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Abstract

This paper examines whether ownership arrangements between manufacturers and intermediaries improve the export performance of the former. We develop a theoretical model of trade with vertically linked industries whereby upstream manufacturers compete in export markets and may decide to acquire ownership stakes in an intermediary. The model highlights how more productive firms succeed in managing the double marginalization problem and in reducing the costs of exporting through forward acquisition. On the flip side, we find that vertical ownership creates a market externality among manufacturers due to the reallocation of market shares from small firms to large firms, forcing some low-productivity firms to exit foreign markets. Predictions from the model are tested using firm-level data on the French agri-food sector. The results confirm the model predictions and reveal that the benefits from forward acquisitions could be quite large.

Keywords: forward integration, trade intermediation, export decision, heterogeneous firms, markups.

JEL classifications: F12, L22

Performances à l'export et lien vertical: analyse des données des entreprises françaises

Résumé

Dans cet article, nous étudions l'impact de l'acquisition d'un intermédiaire par une entreprise sur les performances à l'export de cette entreprise. Nous proposons un modèle avec lien vertical entre industries, dans lequel les entreprises sont en concurrence à l'export et peuvent ou non acquérir des parts dans des intermédiaires de commerce. Nous montrons que l'acquisition d'intermédiaires permet aux entreprises les plus productives de gérer le problème de double marginalisation via l'acquisition et de bénéficier de coûts d'accès aux marchés étrangers plus faibles. Nous montrons également qu'il existe une externalité de marché à l'acquisition d'intermédiaires puisque une réallocation des parts de marché s'effectue vers les grandes entreprises, conduisant les entreprises les moins productives à quitter les marchés étrangers. Les prédictions du modèle sont testées sur les données des entreprises agroalimentaires françaises. Les résultats valident les prédictions du modèle et montrent que les bénéfices à l'acquisition d'intermédiaires sont conséquents.

Mots-clés : intégration de l'aval, exportation, entreprises hétérogènes, intermédiation

Classifications JEL : F12, L22

Vertical ownership and export performance: firm-level evidence from France

1 Introduction

Do firm boundary decisions affect the export performance of firms? The study of firms' internal organization, in connection with their performance, has been a topic of considerable attention since the seminal contribution of Coase (1937), and gives rise to a rich set of theories. The literature on forward integration was almost exclusively developed in a domestic framework, and the decision to integrate remains largely unexplored from an international trade perspective.[1] This lack of interest is surprising regarding the significant part of export-oriented firms that have chosen to integrate downstream stages of their supply chain. For instance, numerous clothing manufacturers such as Zara and Mango have pursued full integration of wholesale and retailing operations.[2] Forward integrations are also frequently observed in other sectors such as the personal computer industry (e.g., Apple, Dell), the oil industry (e.g., BP, Shell, Total), the automotive and tire industries (e.g., Ford, GM, Toyota, Goodyear), and the food and beverage industries (*e.g.*, The Greenery B.V., E & J Gallo Winery) which is the industry that is analyzed in this paper.

Typically, when a manufacturer thinks about how to reach end consumers two options prevail: either contracting with independent retailers (*market transactions*) or managing in-house the selling operations through the internal divisions it owns (*forward integration*). It is well-known from the theory of the firm that by choosing to internalize stages of the sale process (wholesaling, logistic supply chain, retail stores) instead of contracting with arm's length parties, a manufacturer aims to reduce market inefficiencies such as vertical externality (the double marginalization problem), transaction costs and contractual hazards, and inefficient informational transfers, for instance.[3]

Intuitively, there are good reasons to believe that the benefits from integrating forward are greater when selling abroad. Once having crossed the borders, manufacturers incur additional sunk entry costs and address new retail market environments that require specific knowledge traditionally held by the intermediary sector.[4] Informational barriers are also obstacles that

[1] By contrast, there exists a burgeoning literature that examines the impact of trade policies on firms' decision to integrate backward (e.g., Conconi, Legros, and Newman, 2012; Alfaro, Conconi, Fadinger, and Newman, 2010).

[2] American Apparel, one of the most iconic firms of the US garment sector, has even made a selling point of this internal organization. On its website, the company writes: "We believe that having manufacturing under the same roof as design, marketing, accounting, retail and distribution gives us the ability to quickly mobilize all departments, to respond directly to changes in the market, and to have complete visibility over our product - start to finish." (see `http://www.americanapparel.net/aboutus/verticalint/`).

[3] See Lafontaine and Slade (2007) for a primer on forward integration.

[4] Examples of such costs are compliance with public and private standards, language translation services, bureaucratic costs, and costs of establishing distribution networks, among others. Exporting also requires specific knowledge to manage multiple destinations with heterogeneous demand and contingencies.

exporters face in regard to finding local buyers. The role of intermediaries would thus be magnified abroad, and the greater competition encountered in foreign markets creates more damaging market inefficiencies resulting from contractual relationships. Therefore, acquiring (fully or partially) an intermediary may help a manufacturer to increase its operating profits by fixing the double marginalization problem and by lowering fixed export costs while acquiring critical information on foreign markets.

