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ABSTRACT

In this paper we combine two traditions in the analysis of firms' location patterns. One led by trade economists who try to understand why do firms invest *abroad*, and another one led by urban/regional economists, who frequently use patterns of *inter-regional or inter-city* choices to estimate agglomeration economies. We contribute to the trade-motivated set of papers on location choices by adding the domestic country in the choice set, while accounting for firm's heterogeneity in the choices. Our econometric results using French firm-level data show an important "home bias" in manufacturing investment decisions. A crucial finding, which bridges with our contribution to the agglomeration literature, is that the spatial clustering of affiliates belonging to the same industrial group accounts for the lion's share of this home bias.

1. Introduction

Location choices by multinational firms have been studied by mostly two groups of researchers, who generally put the emphasis on different aspects of those decisions. Trade economists – the first group – usually focus their attention on determinants of investments *abroad*.[1] By contrast, urban/regional economists often use patterns of *inter-regional or inter-city* choices to estimate agglomeration economies.[2] In this paper, we try to bridge those two literatures and we also propose contributions to both. In a nutshell, our paper adds to the trade-motivated literature by taking into account domestic investments and identifying a "home bias" in location choices. Our contribution to the agglomeration literature is to consider the spatial clustering of firms belonging to the same industrial group as a determinant of location choices, and to show that it accounts for a large part of the estimated home bias.

The interest for decisions by multinational firms regarding where they locate their manufacturing plants is of course not confined to academia. The extent, determinants and effects of outward investment is a topic of great public interest, in particular in developed countries. While continental Europe is primarily concerned with the possible disappearance of its manufacturing base, the United States and the United Kingdom pay more attention to the offshoring of services. These fears can lead to drastic policy changes. For instance, a survey conducted by Eurobarometer (2005) suggests that the fear of offshoring was the primary reason invoked by the French for rejecting the European Constitutional Treaty in May 2005.[3] Behind this fear is the feeling that Foreign Direct Investment (FDI) will substitute for domestic investment, which may partly be behind these countries' low employment rates.

In this paper, we try to address this question by comparing the determinants of domestic and foreign investment. Our intuition is that FDI will be more likely to reduce domestic investment if it allows the firm to serve the same markets at a lower cost. Using firm-level data on French investments, both in France and abroad, over the 1992–2002 period, we investigate the determinants of location choice, and empirically assess whether (and why) the

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[1] The typical set of questions asked by trade economists relate to whether corporate taxation (Devereux and Griffith, 1998), labour costs (Liu et al., 2010), environmental regulation (Dean et al., 2009), cohesion policy (Basile et al., 2008), and all sorts of variables typically affected by nation-level public policies, matter in location patterns (although they sometimes use sub-national datasets to identify those effects).

[2] Guimarães et al. (2000), Crozet et al. (2004), Strauss-Kahn and Vives (2009), and Spies (2010) are examples of a large set of papers using firm-level location choice data and logit econometric modeling to estimate the extent of clustering behavior at the sub-national level.

[3] Even though the actual relationship between the treaty and offshoring is fairly unclear.

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domestic economy has become less attractive over recent years, as is often claimed in the public debate over offshoring in rich countries.

With respect to previous firm-level analysis of FDI decisions, our value-added is the use of data covering both domestic plant creations and investments in a large number of foreign countries, which makes it possible to investigate the decision to invest abroad rather than in France, *and* the location choice, conditional on having decided to carry out this investment abroad. Previous work has typically focused on only one aspect of this decision process: the choice between exporting and FDI in Brainard (1997) and Head and Ries (2003) for instance, or conditional location choice in, amongst many others, Coughlin et al. (1991), Head et al. (1999), Guimarães et al. (2000) and Head and Mayer (2004). One notable exception is Devereux and Griffith (1998), who model US firms' strategies in European markets as a sequential process involving (i) the choice of serving the European market, (ii) the trade-off between exporting from the USA or investing in Europe, and (iii) the choice of a specific European country, conditional on having decided to invest in Europe.

Our work is close to theirs in spirit, although our data cover a much larger set of foreign locations. Moreover, we add a number of determinants of firms' choices, suggested by a more explicit theoretical model. More specifically, we use a model that builds on Head and Mayer (2004) and Amiti and Javorcik (2008) to derive the determinants of location choices from a New Economic Geography (NEG) perspective. We also integrate results by Helpman et al. (2004) and Markusen (2002) in this framework to explain the choice between domestic and foreign investments. In that respect, our model shares some similarities with Chen and Moore (2010).

In our data, more than 80% of investments involve the creation of an affiliate in France, which strongly suggests the existence of a "home bias" in location choices. While the extent of this home bias tends to decrease over time, it is still very large at the end of the period. We try to explain it by standard, *country-level* determinants of location choices. These variables do explain a substantial part of why French investors continue to invest (so much) in France. However, we also show that the main drivers of the home bias have to be found in *firm-level* determinants. In particular, larger and more productive firms are more likely to engage in FDI.

Finally, our data allow us to account for the worldwide geographical structure of the firm. We build a firm-level network variable describing the strength of financial linkages that a given investor has in each country (including France) due to previous investments there. This turns out to be an important determinant of subsequent location decisions, and also a key factor in explaining the choice between investment at home and abroad. Our results suggest that French firms over-invest in France because they can benefit from agglomeration externalities from affiliates already installed there. In this respect, our paper is also related to the urban economics literature measuring the extent of agglomeration economies. It has been shown that the spatial agglomeration of economic activity improves total factor productivity (Henderson, 2003; Cingano and Schivardi, 2004, being recent examples) and other economic variables like employment growth in Brülhart and Sbergami (2009), wages in Combes et al. (2008) or export decisions in Koenig (2009). The classical distinction in that literature is between *urbanization economies* where the overall density of economic activity is beneficial, and *localization economies* where what matters is within-industry agglomeration. Many papers find stronger evidence in favor of localization economies (see, among others, Henderson, 2003). Within-industry agglomeration economies have also been shown to matter in the spatial distribution of FDI, Strauss-Kahn and Vives (2009) or Spies (2010) being recent examples. We go one step further and ask whether agglomeration benefits are also at play *within-firm*. This turns out to be a crucial determinant of location choices, explaining the lion's share of the home bias in investment.

The remainder of the paper is organized as follows. Section 2 provides our theoretical motivation, mostly combining New Economic Geography determinants of location with firm-specific explanations of the FDI decision. Section 3 presents the data used and a descriptive analysis of the proposed determinants of location choice. Section 4 contains the results of our location choice estimates for investment abroad, which enables comparison with those in previous work, and Section 5 adds domestic investment. Finally, Section 6 concludes.

2. Theory and empirical implementation

2.1. Assumptions

Our theoretical framework builds on Head and Mayer (2004) and Amiti and Javorcik (2008). Those papers describe the expected profits of an affiliate in each of the prospective locations to predict the equilibrium number of affiliates in each country (Amiti and Javorcik, 2008) or the probability that a firm invests in a given location (Head and Mayer, 2004). Our innovation is to integrate results by Helpman et al. (2004) and Markusen (2002) in this framework, in order to also explain the choice between domestic and foreign investments. In that respect, our model shares some similarities with Chen and Moore (2010). We however depart from this paper on two major assumptions, detailed below.

Our partial equilibrium model studies the decision for a firm producing a differentiated good to open a new production unit, either in its own country or abroad.[4] In this context, the arbitrage between alternative locations is explained by the relative attributes of each location. Individual decisions are also sensitive to the firm's productivity, that determines its profitability in each location. As in Helpman et al. (2004), the fixed cost for producing is supposed higher for investing abroad than for producing domestically. This hypothesis accounts for the fact that information on a country is easier to gather when the firm is located there, which reduces the fixed cost of creating a new affiliate.[5]

The production technology is as follows. Each firm f is endowed with a productivity $\theta(f)$, drawn from a common distribution $G(\theta)$.[6,7] To create a new plant, firms bear a fixed cost, expressed in unit of the numeraire good. Entering the domestic market is less costly than investing in a foreign country: $F_{\text{fdi}} > F_{\text{dom}}$. As in Head and Mayer (2004) and Amiti and Javorcik (2008), but contrary to Chen and

[4] Helpman et al. (2004) consider the ex-ante decision for a firm to enter the domestic market and, conditional on entry, the decision to serve foreign markets through exporting or FDI. We depart from them and analyze how firms decide where to locate a new production unit, conditional on having decided to create a plant. On the other hand, we are silent on the reason why the firm decides to create the plant. We have in mind a firm that develops a new product which it will produce itself, and that has to be produced in a new facility (because of capacity constraints or of totally different production process). Our focus on the conditional location decision is dictated by the data we use: our sample only contains information on firms that already produce in France and decide to invest in a new plant, either in France or abroad.

[5] Helpman et al. (2004) also mention plant-level returns to scale associated with the choice of producing domestically rather than abroad. Here, the extra fixed cost for investing abroad cannot be rationalized in that way as the location decision is conditional on the firm opening a *new* plant.

[6] Because we focus on location decisions at the firm level, we do not have to specify $G(\,)$ here.

[7] In the following, we assume that the new plant inherits the productivity of the investing firm. This assumption is dictated by the data availability, as we have no information about the ex-post productivity of the plant. We could also argue that firms may invest in a particular country to increase their productivity. We however expect this motive to be picked up by our measures of the host country's factor costs, notably its GDP per capita.

Moore (2010), we assume the fixed cost does not depend upon the foreign location chosen: $F_j = F_{\text{fdi}}, \forall j \in \text{fdi}$. As shown latter on, this assumption is useful when it comes to derive a theoretically-consistent equation to estimate the conditional location choice for investments abroad.

