Document de travail du LEM / Discussion paper LEM 2019-22

Migration, FDI and the Margins of Trade

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Migration, FDI and the Margins of Trade[1]

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Abstract

This paper investigates the relationships between trade, migration and FDI in an unified framework. Recent literature emphasizes the potential for migration to favor trade and FDI through a reduction in international transaction costs. The relationships between trade and migration on the one hand and trade and FDI on the other hand have been studied separately using standard gravity equations. In this paper, we acknowledge the interdependence between these two modes of foreign market access and present a model that characterizes firms' proximity concentration tradeoff as a function of migration networks. At a theoretical level, we decompose the effect of migration into its impact on the variable trade costs, the fixed cost to penetrate the foreign market, and the costs to set up a subsidiary abroad and derive the conditions under which migration induces an increase in the FDI-sales to trade ratio. At an empirical level, our identification strategy aims at controlling for a number of biases that arise from the interdependency between FDI and trade as well as for the well-known biases potentially arising from the omission of the extensive margin. Our results show that migration networks increase the FDI to trade ratio and that most of the effect comes from the intensive margin. The results are shown to be consistent with an interpretation in terms of information channel and to hold at the sectoral level.

Keywords: Migration, trade, FDI, firms' heterogeneity

JEL Classification : F22, O1

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1. Introduction

Globalization is characterized by a general increase in international transactions for goods, factors and financial flows, with all these components growing more rapidly than output. The international economics literature has acknowledged the interdependency between trade and FDI (the proximity-concentration tradeoff). These two modes of foreign access are likely to respond differently to informational frictions.

This paper investigates the effect of international migration on the concentration-proximity tradeoff. It builds on the idea that international migrants offer a global reach and commercial opportunity that no other social network can bring. Indeed, migration networks have been shown to foster bilateral economic transactions through their removal of informational and cultural barriers between countries. The existing literature has either studied the relationship between migration and trade (e.g. Gould [19], Rauch and Trindade [36], Koenig [26]) or the relationship between migration and FDI (e.g. Kugler and Rapoport [28] Docquier and Lodigiani [15] Javorcik et al. [24]) failing to capture their interrelations.

To the best of our knowledge, this paper is the first to investigate the relationship between trade, migration and FDI in a unified framework, and to do so while accounting for firms' heterogeneity (Melitz [29]). More precisely, we build a model based on Helpman et al. [23] and Helpman et al. [22]. We decompose the effect of migration network into its effect on the variable trade costs of exporting, the fixed cost to penetrate the foreign market, and the fixed cost to set up a subsidiary abroad. Such breakdown enables to identify how migration networks affect the decision on the mode to serve the foreign market. We then derive a number of theoretical propositions. The main one being that, under plausible conditions, migration is expected to increase the FDI-sales to export ratio. We map this theoretical result in an empirical strategy to assess the effect of migration networks on the production-location decision.

We use recent datasets on bilateral migration (Artuc et al. [3], Ozden et al. [33]), trade CEPII gravity dataset (Head et al. [20]) and FDI (the OECD International Direct Investment Statistics), which enables us to highlight new stylized facts : the expansion of FDI flows in a larger set of countries, as well as the spread of international migration across the globe. Those trends are particularly relevant to our research questions since migration networks are likely to play a key role in the development of business opportunities in emerging markets. However, assessing these patterns still requires the use of aggregate national level data which are likely to suffer from a number of potential biases. Indeed, Helpman et al. [22] show that the omission of the within-sector productivity dispersion results in inconsistent estimates for trade barriers because the

estimation would confound the effects of migration on firm-level foreign sales with its effect on the proportion of firms selling abroad. We would expect that extending the analysis to FDI-related sales, and to smaller countries would increase the likelihood to face such self-selection bias. We also suspect that smaller countries face a larger productivity dispersion ; as a result we expect a decrease in transaction barriers to affect exports and FDI mostly at the extensive margin. [2] Moreover, the exclusion of zero bilateral sales due to the logarithmic functional form raises a concern about censoring. This bias might be important when extending the analysis to a larger and more diverse set of countries as smaller countries are more likely to have fewer strictly positive levels of FDI.
Our theoretical model provides a generalized gravity equation that enables to correct those potential omitted variable biases in the standard gravity equation, as highlighted by Helpman et al. [22].

We also show that looking at the effect of migration on trade and FDI jointly reduces the potential endogeneity bias present in the existing literature which has explored the effect of migration on trade and FDI separately. We show that our empirical methodology can mitigate this endogeneity issue but does not eliminate it ; we will therefore also rely on an instrumental variable strategy.

We find that the ratio of FDI to exports is higher, the higher the stock of migrants, especially the stock of high-skilled migrants from the buying country living in the seller country. The elasticity of the FDI to exports ratio with respect to migration is 11 percent. This means that for a given increase in migration from country j to country i, there is a propensity for FDI from i to j to grow 0.11 percent more than exports from i to j. Moreover, the migration externality is shown to affect the volume of FDI not through a change in the share of exporting firms but through an increase in firm-level FDI-related sales (that is, at the intensive margin).

The rest of this paper is organized as follows. Section 2 presents a theoretical model deriving the proximity-concentration tradeoff as a function of migration networks. Section 3 describes the data used. Section 4, we map the theory into an empirical strategy. More precisely, we extend the framework of Helpman et al. [22] to more recent trade data (for the period 2001-2006), recent FDI data (also for 2001-2006), and introducing the stock of migrants (as measured in 2000) as our main variable of interest and FDI to exports ratio as our outcome variable. Section 5 discusses the results. In Sections 6 and 7, we assess our results through alternative estimations. Specifically, Section 6 addresses potential reverse causality and omitted variable bias using two sets of instruments for migration ; past migration stocks (as measured in 1960 and in 1990)

2. See appendix Annexe B.1 for a justification of this intuition.

as an internal instrument and an external - artefact economy- instrument inspired by Autor et al. [4]. Section 7 offers a series of robustness checks ; in particular it tests whether our results are sensitive to disaggregation between horizontal versus vertical FDI proxy by the low or high-income status of the FDI destination country, to the exclusion of outliers, to alternative measures of the migration stocks, and to narrowing the focus of observation at the sectoral level, using U.S. data for a large number of manufacturing industries. Finally, Section 8 concludes.

2. Theoretical framework

In this section, we decompose the effect of migration networks on firm's decision to serve the foreign market into its effect on the variable trade costs, the fixed cost to penetrate the foreign market, and the fixed cost to set up a subsidiary abroad. Our model builds heavily on Helpman, Melitz and Yeaple (2004) (henceforth HMY) and Helpman, Melitz and Rubinstein (2008) (henceforth HMR), which we extend to migration. We use this theoretical framework to derive a number of predictions with respect to the effect of migration on the ratio of sales by foreign subsidiaries relative to exports.

2.1. Basic setup

As in HMR, consider a world with J countries indexed by $j = 1, 2, ..., J$. Each country is assumed to consume and to produce a continuum of goods indexed by l. Country j's utility function is given by :

$$u_j = \left(\int_{i \in B_j} x_j^{\alpha}(l) dl \right)^{\frac{1}{\alpha}} \tag{1}$$

where B_j is the set of products available for consumption in country j. $x_j(l)$ denotes country j's consumption of product l. The parameter $0 < \alpha < 1$ determines the elasticity of substitution across products, which is $\epsilon = \frac{1}{1-\alpha} > 1$. This elasticity is the same in every country. Let Y_j be the income of country j, which is equal to its expenditure level. Then country j's demand for product l is :

$$x_j(l) = \frac{p_j(l)^{-\epsilon}}{P_j^{1-\epsilon}} Y_j \tag{2}$$

where $p_j(j)$ is the price of product l in country j and P_j is country j's ideal price index, given by :

$$P_j = \left(\int_{l \in B_j} p_j(l)^{1-\epsilon} dl \right)^{\frac{1}{(1-\epsilon)}} \tag{3}$$

It takes a units of a bundled good to produce one unit of differentiated good. The cost of one unit of the bundled good is c_j in country j. Each firm uses an expenditure-minimizing combination of inputs that costs $c_j a$. We suppose that every country has the same distribution of a, therefore a is only a measure of comparative cost across firms within a country. c_j is country specific, reflecting differences in factor prices across countries. Therefore, every firm in country j draws its production cost from the distribution $G(a)$. Note that since a is the unit cost, $1/a$ is a measure of the firm's productivity level.

Some of the products are produced domestically whereas others are produced in foreign countries. Each firm produces a distinct good, and firms in different countries produce different goods. Suppose country j has N_j firms, then the total number of differentiated products is given by $\sum_{j=1}^{J} N_j$.[3] Finally, there are additional costs associated with serving the foreign market : a fixed cost $c_j f_{ij}$ of obtaining the required exports permission and building up a sales network at destination, and a melting-iceberg transportation cost τ_{ij}. Here we choose to express the fixed cost in units of c_j. This choice is arbitrary but it does not affect the results since any other difference could be subsumed by a parameter f_{ij}. If the firm chooses to serve foreign markets through FDI, it will save on transportation costs but will produce in the foreign country and face the marginal production cost c_i (the productivity of the firm remains the same). Beyond the sales network cost $c_j f_{ij}$, the firm must also bear an additional cost of setting up a foreign subsidiary $c_j g_{ij}$. Therefore, the total fixed cost of FDI is given by $c_j(f_{ij} + g_{ij})$.

There is monopolistic competition in final products. The price charged to maximize profits by each firm is $\frac{c_j a}{\alpha}$ in the domestic market, $\frac{\tau_{ij} c_j a}{\alpha}$ in the foreign market in case of exports, and $\frac{c_i a}{\alpha}$ in the foreign market in case of FDI.

2.2. The proximity-concentration tradeoff

The profit from serving the domestic market is given by :

3. We follow Chaney [12] by assuming a fixed range of commodities. Since we do not impose free entry, firms make a positive profit that must be redistributed. This assumption simplifies the exposition of the model without having any particular implication on the conclusions.

$$\pi_{jj}^{D}(a) = (1-\alpha)\left(\frac{c_j a}{\alpha P_j}\right)^{1-\epsilon} Y_j > 0, \tag{4}$$

meaning that it is profitable for all existing firms to serve the domestic market. In addition, firms can also serve the foreign market, with the profit from exporting being given by :

$$\pi_{ij}^{X}(a) = (1-\alpha)\left(\frac{\tau_{ij} c_j a}{\alpha P_i}\right)^{1-\epsilon} Y_i - c_j f_{ij}, \tag{5}$$

Exporting to country $i \neq j$ is only profitable if $a \leq a_{ij}^{X}$, where a_{ij}^{X} is defined as the critical threshold for exporting (i.e., $\pi_{ij}^{X}\ (a_{ij}^{X}) = 0$) :

$$a_{ij}^{X} = \left(\frac{(1-\alpha)Y_i}{c_j f_{ij}}\right)^{\frac{1}{\epsilon-1}} \frac{\alpha P_i}{\tau_{ij} c_j}. \tag{6}$$

Alternatively, firms can serve the foreign market by building up a production subsidiary abroad, which would yield the following profits :

$$\pi_{ij}^{I}(a) = (1-\alpha)\left(\frac{c_i a}{\alpha P_i}\right)^{1-\epsilon} Y_i - c_j(f_{ij} + g_{ij}), \tag{7}$$

As Figure 1 shows, the critical threshold required for FDI to be more profitable than exporting, a_{ij}^{I}, is defined such that $\pi_{ij}^{X} = \pi_{ij}^{I}$:

$$a_{ij}^{I} = \left(\frac{(1-\alpha)Y_i}{c_j g_{ij}}\right)^{\frac{1}{\epsilon-1}} \frac{\alpha P_i}{\tau_{ij} c_j} \left(\left(\frac{\tau_{ij} c_j}{c_i}\right)^{\epsilon-1} - 1\right)^{\frac{1}{\epsilon-1}}. \tag{8}$$

Implicitly, this requires $\left(\frac{\tau_{ij} c_j}{c_i}\right)^{\epsilon-1} > 1$, that is, $\tau_{ij} c_j > c_i$. Intuitively, in order to make FDI more profitable than exporting, the variable cost of producing in the foreign country must be lower than the variable cost of exporting, given the higher fixed costs associated with FDI over exporting. Ensuring that $a_{ij}^{X} > a_{ij}^{I}$, that is, the most productive firms engage in FDI, the mid-range productivity firms engage in exporting, and the least productive firms only serve the domestic market (which is in line with the empirical evidence (see HMY)) requires that :

$$\frac{a_{ij}^{X}}{a_{ij}^{I}} = \frac{\left(\frac{(1-\alpha)Y_i}{c_j f_{ij}}\right)^{\frac{1}{\epsilon-1}} \frac{\alpha P_i}{\tau_{ij} c_j}}{\left(\frac{(1-\alpha)Y_i}{c_j g_{ij}}\right)^{\frac{1}{\epsilon-1}} \frac{\alpha P_i}{\tau_{ij} c_j} \left(\left(\frac{\tau_{ij} c_j}{c_i}\right)^{\epsilon-1} - 1\right)^{\frac{1}{\epsilon-1}}} = \frac{\left(\frac{g_{ij}}{f_{ij}}\right)^{\frac{1}{\epsilon-1}}}{\left(\left(\frac{\tau_{ij} c_j}{c_i}\right)^{\epsilon-1} - 1\right)^{\frac{1}{\epsilon-1}}} > 1.$$

This " strict sorting" assumption is equivalent to : $\frac{g_{ij}+f_{ij}}{f_{ij}} > \left(\frac{\tau_{ij}c_j}{c_i}\right)^{\epsilon-1} > 1$. The first term is the ratio of fixed costs for FDI to that of exporting. The second term is the ratio of the variable cost of trade to the variable cost of serving the market through FDI. The first inequality ensures that the productivity threshold for FDI is higher than that for trade. The second inequality ensures that the productivity threshold for FDI is positive. Different patterns of trade/FDI for each country pair could be observed. If we denote the cumulative distribution function G(a) with support [a_L,a_H] to describe the distribution of a across firms, then the above condition implies that $a_H > a_{ij}^X > a_{ij}^I > a_L$.

Similarly to HMY, we can draw a graph illustrating the relationships between firms' decisions and productivity displaying the relevant productivity thresholds. [4]

FIGURE 1: Exports v. FDI for global firms

[domain=0 :5]
[->] (-0.2,0) – (6,0) node[right] $a^{1-\epsilon}$; (2,0) node[anchor=north] $(a_{ij}^X)^{1-\epsilon}$ (4,0)
node[anchor=north] $(a_{ij}^I)^{1-\epsilon}$; [->] (0,-1.6) – (0,2.5) node[left] π_{ij} ; (0,-0.5) node[anchor=east]
$c_i f_{ij}$ (0,-1.5) node[anchor=east] $c_i(f_{ij}+g_{ij})$; [dashed] (4,0) – (4,0.5) ; plot (,0.5*) node[right]
π_{ij}^D ; plot (,0.25*-0.5) node[below] π_{ij}^X ; plot (,0.5*-1.5) node[right] π_{ij}^I ;

We now focus on those country pairs that have both positive trade and positive FDI. Suppose that the cumulative distribution $G(a)$ is a Pareto distribution with power k and support [0,1]. [5] As in HMY, we assume that $k > \epsilon - 1$ to ensure that both the distribution of costs/productivity draws and the distribution of firms' sales have finite variances. Then $G(a) = a^k$. The export sales of country j to country i are given by :

$$S_{ij}^X = \int_{a_{ij}^I}^{a_{ij}^X} \left(\frac{\tau_{ij}c_j a}{\alpha P_i}\right)^{1-\epsilon} Y_i N_j dG(a) = kY_i N_j \left(\frac{\tau_{ij}c_j}{\alpha P_i}\right)^{1-\epsilon} \int_{a_{ij}^I}^{a_{ij}^X} a^{k-\epsilon} da \tag{9}$$

The FDI-related sales from country j to country i are given by :

$$S_{ij}^I = \int_0^{a_{ij}^I} \left(\frac{c_i a}{\alpha P_i}\right)^{1-\epsilon} Y_i N_j dG(a) = kY_i N_j \left(\frac{c_i}{\alpha P_i}\right)^{1-\epsilon} \int_0^{a_{ij}^I} a^{k-\epsilon} da \tag{10}$$

4. Countries are assumed to be symmetric in Figure 1.

5. Recall that the inverse of a represents the firm's productivity level. The Pareto distribution has been found to provide a reasonable approximation of the observed distribution of firms' size. Moreover, it has attractive properties such as remaining Pareto when truncated from below (Melitz and Redding [30]).

$$\text{where} \quad a_{ij}^X = \left(\frac{(1-\alpha)Y_i}{c_j f_{ij}}\right)^{\frac{1}{\epsilon-1}} \frac{\alpha P_i}{\tau_{ij} c_j},$$
$$a_{ij}^I = \left(\frac{(1-\alpha)Y_i}{c_j g_{ij}}\right)^{\frac{1}{\epsilon-1}} \frac{\alpha P_i}{\tau_{ij} c_j} \left(\left(\frac{\tau_{ij} c_j}{c_i}\right)^{\epsilon-1} - 1\right)^{\frac{1}{\epsilon-1}}$$

Finally, the ratio of export to FDI-sales is :

$$\frac{S_{ij}^X}{S_{ij}^I} = \left(\frac{c_i}{\tau_{ij} c_j}\right)^{\epsilon-1} \frac{\int_{a_{ij}^I}^{a_{ij}^X} a^{k-\epsilon} da}{\int_0^{a_{ij}^I} a^{k-\epsilon} da}$$
$$= \left(\frac{c_i}{\tau_{ij} c_j}\right)^{\epsilon-1} \left[\left(\frac{a_{ij}^X}{a_{ij}^I}\right)^{k-\epsilon+1} - 1\right] \tag{11}$$

2.3. The role of migration networks

The available evidence suggests that migration networks reduce bilateral transaction costs by conveying information on export and investment opportunities, thereby stimulating exports and FDI. The presence of migrants is likely to alter the decision to start exporting or forming a subsidiary abroad. Indeed, migration networks facilitate the penetration into a foreign market by providing business links or by simplifying administrative burdens, thereby reducing the fixed costs, f_{ij} and g_{ij}. Therefore, the collection of this information might encourage more firms to start either to export or to set up a subsidiary abroad, increasing the number of firms selling in the foreign market. Migration networks can also affect the volume sold abroad by firms already present in the foreign market by decreasing the variable trade cost, τ_{ij}.

To the best of our knowledge, no analysis has integrated these two types of costs in a single model to investigate whether migration networks affect firms' choices of entry mode to penetrate foreign markets.

We follow the economics literature on diaspora networks (Munshi03, McKenzie and Rapoport 2010 and Beine, Ozden and Docquier (2011)) in assuming that informational costs negatively depend on the size of the diaspora.[6] As in Combes et al. [13] and Felbermayr and Toubal [18], we define transaction costs as a function of migration. More specifically, we assume that the variable cost of exporting from country j to country i is composed of two elements : physical transport costs τ_{ij}^o, and information costs captured in inf_{ij} :

6. See Docquier and Rapoport [17], section 4.5, for a discussion as to whether the size or the intensity (i.e., in terms of emigration rates) matter.

$$\tau_{ij} = \tau_{ij}^{o} inf_{ij} t_i^{\phi_{i,\tau}} t_j^{\phi_{j,\tau}} > 1;$$

where t_i and t_j are defined by Felbermayr and Toubal [18] as multilateral components of trade costs. These factors reflect "potential advantages" of a country towards all its trading partners such as having larger airports or being an English-speaking country. The information cost is defined as :

$$inf_{ij} = \frac{e_{ij}}{M_{ji}^{\delta_\tau}}.$$

where e_{ij} is capturing the extent of information costs. An increase in the stock of migrants in country j from country i reduces the variable costs for firms located in country j to export to country i.

Turning to fixed costs, we represent both the sales network cost, f_{ij}, and the cost of building a subsidiary in country i, g_{ij}, as follows :

$$f_{ij} = \frac{ef_{ij}^{o} t_i^{\phi_{i,f}} t_j^{\phi_{j,f}}}{M_{ji}^{\delta_f}}; \qquad g_{ij} = \frac{eg_{ij}^{o} t_i^{\phi_{i,g}} t_j^{\phi_{j,g}}}{M_{ji}^{\delta_g}}.$$

For the sake of simplicity, we assume that $t_i^{\phi_{i,h}} t_j^{\phi_{j,h}} = 1$ in the rest of this section (an assumption that is relaxed in the empirical analysis).

The relative changes of each cost with respect to migration are then defined as

$$\frac{d\tau_{ij}}{\tau_{ij}} = -\delta_\tau \frac{dM_{ji}}{M_{ji}}; \qquad \frac{df_{ij}}{f_{ij}} = -\delta_f \frac{dM_{ji}}{M_{ji}}; \qquad \frac{dg_{ij}}{g_{ij}} = -\delta_g \frac{dM_{ji}}{M_{ji}}. \tag{12}$$

We do not presuppose any restriction on δ_τ, δ_f and δ_g. Eq. 9, eq. 10 and eq. 11 can then be rewritten as a function of the size of the bilateral migration network :

$$S_{ij}^{X} = \frac{kY_i N_j}{k-\epsilon+1} \left(\frac{\tau_{ij}(M_{ji}) c_j}{\alpha P_i} \right)^{1-\epsilon} \left[\left(a_{ij}^{X}(M_{ji}) \right)^{k-\epsilon+1} - \left(a_{ij}^{I}(M_{ji}) \right)^{k-\epsilon+1} \right] \tag{13}$$

$$S_{ij}^{I} = kY_i N_j \left(\frac{c_i}{\alpha P_i} \right)^{1-\epsilon} \left[\frac{\left(a_{ij}^{I}(M_{ji}) \right)^{k-\epsilon+1}}{k-\epsilon+1} \right] \tag{14}$$

$$\frac{S_{ij}^{X}}{S_{ij}^{I}} = \left(\frac{c_i}{\tau_{ij}(M_{ji}) c_j} \right)^{\epsilon-1} \left[\left(\frac{a_{ij}^{X}(M_{ji})}{a_{ij}^{I}(M_{ji})} \right)^{k-\epsilon+1} - 1 \right] \tag{15}$$

How will migration affect the extent of exports and of affiliates'sales at different margins ? Intuitively, the answer is ambiguous as it will depend on whether the information effect of migration will fall mostly on the variable transportation costs or on the fixed costs of doing FDI/exports. This is started formally in the following two lemmas :

.