In this paper, we theoretically and empirically study the impact of the acquisition of an intermediary on the export performance of manufacturers. To reach our goal, we first formulate a general model of trade with two vertically related industries in which heterogeneous manufacturers supply a differentiated product and domestically-based intermediaries (downstream firms) distribute the differentiated products both in the domestic and foreign markets. Manufacturers and intermediaries can be linked by financial arrangements (*vertical ownership*) involving the acquisition of assets (Grossman and Hart, 1986) or profit claims (Riordan, 1991), or both. The manufacturer's decision to acquire ownership stakes in an intermediary governs the trade-off between higher operating profits and higher costs of acquisition. In an open economy, this choice depends on three key variables: manufacturer efficiency, trade costs and foreign market size. This framework enables us to explore empirically the consequences of using forward integration in distribution activities (i.e., wholesaling or retailing) as a business strategy to enhance foreign market-access.

Our contribution is threefold. First, contrary to the trade literature, we consider that intermediaries operate under imperfect competition, act strategically and may be independent, partially owned or fully controlled by manufacturers. Under these circumstances, a problem of double marginalization occurs because firms along each side of the vertical chain have market power and set a price above the marginal cost. From this setup, we determine endogenously the probability of acquiring ownership stakes in an intermediary and its impact on the probability of serving a market and export sales. Second, our approach differs also from the industrial organization literature by considering heterogeneous firms producing in monopolistic competition as well as fixed and variable trade costs in a general equilibrium model. Third, we test empirically the implications of the model from firm-level data providing information about financial participations in intermediaries and export outcomes of manufacturers.

Developing our model, we show that the upward shift in sales associated with vertical ownership is higher for the most productive manufacturers while the acquisition costs do not vary among them. This result holds under different assumptions related to the market structures and vertical relationships. In other words, we find a productivity sorting of firms. Exporters controlling their distribution network are, on average, more productive than the others. As a result, vertical ownership enables highly-efficient manufacturers to neutralize double marginalization in the vertical chain and to reduce access costs for foreign markets, as expected, and, in turn, boosts their probability of exporting and export sales. As only high productivity (or, equivalently, large) firms are able to acquire equity shares in an intermediary, this creates a market

externality among manufacturers due to the reallocation of market shares from small firms to large firms. By controlling an intermediary, large firms enjoy higher foreign demands and hurt small firms that lose market shares or exit from foreign markets. We also show that manufacturers that have ownership stakes in an intermediary are more likely to serve countries with a small potential market than firms without financial participations in an intermediary. Hence, the positive exporter productivity premium (on average, firms that choose to export directly exhibit a higher productivity than firms that export through intermediaries, as shown by Davies and Jeppesen, 2012) can also be due to better control over distribution channels by the more productive firms.

We test the implications of our model using an original dataset compiling information on French firms from two sources. First, we observe from the Amadeus database (Bureau van Dijk, 2008) the financial participations of manufacturers in intermediaries for two distinct years (2008 and 2012). We then supplement the firm-level data with the French Customs data and gather information on firms export values by destination country. We concentrate our empirical analysis on the "food and beverage industry" (i.e., food firms) due to the prevalence of intermediaries in the flows of food products. This sector is characterized by a large number of heterogeneous agri-food manufacturers selling differentiated products and by use of specialized wholesalers/retailers with various degrees of partial vertical integration (Reardon and Timmer, 2007). Overall, we use pooled cross-section data that provide information on 14,090 food firms.

Our findings support the hypothesis of an "*intermediary premium*"on the export performance of manufacturers. As predicted by the model, we observe first that firms self-select to acquire equity shares in intermediaries based on their productivity. The combination of lower marginal costs and lower markups enables them to cover market entry costs for a larger set of destinations, increasing in turn both their probability of exporting and their export revenues. Moreover, we confirm that firms owning intermediaries have non-negligible advantages for entering foreign markets, especially those with a small market potential. Finally, we find that firms owning intermediaries enjoy lower market-access costs, which lends support to the transfer of intangible inputs from intermediaries to their acquirers.

Related literature. By addressing the issue of intermediation in a context of international trade, this paper relates to the trade literature that questions the existence of intermediaries in trade flows. Early theoretical contributions viewed intermediaries as agents that facilitate matching between foreign buyers and sellers. By offering their network of contacts, intermediaries reduce matching frictions and search costs between buyers and sellers (e.g., Rubinstein and Wolinsky, 1987; Rauch and Watson, 2004; Antràs and Costinot, 2011), thus allowing trade for (small) manufacturers that cannot bear the cost of distribution (Blum, Claro, and Horstmann, 2012). More recently, several studies have highlighted the prevalence of intermediaries in export flows. Wholesale and retail firms account for approximately 20% of French exports (Crozet, Lalanne, and Poncet, 2013), 9% of US exports (Bernard, Jensen, Redding, and Schott, 2010), and 29% of China exports (Ahn, Khandelwal, and Wei, 2011). A number