Once the fixed cost is paid, the firm can produce and sell goods through its new plant. The marginal cost is conditional on its location strategy. A firm f that has invested in country i (which can be either the domestic country or a foreign one) incurs the following cost:

$$C_i(f) = \frac{v_i(f)\epsilon_i(f)}{\theta(f)}$$

where $v_i(f)\epsilon_i(f)$ reflects the cost of inputs incorporated in production. The $\epsilon_i(f)$ component of costs is unobservable and will be the source of the residual term in our estimated equation. In Helpman et al. (2004), the $v_i(f)$ component is equal to the wage level in country i, w_i. In our setting, $v_i(f)$ also depends on the price of the intermediates that the affiliate uses in production, which we measure in the empirics with a supply access variable summarizing the expected supply of domestically produced intermediate goods that the affiliate is able to buy from country i. As explained in Section 3, and following Amiti and Javorcik (2008), the computation of the supply access variable takes into account both the technology used by firm f (which influences its affiliate's input use) and the availability of inputs in country i.

Finally, we also allow $v_i(f)$ to reflect various transaction costs, labeled $TC_i(f)$. This captures the fact that it is probably easier for a French investor to run a business in a proximate, francophone or ex-colonial country.[8] Those advantages are identical for all French investors, but there might be some firm-specific information/transaction-cost differences across countries in $v_i(f)$. In particular, a firm investing in an area where a large number of other firms from the same industrial group have already invested will probably benefit from lower costs there, all else equal. We construct a firm-level network variable to account for this type of effect. This closes our assumptions on costs.

We can now turn to profits earned through different strategies, which requires specifying sales of the affiliates under different scenarios. In our model, production of the new affiliate can both be sold locally and in third countries.[9] Exporting however induces extra costs, which we model using a iceberg cost τ_{ij}. Given a classical CES utility function, the sales on market j by firm f's affiliate located in country i are given by:

$$x_{ij}(f) = A_j[\tau_{ij}p_i(f)]^{1-\sigma}$$

where σ is the constant elasticity of substitution, A_j is the "real" demand level in country j[10] and $p_i(f)$ is the FOB price of the firm, equal to a fixed mark-up over $C_i(f)$ under mill-pricing ($p_i(f) = \frac{\sigma}{\sigma-1}C_i(f)$).

Incorporating demand functions and optimal prices into the firm's profit allows to compare profits expected from different location strategies. If firm f decides to establish its affiliate in its own country, it will serve all locations from this plant, and its profits will therefore sum over profits made in each j destination country:

$$\pi_{\text{dom}}(f) = \sum_j \frac{x_{\text{dom}j}(f)}{\sigma} - F_{\text{dom}} = \frac{1}{\sigma}p_{\text{dom}}^{1-\sigma}(f)MA_{\text{dom}} - F_{\text{dom}}.$$

In this expression, $MA_{\text{dom}} \equiv \sum_j \phi_{\text{dom}j}A_j$ is the "market access" firm f can expect from an affiliate located in its own country, and $\phi_{\text{dom}j} \equiv \tau_{\text{dom}j}^{1-\sigma}$ measures the "free-ness" of trade between the domestic country and market j. Redding and Venables (2004) show how to estimate a theory-consistent version of this variable using bilateral trade data. This is the method used in a location choice context by Head and Mayer (2004), and which we also use later in this paper.

Firm f may also choose to locate its affiliate abroad. If the new plant is located in country $i \neq \text{dom}$, profits are given by:

$$\pi_i(f) = \sum_j \frac{x_{ij}(f)}{\sigma} - F_{\text{fdi}} = \frac{1}{\sigma}p_i^{1-\sigma}(f)MA_i - F_{\text{fdi}}.$$

Profits then depend on the market access of country i: $MA_i \equiv \sum_j \phi_{ij}A_j$, where freeness of trade is defined as above (estimation method will be the same as for MA_{dom} naturally).

2.2. Location decisions

Given our assumptions, a firm's strategy can be decomposed into two decisions. First, the firm decides whether to invest domestically or abroad. Second, if it has decided to do FDI in the first step, its picks up a foreign location. In the following, it is assumed that, at each stage of the decision process, firm f chooses the strategy that maximizes expected profits. Consider the second stage: the probability that firm f chooses country i within the set of foreign locations can be written as:

$$\begin{aligned}\mathbb{P}_{i|\text{fdi}}(f) &= \mathbb{P}\{\pi_i(f) > \pi_j(f), \quad \forall\, i \neq j \in \text{fdi}\} \\ &= \mathbb{P}\{p_i(f)^{1-\sigma}MA_i > p_j(f)^{1-\sigma}MA_j, \quad \forall\, i \neq j \in \text{fdi}\} \\ &= \mathbb{P}\left\{\varepsilon_j(f) - \varepsilon_i(f) < (1-\sigma)\ln\frac{v_i(f)}{v_j(f)} + \ln\frac{MA_i}{MA_j}, \quad \forall\, i \neq j \in \text{fdi}\right\}\end{aligned} \tag{1}$$

where $\varepsilon_i(f) \equiv (1-\sigma)\ln\epsilon_i(f)$, is a measure of unobserved cost advantage of country i for firm f (recall that $\epsilon_i(f)$ is pushing costs upwards for f in i, but that $\sigma > 1$). The interpretation is then fairly straightforward: on the RHS of this expression are the observed advantages of location i: relatively high market access and low costs. On the LHS, we find the unobserved relative attractiveness of country j. If the latter is smaller than the former, firms choose i rather than j. The precise functional form taken by this probability depends naturally on the distribution of ε that is assumed. We will turn to this issue in the next subsection.

Under our assumptions, Eq. (1) makes it clear that the productivity of the decision maker ($\theta(f)$) does not enter the choice of a foreign location, conditional on the firm doing FDI. This distinguishes our model from Chen and Moore (2010) and crucially comes from two assumptions. First, the productivity of the affiliate has to be homogeneous across locations. The assumption is standard in the literature estimating determinants of location choices. Its justification is mainly practical: assuming the productivity to be location-specific would yield predictions that are impossible to test without information about the ex-post productivity of the plant. The second crucial assumption that indeed explains why we do not obtain the same predictions as Chen and Moore (2010) is that the fixed cost is homogeneous across foreign locations.[11] In our theoretical

[8] These transaction costs might also take the form of fixed costs. Since their effect is statistically significant in the regressions, it however seems that at least part of their influence on location decisions operates through the firm's marginal cost.

[9] This distinguishes us from Chen and Moore (2010). Their model considers the creation of a foreign plant is only designed to serve the local market. Profits generated by FDI in each market are thus compared with profits the firm would obtain by exporting from its domestic production unit to this same market. We therefore allow for a richer geographical structure of sales by affiliates, while they allow for a richer structure of fixed costs over space.

[10] In this Dixit–Stiglitz–Krugman setup, $A_j \equiv E_j P_j^{1-\sigma}$, where E_j is total expenditure on the good in question in j, and P_j is the CES price index in the same country on the same good (it is also an inverse measure of competition on this market).

[11] Would we assume the fixed cost to be market-specific ($F_i \neq F_j, i \in \text{fdi} \& j \in \text{fdi}$), we would obtain that the probability of firm f to invest in country i is equal to the probability that: $\theta(f) > \left[\frac{\sigma-1}{\sigma} \times \frac{F_i - F_j}{(v_i(f)\epsilon_i(f))^{1-\sigma}MA_i - (v_j(f)\epsilon_j(f))^{1-\sigma}MA_j}\right]^{\frac{1}{\sigma-1}}, \quad \forall\, j \neq i \in \text{fdi}$. This condition cannot be directly brought to data through log-linearization, which explains why we did not choose this specification.

framework, the choice of a location conditional on the firm doing FDI is thus a function of the countries' relative access to relevant markets in terms of demand and their relative (observed and unobserved) production costs.

Consider now the decision for the firm to invest domestically or abroad. In our model, the probability that firm f holds FDI is the probability that its profit abroad is higher than the profit derived from a domestic plant:

$$\begin{aligned}\mathbb{P}_{\text{fdi}}(f) &= \mathbb{P}\{\pi_{i^*}(f) > \pi_{\text{dom}}(f)\} \\ &= \mathbb{P}\left\{\theta(f) > \left[\frac{\sigma(F_{\text{fdi}} - F_{\text{dom}})}{[v_{i^*}(f)\epsilon_{i^*}(f)]^{1-\sigma} MA_{i^*} - [v_{\text{dom}}(f)\epsilon_{\text{dom}}(f)]^{1-\sigma} MA_{\text{dom}}}\right]^{\frac{1}{\sigma-1}}\right\} \\ &= \mathbb{P}\{(\sigma-1)\ln\theta(f) > \ln\sigma + \ln(F_{\text{fdi}} - F_{\text{dom}}) - \ln\Delta\pi^{op}(f)\} \qquad (2)\end{aligned}$$

where i^* is the foreign location that maximizes (foreign) profits (i.e. the location chosen in the second stage described above), and

$$\Delta\pi^{op}(f) \equiv [v_{i^*}(f)\epsilon_{i^*}(f)]^{1-\sigma} MA_{i^*} - [v_{\text{dom}}(f)\epsilon_{\text{dom}}(f)]^{1-\sigma} MA_{\text{dom}}$$

is the extra operational profit firm f obtains when producing abroad rather than in France. As in Helpman et al. (2004), we observe in (2) that the more productive firms (high $\theta(f)$) are more likely to pay the higher fixed cost of doing FDI ($F_{\text{fdi}} - F_{\text{dom}}$). This is more likely when the extra operational profit ($\Delta\pi^{op}(f)$) this strategy induces is high. The next subsection explains how we approximate the later determinant.

