Firm Heterogeneity and Location Choice of European Multinationals

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Abstract

In this paper we investigate how the different characteristics of European multinational firms affect their decision to locate in different foreign markets. Considering the existence of *n* geographically separated markets with different attributes, in terms of entry or fixed costs, variable production costs and the market potential, our theoretical model shows that both firm and country characteristics determine the location of multinational firms. The model reveals that given the characteristics of the countries, the decision to enter a specific country in order to serve all markets globally will depend on all the sources of a firm's heterogeneity. In the empirical analysis, we drawn on a dataset comprised of harmonized and detailed firm-level data across European countries for 2008 (EFIGE dataset). The results obtained confirm that firms' international location decision reflects the underlying dissimilarities of European multinational firms, including the specific industry in which they operate. More specifically, our estimations show that among European firms investing in non-European countries, only the most productive firms invest in Latin America and those that decide to enter North America are more productive than firms that locate in China and India. However, we find that this ranking may vary across industries, depending not only on TFP, but also on the years of establishment and the firms' human and R&D intensity.

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 transnational corporations. According to 2013 data from UNCTAD, about a third of total world exports are accounted for by the sales of multinational firms (MNEs) that engage in foreign direct investment (FDI). This massive growth of FDI has also altered the location strategies of multinational firms in their attempt to achieve greater market sizes and lower costs, with a substantial increase in the weight of developing and transition economies in attracting global FDI inflows.[1] 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 this paper.

The location of foreign affiliates and the effects of the offshoring of firms has been a central topic in the economic policy debate, particularly in Western Europe and the USA, where countries are increasingly concerned about the possible disappearance of their industry (and consequently about the decreases in their employment rates). For Baldwin (2006), one of the implications of this new paradigm in globalization is that "international competition – which used to be primarily between firms and sectors in different nations – now occurs between individual workers performing similar tasks in different nations".

Not surprisingly the issue of FDI location has attracted a great deal of attention in the recent literature, shifting the emphasis from countries and industries to firms. Two main questions have been addressed in this field. On the one hand, most of the existing studies have focused their attention on the determinants of investments abroad (and particularly on the role played by the host country characteristics that may attract FDI and MNEs), in order to identify whether foreign investments are more driven by market size and agglomeration effects than by cost considerations (see, for instance, the works of Crozet et al., 2004; Head and Mayer, 2004; Baltagi et al., 2007; Basile et al., 2008; Mayer et al., 2010; Martí et al., 2015). On the other hand, and probably encouraged by the growing

[1] See Martí et al. (2015).

availability of micro-data and a better knowledge of the characteristics of multinational firms, some recent works have analyzed the links between the differences between firms conducting foreign investment projects and their internationalization strategies and location choice (see, among others, Helpman et al., 2004; Grossman et al., 2006; Aw and Lee, 2008; Yeaple, 2009; Chen and Moore, 2010).

In this paper, we seek to contribute to this latter strand of the literature by investigating how firms' characteristics are likely to affect the location decision of European MNEs. In a first stage, like the large body of literature in this field, we focus on firms' productivity as the discriminatory feature of their location choice. In a second stage, we try to go a step further by looking into the black box of firms' characteristics. Specifically, we study the relevance of other sources of the heterogeneity of the firms, including size, capital labour ratio, years of establishment, R&D or human capital intensity, as well as the industry to which they belong. For the empirical analysis, we estimate a set of multinomial logit models based on the EU-EFIGE/Bruegel-UniCredit dataset (hereinafter the EFIGE dataset). This database contains homogenous quantitative and qualitative information about European manufacturing firms with foreign (or international) activities for seven European countries and for the period 2007-2009.[2]

The new models of firms' heterogeneity have attempted to improve our understanding of the internationalization strategy and location choice of MNEs. The role of firm heterogeneity as a key factor in firms' internationalization decision was initially introduced by Helpman et al. (2004). Indeed, much of the recent theoretical research that analyzes the links between firms' heterogeneity and their internationalization strategies can be considered an extension of this seminal paper. Following Melitz (2003) and Bernard et al. (2003), these authors stressed the importance of firms' productivity to explain the mode of entry to a foreign market (exports versus FDI). In their work, Helpman et al. (2004) employ US MNE data and find that the most productive firms engage in horizontal FDI, while the least productive firms export to foreign countries.[3] Using a version of this model, Yeaple (2009) showed that host country characteristics

[2] See Altomonte and Aquilante (2012) for more information.