of general patterns emerged from these empirical works: intermediaries are smaller than manufacturing firms, they export a wider range of products in a narrower number of destinations than " pure producers", and they churn products more frequently (Bernard, Grazzi, and Tomasi, 2014). Because intermediaries are more diversified than manufacturers, they also export lower volumes per product-destination. Based on these findings, several authors proposed to recast standard models of trade with heterogeneous firms so that domestic manufacturers can choose between two technologies of distribution: either export directly (*direct exporting*) or contract with an intermediary who takes over the selling activities (*indirect exporting*). By handling large product portfolios, intermediaries are able to spread the fixed costs of exporting over several products (economies of scope) and thus offer cheaper access to foreign markets. This advantage is however counteracted by a lower profitability due to either higher variables costs (Ahn, Khandelwal, and Wei, 2011), market power exerted by intermediaries (Akerman, 2014), or contractual frictions (Felbermayr and Jung, 2011). This tradeoff causes productivity sorting among firms as in Melitz (2003)'s model and only the most efficient firms find it profitable to export directly.[5] The remaining fringe of exporting firms thus export through intermediaries. One of the common findings of these papers is that the share of intermediaries in export flows becomes more important for small potential markets with important market-access costs.

Our approach differs significantly from this literature by accounting for the fact that manufactured goods are necessarily sold by a dedicated corporate service external to the production process. Because only the most-productive firms can bear the fixed costs of acquisition and distribution, part of the intermediaries remains independent. We thus propose an alternative explanation for the prevalence of intermediaries in export flows that relies on manufacturers' productivity heterogeneity (production costs, management) and their ability to extend their boundaries rather than on an intermediary technology advantage (i.e., lower fixed export costs). Further, by explicitly allowing manufacturers to modify the nature of the vertical relationship with intermediaries in our model, the double marginalization issue is accounted for and markups become firm-specific. Forward integration (full or partial) then appears as an interesting device to lower final prices while raising export revenues. This mechanism explains why firms owning their own distribution network are more prevalent in certain destinations, a point that has not been emphasized until now.

The rest of the paper is organized as follows. We develop in Section 2 the model from which we build our predictions. In Section 3, we introduce the data used and document several differences between acquiring and non-acquiring firms. Section 4 discusses the empirical strategy adopted to test the main predictions of the model and reports clear-cut results that give support to the

[5] In addition to the case in which firms are heterogeneous in terms of efficiency, Crozet et al. (2013) investigate the quality-differentiation case. Similar to the literature, for productivity sorting, intermediaries export the most expensive varieties (i.e., higher costs of production). By contrast, in the quality-sorting setting, they export the least expensive products (i.e., lower-quality products). These predictions are then compared with the data and the authors show that, for a given product, price differences between direct and indirect exporters are driven by the level of quality differentiation.

existence of an *intermediary premium*. Finally, Section 5 concludes.

2 A theory of vertical ownership in a global economy

In this section, we present a general equilibrium model with trade in the presence of vertical interactions and ownership arrangements with heterogeneous manufacturers. Our purpose is to derive a set of predictions that will be then confronted with firm-level data.

2.1 General assumptions

Let us set the basic model. Some extensions are discussed in Appendix A. Consider in each country a continuum of manufacturers (upstream firms) with a mass M producing a differentiated good and a continuum of domestically-based intermediaries (downstream firms) distributing differentiated products in the domestic and foreign markets. Manufacturers and intermediaries are linked by the input supply and by financial arrangements (*vertical ownership*). We consider a single period of production, but we can easily extend our framework to multiple periods by assuming an exogenous probability about the survival of firms as in Melitz (2003).
Typically, vertical integrations involve the acquisition of assets (Grossman and Hart, 1986) or an ownership share of profits, i.e., cash flow rights (Riordan, 1991), or both. Indeed, if equity establishes an ownership claim on residual profits, it does not necessarily change control rights over managerial decisions. We assume that partial ownership (i.e., an ownership share strictly between zero and one) does not give control over the target firm so that each firm has its own manager. Partial ownership only induces a partial redistribution of operating profits from the target to the raider. This form of ownership arrangements, also called *passive* ownership, allows us to avoid the discussion of the level at which shareholdings control over pricing decisions arises. The upstream supplier may then offer to buy a fraction $\theta \in [0, 1]$ of the downstream firm at price $b(\theta)$ with $b = 0$, when $\theta = 0$ and $b' \equiv \partial b/\partial\theta > 0$.[6] However, when $\theta = 1$, the manufacturer has the control over managerial decisions of the target (i.e., *controlling* ownership). This limit value is normalized at 1 without loss of generality.
We consider that each intermediary distributes a single variety and each manufacturer produces a single variety and supplies its product to a single intermediary. We also assume that intermediaries exclusively distribute in foreign countries varieties that have the same origin than manufacturers (for example, French intermediaries export the manufactured goods produced by producers set up in France). In Appendix A.1, we show that our results hold with multi-product intermediaries with local monopoly powers.
Hence, in the basic model, there are M configurations in each country implying a manufacturer and an intermediary. Further, we suppose that all firms (manufacturers and intermediaries)

[6] Unlike the standard IO literature, which has almost exclusively focused on the case of full integration, we also consider partial integration.

enjoy market power. We assume the following sequence of events. In the first stage, manufacturers and intermediaries decide whether to enter/exit. In the second stage, the manufacturer chooses to acquire (or not) equity shares in an intermediary (θ). In the third and fourth stages, the manufacturer fixes the wholesale price, z, knowing the price determined by the intermediary. Then, the intermediary takes the wholesale price as given and maximizes its profits by choosing a final price p.