At a given productivity, the probability that a firm invests abroad is decreasing in the extra fixed cost it involves. To approximate this extra fixed cost, we use an argument found in the literature that explains the choice of investing abroad by the need to protect firm-specific assets under contractual incompleteness (Horstmann and Markusen (1987) is a very early contribution in a literature that has recently grown very fast. See Antràs (2003) or Antràs and Helpman (2004) for recent contributions). When the firm's value-added relies on intangible assets like its reputation or brand name, the firm has an incentive to invest in a foreign plant to maintain the firm's stock of goodwill. This means that intangible assets should raise the perceived fixed cost of investing domestically (i.e. reduce $F_{\text{FDI}} - F_{\text{dom}}$) and increase the firm's propensity to invest abroad. To approximate these intangible assets, we use the ratio of advertising expenditures to value-added.

2.3. Empirical implementation

The two-stage discrete choice model just described can be very naturally estimated using a nested logit (Train, 2003, Chapter 4, is a recent and very complete synthesis of those methods). In comparison with a standard conditional logit estimator, this method accounts for the possibility that substitution patterns are not the same across all alternatives. It therefore partitions the set of alternatives into several "nests" and assumes nest-specific substitution patterns across alternatives. In our framework, there are two nests: either the investing firm creates an affiliate within its own country (the "dom" nest) or it locates its affiliate abroad (the "fdi" nest). Under this nested tree structure, location choice is decomposed into two steps, the choice of a nest (i.e. investing domestically or abroad) and the choice of a location within the chosen nest.

The probability that country i be chosen as a location can then be expressed as the product of two probabilities: the probability $\mathbb{P}_k(f)$ that nest $k = \{\text{dom}; \text{fdi}\}$ containing i is chosen (also called the *upper model*), and the conditional probability $\mathbb{P}_{i|k}(f)$ that location i be chosen among the potential locations in the chosen nest (the *bottom model*):

$$\mathbb{P}_i(f) = \mathbb{P}_{i|k}(f)\mathbb{P}_k(f) \qquad (3)$$

The determinants of each of these probabilities in our model are described by Eqs. (1) and (2). In each of those equations, if the unobserved component of profits ($\varepsilon_i(f)$) follows a Generalized Extreme Value (GEV) distribution, McFadden (1978) has shown that each of those probabilities can be expressed as:

$$\mathbb{P}_k(f) = \exp\left[W_k(f) + \rho_k IV_k(f) - \widetilde{IV}(f)\right] \qquad (4)$$

$$\mathbb{P}_{i|k}(f) = \exp\left[Y_i(f)/\rho_k - IV_k(f)\right] \qquad (5)$$

where $Y_i(f)$ is a vector of market-specific determinants impacting where the firm locates, conditional on its having chosen a nest. From (1), these determinants are the market access of each location (MA_i) and the magnitude of production costs ($v_i(f)$). $W_k(f)$ is a vector of nest-specific determinants explaining the choice between a domestic and a foreign location. From (2), these are related to the magnitude of the extra fixed cost of investing abroad. The parameter ρ_k is the "log-sum coefficient" that is inversely related to the correlation of unobserved factors within each nest. Its estimation indicates the relevance of the assumed tree structure.[12] The expression $IV_k(f) \equiv \ln\sum_{j\in k}\exp[Y_j(f)/\rho_k]$ is the "inclusive value" of nest k, and $\rho_k IV_k(f)$ is the expected profit that firm f receives from the choice of a location in nest k (see Train, 2003, p. 87). Its introduction into the upper model brings in information from the bottom model, reflecting that the choice of a nest depends on the expected profit received from all of the locations in that nest.[13] It thus captures the $\Delta\pi^{op}(f)$ term of Eq. (2).[14] Last, $\widetilde{IV}(f) \equiv \ln\sum_k \exp[W_k(f) + \rho_k IV_k(f)]$ summarizes the profit expected from the two nests, which are here France ("dom") and abroad ("fdi"). This term acts as the denominator in the choice probability $\mathbb{P}_k(f)$.

The model can be estimated by maximum likelihood techniques using information on the variables entering the profit function. In the following, we adopt a backward estimation procedure[15]: we first estimate the bottom model using information contained in $Y_i(f)$, and then compute the inclusive value of each nest that is introduced with the variables entering $W_k(f)$ in the estimation of the upper model. We also carry out estimations of the bottom model on the full sample of investments, including domestic investments. Adding a "France" dummy, we can then assess whether there is something specific about domestic investments which justifies the use of a nested tree.

3. Data

3.1. The dependent variable: investments abroad and at home

Our dependent variable consists of investments by French firms in production affiliates located abroad or in France. We use several firm-level datasets which provide us with information on these two types of investments. We focus on manufacturing industries, both because the type of theory available to study FDI is better suited to manufacturing, and because the availability and quality of data on affiliates abroad is far better for manufacturing. There are essentially two types of information required: the characteristics of firms engaging in domestic or foreign investments, and the location of the investments abroad in the latter case.

[12] A parameter $\rho_k = 1$ indicates the absence of correlation in unobserved factors within each nest. In that case, the nested model reduces to a standard logit.

[13] Note that in the particular case we are considering, one of the nests constitutes a single location: France. The inclusive value is then: $IV_{\text{dom}}(f) = Y_{\text{dom}}(f)/\rho_{\text{dom}}$ and it is no longer possible to identify separately the "log-sum" coefficient ρ_{dom}. In the following, we thus constrain both log-sum coefficients to be equal and estimate their value using the variability of $Y_i(f)$ within the nest of foreign locations.

[14] See Anderson et al. (1992) and Train (2003) for a derivation of the expected utility/profit in the logit model: it is in our case the profit expected from investing in the best foreign location (as in $\Delta\pi^{op}(f)$). When the error term is distributed extreme value, this expected utility is equal to $\rho_k IV_k(f)$ (up to a constant term).

[15] This produces consistent (though not efficient) estimates of the parameters: see Train (2003).

Information on the characteristics of firms creating new affiliates abroad or at home comes from a survey called the EAE (“Enquête Annuelle d’Entreprise”) available to us over the 1985–2002 period. This is an annual survey of all French firms with more than 20 employees, with information such as employment, value added, intermediate consumption, and wages. Critically, this source also allows us to detect the creation of new establishments in France. The variable we use is that indicating the number of the firm’s production establishments. We count as a location choice in France, every increase in the number of the firm’s production establishments over a fiscal year.[16] Note that our procedure conditions location choice in France on the fact that the firm already exists and has production establishments previous to the location choice, i.e. we do *not* consider births of firms to be location choices in France, in order to have the most comparable set of firms possible (large and firmly-established firms). This procedure yields 19,309 establishment creations in France over the 1985–2002 period, with 13,342 between 1992 and 2002, which latter will be the focus of our estimation. We also present results restricting the sample to firms belonging to financial groups that have invested abroad at some point in our time frame, i.e. firms belonging to multinational companies (MNC). This drastically reduces the number of domestic investments to 2244 over the 1992–2002 period.

The data used to identify location choices of foreign affiliates come from two sources. First we use an annual survey called “LiFi”, conducted by the French statistical institute. This focuses on the financial links between firms. The firms which are interviewed here have assets of at least 1.2 million Euros. These firms are asked about their financial interest in other establishments both in France and abroad. In 2002 for instance, the survey provides information on 193,895 manufacturing establishments. For each of those establishments, the following information is available: the “head” firm identification number (the final shareholder); the location (address plus a country code); the industry; the share held by the head in the affiliate; “the rank” of the affiliate, defined as the number of firms between the “head” and the affiliate; and the year of investment. LiFi data is available from 1986 to 2002.

We complete this data from a second source. The General Direction for Economic Policy in the French Ministry of Finance (DGTPE) provides independently-collected information on French firms’ affiliates abroad (mostly based on surveys by French embassies abroad). For each affiliate, this database lists the country of residence, the industry, the year of investment, and other information such as employment and, sometimes, sales. Each of these foreign affiliates has been given an identifier and the French national statistical institute has identified the head office in France. Some of these affiliates (and associated heads) are common to the two sources, but the DGTPE data does provide some additional information. These two sources together provide information on 4081 manufacturing foreign affiliates linked to a French MNC since 1970. Of these location decisions, 3036 were taken in the 1992–2002 period. We only keep foreign affiliates that are still in business in 2002. These are located in 118 different countries. In the econometrics, we drop small islands from the dataset which brings our universe of possible location choices to 88 (including France). We also choose to restrict the sample to the 1992–2002 period because of the drastic changes in the incentives to invest in Eastern European countries in the first years following the fall of the Berlin wall.

How different is foreign from domestic investment? Before answering this question, it is useful to apply the hypotheses from the literature to our data. Firms investing abroad are expected to be more productive (and therefore larger in size)[17] and to have a larger share of their costs characterized by multi-plant economies of scale (Research and Development or advertising expenditures are typical of such costs). Table 1 presents descriptive statistics along those lines for the whole sample of investments, as well as for each sub-sample of domestic and foreign investments. We can see that firms investing abroad are on average more productive and larger,[18] and that their advertising ratio is higher than for purely domestic firms (although only slightly so).

We now turn to a description of the different explanatory variables used in the empirical analysis.

