	China and India	Latin America
	34.1	32.3	0.7	2.0

Source: Authors' calculations based on LABORSTAT Database (International Labor Organization, 2014).

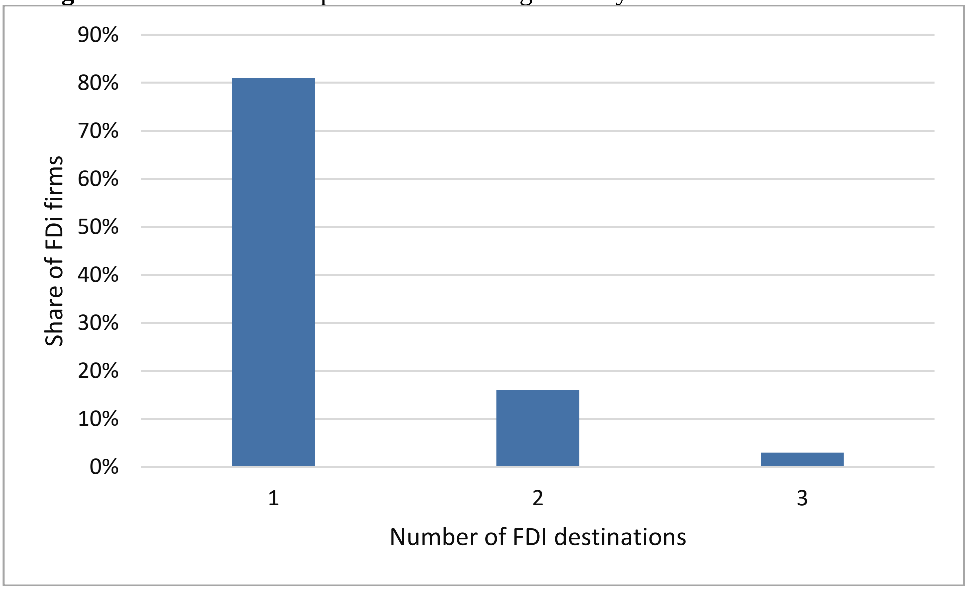
Table A.2. Market Potential by locations, 2007.

Region	EU	North America	China and India	Latin America
	4.5	8.5	3.4	4.1

Source: Authors' calculations based on World Bank database (2014).

Appendix II. The scope of European manufacturing firms

Figure A.1. Share of European manufacturing firms by number of FDI destinations



Source: Authors' calculations based on the EFIGE dataset.

Appendix III. Description of explanatory variables

Table A.3. European manufacturing firms' characteristics: averages by internationalization strategy and investment location, 2007-2009.

Firm Characteristics					
TFP	-0.10	0.11	US&Ca	Ch&Ind	Lat. Am.
	(0.46)	(0.55)			
Size	67.50	187.97	0.25	0.05	0.33
	(100.17)	(178.74)	(0.54)	(0.52)	(0.46)
Turnover	3.12	4.44	218.37	164.30	237.40
	(1.29)	(1.58)	(199.30)	(166.51)	(208.64)
K/L	4.80	5.03	5.11	5.05	5.06
	(0.85)	(0.82)	(0.90)	(0.86)	(0.87)
HK[1]	14.01	93.99	76.79	50.36	61.80
	(41.57)	(457.52)	(126.03)	(89.26)	(116.91)
R&D[1]	3.99	23.16	19.71	8.54	9.27
	(37.03)	(171.07)	(37.83)	(15.25)	(8.87)
Exp. Intensity	12.11	25.65	29.86	24.47	23.60
	(0.42)	(2.61)	(8.49)	(2.43)	(5.77)

Source: Authors' calculations based on the EFIGE dataset. Standard deviations are in parentheses.

Table A.4. Definition of explanatory variables.