2.2 Demand, market structure and prices

As in the standard trade literature, consumers preferences are defined with a CES utility function. The market structure allows monopolistic competition, and trade costs have fixed and variable components. Because preferences across varieties of product have the standard CES form, each firm producing in country i faces a demand from country j for its variety v given by $q_{ij}(v) = E_j P_j^{\varepsilon-1} p_{ij}(v)^{-\varepsilon}$, where $\varepsilon > 1$ is a constant elasticity of substitution, $p_{ij}(v)$ is the price of variety v paid by the end consumer in country j, E_j is the share of income of households living in country j for the differentiated good, $P_j^{\varepsilon-1} = \left[\int_{\Omega_j} p(v)^{1-\varepsilon} \mathrm{d}v\right]^{-1}$ is the price index prevailing in country j, and Ω_j is the set of varieties available in country j.[7] The export sales for a firm located in country i and serving country j are given by $p_{ij}q_{ij}$ with

$$p_{ij}q_{ij} = A_j p_{ij}^{1-\varepsilon} \tag{1}$$

where $A_j \equiv E_j P_j^{\varepsilon-1}$.

Each manufacturer uses only labor to produce, and its marginal cost to serve country j is given by $w_i\tau_{ij}/\varphi$, where w_i is the wage rate prevailing in country i, τ_{ij} is the "iceberg" variable trade cost which is country-specific, and φ is the labor productivity. We choose labor as the numeraire so that $w_i = 1$.

Contrary to what is usually assumed in the trade literature, each product is not directly exported by the producer but necessarily traded by an intermediary. The distribution of products in country j induces a fixed cost f_{ij} and a constant marginal cost normalized at 0. Hence, the fixed distribution cost is specific to each destination and each country of origin. The intermediaries do not differ in productivity, but have different levels of shareholding. They can be independent, partially owned or fully controlled by a manufacturer. The manufacturers differ in the supplied variety v, their labor productivity φ and their equity shares θ. The parameter φ is treated as exogenous, while θ is determined endogenously.

The operating profits of an intermediary distributing in country j a variety produced in country i is given by

$$\Lambda_{ij}^r \equiv (p_{ij} - z_{ij})q_{ij} \tag{2}$$

with z_{ij} the unit price paid to the manufacturer by the intermediary to distribute the product.

[7] In Appendix A.2, we show that our results are similar when we consider a linear demand.

The operating profit of manufacturer located in country i for a variety consumed in country j is given by

$$\Lambda_{ij}^{m} \equiv (z_{ij} - w_i \tau_{ij}/\varphi) q_{ij}. \tag{3}$$

Based on these operating profits, the total profits of operators can be expressed. The profit of the intermediary distributing variety v located in country i is then given by

$$\pi_i(\theta, \varphi) = (1-\theta) \sum\nolimits_j (\Lambda_{ij}^{r} - f_{ij}) + b(\theta) \tag{4}$$

whereas the profit of a manufacturer in country i is

$$\Pi_i(\theta, \varphi) = \sum\nolimits_j \Lambda_{ij}^{m} + \theta \sum\nolimits_j \left(\Lambda_{ij}^{r} - f_{ij}\right) - b(\theta). \tag{5}$$

Because we consider monopolistic competition, A_j (P_j and E_j) is treated parametrically by firms when they determine their prices and the equity shares to be bought. Maximizing π_i with respect to p_{ij} knowing Eq.(1) yields the equilibrium prices given by $p_{ij}^{*} = \varepsilon z_{ij}/(\varepsilon - 1)$. Then, the price of a manufacturer maximizing its profit is given by

$$z_{ij}^{*} = \frac{\varepsilon}{\varepsilon - 1 + \theta} \frac{\tau_{ij}}{\varphi} \tag{6}$$

with $\partial z_{ij}^{*}/\partial\theta < 0$. It is worth noting that even if the pricing rule applied by the intermediaries is standard (the price is equal to a constant markup, $\varepsilon/(\varepsilon - 1)$, times marginal cost), the price policy set by the manufacturers allows for variable markups due to the financial arrangement with intermediaries. In other words, markup is not constant with vertical ownership although demands are iso-elastic. As expected, the price paid by the intermediary decreases with θ. Note that when $\theta = 0$, the markup achieves its maximum value (vertical separation) while the price of the manufactured good is equal to the marginal cost when vertical integration occurs ($\theta = 1$). Without participation in an intermediary, each firm sets prices at a markup over marginal cost and we obtain the so-called double-marginalization problem. Hence, vertical ownership enables the manufacturer to neutralize double marginalization in the vertical chain. Of course, there are other strategies to fix the double marginalization. This is discussed in Appendix A.3 (again, our main results hold). Even if the wholesale price is the only available instrument to determine the terms of trade with its intermediary, the manufacturer may reduce excessively high prices set by its intermediary by acquiring equity shares.