3.2. “Standard” covariates

Our covariates include the standard determinants of location choice underlined in the theoretical and empirical literature. The most important is our measure of final demand: the market access (MA) of each country, which is estimated following Redding and Venables (2004). The estimation procedure is based on a gravity equation specified according to the theoretical NEG framework. This estimation includes fixed effects for both importers and exporters in each cross-section of the data. The Dixit–Stiglitz–Krugman model of trade predicts a bilateral trade equation where the fixed effect of the importing country equals $\ln(E_j P_j^{\sigma-1})$. Specifying trade impediments as a function of distance, regional agreements, currency unions, GATT/WTO membership, colonial links and common language, we can reconstruct a “freeness of trade” measure ϕ_{ij}, and therefore $\mathrm{MA}_i = \sum_j \phi_{ij} E_j P_j^{\sigma-1}$, for each potential location country (including France). Aggregate bilateral trade data come from the IMF’s *DOTS* database, and CEPII provides all of the other gravity variables.[19] This market access variable (which has a time dimension, as most variables do) is calculated for the year of investment.

Three additional spatial variables measuring distance from France, common language and colonial linkages, are included to capture the transaction costs incurred by French investors in setting up a production affiliate abroad, $TC_i(f)$ in Section 2.1. It is likely that a shorter distance, a common language and past colonial links produce greater knowledge of the country by the French business community. A natural reason for this would be that a large number of French or former French citizens are still located there for historical reasons, making social and business networks with France denser. Also, former colonies often retained parts of the French legal system, reducing the information and legal costs needed to start up and run a new firm there. In addition, France imposed a substantial scheme of trade preferences for its former colonies on the EU, making these countries attractive compared to others when the goal is to re-export the product to France or other EU countries.

Another proposed explanation for investing abroad relates to production costs. We proxy labour costs w_i by the level of GDP

[16] Ideally, we would like to concentrate on greenfield investments, for which the location choice determinants seem to be more homogeneous. However our database does not allow to do a good job at excluding all mergers and acquisitions. To limit the number of mergers and acquisitions, we drop observations where the rise in the number of production establishments is greater than 3 (from one year to the next). More than 75% of all creations we observe involve only one establishment, and 20% involve only two. Observations dropped overwhelmingly come from the French part of the sample, they almost never occur for investments abroad. Excluding those therefore keeps the sample more comparable between the two crucial parts of investments we study. We however checked our results are robust to the inclusion of these observations. Results of these estimations are available upon request.

[17] Helpman et al. (2004) are among the first to have derived this result.

[18] In this table, as in all of the regressions, productivity is measured as the ratio of value added (in current Euros) to the number of employees.

[19] The method used is detailed in Redding and Venables (2004), who limit their analysis to one year (1996), and a smaller set of countries and trade costs. We use their preferred (third) specification of trade costs. The Stata program used to generate our MA, are available upon request. A complete database of market access variables for a long period using this method is available at CEPII: http://www.cepii.fr/anglaisgraph/bdd/marketpotentials.htm.

Table 1
Individual features of investing firms.

	All investments	Foreign investments	Investments in France
Median productivity	232	298	225
Median employment	87	406	69
Median advertising ratio	1.0106%	1.0151%	1.0100%
Total number	16,312	2970	13,342

Note: Productivity is measured by value added over the number of firm employees. The advertising ratio is advertising expenditures divided by firm value added.

per capita in the investment year,[20] which we expect to enter negatively once demand MA_i is controlled for. The availability of high-quality/low-price intermediate inputs in the host country is controlled for by the supplier access variable described in greater detail below.

One of the key variables in location choice has repeatedly been shown to be the desire of investors to follow other foreign investors in the same industry. This suggests that the kind of localization economies discussed in the urban economics literature also affect the spatial distribution of FDI. Head et al. (1995) were the first to empirically detect this behavior in a conditional logit model, followed by many others. We follow the literature here and include a "sectoral network" variable aimed at capturing the extent of spillovers between investors of the same sector. We also take advantage of the firm-level dimension of our data to go deeper into these agglomeration effects. Namely, we construct a "MNC network" variable that measures spatial interdependence in location choices *within* industrial groups. As this variable is constructed at the firm-level, it allows us to identify separately spatial interdependence in *individual* FDI decisions. Details on the construction of these network variables are provided below.

Finally all regressions include continental dummy variables that are meant to account for a possible nested structure in the choice of foreign location. It is likely that countries inside a given continent are more comparable than countries belonging to different continents, for instance because firms choose first to serve each continental zone through a production affiliate, and then choose a specific country within that zone. More generally, these dummies also account for all unobserved fixed differences across large regions of the world during the period under consideration. We now describe in greater detail the more novel and complex variables.

3.3. Supply access

In theoretical frameworks of the NEG type, a large number of local suppliers of inputs in a host country reduces the price index of intermediate inputs, and therefore production costs, which makes the country more attractive (Krugman and Venables (1995) provide an early model of those interactions). Amiti and Javorcik (2008) were among the first to introduce a supplier access variable taking into account the actual matrix of inter-industry linkages in empirical location-choice analysis.

Our measure of supply access is inspired by Amiti and Javorcik (2008). The rationale behind its construction is the following. The incentive for a firm in sector s to locate in country i increases in (i) country i's supply of intermediate goods, relative to the rest of the world, and (ii) sector s's use of intermediate inputs. In theory, the construction of this variable should thus use data on local suppliers of intermediate goods, to measure the previous incentive (i), as well as data on the input–output (I/O) structure of French firms' affiliates abroad to assess their dependence with respect to intermediate inputs (incentive (ii) above).

In constructing the variable, we however faced data availability constraints forcing us to make additional assumptions. First, I/O data are only available at the industry/country level, without distinguishing domestic and foreign firms. To measure the affiliate's dependency with respect to intermediate inputs, we are thus let with the choice of using information on the I/O structure of the sector in the host country i or in France. We chose to compute the supply access variable using French I/O data. This rests on the assumption that foreign affiliates of French firms inherit their technological organization from the headquarters. As a consequence, the total share of intermediate goods in the production of the affiliate is approximated by the share recorded in the French I/O tables for sector s (called β^s hereafter). The same holds true for the technical coefficients a^{sm} measuring the quantity of industry m's inputs needed to produce one unit of output in industry s. Measuring each country's supply of intermediate goods is also complicated as it requires production data at the industry level for a large enough cross-section of countries. As an alternative, our measure of country i's supply of intermediate goods uses information on input producers in the host country which are affiliates of French firms.[21] Namely, the share ψ_i^m of inputs m produced in country i is measured by the share of the overall employment by French affiliates in industry m that is located in country i.[22] This implicitly assumes that French affiliates buy their intermediate inputs from other French affiliates (or that the location patterns of French affiliates abroad is a good proxy for the distribution of input-producing firms).

Based on those two assumptions, the availability of inputs within country i that are used by an affiliate operating in industry s is defined as:

$$\text{Supply access}_i^s = \frac{\beta^s}{d^{ii}} \left\{ \sum_{m=1}^{s} a^{sm} \psi_i^m \right\}$$

The supplier access variable thus measures the average share of world intermediate goods produced in country i. In the average, each industry is weighted by the technical coefficient measuring the reliance of sector s to this particular input: affiliates benefit more of the proximity to local suppliers producing intermediate goods they use intensively. The supplier access variable is also higher if intermediate inputs are a large component of costs in industry s (as measured by β_s). Finally, the measure is divided by the internal distance of country i, D^{ii}, in order to account for the ease of access to suppliers inside i. Using IO tables for each year of the sample, we obtain time-series of sector-specific supply access. In the estimates, the explanatory variable is supply access in the year preceding the investment, in order to limit endogeneity and above all not count the firm's own investment in this variable. Supply access is a proxy for lower prices of intermediates in the firm's country, and should therefore enter with a positive sign.

Fig. 1 provides an example of this variable for the automobile sector. We plot the cumulated number of automobile investments in different countries against the supply access of one of the leading inputs in this industry: metal production. The positive association between the two variables is immediate.

[20] GDP data (in current US dollars) and population series are taken from the World Bank's "*World Development Indicators*".

[21] We use information on *all* input producers, without taking into account the fact that these foreign affiliates may indeed be part of the same MNC. Any financial link between these foreign affiliates will be picked up by the "MNC network" variable described above. For a recent theoretical discussion of sourcing from affiliates belonging to the same MNC, see Antràs and Helpman (2004).

[22] Namely, $\psi_i^m \equiv \frac{l_i^m}{l_W^m}$, with l_i^m the overall employment of industry m in country i and l_W^m the sectoral employment cumulated over all countries. In order to allow for some local trade in intermediate inputs by affiliates, we include in l_i^m both French affiliates' employment in i and in its immediate neighboring countries.

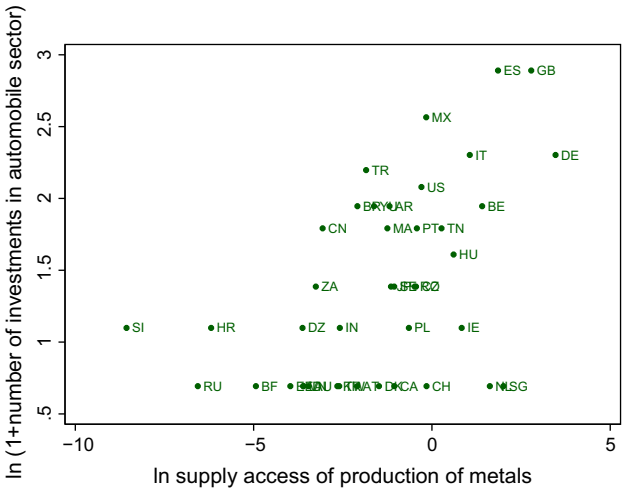

Fig. 1. Supply access.