[3] The conclusions of the theoretical model proposed by Helpman et al. (2004) have also been tested empirically in other works for different countries. This is, for instance, the case of Girma et al. (2004) for Irish firms, Girma et al. (2005) for UK multinational firms, Head and Ries (2003) and Tomiura (2007) for Japanese multinationals.

affect the scope and nature of multinational activity. Specifically, he found that as countries become more attractive for US multinationals, they attract progressively less productive firms. Similarly, Chen and Moore (2010) investigated how the different attributes of firms may lead to diverse effects of host country characteristics in terms of attracting FDI. For these authors, the decision as to how to enter a foreign market via export or via FDI will depend on both firm and host country features.

In the studies mentioned above, the combination of sunk costs and differences in the underlying characteristics of firms explains the response of heterogeneous firms to the traditional trade-off between more proximity and more concentration. Therefore, they assume that firms' decisions depend mainly on a market-seeking motivation (exports versus horizontal FDI).[4] More recently, however, as an extension of the complex models by Yeaple (2003) and Ekholm et al. (2007), Grossman et al. (2006) have examined the links between firms' heterogeneity and the different integration strategies of multinational firms, including vertical and export-platform FDI.[5] Similarly, Aw and Lee (2008) analyzed how firm heterogeneity affects both the firm's location choice and the production destination of Taiwanese firms, considering exports, horizontal FDI, and export-platform FDI strategies.[6]

Based on the works mentioned above, we build a general monopolistic competition model that takes into account the diverse asymmetries between country sizes, transport and variable production costs or entry fixed costs, and where the affiliate activities are not restricted to attending to the host country market. Particularly, following Baltagi et al. (2007) and Blonigen et al. (2007), we include the third country effects as a determinant of the firms' strategy decisions.[7] The model shows that given the characteristics of the countries, the decision to enter a specific country in order to serve all markets globally will rely on all sources of the firm's heterogeneity. The empirical results obtained confirm

[4] To focus on horizontal FDI (and excluding the possibility of export platform and vertical FDI), Yeaple (2009) assumed that transport costs are relatively high compared to wage differences between countries.
[5] They show how, among the many organizational forms available, the integration strategy selected by firms depends on the industry characteristics and the regional composition of the consumer market.
[6] Specifically, they provide firm-level empirical evidence to show that Taiwanese firms investing in both the USA and China are the most productive firms, but also that firms investing only in the USA are more productive than those investing only in China.
[7] Mayer et al. (2010) also included market access in their work. However, they considered that the fixed investment costs are homogenous across locations and focused their study at the macroeconomic level.

that firms' location choice reflects the underlying dissimilarities of multinational firms, including the specific industry in which they operate.

The rest of the paper is organized as follows. The next section presents the data and a set of key stylized facts. Section 3 develops a theoretical model for firms' production location choices. Section 4 describes the econometric methodology. Section 5 presents the estimation results, and the final section concludes.

2. Data and Stylized Facts

This paper uses firm-level data from six developed European countries (Austria, France, Germany, Italy, Spain, and United Kingdom).[8] All firms considered are exporters and some of them have affiliates outside Europe; specifically, we focus on manufacturing European firms that have affiliates in one of these three markets: North America, China and India, and Latin America.[9]

Table 1. Geographical distribution of European firm investments in North America, China and India and Latin America (percent)

Area of destination	North America	China and India	Latin America
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 EFIGE dataset.

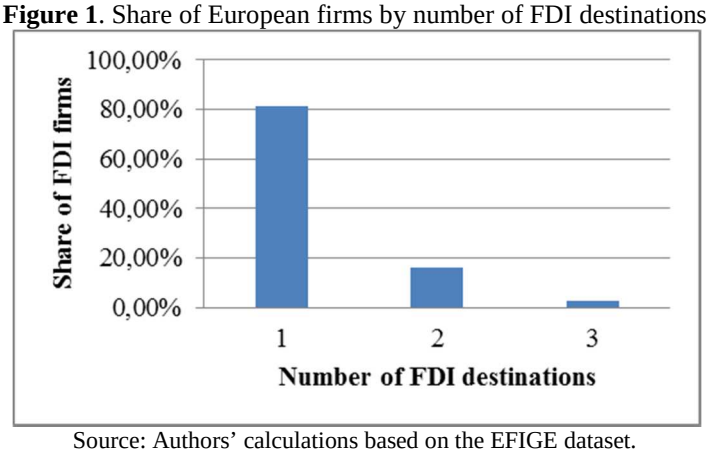
Table 1 shows the relative weight of each of these three areas in terms of number of affiliates, distinguishing among the six different home countries considered in our sample. According to these figures, contrary to the export behavior of European firms (where North America appears as the most important non-European export market destination), for European MNEs, the most frequent production locations outside

[8] For a more homogeneous analysis, we have considered only those six countries (included in the EFIGE dataset) that were classified by the World Bank as high-income countries during the period of study (World Bank, 2013).