Variable	*Definition*
TFP	Solow residual of a Cobb-Douglas production function estimated following the semi-parametric algorithm proposed by Levinsohn and Petrin (2003), 2002-2008.
Size	Natural logarithm of total number of employees.
Turnover	Range of annual turnover in 2008.
K/L	Natural logarithm of capital–labor ratio.
HK[1]	Natural logarithm of number of white-collar workers.
HK[2]	Dummy for Human Capital: firm has a higher share of graduate employees with respect to national average share of graduates.
R&D[1]	Natural logarithm of number of employees involved in R&D activities.
R&D[2]	Dummy for R&D: firm employs more than 0 employees in R&D activities.
Exp. Intensity	Total number of countries where each firm exported its products in 2008.
Innovation	Dummy for firms that carried out any product innovation in years 2007-2009.
Age	Dummy that takes a value of 1 for firms that have been established <6 years, which are considered young innovative firms, 0 otherwise.

Source: Authors' calculations based on EFIGE dataset.

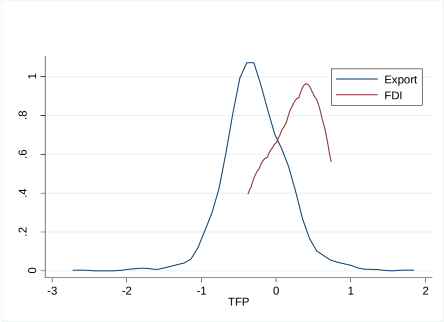
Table A.5. Descriptive Statistics.

Variable	Mean	Std. Dev.	Min.	Max.
TFP	-0.156	0.434	-5.109	2.660
Size	3.579	0.956	2.302	6.214
Turnover	3.17	1.32	1	7
K/L	4.752	0.871	0.734	9.489
HK[1]	1.676	1.210	0	7.605
HK[2]	0.292	0.455	0	1
R&D[1]	1.126	0.935	0	8.006
R&D[2]	0.591	0.491	0	1
Exp. Intensity	11.57	16.39	0	200
Innovation	0.56	0.49	0	1
Age	0.061	0.239	0	1

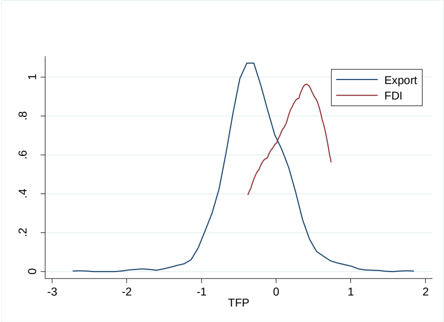
Source: Authors' calculations based on EFIGE dataset.

Appendix IV

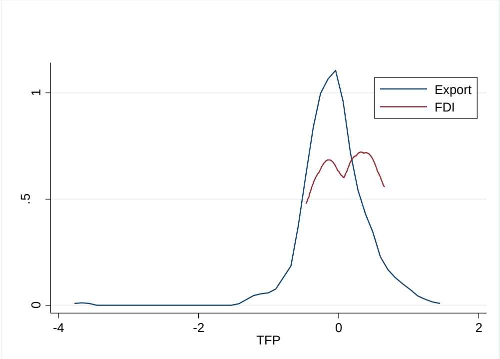
Manufacture of food products, beverages and tobacco
Fig. A.2.a. Density of TFP for export and FDI firms



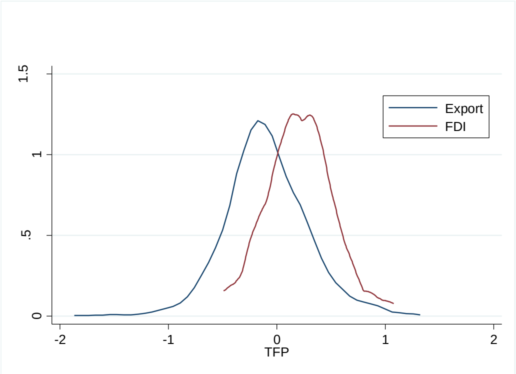
Manufacture of basic metals and fabricated metal products
Fig. A.2.b. Density of TFP for export and FDI firms



Manufacture of transport equipment
Fig. A.2.c. Density of TFP for export and FDI firms



Manufacture of machine and equipment n.e.c
Fig. A.2.d. Density of TFP for export and FDI firms



Source: Authors' calculations based on the EFIGE dataset.