3.4. Sectoral and firm-level networks

The empirical literature offers a very large amount of evidence that FDI decisions are spatially correlated at the industry level: investors tend to follow other foreign investors in the same industry. A potential explanation for such clustering is that there are spillovers across firms from the same industry. Urban economists refer to these within-sector spillovers as localization economies, as opposed to urbanization economies where positive externalities are generated by the overall economic activity.[23] Several factors may induce localization economies, notably the classical Marshallian externalities (sharing of inputs, labor market pooling, knowledge spillovers) or human capital spillovers (Rosenthal and Strange, 2008). Agglomeration may also be the result of the fragmentation of production that pushes firms producing different parts of the same product to locate in the same area and save on trade costs when interacting together. Devereux et al. (2007), Basile et al. (2008) and Liu et al. (2010) are three recent examples of papers finding very strong agglomeration effects in the location choice of firms using very comparable estimation methods.

To account for this type of localization economies, we follow the vast literature on agglomeration effects and build a sector-specific agglomeration variable. The "sectoral network" is calculated as the cumulated number of French affiliates in the same industry located in each potential host country in year $t-1$, where t is the choice year. It is defined as:

$$\text{Sectoral Network}^{s}_{i,t-1} = \sum_{u<t} \sum_{a} D^{s}_{ai,u}$$

where $D^{s}_{ai,u}$ is a dummy variable equal to one for all affiliates a of sector s located in country i and created in year u or before.[24]

Interpretation of this type of variable can be quite broad. The first is to capture localization economies. While this is the most frequent interpretation of the quasi systematically positive coefficients found on this variable in the literature, other channels of influence are possible. For instance, input–output linkages, if the diagonal of the matrix is sufficiently thick, as is often the case. In our paper, the supplier access variable should control for this more precisely, however. More generally, note that any variable omitted from the regression and that makes a country attractive to an industry will be captured by this industry count of firms.[25] It is therefore important to include this variable, if only to temper any industry-specific omitted variable bias, although the interpretation of the resulting estimate is admittedly unclear.

We also use the firm-level dimension of our data to check whether the same type of agglomeration effects holds *inside the multinational firm*. To do this we construct a "MNC network" variable very much inspired by the construction of the industry-level agglomeration variable. It accounts for the history of previous location choices by the same industrial group. This allows us to account for the type of spatial interdependence emphasized in Blonigen et al. (2007) and documented in Basile et al. (2008). One possible reason why FDI decisions might be spatially correlated is that firms fragment their production processes to take advantage of each country's comparative advantage.[26] Also, it could be the case that there are economies of scale in FDI, so that having invested in a region reduces the subsequent transaction costs associated with operating in a country in the same region.

At the firm level, we are able to assess more precisely the intensity of the network relationship. Not only do we know the number of connected affiliates in each country, but also the detailed financial structure linking each affiliate to the head of the group. Namely, we use the financial information available for affiliates from our data sources. This identifies all financial linkages between establishments and a "head" of group, and also describes the intensity of this linkage and therefore the depth of a group's presence in a country in a given year. Our network measure relies on a variable called "share", which gives the percentage ownership held by the group in the affiliate. For each affiliate in a given country, we sum the "share" for all affiliates belonging to the same group and located in the same country:

$$\text{MNC network}^{f}_{i,t-1} = \sum_{u<t} \sum_{a} D^{f}_{ai,u} \times \text{share}^{f}_{a}$$

where $D^{f}_{ai,u}$ is a dummy variable equal to one for all affiliates a belonging to the French industrial group f, located in country i and created in year u or before, and $\text{share}^{f}_{a,u}$ is the share of a's capital owned by f at time u. This variable is thus a cumulative sum (starting in $u = 1980$) of the financial linkages for a given French investor up to the year before the potential investment.[27,28]

Table 2 provides summary statistics on the network variables. On average over the period, the mean sector in a given country receives 1.15 French investment. In the meantime, the average value

[23] See Rosenthal and Strange (2004) for an extensive survey of that literature.

[24] Devereux et al. (2007), Basile et al. (2008) and Liu et al. (2010) all use a very similar definition for their sectoral network variable. Basile et al. (2008) also add spatial lags. They turn out insignificant in the regressions, however.

[25] In particular, this variable probably accounts for the impact of other cost variables such as land prices or institutions, sometimes used in the literature but neglected in this paper due to data constraints. As our sample of investments abroad covers a fairly short time span but a much larger set of host countries than usual, it is very hard to find consistent data for these specific cost variables. Moreover, the use of regional and even country fixed effects will control for most of those determinants since the variance of land prices or institutions for instance should be mostly cross-sectional over the time period under consideration.

[26] See the complex-vertical FDI model in Baltagi et al. (2007). Head et al. (1995) and Head and Mayer (2004) also produce evidence of the impact of those vertical integration networks on agglomeration using data on Japanese multinational firms' location choices and the influence of vertical Keiretsus.

[27] Note that both measures of agglomeration effects do not account for the size of the affiliate. This implicitly assumes that the localization economies are caused more by the proximity of firms rather than that of workers. Henderson (2003) provides empirical evidence supporting this assumption. He finds that plants do seem to generate positive local externalities, but not workers. If we consider each plant as a source of knowledge, this result is the sign, according to Henderson (2003), that information spillovers are more important than labor market externalities.

[28] We experimented different specifications for the MNC network variable to check the robustness of our empirical findings. In particular, we tried using windows rather than the same base year for the initialization of the variable (i.e. cumulated over the last 12 years rather than starting in 1980 for all affiliates). We also tested a variant that includes neighboring countries in the network of the firm. For sake of brevity, the full robustness analysis is not included in the paper. However, it is available upon request.

Table 2
Summary statistics on the network variables.

	Sectoral network	MNC network
Mean	1.15	37.28
Standard deviation	16.36	610.78
Variance decomposition (%)		
Between years	0.1	0.05
Within years, between countries	0.1	0.05
Within years, within countries	99.8	99.9
Investments × countries	2,043,448	2,043,448

Note: The variance decomposition explains the overall variance of each network variable by three mutually exclusive components: the variance between years, the variance within years between countries and the variance within years within countries. The last component thus measures the variability arising because different sectors in a given country-year are featured by different sectoral networks ("Sectoral Network" column) or because all affiliates located in the same country in a given year do not have the same MNC network there ("MNC Network" column).

for the MNC network variable is around 37%. At first view, these figures are low, suggesting agglomeration is small in our data. However, the averages hide a strong heterogeneity, as shown by the very large standard deviations in the second line of Table 2. This variability is what will allow us to identify a significant coefficient associated with these variables in the location choice estimation. One may fear the variability is in large part mechanical: as both network variables are cumulated sums of previous investments over years, they tend to increase over time. However, the variance decomposition provided in the bottom of Table 2 show this is not the main source of variability in the data. Instead, the variance in network variables mainly comes from the within years/within countries dimension of the data. From an econometric perspective, the within variability is important since most of the covariates we already described are country-specific. Accounting for the sectoral and the MNC network of investing firms is thus potentially important to explain the heterogeneity of location choices between sectors or even between firms.

3.5. Trends in the location of French-owned manufacturing establishments

We start by describing the general pattern of French domestic and foreign investment in our sample. Figs. 2 and 3 show the evolution of the spatial distribution of investment (given by the number of new affiliates) among foreign countries and between France and the rest of the world, respectively. Two trends are clear. Within Europe, French FDI has relocated Eastwards, with a substantial fall of the share of new affiliates located in Western Europe, and a rise in Eastern European destination countries. Note that Western Europe still accounts for a major fraction of French FDI at the end of the sample, while Europe's share as a whole has decreased slowly, but remains at just under 60% in 2002. The other important trend is the rise of Asia in general, and China in particular, as French production locations. Fig. 3 shows that while the share of domestic investments is clearly falling, it remains remarkably high.[29]

Before the econometric analysis, we provide a graphical snapshot of some of the determinants considered below. As noted above, the empirical literature has identified the size of the hosting market as one of the primary determinants. Fig. 4 plots the cumulated number of investments between 1980 and 2002 against our measure of market access in the host country in 2002 (both in logs). It also identifies the countries which officially speak French, and the ex-French colonies. The estimated linear relationship has a

[29] The qualitative pattern is very similar in the sample of investments by firms with at least one affiliate abroad. The share of domestic investment peaks at around 60% in 1992, before falling to 40% in 2002.

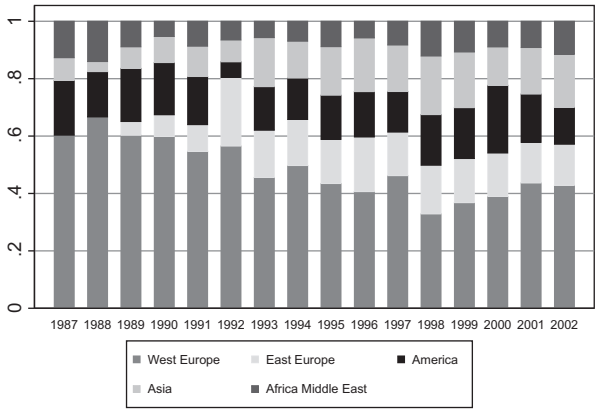

Fig. 2. Distribution of French FDI by geographical zone.

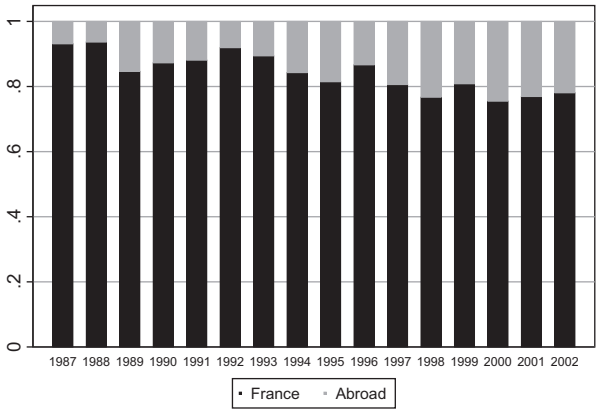

Fig. 3. Investments by French firms: domestic/foreign.