Hence, using Eq.(6), the equilibrium price paid by a consumer residing in country j is given by:

$$p_{ij}^{*} = \frac{\varepsilon}{\varepsilon - 1} \frac{\varepsilon}{\varepsilon - 1 + \theta} \frac{\tau_{ij}}{\varphi}. \tag{7}$$

Finally, note also that, replacing (z_{ij}^*) by its expression in Eq.(3) implies

$$\Lambda_{ij}^m = \frac{1-\theta}{\varepsilon-1+\theta} q_{ij} = \frac{(1-\theta)(\varepsilon-1)}{\varepsilon} \Lambda_{ij}^r \tag{8}$$

with $\Lambda_{ij}^m < \Lambda_{ij}^r$ as well as $\partial\Lambda_{ij}^m/\partial\theta < 0$ and $\partial\Lambda_{ij}^r/\partial\theta > 0$. Hence, an increase in θ shrinks the operating profits of the manufacturer and boosts the operating profits of the intermediary. Indeed, the margins $(z_{ij} - \tau_{ij}/\varphi)$ for the manufacturer (or $(p_{ij} - z_{ij})$ for the intermediary) decrease with θ, while the demand (q_{ij}) for a variety increases due to a lower price paid by the end consumers. Finally, the former effect dominates the latter effect for the manufacturer while the reverse holds for the intermediary.

2.3 Equilibrium vertical ownership

Each manufacturer sets θ by maximizing its profits given by

$$\Pi_i = \frac{(\varepsilon-1+\theta)^{\varepsilon-1}\varphi^{\varepsilon-1}}{(\varepsilon-1)^{1-\varepsilon}\varepsilon^{2\varepsilon}} \sum\nolimits_j A_j \tau_{ij}^{1-\varepsilon} - \theta \sum\nolimits_j f_{ij} - b(\theta)$$

where Eqs.(1), (2), (6), (7), and (8) have been inserted in Eq.(5). The mechanisms at work are as follows. On the one hand, a rise in θ induces a higher cost of acquisition $(b(\theta))$ and a higher fraction of fixed export costs to be incurred by the manufacturer (f_{ij}). On the other hand, by increasing its equity share in its intermediary, the manufacturer raises the consolidated operating profits (i.e., its operating profits $\Sigma_j \Lambda_{ij}^m$ plus the share of operating profits of the intermediary allocated to the manufacturer $\theta\Sigma_j\Lambda_{ij}^r$). Unambiguously, the operating profits of the intermediary increase with θ due to a reduction in the negative effects of the double marginalization. Even if $\partial\Lambda_{ij}^m/\partial\theta < 0$ due to a lower markup, the gains associated with higher operating profits for the intermediary offset the losses related to lower margins in production.
The first order condition $\partial\Pi_i/\partial\theta_i = 0$ implies that the equilibrium equity share is given by θ^* such that

$$\sum\nolimits_j \Lambda_{ij}^r - b'(\theta^*) - \sum\nolimits_j f_{ij} = 0 \tag{9}$$

where θ^* is an interior solution ($0 < \theta^* < 1$) if and only if $b''(\theta) > \sum_j \partial\Lambda_{ij}^r/\partial\theta$.

Vertical separation vs. vertical integration. Consider first that $b''(\theta) < \sum_j \partial\Lambda_{ij}^r/\partial\theta$ so that there is no interior solution. Under this configuration, the optimal choice for each firm is either vertical separation ($\theta^* = 0$) or vertical integration ($\theta^* = 1$). A manufacturer chooses to integrate fully ($\theta^* = 1$) if and only if $\Pi_i(1,\varphi) > \Pi_i(0,\varphi)$. Because the operating profits of a manufacturer increase continuously with its productivity, the occurrence that $\Pi_i(1,\varphi) > \Pi_i(0,\varphi)$ is more likely when φ is high. It is straightforward to check that there exists a unique value of productivity $\overline{\varphi}_i$ such that $\Pi_i(1,\overline{\varphi}_i) = \Pi_i(0,\overline{\varphi}_i)$. Using the expressions of $\Lambda_{ij}^r(1,\overline{\varphi}_i)$

and $\Lambda_{ij}^r(0,\overline{\varphi}_i)$, $\Pi_i(1,\overline{\varphi}_i) = \Pi_i(0,\overline{\varphi}_i)$ implies

$$\overline{\varphi}_i^{\varepsilon-1} = \frac{\left[\varepsilon^{\varepsilon-1}(\varepsilon-1)^{1-\varepsilon}\right]^2}{\varepsilon^{\varepsilon-1}(\varepsilon-1)^{1-\varepsilon}-1}\frac{\varepsilon\left[\sum_j f_{ij}+b(1)\right]}{\sum_j A_j\tau_{ij}^{1-\varepsilon}}. \tag{10}$$

For all $\varphi \geq \overline{\varphi}_i$, the manufacturer has full control over the intermediary, and its profit is given by $\Pi_{ij}(1,\varphi) = \sum_j[\Lambda_{ij}^r(1) - f_{ij}] \geq b'(1)$. Further, $\partial\overline{\varphi}_i/\partial\tau_{ij} > 0$ and $\partial\overline{\varphi}_i/\partial A_j < 0$. Hence, the revenue gains resulting from lower prices due to forward acquisition are higher in the countries facing higher potential demand or lower export costs. The marginal gain of an increase in θ rises with firm productivity and the size of the potential market.