[9] These three big areas are the main destinations of non-European FDI by European MNEs, representing the 81 per cent of total non-European investments (Eurostat database, 2015).

European countries are China and India, followed by North America.[10] This might reflect the fact that, through FDI, European firms try to overcome sizeable trade barriers and to benefit from lower production costs. Moreover, looking at the relative weight that the different home countries have in these three big areas, we observed, on the one hand, similar behavior for North America and for China and India, with Germany and UK as their main investors. However, on the other hand, the greater weight of Spanish MNEs in Latin America suggests the existence of certain historical and cultural ties that leads to lower sunk costs. Overall, this descriptive evidence is consistent with diversity in the motivation underlying the decision on foreign investing and thereby in the location choice of the foreign affiliates of European MNEs.

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



Source: Authors' calculations based on the EFIGE dataset.

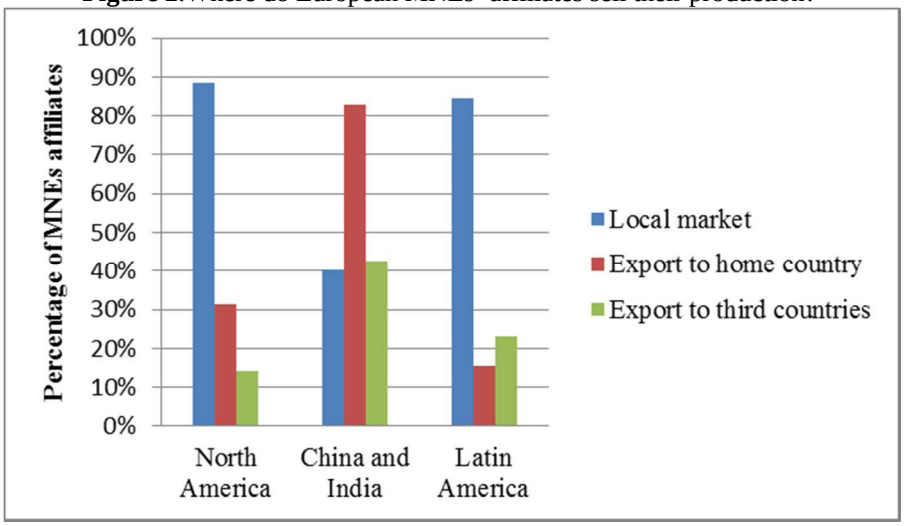
Another remarkable fact about the European firms investing in these markets refers to the number of destinations. As we can see in Figure 1, the share of European MNEs that invests in North America, China and India and Latin America decreases dramatically with the number of host country destinations.[11] Based on this fact and given that our interest is to identify how the firm characteristics are related with a particular location choice, our empirical analysis focuses on those European MNEs that invest only in one of these three locations. By doing so, we try to identify more precisely what type of firms invest in the different locations.

[10] According to the EFIGE dataset, more than 52 percent of total EU exports (excluding intra-EU trade) were sent to North America, while China and India represented only 31 percent during the sample period. These percentages are very similar to those obtained from the Eurostat dataset, when excluding intra-European trade.

[11] Similar behavior was found by Eaton et al. (2004) for exporter firms in the case of French firms, and by Bernard et al. (2007) for US exporters. According to these authors, the share of exporting firms decreases dramatically as the number of foreign destinations increases.

But while European MNEs investing outside Europe tend to locate mainly in a single destination their affiliates seem to serve markets globally, following complex and diversified geographical strategies. As can be appreciated in Figure 2,[12] the vast majority of European firms investing in China and India export their production either partially or totally back to Europe, followed by exports to third countries. Conversely, most European firms locating in North America and Latin America sell their production to the local market.[13] This fact reinforces the previously mentioned idea that the European firms investing in different markets pursue different 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, while those firms that invest in Latin America and North America probably adopt a more market-seeking strategy.[14]

Figure 2.Where do European MNEs' affiliates sell their production?



Source: Authors' calculations based on the EFIGE dataset.