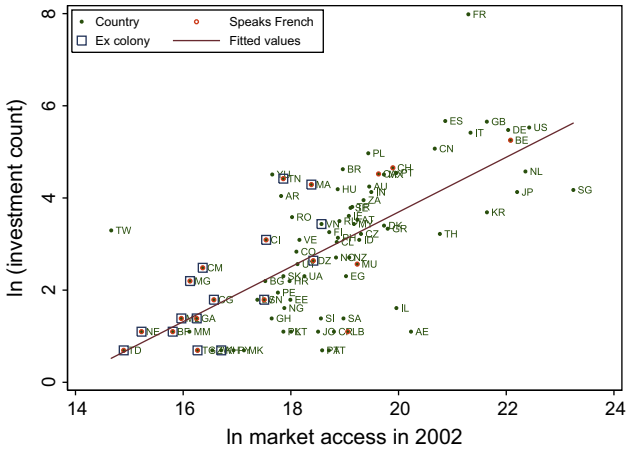

Fig. 4. French investments and market size.

slope of .59 and a R^2 of .46. In addition, most of the ex-colonies and Francophone countries are above the regression line, suggesting that the transaction costs of FDI are reduced by historical linkages. Also, France is a significant positive outlier in this graph.

One of the main points of interest in what follows is to try and quantify more precisely the size of this "home bias" in investment patterns, its evolution and its explanations. There are two main explanations of the size and relative decline in the share of domes-

tic investment. The first is simple: France is a large, rich, and well-known country to most French investors, and there might be no bias per se in its investment share, *once all location choice determinants are properly controlled for*. The same is true for the change in this share. In the time period covered by our sample, France experienced a relatively low growth rate compared to other developed or emerging economies. This with other determinants may suffice to explain the fall in the investment share in the domestic economy. Alternatively, there may be a genuine bias, emerging from some unobserved preference of investors for their home country, or difficulties in investing abroad (for instance due to a lack of knowledge or expertise on how to do business abroad). These biased preferences or barriers to FDI might have diminished, as shown by the gradual increase in the proportion of non-French shareholders in France-based multinational firms for example. These two channels have quite different policy implications; below we will try to quantify their relative importance.

4. Results for foreign affiliates

We first present conditional logit estimation of the location choice for French affiliates abroad. There are 87 possible host countries, for the 2500+ location choices that we analyze over the 1992–2002 period.

There are four different specifications in Table 3. Column (1) present benchmark results with standard control variables. Market access enters with the expected sign and with a size typical of that in the literature. With variables in logs (and a large number of location choices), the estimated coefficients are close to the elasticities of the probability of choosing a country for the average investor (see Train, 2003). A 10% increase in market access therefore increases the probability of attracting French investors by about 5%. The three transaction costs variables (distance, language and colonial links) enter in the expected way, as does our proxy for labour costs (GDP/cap) which is significantly negative. The coefficient on the sectoral network is, as usually found, positive and very significant, and again of the same order of magnitude as other estimates in the literature.[30]

Column (2) introduces supply access, while column (3) introduces the firm-level network variable. Supply access always attracts a significant and positive coefficient, which is consistent with results in Amiti and Javorcik (2008): affiliates tend to be located where it is easier to find suppliers. Note also that the inclusion of supply access reduces the influence of some of the other variables. This applies to distance to France in particular, so that part of the distance effect reflects supply-access considerations. The same holds for the firm-level network measure, although to a lesser extent. These networks have a strong influence on location choice, independently of supply access. Moreover, controlling for the MNC network does not change the significance of the sectoral network variable. This means that both within-sector and within-firm agglomeration economies are at play in FDI decisions.

The comparison of different variables' effects needs to go beyond elasticities (which are very similar to the coefficients here), since variables have different variances. For instance, in column (3)'s sample, the coefficient of variation (standard deviation over the mean) is 2.533 for market access, 4.863 for supply access, 2.998 for sectoral network, and 7.479 for MNC network. Head and Mayer (2004) propose the following thought experiment: take a hypothetical country with the mean value of one of the variables of interest (market access say) and redistribute market access over countries such that the country under consideration experiences a one standard deviation rise in MA (with the overall inclusive value being unchanged). The ratio of the new to the baseline probability of being chosen is $[1 + \mathrm{cv}(\mathrm{MA})]^{\beta_{\mathrm{MA}}}$, with β_{MA} being the estimated coefficient, and cv(MA) the coefficient of variation of the variable in question. This one standard deviation shock exercise produces an increase in the "mean country's" probability of being chosen of 68% for market access, 19% for supply access, 84% for sectoral network, but more than 200% for MNC networks. The large estimated elasticity on this last variable combines with its substantial heterogeneity across firms to generate a very important impact of this type of network. Head and Mayer (Head and Mayer, 2004, Table 3) also find that the MNC network has a much larger effect than the sectoral network, with similar variables and estimation strategy, but a totally unrelated sample of Japanese affiliates in the EU.

The robustness of these results is checked via an additional specification introducing country fixed effects. This accounts for every characteristic of the location countries (some observable, some not) that remain unchanged over our time period, 1992–2002. Distance to France, common language and ex-colony variables are naturally dropped in this specification, which identifies coefficients over the time dimension only. The results are shown in column (4) of Table 3. The largest effect here is on the coefficients on market access and GDP per capita, which become insignificant. In the short time period we consider, the variance in both variables is clearly cross-sectional rather than time-series. It is therefore unsurprising that they lose explanatory power when country fixed effects are introduced. On the contrary, the last variables vary greatly over time and, above all, over affiliates. They remain significant, with coefficients only little changed.[31] This is important as these are the variables that are most likely to introduce endogeneity bias in the regression. To pick this up, we use lagged

Table 3
Conditional logit for the location of foreign investments.

	Dependent variable: foreign country chosen			
	(1)	(2)	(3)	(4)
Ln market access	0.493[a]	0.438[a]	0.412[a]	0.012
	(.024)	(.026)	(.026)	(.112)
Ln distance	−0.440[a]	−0.324[a]	−0.306[a]	
	(.074)	(.078)	(.079)	
Common language	0.035	−0.225[a]	−0.195[b]	
	(.070)	(.077)	(.077)	
Ex-colony	0.210[c]	0.403[a]	0.411[a]	
	(.210)	(.110)	(.111)	
Ln GDP per capita	−0.341[a]	−0.332[a]	−0.304[a]	0.009
	(.024)	(.031)	(.032)	(.170)
Ln (supply access − 1)		0.105[a]	0.097[a]	0.153[a]
		(.013)	(.013)	(.027)
Ln (sectoral network − 1)	0.616[a]	0.556[a]	0.441[a]	0.146[a]
	(.043)	(.043)	(.044)	(.042)
Ln (MNC network − 1)			1.454[a]	1.315[a]
			(.086)	(.077)
Region fixed effects	Yes	Yes	Yes	No
Country fixed effects	No	No	No	Yes
Investments × countries	221,286	207,331	207,331	207,331
Investments	2645	2639	2639	2639
Pseudo R^2	.115	.113	.127	.162

Notes: Robust standard errors in parentheses.
The market access and GDP per capita variables are measured at the year of the investment, while the sectoral network, supply access and MNC network are evaluated the preceding year.
[a,b,c]Significance at the 1, 5 and 10% levels, respectively.

[30] The result that past investments are key predictors of future investment is reminiscent of Wheeler and Mody (1992). Head and Mayer (2004), Devereux et al. (2007), Basile et al. (2008) and Liu et al. (2010) confirm the result in a conditional logit context.

[31] The coefficient for the sectoral network is however smaller. Again, this is not inconsistent with the "residual attractivity" interpretation of this variable, which can represent all omitted characteristics that make a country a desirable place to invest for most investors. If many of those unobservables are fixed, the coefficient will be accordingly reduced in fixed-effects estimation.

Table 4
Conditional logit for the location of domestic and foreign investment.

	Dependent variable: chosen country						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln market access	0.444[a]	0.365[a]	0.360[a]	0.333[a]	0.345[a]	0.335[a]	0.340[a]
	(.023)	(.025)	(.025)	(.029)	(.030)	(.026)	(.029)
Ln distance	−0.444[a]	−0.261[a]	−0.266[a]	−0.286[a]	−0.286[a]	−0.237[a]	−0.285[a]
	(.074)	(.080)	(.080)	(.091)	(.091)	(.081)	(.091)
Common language	0.049	−0.273[a]	−0.222[a]	−0.181[b]	−0.163[c]	−0.178[b]	−0.174[c]
	(.070)	(.077)	(.077)	(.088)	(.087)	(.078)	(.088)
Ex-colony	0.190	0.379[a]	0.355[a]	0.210	0.209	0.357[a]	0.207
	(.109)	(.112)	(.113)	(.129)	(.128)	(.115)	(.129)
Ln GDP per capita	−0.280[a]	−0.272[a]	−0.262[a]	−0.231[a]	−0.245[a]	−0.236[a]	−0.238[a]
	(.030)	(.031)	(.031)	(.035)	(.035)	(.032)	(.035)
France	2.373[a]	2.202[a]	0.947[a]	4.071[a]	4.600[a]	7.490[a]	1.326[a]
	(.069)	(.073)	(.084)	(.300)	(.165)	(.424)	(.094)
Ln (supply access − 1)		0.141[a]	0.125[a]	0.106[a]	0.102[a]	0.120[a]	0.104[a]
		(.012)	(.012)	(.014)	(.014)	(.013)	(.014)
Ln (sectoral network − 1)	0.884[a]	0.868[a]	0.861[a]	0.876[a]	0.824[a]	0.800[a]	0.877[a]
	(.013)	(.013)	(.014)	(.016)	(.017)	(.014)	(.016)
Ln (MNC network − 1)			0.750[a]	0.683[a]	0.724[a]	2.045[a]	0.678[a]
			(.021)	(.022)	(.024)	(.088)	(.022)
France × ln productivity				−0.509[a]			
				(.052)			
France × ln employment					−0.606[a]		
					(.025)		
France × ln MNC network						−1.333[a]	
						(.085)	
France × ln advertising							−1.556[a]
							(.292)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investments × countries	1,266,123	1,183,772	1,183,772	1,131,094	1,138,197	1,183,772	1,136,625
Investments	14,966	14,960	14,960	14,294	14,384	14,960	14,364
French investments	12,321	12,321	12,321	12,238	12,321	12,321	12,306
Pseudo R^2	0.784	0.783	0.795	0.829	0.833	0.797	0.829