Partial vertical ownership. Consider now the case in which $b''(\theta) > \sum_j \partial\Lambda_{ij}^r/\partial\theta$ so that an interior solution may occur. Under this configuration, the interior solution θ^* is implicitly given by Eq.(9) or, equivalently, by

$$(\varepsilon-1+\theta^*)^{\varepsilon-1}\left(\frac{\varepsilon}{\varepsilon-1}\right)^{1-\varepsilon}\frac{\varphi^{\varepsilon-1}}{\varepsilon^{\varepsilon}}\sum\nolimits_j A_j\tau_{ij}^{1-\varepsilon} = b'(\theta^*) + \sum\nolimits_j w_i f_{ij} \tag{11}$$

where we have inserted the expression of $\Lambda_{ij}^r(\theta,\varphi)$ in Eq.(9). Some standard calculations reveal that $\partial^2\Pi_i/\partial\theta\partial\varphi > 0$ so that $\partial\theta^*/\partial\varphi > 0$ when $0 < \theta^* < 1$. In addition, we have $\partial^2\Pi_i/\partial\theta\partial\tau < 0$ and $\partial^2\Pi_i/\partial\theta\partial A_j > 0$, implying that $\partial\theta^*/\partial\tau_{ij} < 0$ and $\partial\theta^*/\partial E_j > 0$. As expected, the equilibrium equity share increases with the productivity of the firm, trade liberalization and the size of trade partners.[8]

It is worth noting that partial integration can be preferred to full integration under some circumstances from the acquirer point of view. The recent IO literature shows that partial backward integration is more profitable than full integration (Greenlee and Raskovich, 2006) because it serves as a strategic device to relax price competition in the downstream market (Hunold and Stahl, 2015), and favors input foreclosure (Gilo, Levy, and Speigel, 2014). By contrast, there are very few papers on partial forward integration mainly because under the standard hypothesis of full information in the supply hierarchy, a manufacturer may extract the monopoly profit of the integrated structure through the use of non-linear contracts, irrespective of the ownership stake. Assuming asymmetric information on retail costs, Fiocco (2014) shows that partial forward ownership may be better for manufacturers than full integration depending on whether the price-raising effect from partial ownership outweighs the partial misalignment of profit objectives. To our knowledge, our paper is the first to analyze (partial or full) forward integration in a context of both heterogeneous manufacturers and downstream markets. Due to the reduction of the double marginalization effect, a manufacturer always prefers to integrate forward but the

[8]Note that, although there is an interior solution, all firms do not acquire an intermediary. Indeed, there exists a threshold value of productivity $\overline{\varphi_i^-}$ such that $\theta_i^* = 0$ when $\varphi < \overline{\varphi_i^-}$ given by $-b'(0)+\sum_j[\Lambda_{ij}^r(0,\overline{\varphi_i^-})-w_i f_{ij}] = 0$. In addition, above a limit value of productivity $\overline{\varphi}_i^+$, the firms fully control intermediaries ($\theta_i^* = 1$) when $\varphi \geq \overline{\varphi}_i^+$. Note that $\overline{\varphi}_i^+$ is implicitly given by $-b'(1) + \sum_j[\Lambda_{ij}^r(1,\overline{\varphi}_i^+) - w_i f_{ij}] = 0$.

share of ownership stake depends on firm efficiency and the features of markets to be served. To summarize, from the expressions of the productivity cutoffs obtained from Eq.(10) and Eq.(11), we obtain the following proposition:

Proposition 1 *The probability of a manufacturer acquiring equity shares in an intermediary increases with its productivity, trade liberalization, and the market size of trade partners.*