Lemma 1 (FDI-related sales from j to i). *The total derivative of FDI-related sales from country j to country i with respect to a change in the stock of migrants between these two countries is given by :*

$$\frac{dS_{ij}^I}{S_{ij}^I} = (k-\epsilon+1)\left[\frac{\delta_g}{\epsilon-1} - \left(\left(\frac{\tau_{ij}c_j}{c_i}\right)^{\epsilon-1} - 1\right)^{-1}\delta_\tau\right]\frac{dM_{ji}}{M_{ji}} \tag{16}$$

Therefore, the change in FDI-related sales will be positive with respect to migration if the change in the fixed cost of building a subsidiary, g_{ij}, is large enough relative to the change of the variable cost, τ_{ij}. Indeed,

$$\frac{dS_{ij}^I}{S_{ij}^I} > 0 \qquad \text{if} \qquad \frac{\delta_g}{\epsilon-1} > \left(\left(\frac{\tau_{ij}c_j}{c_i}\right)^{\epsilon-1} - 1\right)^{-1}\delta_\tau \tag{17}$$

See Appendix Annexe C.1

Lemma 2 (Exports from j to i). *The total derivative of exports from country j to country i with respect to a change in the stock of migrants from i to j is given by :*

$$\begin{aligned}\frac{dS_{ij}^X}{S_{ij}^X} &= \left((\epsilon-1) + (k-\epsilon+1)\frac{\lambda^X}{\lambda^I}\frac{S_{ij}^I}{S_{ij}^X}\left[\left(\frac{\lambda^I}{\lambda^X}\right) - 1\right]^{-1}\right)\delta_\tau\frac{dM_{ji}}{M_{ji}} \\ &+ \left(\frac{(k-\epsilon+1)}{(\epsilon-1)}\left(1 + \frac{\lambda^X}{\lambda^I}\frac{S_{ij}^I}{S_{ij}^X}\right)((\epsilon-1)\delta_\tau + \delta_f - \delta_g)\right)\frac{dM_{ji}}{M_{jir}}\end{aligned} \tag{18}$$

where $\frac{\lambda^X}{\lambda^I} = \left(\frac{\tau_{ij}c_j}{c_i}\right)^{1-\epsilon}$.

The first term on the RHS is always positive due to the assumption of strict sorting defined in eq. 9. However, the sign of the total derivative, $\frac{dS_{ij}^X}{S_{ij}^X}$, is ambiguous due to the effect of migration networks on the extensive margin captured in the second term of the RHS of eq. 19.

See Appendix Annexe C.2

Note that the three types of costs affect the bilateral volume of trade. A decrease in trade costs, δ_τ, and in the fixed cost of penetrating the foreign market, δ_f, induces new exporters with relatively

low productivity to start exporting while at the same time a fall in the fixed cost of setting up a subsidiary, δ_g, drives the most productive exporters towards FDI. The two levels of decision explain why the effect of a change in transaction costs is ambiguous. This ambiguity has not been taken into account in the existing literature that has assessed the relationship between migration and trade and migration and FDI separately. Note also that the size of the effect of migration networks on the volume of exports depends on the ratio $\frac{S_{ij}^I}{S_{ij}^X}$. Therefore, two countries receiving the same stock of migrants from country i will face different relative changes in the volume of FDI-related sales and of exports depending on the initial ratio of FDI- to export-related sales.

From Lemma 1 and Lemma 2, we can compare the relative total change in FDI-related sales to the relative changes in exports to understand how the proximity-concentration tradeoff is affected by migration.

Proposition 1. *The ratio of FDI to export* $\frac{S_{ij}^I}{S_{ij}^X}$ *increases with the size of migration networks if*

$$\left[\frac{\delta_g}{\epsilon-1}-\left(\left(\frac{\tau_{ij}c_j}{c_i}\right)^{\epsilon-1}-1\right)^{-1}\delta_\tau\right] > \left(\frac{(\epsilon-1)}{(k-\epsilon+1)}+\frac{\lambda^X}{\lambda^I}\frac{S_{ij}^I}{S_{ij}^X}\left[\left(\frac{\lambda^I}{\lambda^X}\right)-1\right]^{-1}\right)\delta_\tau \quad (19)$$
$$+\left((\epsilon-1)\left(1+\frac{\lambda^X}{\lambda^I}\frac{S_{ij}^I}{S_{ij}^X}\right)((\epsilon-1)\delta_\tau+\delta_f-\delta_g)\right)$$

Corollary 1.1. (Extensive margin) Assuming no effect on the variable cost, τ_{ij}, the ratio of FDI-related sales to exports increases with a symmetrical decrease in the fixed costs for penetrating the foreign market, f_{ij} and for setting up a subsidiary abroad, g_{ij}.

$$\text{If} \quad \delta_\tau=0, \delta_f=\delta_g=\delta, \text{ then} \quad \frac{dS_{ij}^I}{S_{ij}^I}=\frac{\delta}{\epsilon-1}>0=\frac{dS_{ij}^X}{S_{ij}^X}$$

This result is driven by a change along the extensive margin only. Figure 2 intuitively shows the change in the volume of exports and of FDI-related sales along the change in the proportion of firms serving the foreign market by each mode of entry. A decrease of both fixed costs by δ reduces the productivity thresholds of exports $\frac{1}{a_{ij}^X}$ (due to the fall of f_{ij}) and FDI $\frac{1}{a_{ij}^I}$ (due to the fall of f_{ij}+g_{ij}) to their new positions (to the left). Note that since a_{ij}^I>a_{ij}^X, $\frac{1}{a^I}$ moves to the left more than $\frac{1}{a_{ij}^X}$.

. Note also that the proportional change in the two fixed costs does not affect the volume of exports. Indeed, the aggregate volume of exports from the new entrants exactly compensates the

volume of former exporters that shift from exports to FDI. This can be seen from eq. 19 for δ_τ=0 and δ_f=δ_g=δ.

FIGURE 2: The effect of migration on the extensive margin : exports v FDI

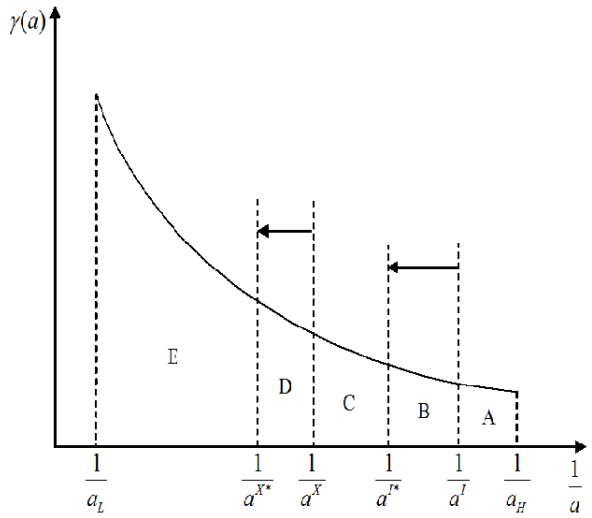

Figure 2 illustrate corollary 1.1. As can be seen, before the decrease, the share of firms doing FDI is given by the area **A** and the share of those doing exports by the area **B**+**C**. After a proportional decrease in the two fixed costs, these shares respectively become **A**+**B** and **C**+**D**. Therefore, the ratio of the number of firms doing FDI v. exports is given by :
Before the decrease : $R_{ix} = \frac{Area(A)}{Area(B)+Area(C)} = \frac{A}{B+C}$
After the decrease : $R^*_{ix} = \frac{Area(A)+Area(B)}{Area(C)+Area(D)} = \frac{A+B}{C+D}$

$$R^*_{ix} - R_{ix} = \frac{A+B}{C+D} - \frac{A}{B+C} = \frac{A(B-D)+BB}{(C+D)(B+C)}$$

Given that as per corollary 1.1, **B-D**=0, then, $R^*_{ix} - R_{ix}$>0 if δ_{tau}=0 and δ_f=δ_g=δ.

COROLLARY 1.2. (Ratio of FDI-sales to exports) The ratio FDI-sales to exports increases when migration affects the variable cost and symmetrically both fixed costs (i.e. $\delta_f = \delta_g = \delta$ and $\delta_\tau > 0$) if the following condition holds

$$\frac{\frac{dS^I_{ij}}{dS^X_{ij}}}{\frac{S^X}{S^I}} > 1 \quad \text{if} \quad \frac{\delta}{\delta_\tau} > \frac{(\epsilon-1)^2}{(k-\epsilon+1)} + (\epsilon-1)\left(\frac{\lambda^X}{\lambda^I}\frac{S^I_{ij}}{S^X_{ij}}+1\right)\left(\left[\left(\frac{\lambda^I}{\lambda^X}\right)-1\right]^{-1}+1\right)$$

The above condition depends on the initial ratio of FDI-related sales to exports. The larger the

initial ratio, the less likely it is that the condition holds.

2.4. Summary and testable implications

The above model decomposes the effect of migration networks on the proximity-concentration tradeoff (i.e., on firms choice of entry mode to penetrate foreign markets). This follows from the recent literature showing that migration networks affect not only the variable costs of exporting but also the fixed costs to penetrate foreign markets. However, a general framework does not lead to an unambiguous proposition. Therefore, an empirical analysis is unavoidable to understand through which channel migration network affects the mode of entry into foreign markets.

The model allows us to derive a number of testable implications on the relationship between migration networks, trade and FDI :

- The size of the effect of migration networks on the volume of exports depends on the initial ratio $\frac{S_{ij}^I}{S_{ij}^X}$. The larger this initial ratio, the more likely it is that an increase in migration networks will lead to an increase in the volume of exports.
- An increase in migration networks increases the volume of FDI-related sales if the induced change in the fixed cost of building a subsidiary abroad, g_{ij} by the migration networks is large enough relative to the change in the variable cost, τ_{ij}.
- Assuming no effect on the variable cost, τ_{ij}, the ratio of FDI-sales to exports increases with a migration-induced symmetrical decrease in the fixed costs f_{ij} and g_{ij} ; moreover, this leaves the volume of exports unchanged.
- Relaxing the previous assumption, the ratio of FDI-sales to exports increases if i. the symmetric effect of migration on both fixed costs, δ, is larger than its effect on the variable cost, δ_τ and ii. the initial ratio of FDI-sales to exports is low enough.

The data limitations and the large number of exogenous parameters affecting our conclusion precludes any structural estimation of those predictions. However, following HMR, we are able to derive a reduced form specification correcting for omitted variable and censoring biases.

3. Data

3.1. Bilateral trade data

The bilateral trade flows are from the CEPII gravity data set. There are 203 country covered over the period 2001-2006. All countries are identified by their ISO3 codes. Other trade-related data taken from this data set include indicators for using the same currency (or belonging to

a currency union), existence of regional trade agreement (free trade agreement), and sharing a common legal system.

We expanded the data set to cover all the pairs between the 203 countries, and assumed zero trade flows if they were missing. In our analysis, the trade data are built by taking the average of the six years'trade flows from 2001 to 2006. The original data used current dollars as units, therefore we used the US CPI-US data to deflate them before taking the average. [7]

3.2. Sectoral trade data

We focus our sectoral analysis on the U.S. because it is one of the few countries that collect data on multinational affiliates sales disaggregated by destination and sector. The trade data disaggregated by NAICS sectors are from Schott [37] and use the concordances from Pierce and Schott [34] to assign exports by NAICS industry. The dataset covers the period 1989-2005. Therefore, we calculate the average of five years trade flows from 2001 to 2005. The original data used US current million dollars as unit, therefore we used the US CPI-US data to deflate them before taking the average. Our sample covers 132 U.S.-FDI receiving countries and 77 manufacturing industries.

3.3. Bilateral FDI data

The bilateral FDI positions (accumulated FDI) are from the OECD International Direct Investment Statistics. It provides foreign direct investment records for inflows from all countries to the OECD countries and outflows from the OECD countries to all countries. These records come from each member country. It is possible that country A keeps a record of inflow from country B, and country B keeps a record of outflow from country A. These two records do not need to be equal. The dataset covers the period from 1990 to 2010. In order to fully utilize the FDI dataset, we combine the inflow and outflow dataset into one dataset. In the cases where both inflow and outflow source data are available, we take the outflow source data in our combined dataset. As a result, our dataset covers all the country pairs with at least one of the two countries belonging to the OECD. [8]

In our analysis, the FDI data are calculated by taking the average of six years FDI positions between 2001 and 2006. The original data used current US million dollars as unit. In order to

7. The dataset is available at http://www.cepii.fr/anglaisgraph/bdd/gravity/col_regfile09.zip. A description of the data set can be found on the CEPII website at http://www.cepii.fr/anglaisgraph/bdd/gravity.htm.

8. The dataset is available at OECD ilibrary http://www.oecd-ilibrary.org.

alleviate investment positions' change due to price changes, stock market volatility or distortion due to fiscal evasion, we deflate the FDI position by the market capitalization index, MSCI ACWI Index before taking the average.[9] For certain countries, the earliest available data in the series are later than 2001. In these cases we start from the earliest data-available date of the period 2001-2006, and take the average of the following years. For example, Estonia has FDI outflow data only starting from the year 2003. In this case, we took the average of 2003-2006 deflated FDI for Estonia, instead of taking the average of 2001-2006 by assuming zero-value observations in 2001 and 2002. In our study, negative FDI are treated as zero.[10]

The ratio of FDI to trade is directly computed by dividing FDI by trade. The ratio of two aggregate variables captures some information. This is why we shortly summarize the main patterns of this ratio and we develop a comprehensive sensitivity analysis in section 7. In our probit analysis, zero ratio is considered equivalent to zero FDI. First, we notice that the strict sorting assumption in our model is observed in our sample. In other words, we do not observe positive trade values when there is no FDI for a particular bilateral pair while the contrary is quite common. Second, trade and FDI are positively correlated (0.71). This complementarity relationship means that our estimate captures a lower bound. Moreover, we should highlight that the largest values of the ratio are partly driven by small values of trade. Third, 65.14% of the observations concerning the ratio are nil and 2% of the sample is made up of negative values, something that will be addressed below. 94% of those negative values are between zero and minus one half and are then very close to zero. The largest negative values (and 20 % of the negative values) concern pairs with Ireland as the host economy. Finally, notice that 84 % of the positive values for the ratio are found between high-income economies, confirming the predominance of horizontal FDI, as discussed in more details in section 7.

3.4. Sectoral FDI data

We collect affiliate sales from the Bureau of Economic Analysis (BEA). From 1999, the industries are classified based on the North American Industry Classification System (NAICS), the industry classification system of the United States. We focus on manufacturing industries and we aggregate the firm level multinational sales at the 4-digit NAICS level to have fewer missing values and to make our FDI data comparable to the data for exports. Our sample covers 132 countries and 77

9. The MSCI ACWI index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed and emerging markets. The MSCI ACWI consists of 45 country indices comprising 24 developed and 21 emerging market country indices.

10. This assumption of equivalence between zero and negative values is relaxed in section 7.

manufacturing industries. Contrary to the country data, we take the average of five year's FDI sales between 2001 and 2005. The latter being the last year for which we have data on exports. The original data used current US dollar million as unit, therefore we used the US CPI-US data to deflate it before taking the average.

3.5. Migration data

We use the Artuc et al. [3] dataset, the last extension of the Docquier and Marfouk [16] dataset, which includes bilateral data on migration by country of birth, skill category (skilled v. unskilled, the former having college education) and gender for 195 sending/receiving countries in 1990 and 2000. The main additional novelty is that the dataset now captures South-South migration based mainly on observations and occasionally on estimated data points (for the skill structure). n our sensitivity analysis in our section 7.5 (REF)below, we restrict the analysis to observations only.

3.6. Other data

The geographic data is from the CEPII Distances data set. [11] The bilateral variables available include : indicators of common border, common official language, "colonial relationship between the countries for a relatively long period of time", geographic distance, and "landlocked status of either or both countries". [12]

In our analysis, several different Doing Business Indicators (compiled by the World Bank) were used as exclusion restriction variables in our 2-stage regressions. [13] These indicators include : time (days) to register a property, and the minimum capital that must be paid (as a percentage of GDP) in order to start a business. We build the indicators from the original doing business dataset by translating them into dummy variables. For example, we will assign the value "1" to the "time to register a property" indicator to a given country-pair if the sum of the number of days in the sending and receiving countries is above each cross-country mean. We also use the minimum capital that must be paid to start a business. We will assign the value "1" to a given country-pair if the minimum capital that must be paid to start a business in both countries is above each cross-country mean.

At the sectoral level, we can better capture a measure of trade cost that affects the proximity-concentration tradeoff. We follow Bernard et al. [6] to define our trade costs variables. We define

11. There are two datasets : the country-level file $geo_cepii.dta$ and the bilateral-level file $distance_cepii.dta$.
12. The dataset is available at http://www.cepii.fr/anglaisgraph/bdd/distances.htm.
13. The "doing business" data is available at http://www.doingbusiness.org.

them in each industry s in year t as the ad valorem duty rate and ad valorem freight and insurance rates. Using the data from Schott [37] and Bernard et al. [6], we compute the ad valorem duty rate as the ratio of the duties collected on the imports to the United States to FOB imports while the ad valorem freight rate is defined as the ratio of CIF imports on the FOB ones. We then take their average of five years.[14]

We compute the within-industry heterogeneity from the size distribution of firms. We follow HMY by assuming that the stochastic process that determines firms'productivity levels is Pareto, with the shape of the distribution varying across industries. We can then measure the dispersion by taking the standard deviation of the logarithm of firms' sales. We use the publicly available data from the 2002 U.S. Census of Manufacturing. The data are aggregated into 10 different size categories. We compute the standard deviation of log sales by assuming that all establishments falling in the same size category have a logarithm of sales that equals to the mean of this category. We then calculate the standard deviation of the logarithm of sales using the number of establishments in each size category as weights.

Finally, we also follow HMY for computing the fixed cost of setting up a subsidiary. We assume that it is defined as the cost of maintaining additional capacity. We measure it as the logarithm of the average number of non-production workers per establishment in each sector as reported in the 2002 U.S. Census of Manufacturing.

4. Empirical methodology

The model described in section 2 extends the HMR framework in two dimensions. First, we introduce migration as a determinant of trade flows. Second, we consider the determination of FDI flows in addition to trade flows. Our framework delivers testable implications as to how variations in migration induce changes in exports and FDI sales controlling for sample selection and firm's heterogeneity.

4.1. The HMR framework

HMR show that the omission of the within-sector productivity dispersion results into inconsistent estimates for trade barriers because the estimation would confound the effects of trade costs on firm-level foreign sales with its effect on the proportion of exporting firms. We expect that the

14. CIF stands for "cost, insurance and freight". CIF imports include trade costs while FOB stands for "free on board". The FOB price is the one charged by the exporter excluding trade costs.

traditional analysis of a reduced-form regressing migration on FDI to trade faces the same type of omitted variable bias aside the endogeneity present when estimating such a relationship. The correction of this potential self-selection bias when assessing the relationship between migration and FDI-related sales in a gravity-type equation is, according to us, particularly relevant given the recent growth of FDI to and between developing countries as well as the spread of international migration across the globe. We expect the extension of the analysis to smaller countries to increase the likelihood of facing this firms'self-selection bias. Indeed, Ottaviano and Mayer [32] show that the adjustment along the extensive margin depends on the productivity dispersion within sectors which varies across industries and countries. [15] We suspect that smaller countries face a larger productivity dispersion ; if this is the case, the adjustment of aggregate exports and FDI-related sales to a decrease in transaction barriers should be driven mostly by the extensive margin. [16]

Moreover, HMR's generalized gravity equation also prevents another selection bias, namely, the exclusion of zero bilateral sales due to the logarithmic functional form. This bias might be important when extending the analysis to a larger and more diverse set of countries. Indeed, smaller countries are more likely to have fewer strictly positive levels of FDI, creating a concern about censoring that our empirical strategy can solve. The latter enables to correct for these biases without requiring firm-level data which are missing for a large number of countries.

In Appendix Annexe D, we first replicate HMR(2008)'s results using more recent trade data (for the period 2000-2006) and then augment their model for migration. We also extend their framework to FDI ; that is we look at trade and FDI separately. In Table D.19 and Table D.21, we obtain an elasticity of trade to migration of about 10%, not significantly different for skilled and unskilled migrants. This is consistent with results from previous studies focusing on the migration and trade relationship. In Table D.20 and Table D.22, we obtain an elasticity of FDI to migration around 17.6%, significantly higher for skilled migrants. Again, this is consistent with results from previous studies that have focused on the migration and FDI relationship. However, as explained, such specifications generate biased estimates. We therefore focus in the following section on the specification derived in our theoretical section that looks at migration and trade/FDI jointly.

15. The extensive margin is defined here as the number of exporters when speaking about trade and number of foreign affiliates when speaking about FDI.

16. See appendix Annexe B.1 for a justification of this intuition.

4.2. An augmented HMR framework with migration and FDI

We augment HMR's model with the bilateral stock of migrants between countries i and j as a measure of the size of the migration network. We then analyze how the size of the network affects the ratio of FDI to trade assuming that more migrants induce a larger network, which leads to a larger decrease in transaction costs. We log-linearize eq. 15 in order to assess Proposition 1.

$$s_{ij}^I - s_{ij}^X = \beta_0 + \theta_j + \theta_i - \lambda_d d_{ij} + \gamma_m m_{ji} + \delta^I \omega_{ij} + u_{ij} \tag{20}$$

The LHS is the logarithm of the relative sales sold from country j to country i. The first term on the RHS is a constant. The second and third terms are buying country and selling country fixed effects, respectively. [17] The variable m_{ji} is the logarithm of the migration from country i to country j reflecting the role of migration from the buying country to the selling country in reducing the transaction costs for sellers. [18]

The variable d_{ij} is a generic representation of distance including standard bilateral variables commonly included in gravity equation estimation which affect the volume of firm-level exports, such as geographic distance, common border, colonial ties, common language and same legal system. As HMR, we assume that the variable trade costs are stochastic due to i.i.d unmeasured trade frictions u_{ij} which are country pair-specific. Therefore, while d_{ij} captures observable variable trade costs, u_{ij} reflects the non-observables variable trade costs and is such that $u_{ij} \backsim \mathrm{N}(0,\sigma_u^2)$.

The variable ω_{ij} corresponds to the logarithm of the second term on the RHS in eq. 15 and is defined as $\log \left[\left(\frac{a_{ij}^X(M_{ji})}{a_{ij}^I(M_{ji})} \right)^{k-\epsilon+1} - 1 \right]$ for countries having at least one firm setting up a subsidiary abroad. $exp(\omega_{ij})$ is a monotonic function of the proportion of firms (possibly zero) from country j setting up a subsidiary in country i relative to the share of firms exporting. In other words, this term captures what is commonly named the extensive margin. It derives from the decision of the marginal firm to either export or to set up a subsidiary. We remember that the framework described in section 2 allows firm's heterogeneity in productivity. Therefore, we model

17. More precisely, following HMR(2008) and their assumption of a Pareto distribution with parameter k for the cumulative distribution of productivity G(a), we have $\theta_i{=}(\epsilon-1)log(c_i))$ and $\theta_j{=}(1-\epsilon)log(c_j)$.

18. We analyze then how the size of the network affects the decision of the channel to serve the foreign market assuming that more migrants induce a larger network which leads to a larger decrease in the fixed costs. Moreover, the use of the country fixed effect enables to also assess the effect of the proportion of migrants in the destination country on the channel through which firms prefer to serve the foreign market.

firm's decision to either penetrate the foreign market or not. However, given the strict sorting assumption and the fact that the characteristics of the marginal exporters can be identified from the variation in features of the destination countries and of observable bilateral costs, we can compute aggregate variables such as the proportion of firm that penetrates the foreign market. This variable characterizes the main difference with traditional estimation and aims to correct the potential omitted variable bias usually present in the estimation of the standard gravity equation.