Notes: Robust standard errors in parentheses.
The market access and GDP per capita variables are measured at the year of the investment, while the cumulated number ofz affiliates in the same industry, supply access and MNC network are evaluated the preceding year.
[a,b,c]Significance at the 1, 5 and 10% levels, respectively.

values, but this may not be sufficient if there is a great deal of persistence in our variables. The country fixed effects does a better job at controlling for this endogeneity problem. The stability of the coefficients compared to those using information on past investments thus suggests that the potential endogeneity bias is not overwhelming in columns (1)–(3).

5. Results on foreign and domestic investments

We now introduce the possibility that firms invest in their own country, France. By doing so, we try to answer the following question: how different is the domestic economy in the location choice of manufacturing affiliates? We first replicate the above conditional logit estimation on the full set of investments, with a dummy for domestic investment. In a second step, we allow for specific substitution patterns between domestic and foreign locations using the nested logit model.

5.1. Conditional logit

The results of conditional logit estimation over the whole set of location choices are shown in Table 4.[32] Column (1) contains the baseline estimates: all coefficients are almost unchanged, except for that on the sectoral network, which increases slightly. However, this is not sufficient to account for the substantial number of investments in France compared to other countries. The coefficient on domestic investment in Column (1) shows that the odds ratio of investing in France rather than in a foreign country with comparable market access, distance, GDP per capita and same number of firms in the industry is slightly over ten. Turning to column (2), we see that part of this "excessive" domestic investment is accounted for by supply access, but column (3) reveals that most of this gap is due to more extensive domestic networks. The probability ratio of investing in France rather than in a comparable foreign country in terms of network is reduced to $\exp(0.95) \simeq 2.6$, and only 1.80 if the foreign country is a former colony ($\exp(0.95 - 0.36)$).

We therefore have a first answer to our question concerning domestic versus foreign investment. While the initial difference in the number of investments might be thought to reflect massive "home bias" by investors, a large part can be accounted for by standard determinants of location choice. In particular, the stronger networks of investors in their home country explain a large proportion of the difference, leaving only little to be explained by any home bias.

We consider the stability of the "French exception" by re-running the regression in column (3) of Table 4 over 3-year windows. The results are graphically summarized by looking at the "French exception" coefficient over time. Fig. 5 presents point estimates for each of the middle years of the windows with 5% confidence intervals. This graph reveals a relative stability of the coefficient over the regression time period (1992–2002), which suggests that the fall in the share of manufactured investments located in France over this period can be mostly explained by the other right-hand side variables. Note that while the French exception coefficient is

[32] Note that we chose to set the colonial and language dummies to 0 for France in this table, which is of course just a matter of rescaling the coefficients. We think that the interpretation is more natural this way. The distance variable for France is the internal distance, as available in the CEPII database (and described at http://www.cepii.fr/distance/noticedist_en.pdf).

fairly stable, this is not true of all of the coefficients. One of the latter is colonial links, as illustrated in Fig. 6. Here, ex-colonies change from being favored to being neutral over 1992–2002 (conditional on their growth performance and other characteristics, which are controlled for in the regression).

Our results thus suggest that a large part of the "French exception" can be explained by the determinants of location choice, among which the firm's network seems to be particularly relevant. Even so, the "France" dummy remains significant after controlling for supply access and the firm's network. According to Helpman et al. (2004), home bias can be explained by the heterogeneity of firms in terms of productivity: if there are fixed costs involved with investing abroad, only the most productive firms will carry out FDI. This explanation of the "Export vs. FDI" arbitrage thus suggests that the amount of domestic investment should be linked to the distribution of productivity among firms. As a first investigation of this phenomenon, we interact the "France" dummy with firm-level productivity. The results are given in column (4) of Table 4. As expected, this interaction attracts a negative significant coefficient, which means that the home bias of French investors is less pronounced when the firm is more productive. One drawback here is that the size of coefficients in the conditional logit model with interactions can no longer be interpreted as elasticities (Ai and Noriton, 2003). To get an idea of the size of the productivity effect, we have thus carried out a simulation exercise. Using the estimated coefficients in column (4), we first compute the median probability of investing abroad in the sample of 14,294 firms, which is 3.2%. We then simulate a one standard deviation positive shock in productivity affecting the whole distribution of firms. The probability of investing abroad increases to 5.9% in consequence. As a robustness check, column (5) interacts the "France" dummy with the firm's employment, used as proxy for its size. Again, the interaction is significantly negative and large: a one standard deviation shock in employment increases the median probability of investing abroad from 2.2% to 15.7% (note that the benchmark baseline probability changes slightly across columns, since the sample varies marginally depending on the availability of different variables used).

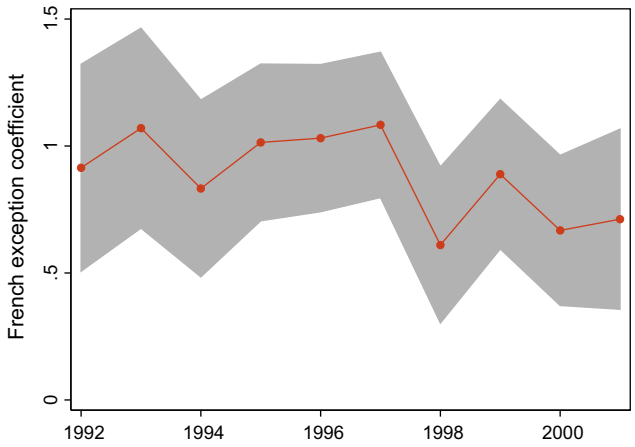

Fig. 5. Coefficient on domestic investment over time.

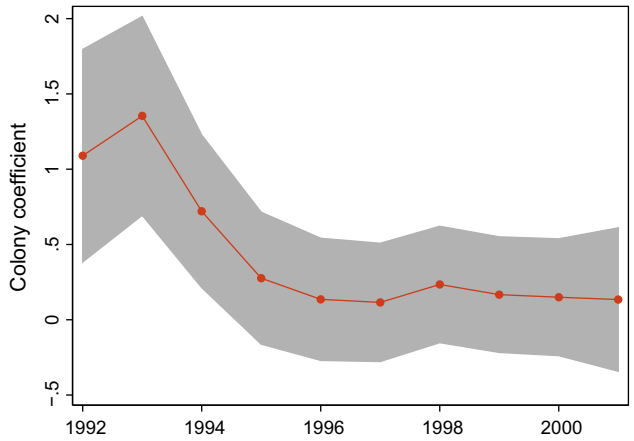

Fig. 6. Coefficient on investment in ex-colonies over time.

In column (6), we interact the "France" dummy with MNC network to ask if, beyond its impact on variable costs, this variable also affects the fixed cost of investing abroad, so that firms are more likely to locate their affiliate abroad when their financial linkages in destination countries are more developed. Here also, the resulting coefficient is negative and significant. Simulations reveal that a one standard deviation shock in this variable increases the probability that the firm invest abroad from 3.7% to 4.9%. Last, column (7) reports results from an estimation interacting the "France" dummy with the ratio of advertising expenditures to value added to assess the impact of "intangible assets" on foreign investment. The ensuing coefficient is significantly negative, and simulations suggest that a one standard deviation increase in advertising expenditures raises the probability of investing abroad from 3.4% to 5.9%.

The results in the last four columns of Table 4 thus suggest that firm-specific features influence the probability that French firms invest abroad. This results will be studied in a more structural manner in Section 5.2, using the nested logit model. Before we do so, we re-estimate Table 4 using a restricted sample of multinational firms that do invest abroad at some point in our sample. This selection drops investments in France by firms that are purely domestic. Another interpretation is that we now concentrate on those investors who are productive enough to have been able to locate at least one affiliate abroad at some point in the last 20 years. Those investors also sometimes choose to locate new affiliates in France, in fact they do so roughly half the time in our sample, which is now much more balanced. The results are summarized in Table 5. Relative to the whole sample results (Table 4), the main difference refers to the coefficient on the France dummy. This is half as large as in the full sample (compare to column (1) in Tables 4 and 5), and drops to a small, insignificant figure in column (3), when supply access and MNC network are included in the regression. Equally, the coefficients on the interacted variables in columns (4)–(7) are smaller (in absolute value). These estimations thus suggest that the "French exception" is less pronounced among large multinational companies.

In short, the determinants of location choice, notably our firm-level network variable, are able to explain almost entirely the difference between investments abroad and at home in this reduced sample where only large international (i.e. more productive) groups are analyzed. This confirms the role of firm-specific factors in explaining the choice between investing in France or carrying out FDI. This decision is studied in a more structural way in the next section using the nested model.