Hence, among the firms that are sufficiently productive to enter foreign markets, the less efficient ones contract with intermediaries ("non-acquiring firms"), while the most productive ones delegate their distribution operations to intermediaries in which they hold a stake ("acquiring firms") or, for the highest level of productivity, manage these operations in-house (again, "acquiring firms"). This productivity sorting among firms can be discussed in light of recent contributions in the trade literature analyzing manufacturers' choice to export directly or indirectly (e.g., Ahn, Khandelwal, and Wei, 2011; Crozet, Lalanne, and Poncet, 2013; Akerman, 2014). Similar to our model, those works show that the most productive manufacturers find it more profitable to manage their own distribution network (direct exporting is equivalent to vertical integration in this case).[9] The revenue gains associated with lower marginal costs enable the most productive manufacturers to cover the fixed costs of exporting. However, in our model, the possibility of integrating forward provides a new instrument for firms to lower prices. By neutralizing intermediaries' markup, acquiring firms enjoy higher operating profits and are thus more likely to bear the fixed costs of exporting. Because the acquisition cost of an intermediary can be incurred only by highly-productive manufacturers, it is more profitable for them to integrate forward. Finally, a notable distinction with the previous works is that a third category of firms emerges from the sorting. Manufacturers with a productivity just below the cutoff associated with the decision to integrate fully, choose to acquire equity shares of an intermediary (i.e., partial integration without control rights) to reach overseas markets. By shrinking intermediaries' markup, they obtain higher revenues than non-acquiring firms. While this form of ownership arrangements leads manufacturers to outsource their exporting activities, it is far different in reality to what is termed *indirect exporting* in the trade literature.
In what follows, we assume without loss of generality that $b''(\theta) < \sum_j \partial \Lambda_{ij}^r / \partial \theta$ so that a manufacturer has full control over its intermediary ($\theta = 1$) if and only if $\varphi > \overline{\varphi}_i$. Introducing the configuration in which some firms may partially own their distributor makes the formal analysis more involved. Our main results hold as long as the equilibrium equity share increases with labor productivity.

2.4 Export decision and export sales

A manufacturer without financial participations in an intermediary can serve a foreign country if and only if its distributor can profitably export its product $\Lambda_{ij}^r(0, \varphi) > f_{ij}$, i.e., its operating

[9] Note also that both the productivity cutoffs $\left(\overline{\varphi}_i, \overline{\varphi}_{ij}\right)$ and their gap decrease with the attractiveness of the destination country.

profits are higher than the fixed costs of exporting. Because $\Lambda_{ij}^r(0,\varphi)$ rises with labor productivity, an independent intermediary exports a product if the productivity of the manufacturer is high enough. Hence, the variety produced by a manufacturer is exported in country j if and only if its productivity is higher than φ_{ij} with $\Lambda_{ij}^r(0,\varphi_{ij}) = f_{ij}$ or, equivalently,

$$\varphi_{ij}^{\varepsilon-1} = \left(\frac{\varepsilon}{\varepsilon-1}\frac{\varepsilon}{\varepsilon-1}\right)^{\varepsilon-1}\frac{\varepsilon f_{ij}}{A_j\tau_{ij}^{1-\varepsilon}} \tag{12}$$

where φ_{ij} is the productivity cutoff for exporting. Clearly, it appears that the double marginalization ($\frac{\varepsilon}{\varepsilon-1}\frac{\varepsilon}{\varepsilon-1}$) increases the productivity cutoff for serving country j. In addition, the effect of $\left(\frac{\varepsilon}{\varepsilon-1}\frac{\varepsilon}{\varepsilon-1}\right)$ on φ_{ij} is enhanced when the foreign market size (A_j) declines and trade costs (τ_{ij} and f_{ij}) increase. Using Eq.(6) and the expression of the final demand q_{ij}, we can now express the value of export sales for non-acquiring manufacturers as a function of the productivity cutoff for exporting:

$$z_{ij}(0,\varphi)q_{ij}(0,\varphi) = \frac{\varepsilon-1}{\varepsilon}\frac{\varphi^{\varepsilon-1}}{\varphi_{ij}^{\varepsilon-1}}f_{ij}.$$

As in Arkolakis, Demidova, Klenow, and Rodriguez-Clare (2008), the export sales of a manufacturer depend negatively on the productivity cutoff for exporting and positively on its productivity.

Regarding the case of a manufacturer owning its intermediary, its product is sold in country j if and only if $\Lambda_{ij}^r(1,\varphi) > f_{ij}$ or, equivalently, $\varphi > \overline{\varphi}_{ij}$, where $\overline{\varphi}_{ij}$ is the productivity cutoff to serve market j when $\theta^* = 1$ is given by $\Lambda_i^r(1,\overline{\varphi}_{ij}) = f_{ij}$ or, equivalently,

$$\overline{\varphi}_{ij} = \frac{\varepsilon-1}{\varepsilon}\varphi_{ij} < \varphi_{ij}. \tag{13}$$

Hence, the probability of exporting is higher for a manufacturer acquiring an intermediary. Indeed, manufacturers owning equity shares have not only lower marginal costs but also lower markups. The value of export sales for the manufacturer pursuing forward integration is then given by