Note that we need FDI-related sales to build the ratio. However, there is no cross-country bilateral data on the sales of foreign subsidiaries. In our empirical application, we therefore use FDI data to proxy for FDI-related sales. In appendix Annexe A, we validate this procedure by showing that for the only country for which we have sectoral bilateral data on FDI and FDI-related sales, namely, the U.S., there is a clear linear relationship between the two.

4.3. Accounting for firm selection

The estimation of the log-linearized form of eq. 15 requires information on a_{ij}^X and a_{ij}^I (i.e., on the productivity distribution) in order to define ω_{ij}. Those data are unavailable given our global analysis.

We follow HMR who proposes a two-step estimation strategy that we borrow. In HMR's procedure, the first-stage consists of estimating a probit equation that specifies the probability that the most productive firms in country j export to country i. We adapt their procedure to our new environment (i.e. including migration, trade and FDI together). In our framework, firms face two types of decision contrary to HMR's analysis. First, firms must decide if they penetrate the foreign market or not (i.e., $\pi_{ij}^X = 0$). If they do, they must decide how to serve the foreign market. The biases generated by the underlying unobserved firm-level heterogeneity (i.e., the omission of ω_{ij} in eq. 15) concerns the second type of decision(i.e., $\pi_{ij}^X = \pi_{ij}^I$). Notice that contrary to HMR, our equation aims to disentangle the effect of migration on the fixed cost to start setting up a subsidiary abroad from the one on the volume sold by incumbents. Our question is then whether the migration networks expansion increases the number of firms setting up a subsidiary abroad to the detriment of exports, or whether it increases more the volume of investment relative to the volume of exports for the incumbents. In order to capture firm's decision on how to serve the market and not the decision to penetrate the foreign market, we only consider firms already in the foreign market when predicting the proportion of firms investing abroad. In other words, we compute ω_{ij} from a sample only including country pairs that have positive trade flows. Therefore,

we do not capture the decision to penetrate the foreign market. To do so, as HMR, we define a latent variable,Z_{ij}, to approximate ω_{ij} :

$$Z_{ij} = exp(\omega_{ij})^{k-\epsilon+1} = E_0 \xi_i \xi_j^X (D_{ij}(M_{ji}))^{\lambda_d} (\Omega(M_{ji}))^{\kappa} e^{(u_{ij}+v_{ij})} \tag{21}$$

where E_0 is a constant, ξ_i and ξ_j are selling country and buying country fixed effects, $\Omega(M_{ji})$ captures the country-pair fixed costs to penetrate the foreign market and $v_{ij} \backsim N(0, \sigma_u^2)$. Finally, κ is a parameter. Z_{ij} captures the decision of the most productive firm in country j to set up a subsidiary instead of exporting. Given the strict sorting assumption, once we identify the decision to either export or setting up a firm abroad, we can derive the proportion of firm investing abroad relative to the proportion of firms exporting.

Positive ratio is observed between i and j if and only if $Z_{ij} > 1$. Although Z_{ij} is unobserved, positive ratio is observed when $Z_{ij} > 1$. [19]

We define the indicator variable T_{ij}=1 if the most productive firm in country i decides to invest in country j instead of exporting (i.e., the ratio is then positive). Let ρ_{ij} be the probability of a positive ratio. We specify the following probit equation :

$$\begin{aligned} \rho_{ij}^{ratio} &= Pr(T_{ij}^{ratio} = 1 | \text{observed variables}) \\ &= \Phi(\gamma_0 + \chi_i + \chi_j - \gamma_d d_{ij} + \gamma_m m_{ji} + \gamma_f \phi + \eta_{ij}) \end{aligned} \tag{22}$$

where the first term on the RHS is a constant. The second and third terms are selling country and buying country fixed effects respectively. As above, the term d_{ij} is a generic representation of distance. The variable m_{ij} is the logarithm of the stock of migrants from country j to country i capturing the effect of migration networks on the decision for the most productive firm to penetrate the foreign market or not. As defined in HMR, ϕ_{ij} is "an observed measure of any additional country-pair specific fixed trade costs". Finally, $\Phi(:)$ is defined by the cumulative distribution function of the unit normal distribution. Following HMR, we estimate eq. 23 to derive a consistent estimate of Z_{ij}, $exp(\Phi^{-1}(\hat{\rho_{ij}^{ratio}}))$. Once we have Z_{ij}, we can approximate ω_{ij} and estimate eq. 20. This empirical strategy enables to assess whether migration affects the aggregate trade volume or the FDI-related sales through the fraction of firms investing abroad (γ_m in eq. 23), through the volume of sales sold in country j (β_m in eq. 20) or through both. By controlling the proportion effect, we are then able to assess how migration affects the relative

19. Given our assumption as well as observations by Helpman et al. [23] and Ottaviano and Mayer [32] of strict sorting, the only condition to be assessed is whether the most productive firm has a productivity larger than the threshold required to cover the fixed cost for investing abroad.

volume of sales from affiliates by incumbents in the foreign markets. The level of aggregation of our data only enables us to define broadly the concept of the extensive margin. Indeed, we assess the minimum stock of migrants necessary to decrease the fixed cost to lead the most productive firm to set up a subsidiary abroad. The aggregated analysis enables to have a better knowledge of the effect of migration network on trade and FDI for an extensive dataset. Given the absence of required data for a large number of countries, it is important to be able to correctly estimate an approximation of the effect as we do here.

Silva and Tenreyro [38] discuss the conditions under which the approximation made by HMY work better. The authors show that the approximation used by HMR of the number of firms by the latent variable "z" is likely to be reasonably accurate for the positive values of S_{ij}^X, the export sales of country j, that are associated with large values of z. In our sample, this is the case for z, large value of Z are associated with large value of volume of exports, S_{ij}^X. The average of z is positive (1.73) and 25% of values of z are larger than 3 (maximum value of z being 5.29). The largest value of S_{ij}^I are also associated with the large value of z. However, the value of FDI are much smaller than the value of trade and the distribution of the variable z is more dispersed for the distribution of FDI across countries. Indeed, the maximum value of trade (95885) is 170 times larger than the largest value of FDI (563) in the sample. if the maximum value is also 5.29, the median value is -0.93. 25% of the distribution of z is above 3 in the case of firms exporting while less than 10% of the distribution of z is above 3 in the case of affiliates. We will discuss further the distribution of FDI across countries that may explain the results we find below.

4.4. Accounting for sample selection

The methodology described above only allows to correct for the bias generated by the underlying firm's heterogeneity. Therefore, as HMR, we augment eq. 20 with a standard Heckman [21] correction for sample selection, η_{ij}. A consistent estimate of this term is obtained from the inverse Mills ratio. Such correction is all the more necessary given our large sample of countries, both developing and developed countries, which raises the probability of facing a censoring issue especially when studying FDI. In our framework, the Heckman correction addresses the first type of decision a firm must make, that is whether to penetrate the foreign market. To address this point, we rely on the assumption of strict sorting defined in section 2. In other words, the most productive firms in country j engage in FDI with country i, the mid-range productivity firms engage in trade with country i, and the least productive firms only serve their domestic market. Given this sorting, we then observe a positive flow between the two countries i and j if the most productive firm sets up a subsidiary abroad or, in case of no investment,if the most productive

firm exports. We estimate an equation similar to eq. 23 but we redefine the dummy variable T_{ij}^{selec}=1 when the investment abroad is positive or, when country j exports to country i and there is no investment between the two economies. [20]

In order to correct both for biases due to the selection of trading partners, and to firms' heterogeneity, we estimate the following equation using nonlinear least squares parametrically, semiparametrically and nonparametrically :

$$s_{ij}^{I} - s_{ij}^{X} = \beta_0 + \theta_j + \theta_i - \lambda_d d_{ij} + \gamma_m m_{ji} + ln(exp(\delta(\hat{z}_{ij} + \hat{\eta}_{ij}) - 1) + \beta_{selec.}\hat{\eta}_{selecij} + u_{ij} \quad (23)$$

where $ln(exp(\delta(\hat{z}_{ij} + \hat{\eta}_{ij}) - 1)$ proxies ω_{ij}. [21]

Both variables ω and $\hat{\eta}$ are obtained from the inverse Mills ratio ($\hat{\eta}$=$\phi(\hat{z}_{ij})/\Phi(\hat{z}_{ij})$) but from two different samples. The first sample is computed from a sample only including firms already present in the foreign market while η_{selec} is computed including the whole set of observations. [22]

4.5. Other identification issues

We believe that our empirical methodology enables to mitigate several identification issues that the literature traditionally faces when analyzing the relation between either trade and migration or FDI and migration. It is well known that those relationships are potentially subject to simultaneity issues as well as potential reverse causality. Indeed, unobserved variables such as technological shocks in an exporting country j may trigger both FDI from j to i (through a cost reduction) and migration from i to j (through a higher real wage). Moreover, FDI may foster migration in the reverse direction. Exports from j to i can also foster migration from i to j through a decrease of the price index, inducing a relative real wage rise. Such identification issues justify the use of the estimation method described above.

The fixed effects capture unobserved characteristics that may have triggered either trade or FDI and migration simultaneously (such as the technological shocks mentioned above). Moreover, the reverse causality should affect current flows of migration. This potential reverse causality explains why we use a lagged stock of migration. Indeed, current flows of migration count for a small share

20. 69.10% of our country pairs have zero investment flows between them.
21. Where $\hat{z}_{ij}$=$\phi^{-1}(\hat{\rho}_{ij})$ with the predicted probability $\hat{\rho}_{ij}$
22. We are not concerned by a potential problem of multicollinearity. First, the Mills ratio is computed from two different samples. Second, ω_{ij} enters non-linearly in the equation, which mitigates the correlation between the two variables. We proxy the relation between the two variables by taking the correlation between exp(ω_{ij}) and $(\hat{z}_{ij} + \hat{\eta}_{ij})$ and we obtain a correlation of -0.10, which alleviates potential concerns about multicollinearity.

of the total stock and are not present in lagged stocks of migration. Last, the estimation of the linearized version of eq. 15 (the ratio between the exports and the sales induced by FDI) enables to mitigate endogeneity issues as discussed above. Indeed, the ratio defines the relationship between migration and the decision for a firm to serve the foreign market either through export or FDI. This narrower relation should reduce the endogeneity issue because the potential omitted variable bias could only exist if any unobserved shock is correlated with migration and the relative minimization cost determining the choice of mode of entry. Although we believe that the specification of eq. 23 may reduce potential endogeneity thanks to the introduction of home and host country fixed effects, the use of lagged variables and the ratio's specification, some omitted variable biases may still subsist. The results we derive for the variables such as legal system or common language can be an indicator that some unobserved cultural characteristics can also affect both the migration and the relative decision to invest abroad. Other types of unobserved factors or shocks could affect the relative decision to invest abroad and the decision to migrate such as technological progress in communication. This type of shock may foster FDI relative to trade as well as expand migration networks. Those unmeasured country-pair specific shocks hinder the quality of our estimation and preclude any potential causal interpretation. After presenting the general results, we further discuss alternative IV specifications.

5. Results

We present the results for the ratio between exports and FDI. In Table 1, we follow Helpman et al. [22] for the presentation of our results. The results in Column 1 show the first stage probit estimation and Column 2 the corresponding Heckman flow equation estimation. The exclusion restriction used is the number of days to register a property, which is part of the fixed cost of FDI. Given that we look at the ratio of FDI to exports and, in our sample, there are no country pairs with positive FDI and zero exports, we use the same exclusion restriction as when we look at FDI only (see Appendix Tables D.20 and D.22). Column 3 provides a benchmark equation that does not correct for any bias. Column 4 provides the parametric estimation of eq. 23 correcting for both selection and firm heterogeneity biases using nonlinear least squares. Column 5 relaxes the Pareto assumption for G(.) ; the distribution of firm's heterogeneity, using a polynomial form of $\hat{z}_{ij}$ showing that the distribution's assumption does not constraint the baseline specification. Finally, Columns 6 and 7 relax the joint normality assumption for the unobserved trade costs using a flexible nonparametric functional form. Column 8 represents the case where only firm heterogeneity is controlled for and Column 9 shows the case in which only selection is corrected for.

The model described in section 2 predicts that, under certain conditions, the ratio of FDI sales to exports from country j to country i will increase with migration from country i to country j; and indeed, we find that the ratio of FDI to exports is higher, the higher the stock of migrants from the buying country. As shown in Column 3 of Table 1, the elasticity of the FDI to exports ratio with respect to migration is 0.11. This means that for a given increase in migration from country i to country j, there is a propensity for FDI from j to i to grow 11 percent more than exports from j to i. This is when we do not control for the different margins detailed in section 2. We therefore proceed to investigate this relationship further.

We know as per Proposition 1 that for an identical migration-induced fall in the fixed costs of selling abroad and of setting up a production subsidiary abroad, we should expect a larger increase in sales associated with FDI than with exports. Column 1 of Table 1 indicates that migration networks increase the likelihood of observing a positive ratio (that is, the increase the probability for the most productive firm to set up a subsidiary abroad). In addition, column 4 shows that the migration externality affects the volume of FDI mostly at the intensive margin. Indeed, the elasticity of the FDI to exports ratio from j to i to the number of migrants from i to j is 0.10 once controlling for the extensive margin. In what follows; we will explore this question further. Note also that the other bilateral controls are generally not significant and would be difficult to interpret anyway given that they capture different types of barriers in relation to trade versus FDI. [23]

Still, controlling for the extensive margin is important in its own right; it is even more relevant in our context for a number of reasons. Notably, we use a global sample including small and medium-sized countries for which we expect a larger dispersion of productivity across firms than would be the case in a sample of industrial countries. Appendix Annexe B.1 qualifies this proposition. In presence of such large dispersion, a decrease in the fixed cost of setting up a subsidiary abroad could lead to large changes in the aggregate volume of FDI; neglecting the extensive margin could therefore lead to inconsistent estimates.

How should we interpret the insignificant result for the stock of migrants on the extensive margin in column 4 of Table 1? Is this evidence evidence that the network effect is not large enough to affect the decision of the marginal firm between exporting or setting up a subsidiary abroad? Another interpretation, however, is possible and has to do with the fact that the HMR framework performs better when the density of firms around the relevant threshold (i.e., a_{ij}^I or a_{ij}^X) is large

23. This is not the case for our variable of interest, migration networks, that reduce informational barriers in both cases, and more so for FDI, as discussed in section 2.

enough so that the extensive margin and the selection of trading partners are not cofounded. While this is clearly the case for trade (and indeed, the extensive margin is significant when we look at exports only - see Appendix (Annexe D) Tables 17 and 19) this is not necessarily the case for FDI, which concern only the utmost competitive firms. In this case, the two margins may be confounded, which would explain why δ is not significant while both z and η are significant respectively in Columns 8 and 9 of Table 23 (as well as in Appendix (REFERENCES) Tables D.19 and D.20 where we reproduce Helpman et al. [22] for FDI).

This second interpretation is corroborated when we use firm-level data to assess the density of firms around the FDI threshold at the country-pair level. [24]

In Table 2, we go further by assessing the effect of migration on the proximity-concentration tradeoff by level of education. A recent literature highlights a larger network effect for high-skilled workers, who are more likely to possess relevant information about international transactions. In line with the recent literature on migration networks (e.g., Kugler and Rapoport [28], Koenig [26], Felbermayr and Toubal [18]), we find that the elasticity of both exports and FDI with respect to the stock of migrants is higher when we consider skilled migrants as opposed to all migrants. The elasticity of the FDI to exports ratio with respect to skilled migration is 0.14. However, we are cautious when interpreting those results because they might spuriously be driven by the characteristics of firms selling abroad. Indeed, since firms selling abroad are more productive, they are also more likely to hire skilled workers.

Note that using the ratio between FDI and exports enables to focus on the relation between migration and the firm's decision to either export or build a subsidiary abroad. Moreover, we are able to better identify the source of potential endogeneity. Indeed, some variables such as free trade agreement reflect some aspects of the cultural proximity between two countries and can indicate whether some cultural characteristics could still affect simultaneously the migration decision and the decision as to whether to penetrate the foreign market through exports or FDI. Indeed, we investigate the relationship between migration, trade and FDI separately using the generalized gravity equation, the results show that variables such as common language, colonial ties or same legal system affect both trade and FDI (see Table D.19 and Table D.20 in Appendix Annexe D). However, these factors are also likely to affect the stock of migrants from country i to country j. Hence, while taking the ratio of FDI to export mitigates some of the potential endogeneity issues, some potential omitted variable biases might still subsist- hence, our reliance on instrumental variables in the next section.

24. We use Belgian data kindly provided by Conconi et al. (2015). See Appendix Annexe B.2

6. 2SLS Results

6.1. Instruments

This subsection discusses the instruments we use to address the potential endogeneity of the migration variable. As is common in this literature, we use the lagged stock of migrants as internal instrument (see Beine et al. [5]). This enables to eliminate any potential reverse causality as well as any omitted variable bias related to technological improvement. Indeed, the potential reverse causality arising from technological progress should affect contemporaneous flows of migration and trade/FDI. Note that reverse causality concerns should be already mitigated given that we use the accumulated stock of migrants in 2000, of which contemporaneous flows account only for a fraction.

We instrument the stock of migrants in 2000 by its lagged values, using bilateral migration stocks in 1960, taken from Ozden et al. [33]. This would seem to be a valid instrument, inasmuch as past migration affects current migration networks but is unlikely to be correlated with future FDI or trade flows. Indeed, while migrants might be influenced by future economic performance, it seems unlikely that migrants in the 1960s took their decisions to migrate based on the potential economic performance at destination in the twenty first century, at the time they would be retired. Moreover, children who migrated in the 1960s have built their human capital in the host country and are less likely to have contacts with their home country. It seems then unlikely that 2001-2006 average FDI, trade flows, or both, influence historical stocks of migration. On the contrary, past migration networks still convey information about contemporaneous economic conditions(Munshi [31]). A remaining concern could be that lagged migration stocks may not be exogenous to time-invariant bilateral cultural proximities measures. Therefore, we will supplement our internal instrument with an external instrument that exploits the common reasons for all migrants from country i to emigrate abroad. Arguably, these reasons are exogenous to dyadic specific cultural factors. This instrumental variable strategy is inspired by Autor et al. [4]. We therefore instrument the stock of migrants between country i and j by the stock of individuals migrating to an "artefact economy" having the same degree of development as country j (according to the World Bank classification). Specifically, the stock of migrants in year t from country i to country j (i.e., M_{jit}) is instrumented by the following stock of migrants :

$$M_{ait} = \frac{1}{N_{i,-j}} \sum_{k \neq j} M_{kit} \tag{24}$$

where a denotes the "artefact economy", $N_{i,-j}$ is the number of countries (with the same degree of development as country j) to which agents from country i have migrated with the exception

of country j.[25] We thus exploit the variations in the stock of migrants which are exogenous to cultural motivations since each artefact economy includes host countries from different continents, cultures and economic structures. For instance, high-income economies are countries with a GDP per capita higher than US$ 12,480 in 2011. As a result, the artefact economy used to proxy any high income economy has a GDP per capita of US$ 38,131. While this artefact economy will share some of the characteristics with the host country j it proxies, it will usually be very different culturally from country j. Moreover, we use the stock of migrants of the artefact economy in either 1960 or to instrument for its stock in 2000, for the same reasons as before.

6.2. First-stage results

6.2.1. Internal and external instruments in the year 1960

Figure 3 and Table 3 show that the instruments have strong predictive power and correlate with the stock of migrants in 2000 in the expected way. Indeed, both instruments are positively correlated with the stock of migrants in 2000. In particular, an increase in the stock of migrants in 1960 by 1 percent increases the stock of migrants in 2000 by 0.14 percent and is significant at 1% ; an increase of 1 percent of the so-called "artefact economy" instrument increases the stock of migrants in 2000 by 0.32 percent and is also significant at 1 percent. In the bottom of Table 3, we report the Kleibergen-Paap-Wald F-statistic for weak identification and the over-identification test (Hansen J statistic). The latter is corrected for error correlation within clusters. The Kleibergen-Paap Wald F-statistic equals 125.14 that is then well above 10 (the rule of thumb) and the joint null hypothesis that the instruments are jointly valid cannot be rejected.

6.2.2. Internal instrument in the year 1960 and external instrument in the year 1990

Figure 4 and Table 4 show that the instruments have strong predictive power and correlate with the stock of migrants in 2000 in the expected way. Indeed, both instruments are positively correlated with the stock of migrants in 2000. In particular, an increase in the stock of migrants in 1960 by 1 percent. increases the stock of migrants in 2000 by 0.29 percent and is significant at 1 percent ; an increase of 1 percent in the so-called "artefact economy" instrument increases the stock of migrants in 2000 by 0.43 percent and is also significant at 1 percent. In the bottom of Table 4 , we report the Kleibergen-Paap-Wald F-statistic for weak identification and the

25. Instrumenting the migration variable is challenging due to the concentration of migrants in a small number of countries. Therefore, the value of the variable often takes a zero value. The distribution of our external instrument is also skewed towards zero. However, the distribution has a large dispersion and the correlation between the instrument and the variable migration is 0.35.

over-identification test (Hansen J statistic). The latter is corrected for error correlation within clusters. The Kleibergen-Paap Wald F-statistic equals 309.91 that is then well above 10 (the rule of thumb) and the joint null hypothesis that the instruments are jointly valid cannot be rejected.

6.2.3. Internal and external instrument in the year 1990 for each level of skills

Figure 5 and Table 5 show that the instruments have strong predictive power and correlate with the stock of migrants by level of education in 2000 in the expected way. Indeed, all instruments are positively correlated with the stock of migrants in 2000 by level of education. In particular, an increase in the total, skilled and unskilled stocks of migrants in 1990 by 1 percent increases the total stocks of migrants in 2000 by 0.88, 0.74 and 0.83 percent respectively, and all instruments are significant at 1 percent. An increase of 1 p.p. in the so-called "artefact economy" instrument by level of education increases the total, skilled and unskilled stocks of migrants in 2000 by 0.33, 0.30 and 0.32 percent respectively and are also significant at 1 percent. In the bottom of Table **??** , we report the Kleibergen-Paap Wald F-statistic for the test statistic for weak identification and the over-identification test (Hansen J statistic). The latter is corrected for error correlation within clusters. The Kleibergen-Paap Wald F-statistic are all well above 10 (the rule of thumb) and the joint null hypothesis that the instruments are jointly instruments cannot be rejected.

6.3. Second-stage results

Table 6 provides results for eq. (23) using Two-Stage Least Squares (2SLS) with the lagged stocks of migrants as well as the stocks of migrants in an "artefact economy" as instruments. The last two columns show the results for skilled and unskilled migrants respectively. The errors are clustered by country-pair to adjust for potential heteroskedasticity. The estimates are slightly higher for the FDI to exports ratio when using 2SLS. The difference between the two estimates in columns (3) and (4) is likely to be explained by the degree of correlation between the past stocks of migration in 1960 and 1990 and the stocks in 2000. The difference in magnitude with the results shown in column (3) in Table 1 and columns (1) and (2) indicates that cultural proximity and technology improvement might have affected the quality of the estimation. However, the network externality has still a strong and significant effect on FDI and on the concentration-proximity tradeoff. The last two columns of Table 6 show the results by level of education. They are also higher than the estimates found using OLS. However, the difference between skilled migrants and unskilled migrants is kept. Skilled migrants foster the FDI to trade more than unskilled migrants.