Next, we focus on the dissimilarities across firms that follow different internationalization strategies and location decisions. For this purpose, we first compare the total factor productivity (TFP) distributions of the firms considered in our sample (through Kernel density estimation). More specifically, in Figure 3.a, we depict the probability density

[12] Each affiliate can sell the foreign production to three different destinations, local market, home or third country; or a combination of them.
[13] The greater importance of exports to third countries in Latin America (with respect to exports to the home country) probably responds to the foreign affiliates located in Mexico with an important export activity toward the USA. World Investment Report, UNCTAD (2009), United Nations, New York.
[14] Tables A.1 and A.2 in the Appendix show the differences in the production costs and market potential across regions.

functions of TFP for export and FDI firms, whereas Figure 3.b refers to the productivity distributions for FDI firms investing in North America, China and India, and Latin America.

Fig. 3.a. Density of TFP for export and FDI firms

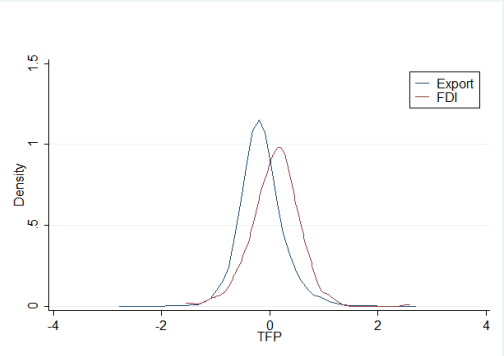
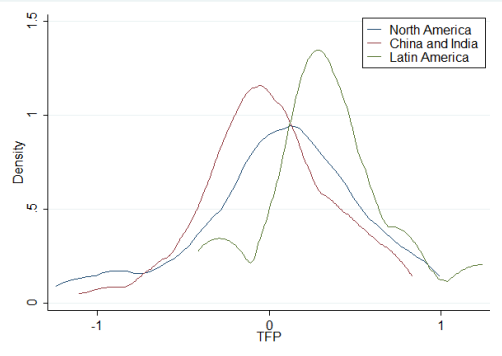


Fig. 3.b. Density of TFP for FDI firms, by location



Source: Authors' calculations based on the EFIGE dataset.

According to Figure 3.a., an FDI firm picked at random is likely to be more productive (with a higher TFP) than a randomly drawn exporter firm. From Figure 3.b. we can see further that, on average, firms investing in China and India are the least productive, medium productive firms invest in North America, and the most productive firms engage in FDI in Latin American countries. Both figures suggest that MNEs with different productivity levels choose different locations.

Finally, in Table 2, we show other characteristics of the European firms that may be relevant in their internationalization strategy and location decision. Particularly, apart from the TFP average, we also present the size, the capital labour ratio (K/L), human capital proxied by the number of white collar workers (WC) and R&D activities of the manufacturing firms.[15] Figures in this table indicate, on the one hand (first two columns), that European firms that invest overseas, besides being the most productive, also have a higher K/L, human capital and R&D intensity than those that only export. On the other hand (last three columns), it shows that the firms investing in North America are the most K/L, human capital and R&D intensive, while the European MNEs that locate in Latin America display the highest TFP and are the largest ones.

Table 2. European manufacturing firms: averages by internationalization strategy and investment location, 2007-2009.

[15] See Table A.3. in the Appendix for a description of the variables.

Firm Characteristics	Home Country (exporter)	FDI	North America	China and India	Latin America
TFP	-0.10	0.11	0.25	0.05	0.33
	(0.46)	(0.55)	(0.54)	(0.52)	(0.46)
Size	67.50	187.97	218.37	164.30	237.40
	(100.17)	(178.74)	(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)
WC	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)

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

The preceding facts reveal that manufacturing European firms that carry out export activities or international investments outside Europe adopt complex internationalization strategies and differ both in terms of target markets for their products, as well as in terms of their own characteristics. In general, as the descriptive evidence shows, European multinational firms focus on few destinations (mainly on just one) and diverge substantially depending on the chosen location.

3. The Underlying Model

Our model assumes CES preferences and monopolistic competition, and more specifically is based on Helpman et al. (2004) and Head and Mayer (2004). It is presupposed that firms produce only one variety of a differentiated good and that they compete in a monopolistically competitive environment. The representative consumer allocate their expenditure across different varieties of a representative industry in accordance with a CES subutility function, with elasticity of substitution across goods equal to σ >1. By maximizing this subutility function subject to country *j* total expenditure in a representative industry, E_j, we obtain the demand curve in country *j* for each variety produced in the representative industry of country *i*,

$$q_{ij} = \frac{p_{ij}^{-\sigma}}{\sum_{k=1}^{N} m_k p_{kj}^{1-\sigma}} E_j,$$

where q_{ij} is the quantity demanded in country *j* of the representative variety produced by a firm in the representative industry in country *i*, p_{ij} is the delivery price of a variety produced in *i* and sold in *j*, m_j is the number of varieties produced in country *j*, and *N* is the number of countries considered.