5.2. Nested logit

We here investigate the trade-off between location at home or abroad using a nested decision tree to model investor choice. This method allows us to model potentially richer substitution patterns than in the conditional logit. In the nested logit estimation, we explicitly account for the specificity of France as a potential investment location. The simplest estimation procedure solves the

Table 5
Conditional logit for the location of domestic and foreign investments by MNCs.

	Dependent variable: country chosen						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln market access	0.475[a]	0.407[a]	0.389[a]	0.370[a]	0.372[a]	0.367[a]	0.374[a]
	(.023)	(.025)	(.025)	(.029)	(.029)	(.026)	(.029)
Ln distance	−0.440[a]	−0.295[a]	−0.287[a]	−0.301[a]	−0.306[a]	−0.266[a]	−0.302[a]
	(.074)	(.079)	(.079)	(.090)	(.090)	(.080)	(.090)
Common language	0.039	−0.235[a]	−0.195[b]	−0.144	−0.142	−0.164[b]	−0.142
	(.070)	(.076)	(.077)	(.087)	(.090)	(.077)	(.087)
Ex-colony	0.200[c]	0.391[a]	0.364[a]	0.217	0.216	0.363[a]	0.217
	(.108)	(.111)	(.112)	(.127)	(.127)	(.113)	(.127)
Ln GDP per capita	−0.320[a]	−0.308[a]	−0.288[a]	−0.266[a]	−0.269[a]	−0.267[a]	−0.270[a]
	(.030)	(.031)	(.031)	(.035)	(.035)	(.032)	(.035)
France	1.142[a]	1.008[a]	0.153	1.948[a]	1.838[a]	4.851[a]	0.549[a]
	(.077)	(.080)	(.097)	(.313)	(.201)	(.386)	(.109)
Ln (supply access − 1)		0.118[a]	0.109[a]	0.087[a]	0.087[a]	0.103[a]	0.086[a]
		(.013)	(.013)	(.014)	(.014)	(.013)	(.014)
Ln (sectoral network − 1)	0.717[a]	0.699[a]	0.740[a]	0.746[a]	0.728[a]	0.694[a]	0.746[a]
	(.016)	(.016)	(.017)	(.018)	(.018)	(.016)	(.018)
Ln (MNC network − 1)			0.620[a]	0.549[a]	0.592[a]	1.491[a]	0.533[a]
			(.031)	(.032)	(.034)	(.079)	(.032)
France × ln productivity				−0.262[a]			
				(.054)			
France × ln employment					−0.235[a]		
					(.030)		
France × ln MNC network						−0.934[a]	
						(.075)	
France × ln advertising							−1.021[b]
							(.465)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investments × countries	397,293	372,330	372,330	324,693	326,755	372,330	325,967
Investments	4694	4688	4688	4086	4112	4688	4102
French investments	2049	2049	2049	2030	2049	2049	2044
Pseudo R^2	0.403	0.401	0.412	0.464	0.467	0.416	0.465

Notes: Robust standard errors in parentheses.
[a,b,c]Significance at the 1, 5 and 10% levels, respectively.

problem backwards. We first estimate the "bottom" model explaining the choice of a given foreign country among the whole set of alternatives (87 foreign countries). For this we use the same explanatory variables as above. The inclusive value is then calculated using the obtained coefficients as the sum of utilities of all choices inside each nest (foreign countries and France). This inclusive value captures the expected profits for the chooser based on the characteristics of all underlying host countries. This is then included in the conditional logit explaining the decision to invest at home or abroad (the "upper" model). In addition to this inclusive value, we add other covariates that pick up firm heterogeneity in the decision to invest abroad.

The results are presented in Table 6. For all columns, the "bottom" estimation (column (1)) remains unchanged. This explains the choice of a foreign location by the destination country's market access, GDP per capita, supply access, gravity variables and the network variables. The results are the same as in Table 3. In the "upper" model, column (2) presents the results obtained when only the inclusive value is introduced to explain the foreign versus domestic investment. The estimated coefficient is strongly significant and close to 0.7, meaning that the correlation between the unobserved components of utility for alternatives within each nest is weak compared to the correlation in errors between nests. As noted above, the nested logit model collapses to the conditional logit model when the inclusive value coefficient is one. Our results hence suggest that the substitution patterns between locations are not radically different whether France is considered as a destination or not. This seems to point in the same direction as our previous results: once the determinants of location choice are taken into account, conditional logit estimates suggest that the initial large home bias is drastically reduced. The value of the inclusive value coefficient we estimate adds that the national economy is not dramatically different from the rest of the world in terms of substitution patterns (although the coefficient being significantly under one indicates the relevance of the tree structure). In columns (3)–(7), we add a "France" dummy as well as its interaction with several firm-specific variables. As already suggested in conditional logit estimations, the propensity to invest in France falls with firm productivity (column (4)) and size (column (5)), as expected from Helpman et al. (2004). Replicating the simulation exercise of Section 5.1, a one standard deviation productivity shock affecting the whole distribution of firms increases the probability of investing abroad from 6.3% to 11.2%. On the other hand, an equivalent shock to the size of investing firms raises this probability from 3.8% to 33.2%. The choice between domestic and foreign investment also seems to be influenced by the firm's network and the size of its intangible assets (columns (5) and (6)). A one standard deviation increase in the MNC network raises the probability of investing in a foreign country from 3.3% to 72.7%,[33] while an equivalent shock to the distribution of advertisement expenditure ratios increases it from 6.4% to 9.8%.

These results thus suggest that the determinants of domestic and foreign investments are similar. Both reflect the willingness of firms to produce at the lowest possible cost while maintaining a large market access. Behind these country-specific determinants, our results suggest that the main difference between investments in France and abroad lies in the composition of firms engaging in each type of activity. Namely, there is a sorting mechanism accord-

[33] This result only takes into account the impact of the network variable on the upper model, thus neglecting the effect of the shock on the inclusive value.

Table 6
Nested logit France/RoW choice.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variable: country chosen						
Ln market access	0.412[a]						
	(.026)						
Ln distance	−0.306[a]						
	(.079)						
Common language	−0.195[b]						
	(.077)						
Ex-colony	0.411[a]						
	(.111)						
Ln GDP per capita	−0.304[a]						
	(.032)						
Ln (supply access − 1)	0.097[a]						
	(.013)						
Ln (sectoral network − 1)	0.441[a]						
	(.044)						
Ln (MNC network − 1)	1.454[a]						
	(.086)						
	Dependent variable: chosen nest						
Inclusive value		0.717[a]	0.721[a]	0.680[a]	0.715[a]	2.072[a]	0.680[a]
		(.009)	(.014)	(.015)	(.018)	(.035)	(.015)
France			1.177[a]	4.013[a]	5.386[a]	14.492[a]	1.401[a]
			(.029)	(.268)	(.133)	(.314)	(.033)
France × ln firm's productivity				−0.484[a]			
				(.048)			
France × ln firm's employment					−0.745[a]		
					(.023)		
France × ln MNC network						−2.246[a]	
						(.050)	
France × ln advertising							−1.239[a]
							(.281)
Observations	207,331	29,998	29,998	28,658	28,838	29,998	28,798
Pseudo R^2	0.127	0.470	0.572	0.604	0.662	0.697	0.599

Notes: Robust standard errors in parentheses.
[a,b]Significance at the 1 and 5% levels, respectively.

ing to productivity, with more productive firms being more likely to carry out FDI.

6. Conclusion

Using a unique dataset of individual investment decisions, this paper analyzes the determinants of French firms' choices of affiliate location. The main originality of this work is that it allows us to account for investments both at home and abroad. We are thus able to assess whether the determinants of domestic investment are the same as those for foreign investment. The dataset also contains details on the financial links between firms and their affiliates worldwide. This allows us to measure the role of the firm's network in future investment decisions. In particular, we can estimate the extent of agglomeration economies in the sequence of decisions taken by a group when locating its different affiliates.

We first concentrate on location decisions abroad. Our conditional logit estimation confirms several results in the empirical literature. Namely, we find that location decisions are positively influenced by the host country's market and supply access, while they are negatively linked to our proxies for labour and transaction/coordination costs. Moreover, our findings provide strong support for the existence of agglomeration economies in FDI: firms are more likely to invest in a country in which many companies of the same industry have already invested. Beyond the *within-industry* concentration of FDI however, we show location choices are also sensitive to *within-firm* agglomeration economies: the probability of investing in a given country increases with the development of the firm's network in that country.

In a second step, we incorporate France as a possible location in the choice set, and ask whether the domestic economy can be considered as a potential location site just like any other country. Näıve conditional logit estimates suggest, on the contrary, that there is a strong "French exception" leading to a much higher probability of investment in France than abroad for French firms. However, when adding controls for agglomeration economies, it appears that a large part of this "home bias" in investment decisions is accounted for by the greater density of the firm's network in France.

The residual premium on the domestic economy is then investigated further using the nested logit model, which allows for different substitution patterns between France and the rest of the world. This third step shows that France is not that different from the rest of the world for French investors. The main difference between investments in France and abroad lies in the nature of the firms engaging in each type of activity. Firms investing abroad are, on average, more productive and larger, which confirms the results in Helpman et al. (2004). The "knowledge capital" model is also consistent with the data, since firms with more intangible assets are more likely to invest abroad than domestically. These results suggest that firms investing abroad pay an additional fixed cost that increases the threshold of operating profit that the firm must achieve to consider FDI as profitable. This explains why only more productive and larger firms invest abroad. However, FDI can also be seen as a way of keeping control over the relationship with customers, notably for firms with more intangible assets.

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