7. Sensitivity analysis

In this section, we extend our analysis in a number of directions. First, we note that our theoretical model and empirical methodology consider FDI and exports as substitute ways to sell on the foreign market. That is we implicitly consider FDI as horizontal, an assumption that we discuss and address in section 7.1. Second, we assess in section 7.2 whether our results were driven by outliers or by countries with specific status such as offshore financial centres. Third, we relax the assumption of symmetric information between zero and negative values for investment. Specifically, we use an inverse hyperbolic transformation instead of a logarithm transformation in order to use the full sample including negative, null and positive values ; we check whether our results are robust to such transformation in section 7.3. Fourth, we control whether our estimates for migration suffers from measurement error induced by the imputed procedure in the ADOP(2015) database and restrict our analysis to observed data only in section 7.4. Fifth, in section 7.5 we carry on the analysis at the sectoral level in order to assess the quality of our proxies for FDI-related sales, trade and fixed costs. Finally, in section 7.6,we assess whether informational friction is the channel through which migration networks affect the sales abroad.

7.1. Horizontal vs vertical FDI

The theoretical model presented in section 2 builds on the HMY framework, which models *horizontal* FDI. In other words, a firm decides to become multinational based on the proximity-concentration tradeoff. However, the reason why a given firm chooses to become multinational could also be driven by the prospect of accessing to cheaper production factors (i.e., vertical FDI). In such a case, a firm produces components in different locations but exports the final product from the home country. To be consistent with our model, we should then consider horizontal FDI in the empirical analysis. Unfortunately, our aggregate data precludes any attempt to disentangle horizontal FDI from vertical FDI. Notwithstanding, many studies show that certain circumstances are more conducive to occurence of horizontal vs vertical FDI. [26] In particular, if FDI-related sales substitute for exports (i.e, horizontal FDI), they should mostly be demand-driven. The Linder hypothesis tells us that consumers with similar per capita income buy similar bundles of goods. Therefore, we should expect horizontal FDI to prevail between countries with similar income per capita, similar skill endowment. A glance at the data shows the prevalence of high-income economies as destination countries for FDI. Indeed, while only 48% of our dataset

26. See Brainard [9], Blonigen [7], Blonigen et al. [8], Carr et al. [11] and Ramondo et al. [35] for instance.

is made up by high-income economies (as classified by the World Bank), those countries attract 84% of the worldwide 2001-2006 average FDI flows. Such a trend is well illustrated on Figure 6.

To assess whether on average, we capture horizontal FDI, we add the capital per worker differential as a control to test the factor-proportions hypothesis.[27] Table 7 shows that the factor proportions do not affect our results neither for the proportion of firms (see column 1 and column 2), the volumes of FDI nor the ratio of FDI to exports. The inclusion of this variable does not affect the estimates of the network externalities. The results hold if we drop Japan, which has the largest capital per workers differentials with its business partners, from ou sample.

In addition, Blonigen et al. [8] empirically assess the knowledge-capital model built by Carr et al. [11] and they find a strong support for the horizontal model of MNEs. According to them, a pure horizontal model does emerge when relative endowments are similar since this removes the factor price differences that generate the incentives for vertical FDI. To assess these conjectures, we run our estimation on a sample composed of pairs of countries trading with similar economies and on a sample including high-income economies (as classified by the World Bank) only. The patterns observed in Table 8 are quite similar. The network externality has a strong and significant effect on FDI as well as on the ratio of FDI to export, and high-skilled migration has a stronger effect. The main difference is the increase in the size of the estimates concerning FDI, which indicates that the migration networks seem to have a stronger impact, the more similar the economies.[28] This is consistent with our theoretical prior.

7.2. Tax haven and outliers

Given that our analysis extends to a large number of countries, we can only proxy FDI-related sales by FDI positions. These include investments which will be sources of capital accumulation as well as transfers to countries providing fiscal advantages. Typically, countries receiving a lot of FDI for fiscal reasons are small and have small trade flows ; this means that they are likely to exhibit a high ratio of FDI to exports. We do not want our results to be distorted by those transactions.

27. The data on capital and population are taken from the Alan Heston and Aten [1] (PWT 7.1) and are an average of the years from 2001 to 2006. We also use the real income per worker differential using data from the World Bank and the results are similar.

28. Common border is not anymore included in the regression because this variables does not present variation. In other words, the sample does not include adjacent countries.

We exclude from our sample all the countries receiving FDI and which can be defined as a "tax haven" or an "offshore financial centre". There is no consensual list of countries classified as "tax haven" or "offshore financial centres". Therefore, in order to guarantee that our results are not driven by those outliers, we consider an inclusive definition based on classifications by IMF (2000), the Global Financial Centres Index in 2010, the Financial Secrecy Index and the OECD (2002), as described in Appendix Annexe E.

The results are shown in the first panel of Table 9. In column 1, we assess whether an accommodating fiscal regulation affects the volume of FDI to exports with our benchmark equation. We find smilar results that the ones in column (3) of Table 1. In other words, the fiscal advantage does not seem to play a key role in our sample regarding the results of Table 9.

More generally, we are also concerned that our results may be driven by country-pairs which exhibit a large ratio of FDI inflows to imports due to very small amounts of the latter. Therefore, to guarantee that our results are not driven by such outliers, we trim the distribution of trade value by disregarding observations for which the values belongs to the first and the last percentiles or the 5th and the 95th ones. Table 9 confirms that our results are not driven by outliers since the elasticity of investment or the ratio FDI to exports to the country of origin of migrants are slightly lower.

7.3. Inverse hyperbolic sine transformation

Our results are obtained applying the standard gravity model to FDI flows implying the use of a log-linearization. However, this transformation restricts the analysis over the range of positive values. We then correct the selection effect induced by country pair zero FDI flows (66 % of the sample) by applying the Heckman correction. However, negative values exist for FDI flows. They compose 2% of our sample. They could arise for a multinational because of unusually large debt liabilities to foreign affiliates or because of discharges of liabilities. In our main analysis, we handled those negative observations by replacing them by zero, implicitly assuming that they contain the same information zero-value FDI flows.

In this section, we relax this assumption and preserve the information contained in all potential cells. On the one hand, it is true that negative and zero values are different since in the first case, firms have been in the host countries and aim to lower their position, while zero values indicate an absence of foreign firms in this economy. Moreover, as for zero values, negative values are more frequent in emerging economies and developing than in developed economies. Factors explaining those negative values might also be correlated with the volume of FDI, leading to inconsistent

estimates if not controlled for. On the other hand, negative values of FDI only compose two percent of the sample and 94% of them are between zero and minus one half and are therefore very close to zero. The largest negative values concern country-pairs with Ireland as the FDI-host economy. This is due to repayment of loans by affiliates to the parent firms in 2005 following a change in tax rate of foreign profits in Ireland (UNCTAD2006).

In order to assess whether those negative values might affect our results, we use the inverse hyperbolic sine transformation of FDI. This procedure has been proposed by Johnson [25] and described as a suitable transformation for household wealth data by Burbidge et al. [10]. This transformation can be applied over positive, negative and zero values.

It takes the following form :

$$sinh^{-1}(x) = ln(x + (x^2 + 1)^{-\frac{1}{2}}) \tag{25}$$

where x denotes the FDI position. We also apply this transformation to the ratio of FDI to trade even though it is less of interest. Indeed, the ratio concerns the choice of the mode to serve the foreign market. Therefore, the decision of penetrating the foreign market (and then have either positive trade and FDI) is already done when deciding how to serve the market (this is why the fixed cost f_{ij} does not affect the decision between exporting or setting up a subsidiary abroad in section 4). For countries having zero FDI, the choice of the mode to serve the market may not exist and the relationship between migration networks and the ratio FDI to trade is not relevant. Increasing the sample by a large number of countries for which this relationship is not relevant should drive down the estimate close to zero. This section then focuses mainly on the FDI values.

Table 10 shows the estimation of the benchmark. The first column assess the relationship between the total migration networks and the ratio of the inverse hyperbolic transformations of FDI to exports. Column (2) and (3) show the results for the skilled and unskilled migrants respectively. The result for FDI is still positive and significant and the effect of skilled migrants is still larger than the impact of unskilled migration on the ratio FDI to exports. However, the effect is much lower. This results is expected since we increase the number of country-pairs with few or no migration as well as to low-income economies for which migration usually results from conflicts. Contrary to the results in Table 1, we do not need to correct for the extensive margin or the sample selection bias since we include the country-pairs with no migration in the sample.

7.4. Mismeasurement of migration stocks

Data on migration (and particularly by education level) are difficult to collect for a global analysis. Many observations are missing, leading researchers (including the authors of the Artuc et al.

[3]'s database) to rely on imputation methods to obtain estimates of some bilateral stocks of migrants. The methodology used to compute those estimates could potentially bias our results. In Table D.23, Table D.24 and Table 11, we assess the relationship between migration networks, trade, FDI and the ratio of FDI to exports using the observational part of the Artuc et al. [3]'s database only.[29] For each estimation, the relationship still holds. As can be seen from Tables D.23, Table D.24and Table 11, the coefficients on our main variable of interest are barely affected. They are slightly larger because most of imputed stocks of migration concerns small corridors. Therefore, eliminating these observations change the distribution of the stock of migration upward (e.g. the median stock of migration between a country-pair is 27 while it is 17.35 in the sample including the imputed observations). In Tables 12 and 12, we estimate eq. 23 by level of education using the observational part of the Artuc et al. [3]'s database only. Indeed, the imputation concerns particularly stock of migrants by educational level. The relationship between migration and the ratio FDI to exports is still strongly positive. The coefficients are slightly larger for the same reasons explained above. We conclude that measurement error induced by data imputation is negligible.

7.5. Analysis of the proximity concentration tradeoff at the sectoral level

The macro analysis enables to have a global view of the relationship between migration, FDI and trade. However, the absence of FDI-related sales for most countries requires to proxy them with FDI position. Our method also forces us to rely on indirect methods to approximate the fact that the distribution of firms productivity cannot be observed directly for a large sample of countries.

Following HMY (2004), we then perform the analysis at the industry level in order to assess whether these proxies affect our results. At the sectoral level, it is unlikely that there is a spurious relationship between the aggregate stock of migration and the proximity concentration tradeoff at the 4-digit NAICS. Finally, we can identify the sectors in which migration networks might play an important role. To the best of our knowledge, multinational affiliates'sales disaggregated by destination and industry are only publicly available for the U.S.. Our sectoral analysis will therefore focus on U.S.-rest of the world international transactions.

We estimate a linearized version of eq. (15) that relates the logarithm of relative sales to our measure of migration networks, the logarithm of transports and tariff costs, the logarithm of our proxies for establishment fixed costs as well as our measure of firm-size dispersion and a set of

29. 69.5 % of the imputed data in our sample are estimated for low-income economies, mostly located in Africa.

country dummies that controls for the difference in the fixed costs to penetrate a foreign market, f_{iUS} and in factor prices, c_j, across countries. Contrary to the aggregate level, we can better proxy trade costs and the fixed costs faced by a firm. As described in detail in section 3, we define the trade costs as the ad valorem duty rate and the ad valorem freight rate. We rely on our model to build the fixed cost variable as well as the within industry heterogeneity measure. In our model, the fixed cost associated with FDI stems from the cost of maintaining an additional capacity. We then follow the model by using the average size of the non-production workforce per establishment as a proxy for the fixed cost. We measure the productivity dispersion within a sector by the size distribution of firms. Thanks to the availability more recent data we can extend the analysis of HMY to a larger sample of countries (115 countries) as well as to more sectors (67 4-digit level NAICS manufacturing industries).

Our results are presented in Table 14. In the first three columns, we report the results corresponding to the linearized version of eq. (15) for the total stock of migrants, high-skilled and low-skilled migrations, respectively. We control for the variable and the fixed costs to penetrate the foreign market as well as for any unobserved time-invariant country characteristics. Therefore, our variable defining the migration networks only capture the spillovers of this network on the proximity concentration tradeoff. We confirm the results described in section 5. Indeed, we find that the ratio of FDI to exports is higher, the higher the stock of migrants from the buying country. The elasticity of the FDI to exports ratio in sector k with respect to migration is 0.33. This means that for a given increase in migration from country i to country j there is a propensity for FDI sales from j to i to grow 0.33 more than exports from j to i in sector s once we control for the variable and fixed costs. It is interesting to note that this positive spillover of migration is driven by high-skilled workers. Indeed, the elasticity of the FDI to exports ratio in sector s with respect to skilled migration is 0.36 while low-skilled migration at the sector level would seem to stimulate exports more. This is an interesting result that would require a further investigation at a more disaggregated level. Moreover, as HMY and Brainard (1997), we confirm the prediction of the proximity concentration tradeoff. Firms substitute FDI-related sales for exports when the trade costs are relatively high and the fixed costs of setting up a new subsidiary are small. Firm level heterogenity has also a large impact on the mode to serve the market. Investing abroad is stimulated in sectors with higher levels of dispersion in firms'domestic sales. [30] Finally, we control for potential reverse causality. Migration has a skewed distribution across

30. Notice that the tariff does not significantly affect the proximity concentration tradeoff at this level of aggregation.

sectors. If most of migrants are located in the manufacturing sector, the potential endogeneity discussed in previous sections would still subsist. However, it is not the case. The DIOC database from the OECD provide the data on migration disaggregated by sector. We find that the share of migrants in the manufacturing sector for each origin country is on average 12 %. We then build the non-manufacturing stock of migration by subtracting the number of migrants working in the manufacturing sector in the U.S. in 2000 from the total stock of migration. The results are shown in the last column of Table 14 and they are confirmed.

7.6. Informational frictions and degree of proximity

In our analysis, migration networks stimulate exports and FDI by conveying information. To assess that informational frictions are the channel through which migration networks affect exports and FDI, we assess their role in environments with different degrees of cultural proximity.[31] We expect the effect of migration networks on exports and investments to be stronger in culturally distant environments where informational frictions are expected to be large. This is all the more true given that our theoretical framework assumes that FDI are more information sensitive than exports. To do so, we compare the relationship between migration and the ratio of FDI to trade for pairs of countries characterized by different degrees of cultural proximity.

To do so, we augment eq. 23 with interaction terms between migration and cultural proximity variables, namely : common language, common colonizer, and common currency union. We expect a negative sign for the coefficient on the interaction terms. Table 15 shows the result for all migrants while Table 16 and Table 17 present the result for high-skilled and low-skilled migrants respectively. The coefficients on migration networks are similar to the ones in Table 1 and Table 2. The magnitude of these coefficient appears to be driven by the relationship between countries that are culturally distant. Indeed, the coefficients on interaction terms are significantly negative for currency union and colonial ties. These results enable to confirm that migration networks affect exports and FDI by reducing informational frictions. Table 16 and Table 17 show that these results are mainly driven by skilled migrants.

8. Conclusion

Migration, trade and FDI are complement in the sense that more of one of them is often accompanied by more of the others. This could be due to third factors driving the joint evolution of the

31. This is similar in spirit to Kugler et al. [27] for the effect of migration on different types of financial flows.

three, for example when trade prepares the ground for FDI or when FDI stimulates trade. This paper explores the effect of migration on trade and FDI while at the same time accounting for their interdependencies. The channel we analyze is the international information transmission by migrants about business opportunities in their country of origin. These business opportunities arise both for exporters and investors. Because exporters and investors are interlinked, we build a general theoretical framework assessing how migration networks affect the decision as to how to serve the foreign market. We decompose this effect into its impact on the variable trade costs, the fixed cost to penetrate the foreign market, and the fixed cost to set up a subsidiary abroad. The main theoretical prediction from this model is that the effect of migration in stimulating FDI sales should exceed its effect on exports sales. Our theoretical model yields a general gravity equation that corrects for self-selection of firms and sample selection biases, effectively extending the HMR and HMY frameworks.

We estimate the elasticity of exports to the country of origin of migrants to be 0.11, when we use the stock of skilled migrants. We obtain a corresponding elasticity for FDI of 0.21. This suggests that FDI is more sensitive to migration than exports. And indeed, the elasticity of the FDI to exports ratio with respect to skilled migration is 0.148. The results are suggestive of the importance of migration for the formation of international business and information networks. Our interpretation in terms of information channel is consistent with the fact that skilled migration rather than total migration has a stronger link with exports and FDI as well as with the fact that the impact of migration is magnified for country pairs characterized by higher informational frictions or lower degrees of cultural proximity. The results are robust to instrumenting for migration and to a series of simple truncation and functional form and are consistent with the view that setting up a subsidiary in a new country requires much more information than simply shipping merchandise.

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Tables

TABLE 1: Ratio of 2001-2006 Average FDI Position/Exports, Total Migration

	(1) Prob(FDI/exports) Probit	(2) ln(FDI/exports) ols	(3) ln(FDI/exports) benchmark	(4) ln(FDI/exports) nls	(5) ln(FDI/exports) Polynomial	(6) ln(FDI/exports) bin 50	(7) ln(FDI/exports) bin 100	(8) ln(FDI/exports) firm heterogeneity	(9) ln(FDI/exports) firm selection
ln(Total migration in 2000)	0.027***	0.113***	0.114***	0.102***	0.116***	0.112***	0.100***	0.076***	0.134***
	(0.004)	(0.023)	(0.023)	(0.024)	(0.024)	(0.024)	(0.024)	(0.025)	(0.023)
ln(distance)	-0.210***	-0.032	-0.035	-0.055	0.046	-0.057	-0.058	0.205*	-0.134
	(0.022)	(0.098)	(0.098)	(0.103)	(0.109)	(0.116)	(0.115)	(0.116)	(0.100)
Common border	0.107	-0.033	-0.041	-0.095	-0.075	-0.093	-0.061	-0.066	-0.102
	(0.116)	(0.223)	(0.222)	(0.213)	(0.222)	(0.221)	(0.221)	(0.230)	(0.228)
Currency union	0.299***	0.263	0.100	0.249	0.169	0.161	0.076	0.142	0.107
	(0.103)	(0.211)	(0.212)	(0.202)	(0.211)	(0.216)	(0.218)	(0.224)	(0.219)
Free trade agreement	-0.001	0.055	0.048	0.037	0.051	0.109	0.103	0.032	0.040
	(0.040)	(0.239)	(0.239)	(0.230)	(0.235)	(0.238)	(0.237)	(0.238)	(0.236)
Country-pair is landlocked	-0.003	0.233	0.483	0.227	0.526	0.501	0.734**	0.384	0.347
	(0.066)	(0.359)	(0.354)	(0.385)	(0.345)	(0.358)	(0.357)	(0.357)	(0.349)
Same legal system	0.087***	0.130	0.125	0.152	0.177	0.173	0.211*	0.047	0.239**
	(0.028)	(0.117)	(0.117)	(0.115)	(0.117)	(0.119)	(0.119)	(0.119)	(0.118)
Same official language	0.141***	0.410**	0.427**	0.325*	0.371*	0.366*	0.344*	0.301	0.403**
	(0.050)	(0.205)	(0.205)	(0.197)	(0.204)	(0.204)	(0.205)	(0.210)	(0.205)
Colonial ties	0.236***	0.341*	0.328*	0.246	0.342*	0.371*	0.359*	0.062	0.464**
	(0.060)	(0.197)	(0.196)	(0.206)	(0.205)	(0.210)	(0.210)	(0.214)	(0.198)
Time (days) to register a property	-0.068*	-0.237							
	(0.039)	(0.194)							
δ				0.000					
				(0.166)					
z					2.463**			0.468***	
					(0.992)			(0.116)	
z^2					-0.630**				
					(0.320)				
z^3					0.052				
					(0.032)				
η				1.145***	1.609***				0.696***
				(0.142)	(0.376)				(0.156)
Observations	6462	2180	2180	2180	2180	2180	2180	2180	2180
R^2		0.546	0.546	0.554	0.557	0.567	0.582	0.549	0.552

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE 2: Ratio of 2001-2006 Average FDI Position/Exports, by level of education

	Skilled migration					Low-skilled migration				
	(1) Prob(FDI/export) Probit	(2) ln(FDI/export) benchmark	(3) ln(FDI/export) nls	(4) ln(FDI/export) firm heterogeneity	(5) Prob(FDI/export) firm selection	(6) ln(FDI/export) Probit	(7) ln(FDI/export) benchmark	(8) ln(FDI/export) nls	(9) ln(FDI/export) firm heterogeneity	(10) ln(FDI/export) firm selection
ln(migration in 2000)	0.032***	0.157***	0.143***	0.114***	0.178***	0.026***	0.120***	0.121***	0.083***	0.136***
	(0.005)	(0.026)	(0.028)	(0.029)	(0.026)	(0.004)	(0.022)	(0.025)	(0.024)	(0.022)
ln(distance)	-0.212***	-0.007	0.045	0.221*	-0.104	-0.217***	-0.031	0.029	0.196*	-0.132
	(0.022)	(0.099)	(0.103)	(0.116)	(0.101)	(0.022)	(0.097)	(0.103)	(0.115)	(0.099)
Common border	0.110	-0.035	-0.036	-0.061	-0.088	0.109	-0.075	-0.053	-0.094	-0.135
	(0.115)	(0.219)	(0.210)	(0.227)	(0.224)	(0.119)	(0.221)	(0.214)	(0.229)	(0.228)
Currency union	0.288***	0.218	0.143	0.129	0.075	0.300***	0.248	0.155	0.156	0.107
	(0.103)	(0.210)	(0.201)	(0.221)	(0.217)	(0.101)	(0.212)	(0.203)	(0.222)	(0.219)
Free trade agreement	-0.003	0.015	0.080	0.005	0.011	0.004	0.059	0.090	0.037	0.052
	(0.040)	(0.237)	(0.229)	(0.236)	(0.235)	(0.041)	(0.238)	(0.230)	(0.237)	(0.236)
Country-pair is landlocked	-0.002	0.227	0.521	0.375	0.346	0.002	0.237	0.525	0.381	0.355
	(0.066)	(0.351)	(0.380)	(0.353)	(0.347)	(0.067)	(0.352)	(0.386)	(0.354)	(0.347)
Same legal system	0.089***	0.112	0.164	0.035	0.222*	0.090***	0.133	0.172	0.057	0.245**
	(0.028)	(0.116)	(0.115)	(0.119)	(0.117)	(0.028)	(0.116)	(0.115)	(0.119)	(0.117)
Same official language	0.132***	0.392*	0.271	0.282	0.364*	0.142***	0.405**	0.287	0.290	0.381*
	(0.050)	(0.204)	(0.197)	(0.209)	(0.205)	(0.050)	(0.204)	(0.197)	(0.209)	(0.205)
Colonial ties	0.241***	0.279	0.226	0.023	0.413**	0.229***	0.281	0.252	0.041	0.413**
	(0.060)	(0.195)	(0.206)	(0.213)	(0.197)	(0.060)	(0.195)	(0.205)	(0.212)	(0.197)
Time to register a property	-0.069*					-0.073*				
	(0.040)					(0.039)				
δ			0.001					0.001		
			(0.165)					(0.165)		
z				0.443***					0.438***	
				(0.114)					(0.112)	
η			0.933***		0.670***			0.951***		0.672***
			(0.142)		(0.155)			(0.143)		(0.155)
Observations	6462	2180	2180	2180	2180	6462	2180	2180	2180 2180	2180
R^2		0.549	0.528	0.552	0.554		0.547	0.526	0.550	0.552

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

Table 3: First-stage predictions

	(1) ln(total migration in 2000)	(2) ln(total migration in 2000)	(3) ln(total migration in 2000)
ln(Total migration in 1960)	0.39***		0.14***
	(0.025)		(0.024)
ln(Total migration$_{artefa,1960}$)		0.24***	0.32***
		(0.023)	(0.026)
Observations	2180	2145	2145
Kleibergen-Paap F test	246.90	106.38	125.14
Sargan p-value			0.62

Robust standard errors (clustering by country pair) in parentheses.