Each firm producing a variety of the differentiated good is endowed with a productivity (output per unit labor) θ, draw from a common distribution $G(\theta)$. Given that in this framework firms are atomistic, each firm treats the elasticity of substitution, σ, as its own price elasticity of demand, and the delivery price set by a representative firm producing in country *i* and selling in *j* is,

$$p_{ij} = \frac{\sigma}{\sigma - 1} \frac{\tau_{ij} w_i}{\theta}$$

where $\frac{\tau_{ij} w_i}{\theta}$ is the marginal cost of a firm producing in country *i* to serve country *j*, which depends on three factors: 1) the firm's productivity, θ, which is idiosyncratic for each firm and is a "catch-all" that includes all sources of heterogeneity among firms, that is, $\theta = \theta(x)$, where x includes all the firm characteristics related to its heterogeneity in terms of revenue relative to factor inputs;[16] 2) the composite input cost required to produce the representative variety in country *i*, w_i; and 3) the transport costs to serve country *j* from a firm located in country *i*, τ_{ij},where τ_{ij} is the iceberg transport cost factor, with $\tau_{ij} > 1$ for all $i \neq j$, and $\tau_{ij} = 1$ for all $i = j$.

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

$$\pi_{ij} = \frac{1}{\sigma} \left(\frac{\tau_{ij} w_i}{\theta} \right)^{1-\sigma} \frac{E_j}{P_j} \qquad (1)$$

where $P_j \equiv \sum_{k=1}^{N} m_k \, p_{kj}^{1-\sigma}$.

Finally, if setting up a production plant in country *i* means the firm must incur in a fixed cost f_i, the aggregate net profits earned by a firm producing in country *i* and selling to all potential countries *j* (j = 1,…, N), π_i , are given by:

[16] As stated by Melitz and Redding (2014), in this type of models, productivity "is a catch-all that includes all sources of heterogeneity in revenue relative to factor inputs across firms, including differences in technical efficiency, management practice, firm organization, and product quality" p.8.

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

where $MP_i = \sum_{j=1}^{N} \frac{(\tau_{ij})^{1-\sigma} E_j}{P_j}$ is the market potential of country *i*.[17]

In the above expression, we can see that this model yields sharp predictions about the relationship between the profits obtained by a firm that decides to establish an affiliate in a particular country and the firm and country characteristics. First, π_i is increasing with θ. Although much of the theoretical analysis concentrates on heterogeneity in productivity, θ here includes all sources of heterogeneity in revenue relative to factor inputs across firms, x. Secondly, π_i also increases with market potential MP_i and decreases with the variable production costs, associated to w_i, and with the fixed investment costs f_i. That is, it depends on destination country characteristics. However, while the fixed costs of entry into a foreign market have a direct impact on the firm's profits, the productivity or efficiency of the firms that choose to invest in each market depend on the trade-off between the market potential and the variable cost of production in that market.

So, 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,

$$\Pr(\pi_i > \pi_j) = Pr\left\{ \theta > \left[\frac{f_i - f_j}{\left(\frac{MP_i}{w_i^{\sigma-1}} - \frac{MP_j}{w_j^{\sigma-1}} \right)} \right]^{\frac{1}{\sigma-1}} \right\} \quad (3)$$

for all $j \neq i \in N$.

Then, given the country characteristics, the above equation suggests that the probability of entering a given market *i* is an increasing function of all sources of heterogeneity of the firm that raise the revenue from potentially supplying the different markets from *i* relative to the costs involved in producing in this country.

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

4. Estimation Methodology

To analyze the underlying location decision problem empirically, we estimate a multinomial logit model (MNL). This methodology provides an adequate framework in which to analyze firm location decisions when a set of choices are considered and the choice among alternatives is modeled 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 profit (i.e., $\pi_i > \pi_j$ for all $j \neq i$). The expected profit of a firm that invests in *i* consists of two components, the deterministic part, which depends on a location-specific parameter, α_i, and on a set of observed firm characteristics that determine the firm's efficiency, x, and the unobservable part, which is captured by a stochastic term, ε. That is,

$$\pi_i = \alpha_i + \beta_i x + \varepsilon$$

Given that ε is unknown, the final choice is predicted in terms of probability and we should impose a probability density function on ε. In particular, if we assume that the error term is independently and identically distributed (iid) with type I extreme value distribution,[18] the probability of a firm choosing country *i* to locate an affiliate is,

$$Pr_i = \frac{exp[\alpha_i + \beta_i x]}{\sum_{h=1}^{N} exp[\alpha_h + \beta_h x]} \qquad (3)$$

where $Pr_i = \Pr(\pi_i > \pi_j)$.