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

Table 4: First-stage predictions

	(1) ln(total migration in 2000)	(2) ln(total migration in 2000)	(3) ln(total migration in 2000)
ln(Total migration in 1960)	0.39***		0.29***
	(0.025)		(0.023)
ln(Total migration$_{artefa,1990}$)		0.49***	0.43***
		(0.022)	(0.023)
Observations	2180	2167	2167
Kleibergen-Paap F test	246.90	491.92	309.91
Sargan p-value			0.3030

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE 5: First-stage predictions

	Total			Skilled			Unskilled		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ln(migration)	ln(migration)	ln(migration)	ln(migration)	ln(migration)	ln(migration)	ln(migration)	ln(migration)	ln(migration)
ln(Total migration in 1990)	0.69***		-0.003						
	(0.022)		(0.022)						
ln(Total migration$_{artefa,1990}$)		0.49***	0.691***						
		(0.021)	(0.027)						
ln(Skilled migration in 1990)				0.72***		0.68***			
				(0.022)		(0.024)			
ln(Skilled migration$_{artefa,1990}$)					0.49***	0.040**			
					(0.023)	(0.021)			
ln(Unskilled migration in 1990)							0.77***		0.755***
							(0.021)		(0.026)
ln(Unskilled migration$_{artefa,1990}$)								0.53***	0.020
								(0.021)	(0.020)
Observations	2180	2167	2167	2180	2167	2167	2180	2167	2167
Kleibergen-Paap F-test	965.96	505.16	466.10	1029.96	456.12	504.49	1302.797	598.30	629.41
Sargan p-value			0.4626			0.576			0.3062

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE 6: 2SLS

	(1) ln(FDI/export) Total migration	(2) ln(FDI/export) Total migration	(3) ln(FDI/export) Skilled migration	(4) ln(FDI/export) Unskilled migration
ln(Total migration in 2000)	0.139**	0.160***	0.216***	0.147***
	(0.064)	(0.038)	(0.034)	(0.026)
ln(distance)	0.003	0.018	0.052	-0.003
	(0.131)	(0.104)	(0.101)	(0.097)
Common border	-0.127	-0.154	-0.134	-0.182
	(0.204)	(0.204)	(0.202)	(0.204)
Currency union	0.234	0.259	0.215	0.251
	(0.214)	(0.213)	(0.200)	(0.201)
Free trade agreement	0.031	-0.021	-0.062	0.013
	(0.251)	(0.241)	(0.235)	(0.235)
Country-pair is landlocked	0.168	0.178	0.183	0.187
	(0.353)	(0.348)	(0.384)	(0.393)
Same legal system	0.112	0.099	0.082	0.128
	(0.132)	(0.120)	(0.116)	(0.114)
Same official language	0.406**	0.402*	0.355*	0.380*
	(0.206)	(0.205)	(0.200)	(0.198)
Colonial ties	0.327	0.261	0.202	0.247
	(0.242)	(0.207)	(0.208)	(0.205)
Observations	2145	2167	2167	2167
F	7.731	8.860	13.436	11.571
R^2	0.039	0.037	0.042	0.041
Instruments	artefact economy in 1960 migration in 1960	artefact economy in 1990 migration in 1960	artefact economy in 1990 migration in 1990	artefact economy in 1990 migration in 1990

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE 7: Horizontal FDI Vs Vertical FDI

	(1) Prob(FDI) Total migration	(2) ln(FDI/export) Total migration	(3) ln(FDI/export) Skilled migration	(4) ln(FDI/export) Low skilled migration
ln(migration in 2000)	0.027***	0.113***	0.156***	0.114***
	(0.004)	(0.023)	(0.026)	(0.023)
ln(distance)	-0.212***	-0.034	-0.006	-0.037
	(0.022)	(0.098)	(0.099)	(0.098)
Common border	0.106	-0.041	-0.035	-0.058
	(0.116)	(0.222)	(0.219)	(0.223)
Currency union	0.299***	0.252	0.222	0.252
	(0.103)	(0.212)	(0.210)	(0.212)
Free trade agreement	-0.001	0.052	0.019	0.048
	(0.040)	(0.239)	(0.237)	(0.239)
Country-pair is landlocked	-0.002	0.230	0.230	0.238
	(0.066)	(0.354)	(0.351)	(0.354)
Same legal system	0.087***	0.134	0.120	0.135
	(0.28)	(0.117)	(0.116)	(0.116)
Same official language	0.141***	0.407**	0.372*	0.400*
	(0.50)	(0.204)	(0.203)	(0.204)
Colonial ties	0.233***	0.351*	0.303	0.348*
	(0.06)	(0.196)	(0.195)	(0.196)
Time (days) to register a property		-0.069*		
		(0.040)		
Capital per worker differential -0.000***	-0.000***	-0.000	-0.000	
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	6440	2174	2174	2174
R^2		0.547	0.549	0.547

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification. Robust standard errors (clustering by country pair) in parentheses.

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

Table 8: Horizontal FDI Vs Vertical FDI

	Sharing the same endowment per capita			High income economies		
	(1)	(2)	(3)	(4)	(5)	(6)
	ln(FDI/export)	ln(FDI/export)	ln(FDI/export)	ln(FDI/export)	ln(FDI/export)	ln(FDI/export)
	Total migration	Skilled migration	Low skilled migration	Total migration	Skilled migration	Low skilled migration
ln(Migration in 2000)	0.207***	0.247*** 0.222***	0.265***	0.301***	0.274***	
	(0.047)	(0.052)	(0.047)	(0.047)	(0.051)	(0.048)
ln(distance)	-0.127	-0.147	-0.098	-0.365	-0.392	-0.330
	(0.187)	(0.185)	(0.188)	(0.246)	(0.240)	(0.248)
Currency union	0.176	0.172	0.175	0.250	0.251	0.258
	(0.332)	(0.325)	(0.333)	(0.322)	(0.315)	(0.324)
Free trade agreement	-0.330	-0.386	-0.344	-1.176**	-1.200**	-1.181**
	(0.383)	(0.378)	(0.384)	(0.511)	(0.498)	(0.514)
Country-pair is landlocked	-1.897**	-1.910**	-1.881**	0.912	0.913	0.914
	(0.826)	(0.827)	(0.810)	(0.649)	(0.644)	(0.649)
Same legal system	-0.369	-0.333	-0.378	-0.550*	-0.506*	-0.569*
	(0.286)	(0.282)	(0.286)	(0.292)	(0.286)	(0.293)
Same official language	0.612*	0.508	0.678*	0.790**	0.665*	0.871**
	(0.352)	(0.343)	(0.356)	(0.360)	(0.351)	(0.367)
Colonial ties	0.179	0.117	0.113	-0.055	-0.109	-0.112
	(0.503)	(0.498)	(0.503)	(0.586)	(0.581)	(0.591)
Observations	430	430	430	369	369	369
R^2	0.316	0.323	0.319	0.269	0.276	0.270

Standard errors (clustering by country pair) in parentheses. Time to register a property is the excluded variable in the second stage specification.

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

TABLE 9: Sensitivity Analysis : Trimmed sample

	Exclusion of Offshore financial centres	5 percent trimming
	(1)	(2)
	ln(FDI/export)	ln(FDI/export)
ln(Total migration in 2000)	0.119***	0.107***
	(0.023)	(0.027)
ln(distance)	-0.023	-0.021
	(0.101)	(0.129)
Common border	-0.037	0.221
	(0.223)	(0.390)
Currency union	0.209	0.217
	(0.214)	(0.374)
Free trade agreement	0.034	0.225
	(0.246)	(0.259)
Country-pair is landlocked	0.233	0.085
	(0.356)	(0. 353)
Same legal system	0.119	0.101
	(0.119)	(0.138)
Same official language	0.458**	0.573**
	(0.209)	(0.264)
Colonial ties	0.322	0.311
	(0.199)	(0. 232)
Observations	2115	1869
R^2	0.547	0.529

Robust standard errors (clustering by country pair) in parentheses.

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

Table 10: IHS transformations

	(1) FDI/exports IHS Total migration	(2) FDI/exports IHS Skilled migration	FDI/exports IHS Unskilled migration
ln(Total migration in 2000)	0.004***	0.007***	0.004***
	(0.001)	(0.001)	(0.001)
ln(distance)	-0.022***	-0.021***	-0.023***
	(0.004)	(0.004)	(0.004)
Common border	0.073***	0.072***	0.072***
	(0.015)	(0.015)	(0.015)
CUrrency union	0.065***	0.064***	0.064***
	(0.019)	(0.019)	(0.019)
Free trade agreement	0.015*	0.014*	0.015*
	(0.008)	(0.008)	(0.008)
Country-pair is landlocked	0.032	0.032	0.032
	(0.026)	(0.026)	(0.026)
Same legal system	0.003	0.003	0.004
	(0.005)	(0.005)	(0.005)
Same official language	0.005	0.003	0.005
	(0.010)	(0.010)	(0.010)
Colonial ties	0.020**	0.016*	0.019*
	(0.010)	(0.010)	(0.010)
Observations	6462	6462	6462
F	7.531	7.664	7.595
r2	0.110	0.110	0.110

Robust standard errors in parentheses.

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

TABLE 11: Ratio of 2001-2006 Average FDI Position/Exports, Total **Observed** Migration

	(1) Ind(FDI/exports) Probit	(2) ln(FDI/exports) ols	(3) ln(FDI/exports) benchmark	(4) ln(FDI/exports) nls	(5) ln(FDI/exports) Polynomial	(6) ln(FDI/exports) bin 50	(7) ln(FDI/exports) bin 100	(8) ln(FDI/exports) firm heterogeneity	(9) ln(FDI/exports) firm selection
ln(Total migration in 2000)	0.034***	0.117***	0.121***	0.125***	0.120***	0.117***	0.104***	0.079***	0.138***
	(0.005)	(0.024)	(0.024)	(0.025)	(0.025)	(0.026)	(0.026)	(0.026)	(0.024)
ln(distance)	-0.257***	-0.028	-0.024	0.031	-0.064	-0.040	-0.015	0.206*	-0.129
	(0.029)	(0.100)	(0.100)	(0.105)	(0.113)	(0.120)	(0.120)	(0.119)	(0.102)
Common border	0.069	-0.053	-0.058	-0.047	-0.078	-0.125	-0.097	-0.037	-0.132
	(0.122)	(0.201)	(0.199)	(0.212)	(0.204)	(0.201)	(0.207)	(0.211)	(0.208)
Currency union	0.310***	0.281	0.270	0.173	0.215	0.215	0.124	0.161	0.136
	(0.102)	(0.212)	(0.213)	(0.205)	(0.213)	(0.213)	(0.215)	(0.223)	(0.221)
Free trade agreement	0.005	-0.015	-0.022	0.054	-0.031	-0.021	-0.024	-0.049	-0.034
	(0.050)	(0.250)	(0.251)	(0.240)	(0.246)	(0.245)	(0.246)	(0.249)	(0.248)
Country-pair is landlocked	-0.027	0.213	0.217	0.504	0.511	0.377	0.550	0.369	0.295
	(0.083)	(0.364)	(0.356)	(0.390)	(0.341)	(0.351)	(0.336)	(0.358)	(0.347)
Same legal system	0.108***	0.161	0.149	0.190	0.211*	0.198*	0.249**	0.077	0.272**
	(0.034)	(0.118)	(0.118)	(0.118)	(0.118)	(0.119)	(0.118)	(0.120)	(0.119)
Same official language	0.166***	0.306	0.317	0.238	0.280	0.318	0.307	0.194	0.305
	(0.060)	(0.204)	(0.203)	(0.198)	(0.203)	(0.208)	(0.211)	(0.209)	(0.204)
Colonial ties	0.232***	0.376*	0.350*	0.268	0.387*	0.359*	0.257	0.126	0.479**
	(0.069)	(0.198)	(0.197)	(0.209)	(0.204)	(0.206)	(0.208)	(0.213)	(0.198)
Time (days) to register a property	-0.092*	-0.275							
	(0.053)	(0.198)							
δ				0.000					
				(0.174)					
z					3.150***			0.460***	
					(1.049)			(0.121)	
z^2					-0.846**				
					(0.338)				
z^3					0.072**				
					(0.034)				
η				0.945***	1.900***				0.701***
				(0.149)	(0.399)				(0.165)
Observations	5305	1989	1980	1989	1989	1989	1989	1989	1989
R^2		0.523	0.521		0 .536	0.547	0.565	0.526	0.529

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE 12: Ratio of 2001-2006 Average FDI Position/Exports, Total **Observed** skilled migration

	(1) Ind(FDI/exports) Probit	(2) ln(FDI/exports) ols	(3) ln(FDI/exports) benchmark	(4) ln(FDI/exports) nls	(5) ln(FDI/exports) Polynomial	(6) ln(FDI/exports) bin 50	(7) ln(FDI/exports) bin 100	(8) ln(FDI/exports) firm heterogeneity	(9) ln(FDI/exports) firm selection
ln(Skilled migration in2000)	0.120***		0.163***		0.159***	0.145***	0.140***	0.115***	0.179***
	(0.019)		(0.027)		(0.029)	(0.030)	(0.030)	(0.030)	(0.028)
ln(distance)	-0.779***	-0.014	0.008		-0.042	0.034	0.033	0.222*	-0.095
	(0.087)	(0.099)	(0.101)		(0.112)	(0.118)	(0.119)	(0.119)	(0.103)
Common border	0.213	-0.108	-0.042		-0.060	-0.091	-0.077	-0.030	-0.109
	(0.332)	(0.200)	(0.197)		(0.201)	(0.198)	(0.207)	(0.208)	(0.204)
Currency union	0.791***	0.289	0.238		0.188	0.196	0.158	0.145	0.105
	(0.265)	(0.213)	(0.212)		(0.212)	(0.212)	(0.212)	(0.220)	(0.219)
Free trade agreement	0.016	-0.032	-0.039		-0.039	0.008	0.051	-0.064	-0.046
	(0.153)	(0.249)	(0.249)		(0.245)	(0.244)	(0.246)	(0.248)	(0.247)
Country-pair is landlocked	-0.084	0.222	0.219		0.499	0.438	0.538	0.361	0.294
	(0.256)	(0.359)	(0.352)		(0.339)	(0.353)	(0.363)	(0.355)	(0.344)
Same legal system	0.316***	0.144	0.137		0.202*	0.179	0.193	0.068	0.257**
	(0.095)	(0.117)	(0.117)		(0.118)	(0.121)	(0.122)	(0.120)	(0.118)
Same official language	0.438***	0.286	0.286		0.254	0.258	0.283	0.179	0.271
	(0.156)	(0.202)	(0.203)		(0.202)	(0.209)	(0.212)	(0.208)	(0.204)
Colonial ties	0.632***	0.304	0.303		0.350*	0.303	0.262	0.090	0.431**
	(0.176)	(0.196)	(0.196)		(0.203)	(0.203)	(0.203)	(0.212)	(0.197)
dyadic_r_time	-0.283*	-0.263							
	(0.166)	(0.198)							
δ									
z					2.988***			0.436***	
					(1.047)			(0.119)	
z^2					-0.797**				
					(0.337)				
z^3					0.067**				
					(0.034)				
η					1.839***				0.674***
					(0.403)				(0.164)
Observations	5305	1989	1980		1989	1989	1989	1989	1989
R^2		0.526	0.524		0.538	0.550	0.565	0.529	0.531

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE 13: Ratio of 2001-2006 Average FDI Position/Exports, Total **Observed** Unskilled migration

	(1) Ind(FDI/exports) Probit	(2) ln(FDI/exports) ols	(3) ln(FDI/exports) benchmark	(4) ln(FDI/exports) nls	(5) ln(FDI/exports) Polynomial	(6) ln(FDI/exports) bin 50	(7) ln(FDI/exports) bin 100	(8) ln(FDI/exports) firm heterogeneity	(9) ln(FDI/exports) firm selection
ln(Unskilled migration in 2000)	0.098***	0.138***	0.141***	0.125***	0.139***	0.145***	0.146***	0.104***	0.157***
	(0.016)	(0.023)	(0.023)	(0.0257)	(0.025)	(0.025)	(0.025)	(0.026)	(0.024)
ln(distance)	-0.803***	-0.014	-0.012	0.030	-0.057	-0.050	-0.018	0.210*	-0.115
	(0.086)	(0.099)	(0.099)	(0.104)	(0.112)	(0.119)	(0.117)	(0.119)	(0.101)
Common border	0.210	-0.108	-0.114	-0.057	-0.135	-0.153	-0.164	-0.095	-0.189
	(0.349)	(0.200)	(0.199)	(0.212)	(0.203)	(0.201)	(0.203)	(0.209)	(0.207)
Currency union	0.821***	0.289	0.278	0.174	0.224	0.198	0.178	0.179	0.147
	(0.257)	(0.213)	(0.214)	(0.205)	(0.213)	(0.213)	(0.217)	(0.222)	(0.221)
Free trade agreement	0.024	-0.032	-0.039	0.048	-0.045	-0.028	0.003	-0.068	-0.049
	(0.152)	(0.249)	(0.250)	(0.240)	(0.245)	(0.239)	(0.239)	(0.248)	(0.247)
Country-pair is landlocked	-0.070	0.222	0.226	0.507	0.509	0.434	0.479	0.365	0.303
	(0.261)	(0.359)	(0.352)	(0.391)	(0.338)	(0.341)	(0.349)	(0.354)	(0.343)
Same legal system	0.313***	0.144	0.135	0.188	0.200*	0.208*	0.210*	0.065	0.253**
	(0.095)	(0.117)	(0.117)	(0.117)	(0.118)	(0.118)	(0.119)	(0.119)	(0.119)
Same official language	0.458***	0.286	0.298	0.234	0.262	0.302	0.290	0.185	0.283
	(0.154)	(0.202)	(0.202)	(0.198)	(0.201)	(0.205)	(0.207)	(0.207)	(0.203)
Colonial ties	0.628***	0.304	0.284	0.266	0.325	0.351*	0.287	0.069	0.406**
	(0.176)	(0.196)	(0.195)	(0.208)	(0.201)	(0.202)	(0.210)	(0.210)	(0.196)
Time (days) to register a property	-0.288*	-0.263							
	(0.166)	(0.198)							
δ				0.000					
				(0.173)					
z					2.957***			0.431***	
					(1.050)			(0.117)	
sumznsquare					-0.790**				
				(0.338)					
sumzncubic					0.067*				
				(0.034)					
eta				0.943	1.819***				0.678***
			(0.149)	(0.398)				(0.163)	
Observations	5305	1989	1980	1989	1989	1989	1989	1989	1989
R^2		0.526	0.524 = 0.409	0.538	0.554	0.572	0.529	0.531	

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE 14: Ratio of 2001-2005 Average FDI Sales/Exports at the sector level

	(1) ln(FDI/export) Total	(2) ln(FDI/export) Skilled	(3) ln(FDI/export) Unskilled	(4) ln(FDI/export) Total
ln(migration in2000)	0.334***	0.357***	-0.225***	1.141***
	(0.002)	(0.002)	(0.006)	(0.017)
ln(freight)	1.944***	1.944***	1.944***	1.871***
	(0.388)	(0.388)	(0.388)	(0.372)
ln(tariff)	0.006	0.006	0.006	0.005
	(0.011)	(0.011)	(0.011)	(0.011)
ln(FC)	-0.585***	-0.585***	-0.585***	-0.588***
	(0.030)	(0.030)	(0.030)	(0.029)
dispersion	1.825***	1.825***	1.825***	1.836***
	(0.065)	(0.065)	(0.065)	(0.065)
Constant	2.004***	2.004***	6.151***	-4.278***
	(0.672)	(0.672)	(0.660)	(0.772)
Observations	4989	4989	4989	4874
R^2	0.383	0.383	0.383	0.117

Standard errors (clustering by sending country) in parentheses

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

FIGURE 3: First-stage predictions

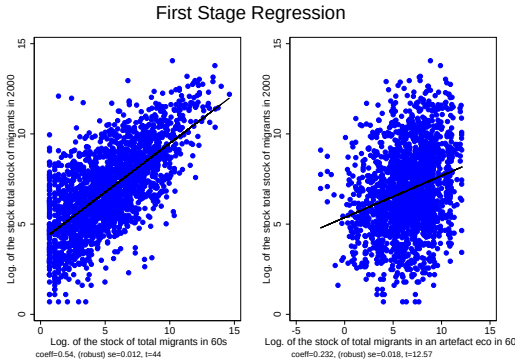


FIGURE 4: First-stage predictions

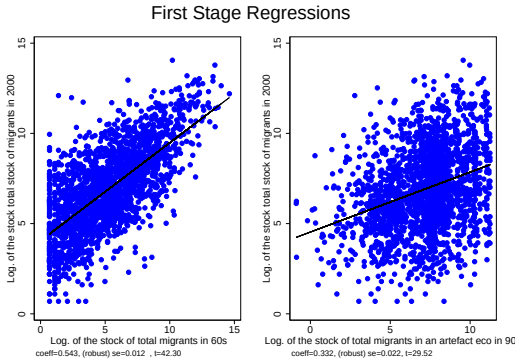


FIGURE 5: First-stage predictions

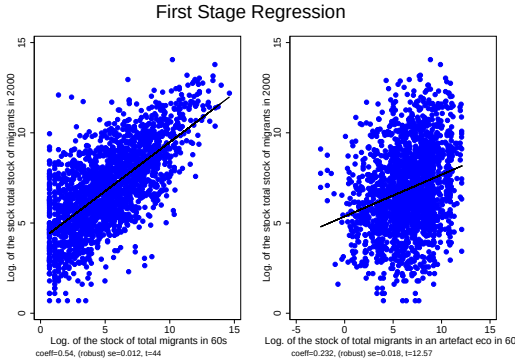


FIGURE 6: Destination of FDI

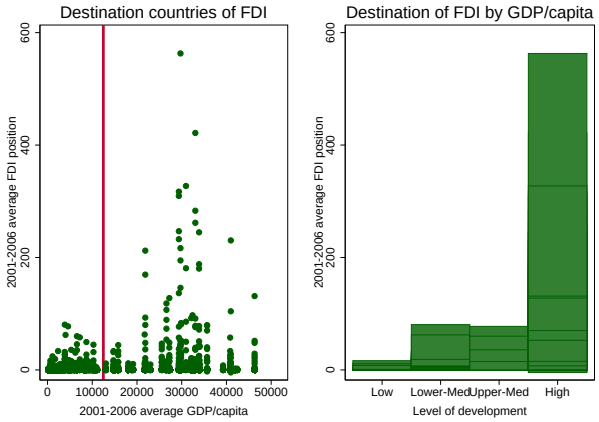


TABLE 15: Ratio of 2001-2006 Average FDI Position/Exports and Total Migration : Cultural proximity