Since $\sum_h Pr_h = 1$, the *N* sets of parameters (α, β) are not unique. So, to identify the parameters α_i and β_i, we need to fix the coefficients for one alternative, in this case

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

location 1, the home country destination, to zero (that is, $\alpha_1 = 0$ and $\beta_1 = 0$).[19] In fitting such a model, the estimated MNL model becomes,

$$Pr_i = \frac{exp\left[\alpha_i^{'} + \beta_i^{'} x\right]}{1 + \sum_{l=1}^{N-1} exp\left[\alpha_l^{'} + \beta_l^{'} x\right]} \quad (4)$$

where, according to Eq. 2, 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). 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 fixed investment costs for each foreign investment strategy, capturing both physical costs and informational barriers that are specific to each location.

5. Empirical Results

To estimate the MNL model outlined above, we start by using different firms' characteristics separately as a discriminatory variable of firm heterogeneity. These estimations provide an initial valuation of both the role played by the fixed cost that a firm must incur to enter a specific market and the importance of firms' attributes in the probability of choosing a given foreign location instead of producing only at home. Next, and in line with previous empirical works, we estimate an extended MNL model including the TFP together with 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.[20]

By adding these new variables, we can disentangle the links between the various aspects of firms' advantages, such as superior technology, greater skills endowment or higher experience with the different internationalization strategies. Moreover, the inclusion of these firm-specific factors can be viewed as a robust test of the extent to which firms'

[19] 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.
[20] See, for instance, Helpman et al. (2004), Castellani and Zanfei (2007) and Aw and Lee (2008).

heterogeneity, in productivity terms, 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 (Basic model).

Independent Variables	North America	China and India	Latin America	North America vs. China and India	North America vs. Latin America	China and India vs. Latin America
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]
Size	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	-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]
WC	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	-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					

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

In Table 3 we present the results of the basic MNL model for different firms' characteristics separately.[21] The first three columns show how variations in these attributes influence the likelihood of a firm deciding to invest in North America, China and India or Latin America, rather than locate in the home country and export globally. In addition, the coefficients of the constant terms represent the country-wide characteristics which are invariant across firms. In our case, they are showing the effect of fixed investment costs on the probability of setting up a production plant in each location. A negative and significant coefficient on this regressor reflects the higher fixed investment costs involved in engaging in FDI in every location relative to exporter firms. In the last three columns, we report the differences in these coefficients between the alternative destinations considered.

From the above outcomes, we can clearly identify a ranking in terms of the negative influence of the fixed investment costs on the probability of entering each alternative

[21] According to Helpman et al. (2004), the dispersion of firm size captures the joint effect of the dispersion of the firm's productivity and the elasticity of substitution. Thus, in order to distinguish the size effects from TFP as well as the possible correlation between TFP with the other firms' characteristics taken into account, we estimate separately the MNL model for these variables.

location. Specifically, we find that fixed investment costs penalize Latin American countries more than North America and China and India, but also that the deterring influence of the fixed investment costs in North America is higher than in China and India. According to these outcomes, we can also conclude that firms involved in FDI projects are more productive than firms that just produce at home and export (as shown by the positive and significant coefficients on TFP). But more importantly, only the most productive firms could engage in setting up a production plant in Latin America. Similarly, firms that decide to enter North America are more productive than firms that locate in China and India, although the difference is not significant.[22]

As shown in Section 3, the different patterns concerning the influence of TFP on the location decision are related to the diverse balance from the market potential and the production costs for each market. So, for firms investing in China and India, the effect of higher productivity, although positive relative to exporters from the home country, is smaller than for firms engaging in FDI in other locations, thereby reflecting the fact that despite the lower production costs in these countries, the market potential is still very low.[23] In other words, this result is reflecting that a combination of the market access, lower fixed and variable costs of production are a potential reason for why China and India attract, in the margin, firms with lower productivity relative to other regions. In contrast, for European firms entering Latin America, the great influence of a growth in productivity on the probability of entering (greater than in North America and China and India) suggests a combination of a relatively high market potential and lower production costs. 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.[24] In the case of North America, the coefficient on TFP (higher than the one obtained for China and India but lower than the one for Latin America) reflects that even with its huge market potential (the highest in the world), the costs of production are also very high, which is consistent with the lack of significance of the parameter measuring the different effect of TFP seen between China and India and Latin America.