	(1) Prob(FDI/exports) Probit	(2) ln(FDI/exports) ols	(3) ln(FDI/exports) benchmark	(4) ln(FDI/exports) nls	(5) ln(FDI/exports) Polynomial	(6) ln(FDI/exports) bin 50	(7) ln(FDI/exports) bin 100	(8) ln(FDI/exports) firm heterogeneity	(9) ln(FDI/exports) firm selection
ln(Total migration in 2000)	0.090***	0.117***	0.118***	0.128***	0.127***	0.121***	0.121***	0.085***	0.141***
	(0.016)	(0.023)	(0.023)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.023)
ln(distance)	-0.791***	-0.025	-0.027	0.031	-0.081	-0.024	-0.026	0.189*	-0.139
	(0.082)	(0.098)	(0.098)	(0.102)	(0.106)	(0.110)	(0.111)	(0.114)	(0.100)
Common border	0.392	-0.003	-0.008	-0.007	-0.011	-0.050	-0.062	-0.042	-0.024
	(0.339)	(0.230)	(0.229)	(0.219)	(0.227)	(0.234)	(0.231)	(0.233)	(0.235)
Currency union	-0.481	0.877	0.905	0.718	1.304*	1.349*	1.320*	0.491	1.635**
	(1.179)	(0.730)	(0.736)	(0.698)	(0.745)	(0.766)	(0.764)	(0.801)	(0.727)
Free trade agreement	0.012	0.066	0.060	0.104	0.060	0.115	0.146	0.048	0.041
	(0.151)	(0.240)	(0.240)	(0.231)	(0.236)	(0.236)	(0.236)	(0.239)	(0.237)
Country-pair is landlocked	-0.019	0.228	0.223	0.537	0.536	0.509	0.747*	0.365	0.370
	(0.244)	(0.357)	(0.352)	(0.387)	(0.341)	(0.376)	(0.384)	(0.350)	(0.345)
Same legal system	0.315***	0.136	0.131	0.179	0.194*	0.187	0.185	0.058	0.252**
	(0.091)	(0.116)	(0.116)	(0.114)	(0.115)	(0.118)	(0.119)	(0.119)	(0.116)
Same official language	0.144	-0.430	-0.399	-0.137	-0.496	-0.444	-0.363	-0.538	-0.512
	(0.317)	(0.663)	(0.666)	(0.640)	(0.708)	(0.693)	(0.718)	(0.669)	(0.699)
Colonial ties	-0.303	1.267**	1.279**	0.806	1.524**	1.542**	1.528**	1.494**	1.516**
	(0.404)	(0.621)	(0.623)	(0.593)	(0.620)	(0.632)	(0.644)	(0.613)	(0.628)
ln(Total migration in 2000) *Language	0.037	0.101	0.100	0.051	0.107	0.096	0.089	0.103	0.113
	(0.042)	(0.069)	(0.069)		(0.074) (0.068)	(0.073)	(0.076)	(0.070)	(0.073)
ln(Total migration in 2000) *Colonizer	0.139**	-0.112*	-0.114*	-0.067	-0.138**	-0.145**	-0.150**	-0.173***	-0.126*
	(0.054)	(0.065)	(0.065)	(0.063)	(0.066)	(0.069)	(0.070)	(0.066)	(0.067)
ln(Total migration in 2000) *Currency union	0.216	-0.075	-0.079	-0.067	-0.135*	-0.145*	-0.143*	-0.050	-0.182**
	(0.185)	(0.072)	(0.073)	(0.070)	(0.074)	(0.077)	(0.076)	(0.082)	(0.073)
Time (days) to register a property	-0.270*	-0.227							
	(0.153)	(0.193)							
δ				0.000					
				(0.156)					
z					2.352**			0.419***	
					(0.991)			(0.109)	
z^2					-0.601*				
					(0.320)				
z^3					0.049				
					(0.032)				
η				0.939***	1.670***				0.761***
				(0.144)	(0.377)				(0.157)
Observations	6462	2180	2180	2180	2180	2180	2180	2180	2180
R^2		0.547	0.547	0.540	0.558	0.569	0.578	0.550	0.554

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE 16: Ratio of 2001-2006 Average FDI Position/Exports and High Skilled Migration : Cultural proximity

	(1) Prob(FDI/exports) Probit	(2) ln(FDI/exports) ols	(3) ln(FDI/exports) benchmark	(4) ln(FDI/exports) nls	(5) ln(FDI/exports) Polynomial	(6) ln(FDI/exports) bin 50	(7) ln(FDI/exports) bin 100	(8) ln(FDI/exports) firm heterogeneity	(9) ln(FDI/exports) firm selection
ln(Skilled migrants in 2000)	0.106***	0.160***	0.162***	0.146***	0.169***	0.156***	0.157***	0.124***	0.185***
	(0.018)	(0.026)	(0.026)	(0.028)	(0.028)	(0.028)	(0.029)	(0.029)	(0.026)
ln(distance)	-0.794***	0.004	0.001	0.044	-0.057	-0.008	-0.011	0.208*	-0.109
	(0.082)	(0.099)	(0.099)	(0.102)	(0.106)	(0.109)	(0.109)	(0.114)	(0.100)
Common border	0.397	0.008	0.004	0.002	0.008	-0.032	-0.081	-0.030	-0.006
	(0.335)	(0.227)	(0.226)	(0.216)	(0.224)	(0.226)	(0.225)	(0.230)	(0.231)
Currency union	-0.536	0.818	0.845	0.666	1.228*	1.254*	1.246*	0.473	1.528**
	(1.170)	(0.731)	(0.737)	(0.692)	(0.736)	(0.747)	(0.745)	(0.804)	(0.718)
Free trade agreement	0.004	0.035	0.028	0.094	0.038	0.112	0.112	0.022	0.014
	(0.151)	(0.238)	(0.238)	(0.230)	(0.234)	(0.233)	(0.236)	(0.238)	(0.235)
Country-pair is landlocked	-0.016	0.230	0.224	0.537	0.527	0.509	0.303	0.359	0.368
	(0.242)	(0.353)	(0.349)	(0.382)	(0.339)	(0.355)	(0.356)	(0.347)	(0.343)
Same legal system	0.319***	0.122	0.117	0.172	0.182	0.177	0.190	0.046	0.237**
	(0.091)	(0.116)	(0.116)	(0.114)	(0.115)	(0.118)	(0.119)	(0.118)	(0.116)
Same official language	0.149	-0.399	-0.368	-0.111	-0.470	-0.450	-0.467	-0.498	-0.483
	(0.316)	(0.661)	(0.664)	(0.636)	(0.704)	(0.701)	(0.703)	(0.667)	(0.695)
Colonial ties	-0.300	1.291**	1.303**	0.791	1.539**	1.563**	1.589**	1.502**	1.534**
	(0.405)	(0.624)	(0.626)	(0.595)	(0.623)	(0.645)	(0.645)	(0.617)	(0.630)
ln(Skilled migration in 2000)*Language	0.033	0.094	0.092	0.046	0.101	0.097	0.104	0.096	0.105
	(0.042)	(0.069)	(0.069)	(0.068)	(0.074)	(0.074)	(0.074)	(0.070)	(0.073)
ln(Skilled migration in 2000)*Colonizer	0.140**	-0.120*	-0.122*	-0.068	-0.144**	-0.150**	-0.156**	-0.178***	-0.133**
	(0.055)	(0.065)	(0.065)	(0.064)	(0.067)	(0.070)	(0.070)	(0.066)	(0.067)
ln(Skilled migration in 2000)*Currency union	0.220	-0.072	-0.076	-0.063	-0.129*	-0.136*	-0.133*	-0.049	-0.173**
	(0.184)	(0.073)	(0.073)	(0.070)	(0.073)	(0.075)	(0.074)	(0.083)	(0.072)
Time (days) to register a property	-0.272*	-0.226							
	(0.153)	(0.192)							
δ				0.001					
				(0.156)					
z					2.235**			0.399***	
					(0.992)			(0.108)	
z^2					-0.566*				
					(0.320)				
z^3					0.045				
					(0.032)				
η				0.922***	1.618***				0.735***
				(0.143)	(0.379)				(0.156)
Observations	6462	2180	2180	2180	2180	2180	2180	2180	2180
R^2		0.550	0.549	0.535	0.560	0.572	0.578	0.552	0.556

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE 17: Ratio of 2001-2006 Average FDI Position/Exports and Low Skilled Migration : Cultural proximity

	(1) Prob(FDI/exports) Probit	(2) ln(FDI/exports) ols	(3) ln(FDI/exports) benchmark	(4) ln(FDI/exports) nls	(5) ln(FDI/exports) Polynomial	(6) ln(FDI/exports) bin 50	(7) ln(FDI/exports) bin 100	(8) ln(FDI/exports) firm heterogeneity	(9) ln(FDI/exports) firm selection
ln(unskilled migration in 2000)	0.087***	0.122***	0.123***	0.128***	0.126***	0.118***	0.117***	0.091***	0.142***
	(0.014)	(0.022)	(0.022)	(0.025)	(0.023)	(0.024)	(0.024)	(0.024)	(0.022)
ln(distance)	-0.809***	-0.021	-0.024	0.030	-0.085	-0.032	-0.040	0.182	-0.139
	(0.082)	(0.097)	(0.097)	(0.101)	(0.105)	(0.107)	(0.107)	(0.113)	(0.099)
Common border	0.400	-0.041	-0.046	-0.013	-0.049	-0.079	-0.062	-0.072	-0.065
	(0.345)	(0.229)	(0.228)	(0.219)	(0.228)	(0.227)	(0.225)	(0.233)	(0.235)
Currency union	-0.481	0.913	0.941	0.735	1.317*	1.316*	1.281*	0.527	1.642**
	(1.214)	(0.731)	(0.738)	(0.704)	(0.748)	(0.749)	(0.761)	(0.799)	(0.731)
Free trade agreement	0.029	0.076	0.070	0.102	0.070	0.074	0.055	0.054	0.053
	(0.151)	(0.239)	(0.239)	(0.231)	(0.235)	(0.236)	(0.235)	(0.239)	(0.236)
Country-pair is landlocked	-0.004	0.237	0.232	0.542	0.531	0.539	0.751**	0.365	0.375
	(0.245)	(0.354)	(0.350)	(0.388)	(0.340)	(0.351)	(0.356)	(0.349)	(0.344)
Same legal system	0.321***	0.144	0.140	0.179	0.207*	0.200*	0.197*	0.069	0.260**
	(0.091)	(0.116)	(0.116)	(0.114)	(0.115)	(0.118)	(0.118)	(0.118)	(0.115)
Same official language	0.074	-0.549	-0.520	-0.142	-0.620	-0.680	-0.691	-0.628	-0.641
	(0.319)	(0.649)	(0.652)	(0.640)	(0.694)	(0.696)	(0.705)	(0.655)	(0.686)
Colonial ties	-0.322	1.168*	1.179*	0.815	1.414**	1.502**	1.361**	1.393**	1.402**
	(0.412)	(0.613)	(0.615)	(0.588)	(0.609)	(0.632)	(0.659)	(0.606)	(0.618)
ln(Unskilled migration in 2000)*Language	0.048	0.112*	0.111	0.052	0.119	0.120	0.122*	0.110	0.125*
	(0.042)	(0.067)	(0.068)	(0.068)	(0.073)	(0.073)	(0.074)	(0.069)	(0.072)
ln(Unskilled migration in 2000)*Colonizer	0.137**	-0.106*	-0.109*	-0.068	-0.130**	-0.147**	-0.138*	-0.164**	-0.120*
	(0.055)	(0.063)	(0.064)	(0.063)	(0.065)	(0.068)	(0.071)	(0.065)	(0.065)
ln(Unskilled migration in 2000)*Currency union	0.218	-0.079	-0.084	-0.069	-0.136*	-0.142*	-0.143*	-0.052	-0.182**
	(0.190)	(0.072)	(0.073)	(0.071)	(0.074)	(0.075)	(0.075)	(0.082)	(0.074)
Time (days) to register a property	-0.281*	-0.222							
	(0.152)	(0.193)							
δ				0.001					
				(0.156)					
z					2.053**			0.395***	
					(0.994)			(0.106)	
z^2					-0.509				
					(0.321)				
z^3					0.040				
					(0.033)				
η				0.936***	1.543***				0.734***
				(0.144)	(0.377)				(0.155)
Observations	6462	2180	2180	2180	2180	2180	2180	2180	2180
R^2		0.548	0.548	0.535	0.558	0.568	0.576	0.550	0.554

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

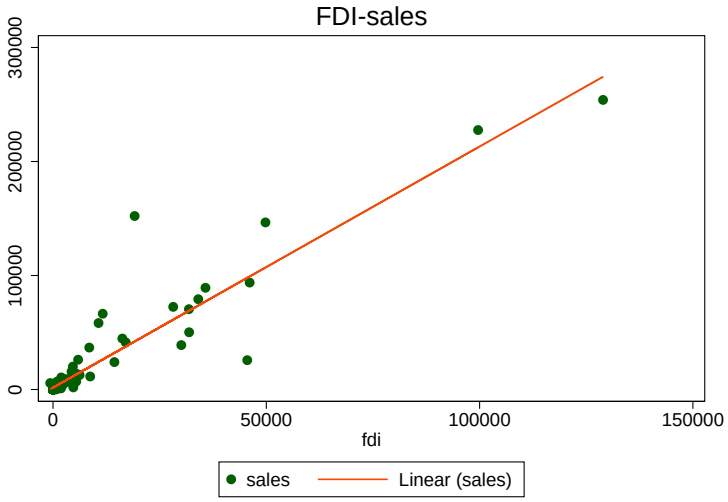
* p<0.1, ** p<0.05, *** p<0.01

Annexe A. FDI data as a proxy for FDI-related sales

In order to test Proposition 1, we need to gather data on FDI-related sales. Unfortunately, in most instances, data on FDI-related sales are not publicly available for large set of countries. In this appendix, we attempt to overcome this data constraint by empirically approximating FDI-related sales with FDI data. We use the US sample, which is the only publicly available source of data for FDI-related sales data o demonstrate the validity of this procedure.

Figure A.7 depicts the relationship between the amount of US FDI and the foreign affiliates' sales in 147 countries. Countries with missing data on FDI or affiliate sales are excluded from this graph. FDI refers to the year and FDI position, taking the average of 2001-2006 after deflating by the MSCI ASWI index.[32] Sales refer to the sales of all foreign affiliates, taking the average of 2001-2006 after deflating by the US CPI-U index. A "foreign affiliate" is a foreign business enterprise in which there is U.S. direct investment, that is, in which a U.S. firm owns or controls 10 percent of the voting securities or the equivalent. Here FDI data comes from the CEPII dataset, in line with other sections of this paper.

FIGURE A.7: US FDI and US foreign affiliate sales, average of 2001-2006



The correlation between the two is 0.82, indicating a very highly linear relationship. Regressing

32. The analysis has also been done when deflating data by a U.S. market capitalization index. However, to keep coherence with the sample studied in the analysis, we show the results when data are deflated with the same market capitalization index used for the main analysis, i.e. MSCI ASWI index.

foreign affiliates' sales data on FDI with various specifications yields the following result :

TABLE A.18: Regression of foreign affiliate sales on FDI

	(1) sales	(2) sales	(3) sales
FDI	3.925***	2.309***	2.358***
	(0.413)	(0.096)	(0.091)
FDI^2	-0.005***		
	(0.001)		
FDI^3	0.000***		
	(0.000)		
Constant	1.055	22.549	
	(14.527)	(14.144)	
Observations	147	147	147
Adjusted-R^2	0.817	0.799	0.819
F-Stat	218.127	580.161	666.441

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

Specification 1 includes both higher order products of FDI and a constant term. Specification 2 includes only FDI and constant term. Specification 3 includes only FDI and suppresses the constant term. As we can see, adding higher order products does not help increasing the explanatory power of FDI on FDI-sales. The coefficients on FDI^2, FDI^3 are zero while the constant term is not significant. After suppressing the higher order terms, the adjusted R-squared decreases a little bit, but the overall significance of the model increases substantially as the F-stat is tripled. The constant term is again not significant. This suggests using specification 3. This specification yields the highest adjusted R-squared stat, F-stat, and significance of the coefficient on FDI. The results show that there is a robust linear relationship between US foreign affiliates'sales and US FDI. If we assume that this linear relationship also holds for data on other countries, then our analysis in section 4 would hold for the ratio of FDI to trade. This would validate our empirical study in section 4.

Annexe B. Distribution of Multinational corporations

Annexe B.1. Comparison across countries

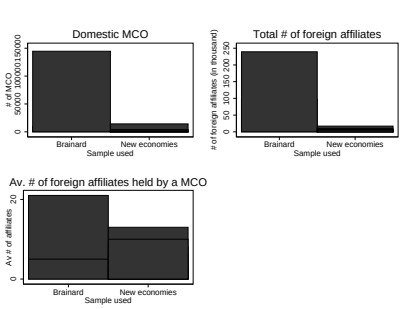
In this section, we detail why we believe that modelling the fixed cost is especially important for smaller economies and why this calls for using the HMR framework. Our empirical strategy has been influenced by a number of stylized facts regarding the distribution of MCOs across countries.

Altomonte and Rungi [2] is, to the best of our knowledge, the first worldwide study analyzing the nature of "business group" at the firm-level.[33] They find a large variation in the number of business groups, the number of domestic affiliates, as well as in the average number of affiliates financed by one MCO across countries. However, they also show that even though the distribution of firms as well as the distribution of affiliates are extremely skewed, firms with a large number of affiliates are responsible for more than 50% percent of the value added. Therefore, we expect that the entry of one firm in a small economy might change the aggregate volume of sales significantly and could then bias the estimate of the migration coefficient in a standard gravity equation. This intuition is backed by the following graphs. In Figure B.8a, we translate the figures showed in Table 1 in Altomonte and Rungi [2] in terms of samples already studied in the proximity-concentration tradeoff literature (named "Brainard") and small economies (named "New") included in our sample and for which Altomonte and Rungi [2] has information. One can see that the extensive margin (number of MCO and number of affiliates per MCO) is smaller in the new countries, as expected. This is due among other things due to higher fixed costs. The potential growth of this margin is then larger if one factor such migration decreases the fixed cost to penetrate the market. In Figure B.8b, we compare the number of MCO by level of development. We consider USA, Japan and China from the Altomonte and Rungi [2] dataset and Poland, for which we use another database, namely the Amadeus database which, has a large coverage (Amadeus collected information on 86% of Polish firms).[34] Again,one can see that in emerging countries, the extensive margin is smaller such that the penetration of affiliates from one MCO could significantly affect the volume of sales. The impact of migration on the sales would then happen through the number of firms instead of the volume sold by incumbents. Since

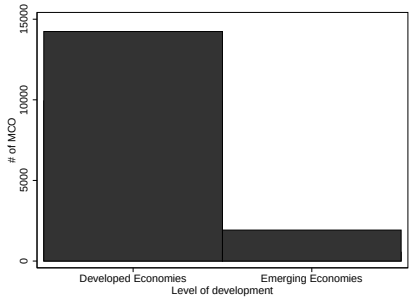
33. "Business groups" are defined in a broader way than multinational firms. They include multinational firms but also other legal structure. Altomonte and Rungi [2] define "Business groups" as *a combination of firms with autonomous legal status under some form of hierarchical control where control is assumed if (directly or indirectly) the parent exceeds the majority (50.01%) of voting rights of the affiliate.*

34. Amadeus is a dataset published by the Bureau Van Dijck.

we include smaller economies in our sample, we believe that it was reasonable to disentangle the effect of migration on the number of firms and on the volume sold by incumbents.



(a) Comparison of the Extensive margin by sample of countries



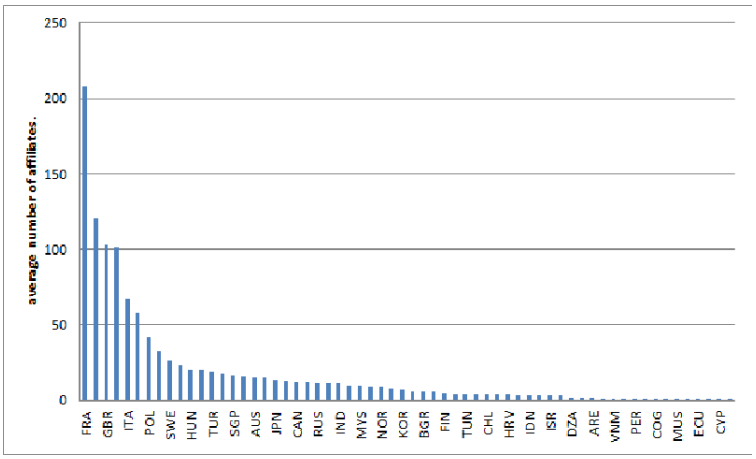
(b) Comparison of the Extensive margin by level of development

Moreover, observing the share of MCO by country in Amadeus, one can observe the large variations in the number of foreign affiliate aross countries. This suggests that heterogeneity may bias our results and justifies our empirical strategy. As already mentioned, our intuition relies on the few data available on the number of firms and the share of MCOs. Moreover, the comparison across countries is difficult due to methodological issues (survey, report, definition of firm, and so on). However, those sparse observations lead us to assess the impact of productivity heterogeneity affects FDI.

Annexe B.2. Belgian Multinationals

We use data on Belgian multinationals kindly provided by Conconi et al. [14] to map the distribution of Belgian affiliates across foreign markets. The sample includes the number manufacturing affiliates (i.e., four-digit codes belonging to sectors between 15 and 37 of NACE revision 1) with at least 5 employees, by country of destination. We take the weighted average of the number of affiliates by destination country over the 2000-2006 period. Figure B.9 shows that the distribution of affiliates across countries is very skewed. 30% of them have either 0 or one affiliate. It also shows that Belgian multinationals have more affiliates in closer and large markets.