[22] Note that this ranking is similar to the one shown in Figure 4.b. Moreover, these results are robust to the inclusion of fixed industry effects.
[23] See Tables A.1 and A.2 in the appendix.
[24] This would be consistent with the idea of a component in the productivity or in the efficiency of firms associated to any mobile capability that is especially effective in this market (Nocke and Yeaple, 2007).

Additionally, our results show that firms involving in FDI are in all cases larger, more capital intensive, with a higher endowment of white collars and more R&D intensive than exporters. However, we do not obtain any significant difference of these variables across destinations for firms that invest in one of the three locations considered, suggesting that in terms of size, K/L, human capital and R&D, European firms engaging in foreign investment activities in alternative destinations are not so much different among them.

As can be seen in Table 4, similar results are obtained when we analyze how TFP affects the probability of investing in different regions once we control for human capital (HK), R&D and the years of establishment (age).[25] The coefficients of these additional explanatory variables confirm that European firms involved in FDI in North America or China and India are older than those that only export. Similarly, there is not discrepancy among firms that participate in internationalization activities rather than the TFP.

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

Independent Variables	North America	China and India	Latin America	North America vs. China and India	North America vs. Latin America	China and India vs. Latin America
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	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.

But differences in firms' characteristics may not be the only source of variations that influence the decision of where to locate foreign affiliates. Some other unobservable characteristics of the industries in which they operate may also affect the links between firms' specific factors and location choices. To take this into account, we now re-estimate our previous specifications for the different industries separately (Tables 5 and 6).[26]

[25] Note that unlike Table 3, now the variables related to HK, $R\&D^2$ and age are dummies (see Table A.3 in the appendix).

[26] On the one hand, as we can appreciate, in some of the industries considered in the study there are not European firms investing in Latin American countries.FDI flows in these economies focus mainly on commodity production. Particularly, food, beverages and tobacco, transport equipment, and machinery and equipment n.e.c. accounted for the vast majority of inward FDI at this location in 2008. See the World Investment Report, UNCTAD (2014), United Nations, New York, for more details. On the other hand, note that we only report the results for four of the ten industries considered in our sample. There are two main reasons. Firstly, because in some industries the MNEs only engage FDI in one of the three foreign markets considered. And secondly, because in other cases some industries in the sample are built by joining together different types of industries, which difficult their empirical analysis. The results for the rest of industries are available on request.

Table 5. MNL regression of European firms' investment location decision by industries, 2008 (Basic model).

Independent Variables	North America	China and India	Latin America	North America vs. China and India	North America vs. Latin America	China and India vs. Latin America
Manufacture of basic metals and fabricated metal products						
Constant	-7.01 (0.70)[a]	-6.01 (0.39)[a]		1.00 (0.80)		
TFP	0.73 (0.12)[a]	-0.73 (0.37)[b]		-1.47 (0.38)[a]		
Observations	2432					
Likelihood	-63.56					
Manufacture of food products, beverages and tobacco						
Constant	-5.34 (0.50)[a]	-6.73 (1.00)[a]	-7.38 (0.98)[a]	-1.39 (1.11)	-2.04 (1.10)[c]	-0.65 (1.40)
TFP	1.55 (0.87)[c]	1.73 (0.18)[a]	3.45 (0.54)[a]	0.18 (0.84)	1.90 (0.91)[b]	1.71 (0.38)[a]
Observations	1023					
Likelihood	-38.67					
Manufacture of transport equipment						
Constant	-6.70 (0.99)[a]	-5.81 (0.70)[a]		0.89 (1.22)		
TFP	3.47 (0.47)[a]	3.15 (0.42)[a]		-0.32 (0.10)[a]		
Observations	305					
Likelihood	-15.46					
Manufacture of machine and equipment n.e.c.						
Constant	-6.70 (0.71)[a]	-4.26 (0.25)[a]	-6.08 (0.58)[a]	2.43 (0.75)[a]	0.62 (0.91)	-1.81 (0.63)[a]
TFP	2.85 (0.30)[a]	1.45 (0.51)[a]	2.18 (0.28)[a]	-1.40 (0.54)[a]	-0.66 (0.33)[b]	0.73 (0.55)
Observations	1139					
Likelihood	-114.39					

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

An analysis of the industry confirms our previous results, showing that only the most productive firms invest abroad.[27] 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 significant.