FIGURE B.9: Number of average affiliate by Belgian multinationals, 2001-2006



Annexe C. Impact of migration on trade and FDI-related sales

Annexe C.1. Bilateral FDI-related sales

Lemma 1 (Reminded). *The total relative change in FDI-related sales from country j to country i with respect to a change in the stocks of migration between these two countries is given by :*

$$\frac{dS_{ij}^I}{S_{ij}^I} = (k-\epsilon+1)\left[\frac{\delta_g}{\epsilon-1} - \left(\left(\frac{\tau_{ij}c_j}{c_i}\right)^{\epsilon-1} - 1\right)^{-1}\delta_\tau\right]\frac{dM_{ij}}{M_{ij}} \tag{C.1}$$

The sign of the change in FDI-related sales depends on the effect of migration on the fixed cost of building a subsidiary, g_{ij} relative to its impact on the variable cost, τij.

$$\frac{dS_{ij}^I}{S_{ij}^I} > 0 \qquad \text{if} \qquad \frac{\delta_g}{\epsilon-1} > \left(\left(\frac{\tau_{ij}c_j}{c_i}\right)^{\epsilon-1} - 1\right)^{-1}\delta_\tau \tag{C.2}$$

We take the total differentiation of the aggregate FDI-related sales from country j to country i with respect to all transaction costs defined in the text ; τ_{ij},f_{ij} and g_{ij}. Following Chaney [12], we decompose the effect of a change in the transaction costs into the intensive margin (i.e volume of FDI-related sales by incumbents) and the extensive margin (i.e. the firms deciding to set up a subsidiary abroad following the reduction in the transaction cost). Applying the Leibniz rule, the total differentiation of the aggregate FDI-related sales from country j to country i is defined

as[35]

$$dS_{ij}^I = \left(\int_0^{a_{ij}^I} \frac{\partial x_{ij}^I(a)}{\partial \tau_{ij}} dG(a)\right) d\tau_{ij} + \left(x_{ij}^I(a_{ij}^I) g(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial \tau_{ij}}\right) d\tau_{ij} \quad \text{(C.3)}$$

$$+ \left(\int_0^{a_{ij}^I} \frac{\partial x_{ij}^I(a)}{\partial f_{ij}} dG(a)\right) df_{ij} + \left(x_{ij}^I(a_{ij}^I) g(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial f_{ij}}\right) df_{ij} \quad \text{(C.4)}$$

$$+ \underbrace{\left(\int_0^{a_{ij}^I} \frac{\partial x_{ij}^I(a)}{\partial g_{ij}} dG(a)\right)}_{\text{intensive margin}} dg_{ij} + \underbrace{\left(x_{ij}^I(a_{ij}^I) g(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial g_{ij}}\right)}_{\text{extensive margin}} dg_{ij} \quad \text{(C.5)}$$

First, note that FDI-related sales are only affected by migration through a change in the productivity cutoff (i.e. by a change in the number of firms having affiliates). In other words, we have

$$\int_0^{a_{ij}^I} \frac{\partial x_{ij}^I(a)}{\partial \tau_{ij}} dG(a) = \int_0^{a_{ij}^I} \frac{\partial x_{ij}^I(a)}{\partial g_{ij}} dG(a) = \int_0^{a_{ij}^I} \frac{\partial x_{ij}^I(a)}{\partial f_{ij}} dG(a) = 0$$

Second, the servicing network fixed cost must be paid by each firm entering in the foreign market regardless how it serves it. Therefore, f_{ij} is not affecting the decision of how to serve the foreign market (captured by the proximity concentration tradeoff). That is why, we also have

$$x_{ij}^I(a_{ij}^I) f(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial f_{ij}} = 0$$

The relative total differentiation of the aggregate FDI-related sales from country j to country i can then be rewritten as

$$dS_{ij}^I = \left(x_{ij}^I(a_{ij}^I) g(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial \tau_{ij}}\right) d\tau_{ij} + \left(x_{ij}^I(a_{ij}^I) g(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial g_{ij}}\right) dg_{ij}$$

Let us rewrite the definition of affiliate-level sales as

$$\begin{aligned} x_{ij}^I(a) &= \left(\frac{c_i a}{\alpha P_i}\right)^{1-\epsilon} Y_i N_j \\ &= \lambda^I a^{1-\epsilon} \end{aligned}$$

35. $x_{ij}^I(a) = \left(\frac{c_i a}{\alpha P_i}\right)^{1-\epsilon} Y_i N_j$ is the the quantity sold by an affiliate of a firm with productivity a located in country j and selling in country i.

and the bilateral aggregate FDI-related sales can be rewritten as

$$S_{ij}^I = \int_0^{a_{ij}^I} \lambda^I a^{k-\epsilon} da = \frac{\lambda^I}{k-\epsilon+1}(a_{ij}^I)^{k-\epsilon+1} \tag{C.6}$$

From the latter we can rewrite the productivity threshold, a_{ij}^I as a function of the aggregate FDI-related sales. We then obtain

$$\frac{\partial S_{ij}^I}{\partial \tau_{ij}} = x_{ij}^I(a_{ij}^I) g(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial \tau_{ij}} \quad = \quad (k-\epsilon+1)\frac{S_{ij}^I}{\tau_{ij}} \left[\left(\frac{\tau_{ij} c_j}{c_i} \right)^{\epsilon-1} - 1 \right]^{-1} \tag{C.7}$$

With the same reasoning, we derive

$$\begin{aligned} \frac{\partial S_{ij}^I}{\partial g_{ij}} &= x_{ij}^I(a_{ij}^I) g(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial g_{ij}} \\ &= -\frac{(k-\epsilon+1)}{(\epsilon-1)} \frac{S_{ij}^I}{g_{ij}} \end{aligned} \tag{C.8}$$

Of course, both effects affect the volume of FDI-related sales in opposite direction. It is interesting to see that the change of the volume of sales is function of the initial bilateral size. As Chaney [12] concludes, the elasticity of substitution plays a role. A decrease in transaction costs with respect to migration has a larger effect in markets of goods highly differentiated. In such market, the competition is lower and firms with a lower productivity can start investing and capturing large market shares despite having to charge a higher price than other firms. In other words, in presence of a large migration network in a market with highly differentiated goods, some firms with a low level of productivity are able to enter and they are relatively large compared to the incumbents and their impact is then large.

Using definitions 12, we can then express the relative total differentiation of the aggregate FDI-related sales from country j to country i

$$\frac{dS_{ij}^I}{S_{ij}^I} = (k-\epsilon+1) \left[\frac{\delta_g}{\epsilon-1} - \left(\left(\frac{\tau_{ij} c_j}{c_i} \right)^{\epsilon-1} - 1 \right)^{-1} \delta_\tau \right] \frac{dM_{ij}}{M_{ij}} \tag{C.9}$$

lemma 2 (Reminded).

The total relative change in exports from country j to country i with respect to a change in the costs of migration between these two countries is given by :

$$\begin{aligned}\frac{dS_{ij}^X}{S_{ij}^X} &= \left((\epsilon-1)+(k-\epsilon+1)\frac{\lambda^X}{\lambda^I}\frac{S_{ij}^I}{S_{ij}^X}\left[\left(\frac{\lambda^X}{\lambda^I}\right)-1\right]^{-1}\right)\delta_\tau\frac{dM_{ij}}{M_{ij}} \\ &+ \left(\frac{(k-\epsilon+1)}{(\epsilon-1)}\left(1+\frac{\lambda^X}{\lambda^I}\frac{S_{ij}^I}{S_{ij}^X}\right)((\epsilon-1)\delta_\tau+\delta_f-\delta_g)\right)\frac{dM_{ij}}{M_{ij}}\end{aligned} \tag{C.10}$$

where $\frac{\lambda^X}{\lambda^I}=\left(\frac{\tau_{ij}c_j}{c_i}\right)^{1-\epsilon}$

The total differentiation of the aggregate export can be rewritten as

$$dS_{ij}^X = \frac{\partial S_{ij}^X}{\partial \tau_{ij}}d\tau_{ij}+\frac{\partial S_{ij}^X}{\partial f_{ij}}df_{ij}+\frac{\partial S_{ij}^X}{\partial g_{ij}}dg_{ij} \tag{C.11}$$

First, let us focus on the first term on the RHS which captures the effect of a change in variable trade costs on the aggregate export between country j and country i. Using Leibniz rule, we can rewrite

$$\frac{\partial S_{ij}^X}{\partial \tau_{ij}} = \underbrace{\int_{a_{ij}^I}^{a_{ij}^X}\frac{\partial x_{ij}^X}{\partial \tau_{ij}}dG(a)}_{\text{intensive margin}} + \underbrace{x_{ij}^X(a_{ij}^X)g(a_{ij}^X)\frac{\partial a_{ij}^X}{\partial \tau_{ij}} - x_{ij}^X(a_{ij}^I)g(a_{ij}^I)\frac{\partial a_{ij}^I}{\partial \tau_{ij}}}_{\text{extensive margin}} \tag{C.12}$$

where $x_{ij}^X(a)=\frac{\tau_{ij}c_j a}{\alpha P_i}$

As Chaney [12], we assume that country i is small enough, so that $\frac{\partial P_i}{\partial \tau_{ij}}=0$. The adjustment along the intensive margin is then equal to

$$\frac{(1-\epsilon)}{\tau_{ij}}\int_{a_{ij}^I}^{a_{ij}^X}x_{ij}^X(a)dG(a)=\frac{(1-\epsilon)}{\tau_{ij}}S_{ij}^X \tag{C.13}$$

The extensive margin is more challenging to identify. As for the cutoff, a_{ij}^I, we express the cutoff, a_{ij}^X as a function of aggregate export and FDI-related sales. Remember that

$$S_{ij}^X=\int_{a_{ij}^I}^{a_{ij}^X}\frac{\tau ij c_j a}{\alpha P_i}dG(a)=\int_{a_{ij}^I}^{a_{ij}^X}\lambda^X a^{k-\epsilon}da=\frac{\lambda^X}{k-\epsilon+1}[(a_{ij}^X)^{k-\epsilon+1}-(a_{ij}^I)^{k-\epsilon+1}] \tag{C.14}$$

Substituting C.6 for $(a_{ij}^I)^{k-\epsilon+1}$, we get

$$\lambda^X (a_{ij}^X)^{k-\epsilon+1} = (k-\epsilon+1)\left[S_{ij}^X + \frac{\lambda^X}{\lambda^I} S_{ij}^I\right] \tag{C.15}$$

From C.15 and C.6, we derive the second and the third terms of the RHS of eq. C.12

$$x_{ij}^X(a_{ij}^X) g(a_{ij}^X) \frac{\partial a_{ij}^X}{\partial \tau_{ij}} = -(k-\epsilon+1)\left[S_{ij}^X + \frac{\lambda^X}{\lambda^I} S_{ij}^I\right] \tag{C.16}$$

and

$$x_{ij}^X(a_{ij}^I) g(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial \tau_{ij}} = \frac{\lambda^X}{\lambda^I} \frac{(k-\epsilon+1)}{\tau_{ij}} S_{ij}^I \left[\left(\frac{\tau_{ij} c_j}{c_i}\right)^{\epsilon-1} - 1\right]^{-1} \tag{C.17}$$

from eq. C.13,eq. C.16 and eq. C.17, we derive the partial derivative of the aggregate volume of trade with respect to the variable cost, τ_{ij}

$$\frac{\partial S_{ij}^X}{\partial \tau_{ij}} = -\left[(\epsilon-1)S_{ij}^X + (k-\epsilon+1)\left(S_{ij}^X + \frac{\lambda^X}{\lambda^I} S_{ij}^I\right) + (k-\epsilon+1)\frac{\lambda^X}{\lambda^I} S_{ij}^I \left[\left(\frac{\tau_{ij} c_j}{c_i}\right)^{\epsilon-1} - 1\right]^{-1}\right] \tag{C.18}$$

The effect of the sales fixed cost on aggregate bilateral trade only occurs through the productivity cutoff, a_{ij}^X. The adjustment goes then only through the decision of firms to either serving only the domestic market or serve also the foreign market by exporting. We then have

$$\frac{\partial S_{ij}^X}{\partial f_{ij}} = x^X(a_{ij}^X) g(a_{ij}^X) \frac{\partial a_{ij}^X}{\partial f_{ij}} \tag{C.19}$$

From C.15, we have

$$x^X(a_{ij}^X) g(a_{ij}^X) \frac{\partial a_{ij}^X}{\partial f_{ij}} = \frac{(k-\epsilon+1)}{(\epsilon-1)}\left[S^X + \frac{\lambda^X}{\lambda^I} S^I\right] \frac{1}{f_{ij}} \tag{C.20}$$

By the same reasoning, we derive the partial derivative of the aggregate sales with respect to the fixed cost of building a subsidiary abroad.

$$x^X(a_{ij}^I) g(a_{ij}^I) \frac{\partial a_{ij}^I}{\partial g_{ij}} = \frac{(k-\epsilon+1)}{(\epsilon-1)}\left[S^X + \frac{\lambda^X}{\lambda^I} S^I\right] \frac{1}{g_{ij}} \tag{C.21}$$

Plug in eq. C.18, eq. C.20 and eq. C.21 into eq. C.11 and using definition 12 , we obtain

$$\begin{aligned}\frac{dS_{ij}^X}{S_{ij}^X} &= \left((\epsilon-1)+(k-\epsilon+1)\frac{\lambda^X}{\lambda^I}\frac{S_{ij}^I}{S_{ij}^X}\left[\left(\frac{\lambda^X}{\lambda^I}\right)-1\right]^{-1}\right)\delta_\tau\frac{dM_{ij}}{M_{ij}} \\ &+ \left(\frac{(k-\epsilon+1)}{(\epsilon-1)}\left(1+\frac{\lambda^X}{\lambda^I}\frac{S_{ij}^I}{S_{ij}^X}\right)((\epsilon-1)\delta_\tau+\delta_f-\delta_g)\right)\frac{dM_{ij}}{M_{ij}}\end{aligned} \tag{C.22}$$

Annexe D. migration network, trade and FDI : Relationships revisited

Annexe D.1. Empirical methodology

In this appendix, we revisit the relationship between migration vs. trade and migration vs. FDI separately using the generalized gravity equation and a recent dataset on migration. We aim to assess whether the traditional analysis of a reduced-form assessing migration on trade or FDI using a standard gravity equation suffers from the biases in this analysis. Moreover, those improved estimates help us to interpret the relationship between migration network and the choice between exports and FDI described in the main analysis. We augment HMR's model with the bilateral stock of migrants between countries j and i as a proxy for the migration network and the determination of FDI. We then analyze how the size of the network affects trade and FDI-related sales assuming that more migrants induce a larger network which leads to a larger decrease in transaction costs.

At the outset, we study the relationship between trade and migration network assuming no FDI-related sales. To do so, we log-linearize eq. 13 (assuming $a_{ij}^I > a_L$), and express the export volume from i to j as :

$$s_{ij}^X = \beta_0^X + \theta_j^X + \theta_i^X - \lambda_d d_{ij}^X + \beta_m m_{ij} + \omega_{ij}^X(M_{ij}) + u_{ij}^X \tag{D.1}$$

The LHS is the log of the export volume from i to j. The first term on the RHS is a constant. The second and third terms are selling country and buying country fixed effects respectively.[36] The variable m_{ij} is the logarithm of the stock of migrants from country j to country i reflecting

36. More precisely, following HMR model and their assumption such as a Pareto distribution with parameter k for the cumulative distribution of productivity G(a) : θ_j^X=$log(N_j)$-$(\epsilon-1)log(c_j)$ and θ_i^X= $log(Y_i)$+ $(\epsilon-1)log(P_i)$. The use country fixed effect in eq. D.1 enables to also assess the effect of the proportion of migrants in the destination country on trade flow.

the role of migration from the buying country to the selling country in reducing the transaction costs for sellers. d_{ij} is a generic representation of distance including standard bilateral variables commonly included in gravity equation estimation which affect the volume of firm-level exports, such as geographic distance, common border, colonial ties, common language and same legal system. As HMR, we assume that the variable trade costs are stochastic due to i.i.d unmeasured trade frictions u_{ij} which are country pair-specific. Therefore, while d_{ij} captures observable variable trade costs, u_{ij} reflects the non-observables variable trade costs and is such that $u_{ij}^X \backsim$ N(0,σ_u^2). The variable, ω_{ij}^X controls for the fraction of firms (possibly zero) that export from j to i.[37] As describe in the main text, this variable characterizes the main differences with traditional estimation and aims to correct the potential omitted variable bias usually present in the estimation of the standard gravity equation. Indeed, existing literature confounds the effect of migration network on trade with its effect on the proportion of exporting firms.

Analogously, we characterize the FDI-related sales between countries j and i as the following by log-linerazing eq. 14 :

$$s_{ij}^I = \beta_0^I + \theta_j^I + \theta_i^I - \lambda_d d_{ij} + \gamma_m^I m_{ij} + \delta^I \omega_{ij}^I(M_{ij}) + u_{ij}^I \tag{D.2}$$

This equation is similar to eq. D.1 except for ω_{ij}^I which is defined as $\log\Big[(\frac{a^I}{a_L})^{k-\epsilon+1} - 1\Big]$. We include m_{ij} because even tough a firm investing abroad does not bear the transportation costs, it is subject to variable costs such as informational frictions. The threshold to start investing abroad is not the same as the export threshold. The term in brackets captures the proportion of country j firms having affiliates in country i. The left-hand side variable is affiliate sales.

Eq. D.1 and eq. D.2 require information on the various productivity thresholds, a_{ij}^X, a_{ij}^I and a_L in order to derive ω_{ij}^X and ω_{ij}^I. The required micro-ose data to characterize the productivity distribution from which the thresholds originate are unavailable, given the global coverage of our analysis. We therefore follow HMR in order to approximate them by defining latent variables Z_{ij}^X and Z_{ij}^I respectively :

$$Z_{ij}^X == exp(\omega_{ij})^{k-\epsilon+1} = E_0 \xi_i^X \xi_j^X (D_{ij}(M_{ij}))^{\lambda_d} (\Omega^X(M_{ij}))^{\kappa} e^{(u_{ij}^X + v_{ij}^X)} \tag{D.3}$$

Where E_0 is a constant, ξ_i^X and ξ_j^X are importing country and exporting country fixed effects, Ω^X captures the country-pair fixed cost to penetrate the foreign market and $v_{ij}^X \backsim N(0, \sigma_u^2)$. Finally, κ is a parameter. Z_{ij}^X represents the ratio of the variable exports profits for the most

37. $\omega_{ij}^X = [(\frac{a^X(M_{ij})}{a^L})^{k-\epsilon+1} - 1]$

productive firm to the fixed export costs, $c_j f_{ij}$ from country j in country i times the relative variable cost from j to i. In other words, Z_{ij}^X captures the decision of the most productive firm in country j to export. Trade occurs between i and j if and only if $Z_{ij}^X > 1$. Although Z_{ij}^X is unobserved, trade flows are observed. [38]

We follow an analogous procedure to approximate ω_{ij}^I and define a latent variable Z_{ij}^I :

$$Z_{ij}^I = E_0 \xi_i^I \xi_j^I (D_{ij}(M_{ij})^I)^{\lambda_d} (\Omega^I (M_{ij})^I)^{\kappa} e^{(u_{ij}^I + v_{ij}^I)} \tag{D.4}$$

Z_{ij}^I represents then the ratio of the variable profit related to FDI-sales for the most productive firm to the fixed costs to set up a subsidiary in country i times the relative variable cost which reflects the proximity-concentration tradeoff. Note again that this latent variable which enables to estimate the unobserved endogenous variable, ω_{ij}^I, has been derived from a firm-level decision.

As described in the core analysis, we then define the probability, ρ_{ij}^X, that country j exports to country i, conditional to observed variables. ρ_{ij}^X is estimated by a probit model. To do so, we define an indicator variable T_{ij}=1 whether country j export to country i and 0 otherwise. We then derive ρ_{ij}^X :

$$\begin{aligned} \rho_{ij}^X &= Pr(T_{ij} = 1 | \text{observed variables}) \\ &= \Phi(\gamma_0^X + \chi_i + \chi_j - \gamma_d d_{ij} + \gamma_m^X m_{ij} + \gamma_f \phi + \eta_{ij}^X) \end{aligned} \tag{D.5}$$

where the first term on the RHS is a constant. The second and third terms are importing country and exporting country fixed effects respectively. As above, the term d_{ij} is a generic representation of distance. The variable m_{ij} is the logarithm of the stock of migrants from country j to country i capturing the effect of the migration network on the decision for the most productive firm to penetrate the foreign market or not. As defined in HMR, ϕ_{ij} is "an observed measure of any additional country-pair specific fixed trade costs". Finally, $\Phi(:)$ is defined as the cdf of the standard normal distribution. Following HMR, we estimate eq. D.5 to derive consistent estimates of Z_{ij}^X. We estimate a similar specification to eq. D.5 is used in order to estimate Z_{ij}^I. Once we have Z_{ij}^X and Z_{ij}^I, we can approximate ω_{ij}^X, ω_{ij}^I and estimate eq. D.1 and eq. D.2. This empirical

38. Given our assumption as well as observations by Helpman et al. [23] and Ottaviano and Mayer [32] of strict sorting, the only condition to be assessed is whether the most productive firm has a productivity larger than the threshold required to cover the fixed cost to export.

strategy enables us to assess whether migration affects the aggregate trade volume or the FDI-related sales either through the extensive margin (i.e. γ_m from eq. D.5), through the intensive margin (i.e. β_m from eq. D.1 and in eq. D.2) or through both.[39]

Annexe D.2. Results

We present the results for exports and FDI in the same fashion as section 5. The exclusion restriction used when we estimate the exports equation is the minimum capital that must be paid to start a business. When we estimate the FDI equation, we use the number of days to register a property in the host country as the exclusion restriction.

Our results are similar to the one found by HMR using data from a different time period, namely 2001-2006 concerning the trade analysis. We find that exports to foreign locations are explained both by selection patterns whereby trading partners are matched as well as underlying unobserved firm heterogeneity determining the extensive and intensive margins of trade volume growth. As in HMR, we find that firm heterogeneity induces more substantial biases in estimating the effects of trade frictions in explaining sales abroad. Our results also highlight the dissimilar pattern between trade flows and FDI sales as well as their different reactions according to the type of costs in Table D.19 and Table D.20. Indeed, first, if 81% pairs of countries exports, only 33 % of the bilateral relations have positive value for FDI. Such pattern reinforces our rationale for the use our use of HMR's method to correct for sample selection. Second, the distance has a stronger effect on trade flows than on the FDI sales. Currency union, trade agreements and whether a country is landlocked or not do not significantly affect FDI flows. However, one needs to be cautious when comparing the coefficients of the explanatory variables as they capture different phenomena. While these explanatory variables capture trade barriers when analyzing trade, they control for information frictions when considering FDI. Note that in both cases, migration network captures information externalities and can then be compared.

As described previously, we proxy the migration network by the lagged stock of migrants from the importing country living in the exporting country in 2000 in order to alleviate some potential endogeneity issues. Table D.19 shows the positive impact of total migration on the probability of exporting in column 1. Migration fosters bilateral trade between two countries i and j and its impact significantly affects the aggregate volume of trade between the two countries as shown in the other columns.

39. For the sake of clarity, we would like to highlight that it provides information and not a clear decomposition of the aggregate trade volume that could quantify the impact on the extensive margin versus the intensive margin.

Concerning FDI, the results in column 1 of Table D.20 show the strong impact of the migration network on the decision to set up a subsidiary abroad. In column 4, we investigate the relationship between migration and FDI correcting for both selection and firm heterogeneity using nonlinear least squares. On the other words, the coefficient of the variable "migrant" captures the effect of the migration network on the volume of sales. This effect is stronger. The elasticity of FDI to the country of origin of migrants is 17.6%. This last estimation clearly indicates that FDI is more sensitive to migration to the home country of multinational corporations than are exports to migration from the importing to exporting country.

Column 4 shows that the migration externality affects the volume of FDI not through a change in the share of exporting firms but through an increase in the volume of FDI by firms already investing abroad. It is however, interesting to see that even though the unobserved firms heterogeneity is not significant in column 4, the heterogeneity bias seems to play a role given the difference of estimates between column 4 and column 8. Such results deserve a deeper investigation at a more disaggregated level. In Table D.21 and Table D.22, we go further by assessing the effect of migration on trade and FDI by level of education. However, as described earlier we are cautious when interpreting those results because they might spuriously be driven by the characteristics of firms selling abroad.

To sum up, we aim to assess whether previous estimates found in the literature confound the effects of migration on firm-level foreign sales with its effect on the proportion of firms selling abroad. Moreover, we are concerned with a potential censoring issue. Our results provide evidence of potential biases mainly driven by a sample selection issue. We observe a dissimilarity of patterns between trade flows and FDI sales as well as differences in results which lead us to further investigate factors affecting the costs either to export or to build up a subsidiary such as the migration. Indeed, as described even though the literature has assessed the relationship between migrants, trade or FDI separately. These two modes of serving the foreign market are correlated as analyzed by the literature on what is commonly named the proximity-concentration tradeoff (when considering horizontal FDI, we will address this issue later). Moreover, we believe that focusing on the relationship between migration, trade and FDI enables to mitigate the traditional endogeneity issue that one faces once assessing these two relationships.

TABLE D.19: 2001-2006 Average Trade, Total Migration

	(1) Prob(trade) Probit	(2) ln(trade) ols	(3) ln(trade) benchmark	(4) ln(trade) nls	(5) ln(trade) Polynomial	(6) ln(trade) bin 50	(7) ln(trade) bin 100	(8) ln(trade) firm heterogeneity	(9) ln(trade) firm selection
ln(Total migration in 2000)	0.003***	0.150***	0.151***	0.105***	0.112***	0.108***	0.108***	0.097***	0.149***
	(0.001)	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)
ln(distance)	-0.048***	-1.492***	-1.492***	-0.994***	-1.113***	-1.048***	-1.037***	-0.892***	-1.549***
	(0.003)	(0.036)	(0.036)	(0.043)	(0.048)	(0.054)	(0.054)	(0.051)	(0.037)
Common border	-0.020	0.341**	0.338**	0.539***	0.529***	0.539***	0.557***	0.577***	0.300**
	(0.023)	(0.149)	(0.149)	(0.126)	(0.146)	(0.144)	(0.145)	(0.148)	(0.150)
Currency union	0.020**	0.606***	0.615***	0.340*	0.360*	0.330*	0.326	0.285	0.701***
	(0.006)	(0.209)	(0.207)	(0.196)	(0.198)	(0.199)	(0.199)	(0.202)	(0.209)
Free trade agreement	0.024***	0.642***	0.651***	0.462***	0.606***	0.561***	0.554***	0.415***	0.643***
	(0.004)	(0.095)	(0.094)	(0.081)	(0.089)	(0.090)	(0.089)	(0.092)	(0.096)
Country-pair is landlocked	-0.013*	-0.639***	-0.639***	-0.488***	-0.482***	-0.474***	-0.474***	-0.461***	-0.661***
	(0.008)	(0.135)	(0.135)	(0.127)	(0.131)	(0.132)	(0.132)	(0.133)	(0.135)
Same legal system	0.007***	0.363***	0.362***	0.288***	0.326***	0.316***	0.313***	0.271***	0.363***
	(0.002)	(0.049)	(0.049)	(0.045)	(0.048)	(0.048)	(0.048)	(0.048)	(0.049)
Same official language	0.023***	0.681***	0.686***	0.349***	0.392***	0.354***	0.345***	0.284***	0.733***
	(0.003)	(0.071)	(0.071)	(0.069)	(0.074)	(0.076)	(0.077)	(0.075)	(0.071)
Colonial ties	-0.337***	0.111	0.106	1.253***	0.921***	1.048***	1.068***	1.489***	0.056
	(0.213)	(0.177)	(0.176)	(0.160)	(0.170)	(0.182)	(0.182)	(0.179)	(0.182)
Paid-in minimum capital	-0.010**	-0.138							
	(0.004)	(0.098)							
δ				0.949***					
				(0.063)					
z					3.135***			1.196***	
					(0.551)			(0.070)	
z^2					-0.463***				
					(0.166)				
z^3					0.021				
η				0.562***	1.928***				0.607***
				(0.118)	(0.278)				(0.124)
Observations	19283	15615	15615	15615	15615	15615	15615	15615	15615
R^2		0.677	0.676	0.682	0.685	0.686	0.687	0.681	0.677

Marginal effects at sample means are reported for Probit. Paid-in minimum capital (as a % of income per capita) is the excluded variable in the second stage specification.
Robust standard errors (clustering by country pair) in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

TABLE D.20: Average FDI Position, Total Migration

	(1) Prob(FDI) Probit	(2) ln(FDI) ols	(3) ln(FDI) benchmark	(4) ln(FDI) nls	(5) ln(FDI) Polynomial	(6) ln(FDI) bin 50	(7) ln(FDI) bin 100	(8) ln(FDI) firm heterogeneity	(9) ln(FDI) firm selection
ln(Total migration in 2000)	0.027***	0.198***	0.199***	0.176***	0.179***	0.174***	0.172***	0.158***	0.212***
	(0.004)	(0.023)	(0.024)	(0.025)	(0.025)	(0.026)	(0.026)	(0.025)	(0.024)
ln(distance)	-0.207***	-1.053***	-1.056***	-0.918***	-0.944***	-0.953***	-0.921***	-0.796***	-1.117***
	(0.022)	(0.104)	(0.104)	(0.111)	(0.123)	(0.129)	(0.130)	(0.118)	(0.110)
Common border	0.105	0.103	0.091	0.060	0.084	0.049	0.018	0.065	0.053
	(0.115)	(0.290)	(0.289)	(0.256)	(0.289)	(0.285)	(0.285)	(0.292)	(0.297)
Currency union	0.296***	0.146	0.028	0.127	0.071	0.080	0.056	0.012	0.039
	(0.103)	(0.220)	(0.222)	(0.211)	(0.221)	(0.225)	(0.228)	(0.226)	(0.230)
Free trade agreement	-0.001	-0.038	-0.047	-0.057	-0.037	0.011	0.045	-0.064	-0.052
	(0.039)	(0.244)	(0.244)	(0.230)	(0.238)	(0.238)	(0.238)	(0.242)	(0.242)
Country-pair is landlocked	-0.003	0.292	0.283	0.502	0.605	0.536	0.478	0.454	0.357
	(0.065)	(0.409)	(0.397)	(0.415)	(0.397)	(0.405)	(0.409)	(0.406)	(0.400)
Same legal system	0.086***	0.474***	0.467***	0.442***	0.434***	0.466***	0.459***	0.381***	0.536***
	(0.027)	(0.121)	(0.121)	(0.118)	(0.124)	(0.124)	(0.125)	(0.123)	(0.124)
Same official language	0.139***	0.679***	0.701***	0.600***	0.614***	0.616***	0.609***	0.565**	0.687***
	(0.049)	(0.222)	(0.222)	(0.208)	(0.220)	(0.224)	(0.227)	(0.223)	(0.224)
Colonial ties	0.233***	0.829***	0.812***	0.655***	0.667***	0.685***	0.633***	0.522**	0.895***
	(0.060)	(0.222)	(0.221)	(0.224)	(0.237)	(0.236)	(0.241)	(0.235)	(0.227)
Time (days) to register a property	-0.068*	-0.327							
	(0.152)	(0.039)							
δ				0.066					
				(0.173)					
z					3.940***			0.508***	
					(0.956)			(0.112)	
z^2					-1.063***				
					(0.310)				
z^3					0.095***				
					(0.032)				
η				0.862***	1.707***				0.427***
				(0.143)	(0.355)				(0.156)
Observations	6512	2180	2180	2180	2180	2180	2180	2180	2180
R^2		0.772	0.771	0.775	0 .777	0.783	0.787	0.774	0.773

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE D.21: Average Trade Position by level of education

	Skilled migration					Low-skilled migration				
	(1) Prob(trade) Probit	(2) ln(trade) benchmark	(3) ln(trade) nls	(4) ln(trade) firm heterogeneity	(5) ln(trade) firm selection	(6) Prob(trade) Probit	(7) ln(trade) benchmark	(8) ln(trade) nls	(9) ln(trade) firm heterogeneity	(10) ln(trade) firm selection
ln(migrant in 2000)	0.003**	0.160***	0.114***	0.106***	0.155***	0.003***	0.150***	0.105***	0.097***	0.148***
	(0.001)	(0.012)	(0.012)	(0.012)	(0.012)	(0.001)	(0.011)	(0.010)	(0.011)	(0.011)
ln(distance)	-0.049***	-1.545***	-1.010***	-0.918***	-1.601***	-0.048***	-1.500***	-0.993***	-0.891***	- 1.558***
	(0.003)	(0.036)	(0.044)	(0.052)	(0.037)	(0.003)	(0.036)	(0.044)	(0.052)	(0.037)
Common border	-0.016	0.433***	0.600***	0.626***	0.403***	-0.020	0.316**	0.520***	0.559***	0.277*
	(0.019)	(0.149)	(0.126)	(0.148)	(0.151)	(0.021)	(0.150)	(0.127)	(0.149)	(0.151)
Currency union	0.021**	0.723***	0.403**	0.352*	0.803***	0.020**	0.628***	0.348*	0.292	0.714***
	(0.006)	(0.207)	(0.195)	(0.202)	(0.210)	(0.006)	(0.207)	(0.196)	(0.202)	(0. 210)
Free trade agreement	0.025***	0.705***	0.483***	0.436***	0.702***	0.024***	0.654***	0.459***	0.413 ***	0.646***
	(0.003)	(0.094)	(0.081)	(0.092)	(0.096)	(0.004)	(0.095)	(0.082)	(0.092)	(0.096)
Country-pair is landlocked	-0.013*	-0.640***	-0.482***	-0.459***	-0.662***	-0.013*	-0.639***	-0.487***	-0.460***	-0 .662***
	(0.007)	(0.135)	(0.127)	(0.133)	(0.136)	(0.007)	(0.135)	(0.127)	(0.133)	(0. 135)
Same legal system	0.007***	0.364***	0.288***	0.273***	0.365***	0.007***	0.365***	0.290***	0.273***	0.366***
	(0.002)	(0.049)	(0.045)	(0.048)	(0.002)	(0.037)	(0.049)	(0.045)	(0.048)	(0.049)
Same official language	0.023***	0.685***	0.334***	0.277***	0.023***	0.403***	0.702***	0.357***	0.292***	0.749***
	(0.002)	(0.071)	(0.070)	(0.076)	(0.072)	(0.002)	(0.071)	(0.069)	(0.075)	(0.071)
Colonial ties	-0.341***	0.096	1.284***	1.497***	0.056	-0.337***	0.096	1.258***	1.493***	0.046
	(0.213)	(0.180)	(0.162)	(0.180)	(0.186)	(0.211)	(0.177)	(0.161)	(0.179)	(0.183)
Paid-in minimum capital	-0.010**					-0.010**				
	(0.004)					(0.004)				
δ			0.978***					0.962***		
			(0.062)					(0.063)		
z				1.203***					1.207***	
				(0.069)					(0.070)	
η			0.514***		0.574***			0.559***		0.617***
			(0.118)		(0.124)			(0.119)		(0.124)
Observations	19283	15615	15615	15615	15615	19283	15615	15615	15615	15615
R^2		0.676	0.681	0.681	0.676		0.676	0.682	0.681	0.677

Marginal effects at sample means are reported for Probit. Paid-in minimum capital (as a % of income per capita) is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE D.22: Average FDI Position by level of education

	Skilled migration					Low-skilled migration				
	(1) Prob(FDI) Probit	(2) ln(FDI) benchmark	(3) ln(FDI) nls	(4) ln(FDI) firm heterogeneity	(5) ln(FDI) firm selection	(6) Prob(FDI) Probit	(7) ln(FDI) benchmark	(8) ln(FDI) nls	(9) ln(FDI) firm heterogeneity	(10) ln(FDI) firm selection
ln(migration in 2000)	0.031***	0.243***	0.214***	0.194***	0.255***	0.029***	0.186***	0.176***	0.145***	0.196***
	(0.005)	(0.027)	(0.029)	(0.029)	(0.004)	(0.014)	(0.022)	(0.026)	(0.024)	(0. 023)
ln(distance)	-0.209***	-1.044***	-0.904***	-0.789***	-1.102***	-0.206***	-0.924***	-1.078***	-0.824***	- 1.138***
	(0.022)	(0.105)	(0.111)	(0.118)	(0.111)	(0.021)	(0.104)	(0.110)	(0.117)	(0. 110)
Common border	0.108	0.122	0.094	0.094	0.092	0.352	0.059	0.039	0.038	0.023
	(0.114)	(0.285)	(0.253)	(0.288)	(0.293)	(0.113)	(0.291)	(0.257)	(0.294)	(0.299)
Currency union	0.285***	0.071	-0.015	-0.027	-0.014	0.300***	0.119	0.030	0.016	0 .035
	(0.104)	(0.219)	(0.209)	(0.223)	(0.227)	(0.102)	(0.222)	(0.212)	(0.226)	(0.230)
Free trade agreement	-0.003	-0.075	-0.077	-0.085	-0.077	0.003	-0.008	-0.062	-0.032	-0.012
	(0.039)	(0.242)	(0.229)	(0.240)	(0.241)	(0.039)	(0.245)	(0.230)	(0.243)	(0.243)
Country-pair is landlocked	-0.002	0.284	0.498	0.450	0.355	0.003	0.298	0.515	0.460	0.368
	(0.065)	(0.397)	(0.411)	(0.407)	(0.401)	(0.065)	(0.395)	(0.416)	(0.403)	(0.398)
Same legal system	0.087***	0.466***	0.438***	0.381***	0.086***	0.312***	0.498***	0.442***	0.412***	0.564***
	(0.028)	(0.120)	(0.117)	(0.122)	(0.123)	(0.027)	(0.121)	(0.117)	(0.123)	(0. 124)
Same official language	0.131***	0.649***	0.555***	0.526**	0.632***	0.137***	0.669***	0.591***	0.540**	0.655***
	(0.049)	(0.221)	(0.207)	(0.222)	(0.223)	(0.049)	(0.221)	(0.207)	(0.222)	(0.223)
Colonial ties	0.239***	0.789***	0.629***	0.503**	0.869***	0.223***	0.787***	0.657***	0.517**	0.866***
	(0.060)	(0.220)	(0.224)	(0.234)	(0.227)	(0.059)	(0.222)	(0.223)	(0.236)	(0.228)
Time (days) to register a property	-0.069*					-0.068*				
	(0.039)					(0.039)				
δ			0.060					0.063		
			(0.174)					(0.173)		
z				0.495***					0.492***	
				(0.111)					(0.110)	
η			0.844***		0.403***			0.854***		0.398**
			(0.142)	(0.154)				(0.143)	(0. 155)	
Observations	6512	2180	2180	2180	2180	6512	2180	2180	2180	2180
R^2		0.773	0.777	0.775	0.774		0.771	0.775	0.773	0 .772

Marginal effects at sample means are reported for Probit. Time to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE D.23: 2001-2006 Average Trade, Total **Observed** Migration

	(1) Ind(trade) Probit	(2) ln(trade) ols	(3) ln(trade) benchmark	(4) ln(trade) nls	(5) ln(trade) Polynomial	(6) ln(trade) bin 50	(7) ln(trade) bin 100	(8) ln(trade) firm heterogeneity	(9) ln(trade) firm selection
ln(Total migration in 2000)	0.001*	0.146***	0.146***	0.104***	0.106***	0.103***	0.100***	0.100***	0.146***
	(0.001)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
ln(distance)	-0.024***	-1.577***	-1.577***	-1.109***	-1.195***	-1.162***	-1.152***	-1.103***	-1.591***
	(0.003)	(0.047)	(0.047)	(0.058)	(0.061)	(0.064)	(0.067)	(0.063)	(0.047)
Common border	-0.075**	-0.060	-0.061	0.560***	0.486***	0.524***	0.559***	0.587***	-0.077
	(0.063)	(0.188)	(0.188)	(0.182)	(0.188)	(0.188)	(0.191)	(0.192)	(0.188)
Currency union	0.012**	1.172***	1.173***	0.761**	0.765**	0.702**	0.679**	0.709**	1.199***
	(0.003)	(0.331)	(0.331)	(0.321)	(0.317)	(0.317)	(0.318)	(0.316)	(0.333)
Free trade agreement	0.014***	0.455***	0.456 ***	0.242**	0.392***	0.358***	0.316***	0.182*	0.448***
	(0.002)	(0.115)	(0.115)	(0.102)	(0.109)	(0.111)	(0.112)	(0.110)	(0.117)
Country-pair is landlocked	-0.005	-0.268	-0.268	-0.134	-0.124	-0.099	-0.078	-0.147	-0.273
	(0.006)	(0.184)	(0.184)	(0.178)	(0.179)	(0.179)	(0.180)	(0.181)	(0.184)
Same legal system	0.004**	0.217***	0.217***	0.154**	0.187***	0.174***	0.174***	0.147**	0.217***
	(0.002)	(0.064)	(0.064)	(0.061)	(0.063)	(0.063)	(0.063)	(0.063)	(0.064)
Same official language	0.015***	0.772***	0.772***	0.205**	0.276***	0.249**	0.234**	0.221**	0.791***
	(0.002)	(0.093)	(0.093)	(0.104)	(.105)	(0.108)	(0.110)	(0.108)	(0.094)
Colonial ties	-0.019	-0.058	-0.059	0.298	0.276	0.287	0.313	0.266	-0.070
	(0.031)	(0.285)	(0.285)	(0.225)	(0.229)	(0.230)	(0.229)	(0.236)	(0.288)
Procedures to register a property	-0.006**	-0.027							
	(0.003)	(0.091)							
δ				0.836***					
				(0.089)					
z					3.460***			0.947***	
					(0.726)			(0.086)	
z^2					-0.628***				
					(0.216)				
z^3					0.042**				
					(0.021)				
η				0.311*	1.687***				0.198
				(0.180)	(0.399)				(0.186)
Observations	8751	7467	7467	7467	7467	7467	7467	7467	7467
R^2		0.701	0.701	0.706	0.708	0.711	0.715	0.705	0.701

Marginal effects at sample means are reported for Probit. Procedures to register a property is the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

TABLE D.24: Average FDI Position, Total **observed** Migration

	(1) Ind(FDI) Probit	(2) ln(FDI) ols	(3) ln(FDI) benchmark	(4) ln(FDI) nls	(5) ln(FDI) Polynomial	(6) ln(FDI) bin 50	(7) ln(FDI) bin 100	(8) ln(FDI) firm heterogeneity	(9) ln(FDI) firm selection
ln(Total migration in 2000)	0.033***	0.203***	0.209***	0.182***	0.182***	0.178***	0.162***	0.161***	0.217***
	(0.005)	(0.025)	(0.025)	(0.026)	(0.027)	(0.028)	(0.029)	(0.027)	(0.025)
ln(distance)	-0.255***	-1.064***	-1.062***	-0.938***	-0.961***	-0.937***	-0.896***	-0.803***	-1.134***
	(0.028)	(0.109)	(0.109)	(0.115)	(0.127)	(0.133)	(0.134)	(0.122)	(0.116)
Common border	0.068	0.077	0.067	0.065	0.097	0.047	0.077	0.094	0.019
	(0.122)	(0.268)	(0.265)	(0.257)	(0.272)	(0.274)	(0.280)	(0.273)	(0.277)
Currency union	0.309***	0.191	0.177	0.075	0.120	0.115	0.034	0.056	0.086
	(0.103)	(0.219)	(0.221)	(0.212)	(0.220)	(0.223)	(0.227)	(0.225)	(0.229)
Free trade agreement	0.005	-0.096	-0.118	-0.130	-0.114	-0.114	-0.090	-0.136	-0.114
	(0.50)	(0.255)	(0.256)	(0.241)	(0.248)	(0.247)	(0.253)	(0.253)	(0.254)
Country-pair is landlocked	-0.027	0.342	0.357	0.554	0.680*	0.595	0.683*	0.515	0.389
	(0.083)	(0.406)	(0.391)	(0.422)	(0.391)	(0.397)	(0.399)	(0.403)	(0.397)
Same legal system	0.107***	0.468***	0.455***	0.446***	0.435***	0.420***	0.465***	0.374***	0.541***
	(0.034)	(0.122)	(0.122)	(0.121)	(0.123)	(0.126)	(0.125)	(0.124)	(0.124)
Same official language	0.165***	0.588***	0.600***	0.508**	0.517**	0.539**	0.491**	0.464**	0.596***
	(0.059)	(0.223)	(0.222)	(0.212)	(0.222)	(0.234)	(0.239)	(0.226)	(0.225)
Colonial ties	0.231***	0.825***	0.795***	0.678***	0.690***	0.650***	0.556**	0.545**	0.887***
	(0.069)	(0.229)	(0.229)	(0.231)	(0.241)	(0.241)	(0.246)	(0.240)	(0.236)
Time (days) to register a property	-0.092*	-0.327							
	(0.053)	(0.201)							
δ				0.051					
				(0.181)					
z					4.807***			0.514***	
					(0.996)			(0.117)	
z^2					-1.342***				
					(0.322)				
z^3					0.123***				
					(0.033)				
η				0.908***	2.053***				0.470***
				(0.149)	(0.370)				(0.164)
Observations	5326	1989	1980	1989	1989	1989	1989	1989	1989
R^2		0.768	0.766	0.775	0.772	0.780	0.787	0.770	0.769

Marginal effects at sample means are reported for Probit. Time to register a propertyis the excluded variable in the second stage specification.

Robust standard errors (clustering by country pair) in parentheses.

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

Annexe E. List of countries labelled as "offshore financial centres"

REFERENCES Andorra, Anguilla, Antigua, Aruba, Bahamas, Bahrain, Barbados, Belize, Bermuda, Brunei, Cook islands, Cayman Islands,Costa Rica,Curaçao,Cyprus, Dominica, Gibraltar, Grenada,Jersey, Lebanon, Liberia, Liechtenstein, Luxembourg Macao, Malaysia, Mauritius, Monaco, Montserrat, Panama, St Vincent, St Kitts ,St Lucia,San Marino, Singapore, Seychelles, Turks and Caicos Islands, British Virgin Islands, United States Virgin Islands