We also identify different rankings of TFP and entry investment costs across destinations. Particularly, we find that firms that engage in FDI in North America in manufacturing basic metals and fabricated metal products, transport equipment and machine and equipment n.e.c. are more productive and intensive in R&D than firms that invest in China and India in the same industry. This is not surprising if we consider, on the one hand, that these industries largely depend on high technologies in order to obtain economies of

[27] We find an exception in the industry devoted to the manufacture of basic metals and fabricated metal products. In this case, firms that invest in China and India are the least productive (even less productive than firms that only produced in Europe and export) and have the greatest fixed investment costs. This is to be expected if we consider the extraordinary levels of industrial growth mainly in China and its rapid growth in demand for steel in the period under analysis. According to the IISI (International Iron and Steel Institute, more information at: http://www.worldsteel.org), China was not only the largest producer of steel in the world in this period, with about 31% of world production (which is almost twice the share for the EU-25, 17%), but was also the largest user of steel, with a share in consumption that was very close to its production share. Therefore, it is easy to find that some European firms in this industry with low TFP levels prefer to pay higher fixed investment costs to locate closer to the demand with lower production costs.

scales.[28] On the other hand, such as Chung and Alcácer (2002) mentioned, we expect that firms in research-intensive industries tend to locate in regions with high R&D intensities, as is the case of North America.

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

Independent Variables	North America	China and India	Latin America	North America vs. China and India	North America vs. Latin America	China and India vs. Latin America
Manufacture of basic metals and fabricated metal products						
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	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 food products, beverages and tobacco						
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	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 transport equipment						
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	-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.						
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	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.

Additionally, our results suggest that while in the industry devoted to the manufacture of food products, beverages and tobacco the most productive firms locate in Latin America, it also reveals that firms in China and India are more productive than firms in North America in these industries. Conversely, the probability that a firm in this industry with low-tech intensity locate in a developing area (and concretely on Latin America and China and India) decreases with its level of human capital.

Overall, we can conclude that firms that engage in FDI (regardless of the industry or the destination) are more productive than firms that just produce at home and export.

[28] According to OECD's classification of manufacturing industries into categories based on R&D intensities, these three industries are considered medium-technology industries, while the manufacturing of food products, beverages and tobacco industry is classified as a low-technology industry.

Nonetheless, the decision of MNEs as to where to locate their affiliates will depend on how the different features of firms and the industry they operate in combine with the characteristics of the destination market.

6. Conclusions

In this paper we examine, both theoretically and empirically, the links between firms' heterogeneity and their internationalization strategy. We present a model that analyzes firms' location decision assuming that firms decide to locate in a foreign country to potentially serve all markets globally. Our theoretical model shows that firms investing abroad choose a specific location depending on their own characteristics (productivity level, size, K/L, R&D or human intensity) and the host country characteristics (entry or fixed costs, variable production costs and the market potential).

The empirical study based on harmonized and detailed firm-level data across European countries shows some interesting results. Our estimates confirm the existence of a negative and significant effect of higher fixed investment costs on the probability of a European firm entering a non-European market in relation to locating a production plant in home country so as to be able to export globally. We also identify a ranking of different markets in terms of the impact that the entry costs have on the probability of entry, with the fixed investment costs in Latin America exercising the highest negative influence, followed by North America, and China and India.

In all cases, an increase in the above firm's characteristics shows a positive influence on the decision to enter a market outside Europe. In the case of firm's productivity, the estimates also depict different magnitudes depending on the host market under consideration (Latin America and China and India being the markets that attract firms with the highest and lowest productivity levels, respectively). These differences reflect the underlying distinctions in market potential and the fixed and variable production costs of each location.

Our results further confirm that firms' differences other than productivity, such as R&D intensity and the age, play a key role in the internationalization strategies of European firms. Moreover, we prove that the relevance of the heterogeneity of different types of

firms regarding the choice of location of FDI would also depend on the specific industry in which the firm operates.

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Appendix

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

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

Authors' calculations based on World bank database (2014).

Table A.3. Definition of explanatory variables.

Variable	*Definition*
TFP	Solow residual of a Coob-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.
K/L	Natural logarithm of capital labour ratio.
WC	Natural logarithm of number of white collars.
$R\&D^1$	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.
HK	Dummy for Human Capital: firm has a higher share of graduate employees with respect to national average share of graduates.
Age	Dummy that takes value 1 for firms with <6 years of establishment, which are considered young innovative firms, 0 otherwise.

Source: EFIGE dataset.