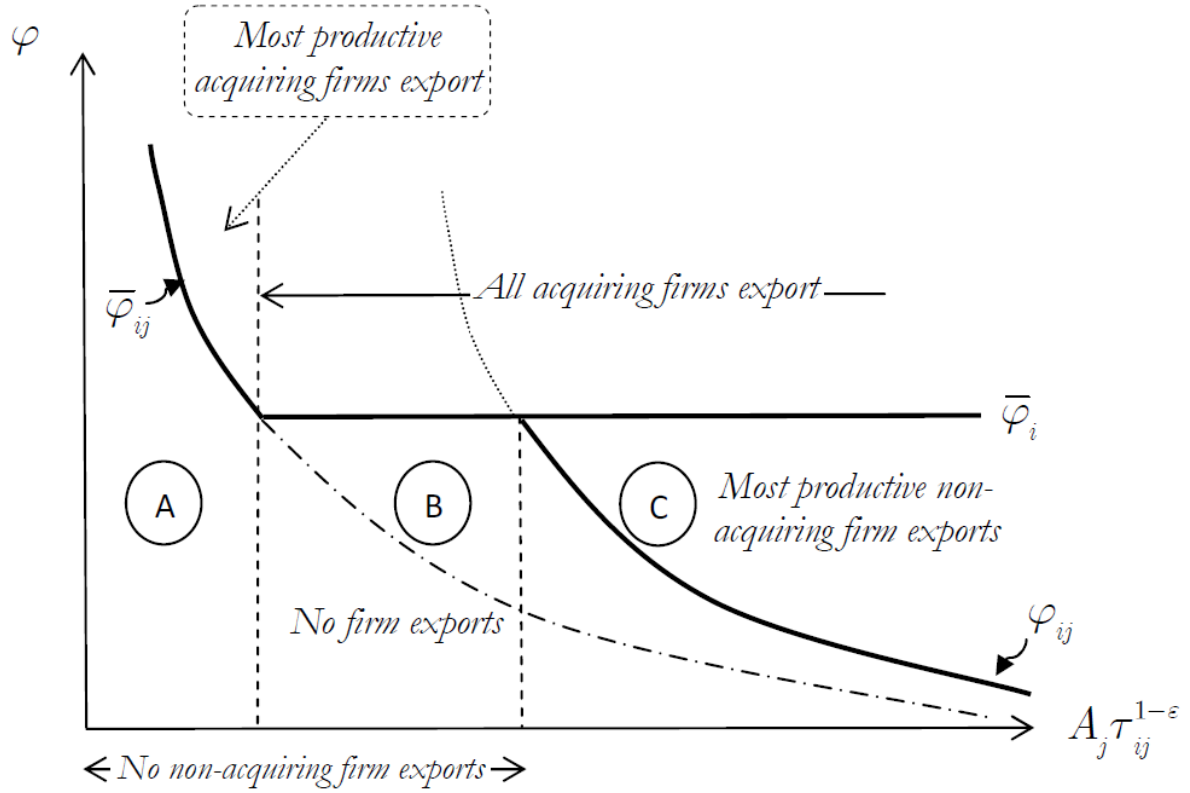
$$p_{ij}(1,\varphi)q_{ij}(1,\varphi) = \frac{\varphi^{\varepsilon-1}}{\overline{\varphi}_{ij}^{\varepsilon-1}}f_{ij} = \left(\frac{\varepsilon}{\varepsilon-1}\right)^{\varepsilon-1}\frac{\varphi^{\varepsilon-1}}{\varphi_{ij}^{\varepsilon-1}}f_{ij}.$$

It follows that, for a given level of productivity, an acquiring firm has higher export sales than non-acquiring firms (i.e., $p_{ij}(1,\varphi)q_{ij}(1,\varphi) > z_{ij}(0,\varphi)q_{ij}(0,\varphi)$).

Proposition 2 *The probability of exporting and export sales are higher for a firm with an ownership stake in its intermediary because of lower marginal costs and markups.*

According to Eq.(13), the export productivity cutoff for acquiring firms is always below that for non-acquiring firms, $\overline{\varphi}_{ij} < \varphi_{ij}$, and the gap between the cutoffs ($\varphi_{ij} - \overline{\varphi}_{ij}$) increases with the market potential of destination country ($A_j\tau_{ij}^{1-\varepsilon}$). This is illustrated in Fig. 1. The dashed dotted line corresponds to the export productivity cutoff of acquiring firms, while the dotted

Figure 1: Productivity Cutoffs and Market Potential



line represents the export productivity cutoff of non-acquiring firms. For destinations with large market size and low trade costs (high $A_j\tau_{ij}^{1-\varepsilon}$, see Panel C of the figure); then $\overline{\varphi}_{ij} < \varphi_{ij} < \overline{\varphi}_i$ and all acquiring firms serve country j, while only the more productive non-acquiring firms export to that country. When the interaction term between the market size and trade costs of the destination decreases (Panel B), then $\overline{\varphi}_i < \varphi_{ij}$, and none of the non-acquiring firms can serve country j. Finally, for small potential markets (Panel A), then $\overline{\varphi}_{ij} > \overline{\varphi}_i$, and only the most productive acquiring firms export to country j.[10] Consequently, as the ratio of acquiring firms over exporting firms, $r_{ij} = [1 - G(\overline{\varphi}_{ij})]/[1 - G(\varphi_{ij})]$ (where $G(\varphi)$ is a continuous cumulative function) increases when A_j diminishes and τ_{ij} increases, then *foreign countries with a small potential market are more likely to be served by manufacturers owning an intermediary and exhibiting high productivity*. This is summarized in the following proposition:

Proposition 3 *The ratio of exporting firms owning its own distribution network to the total exporting firms serving a given country increases with distance to that country and decreases with the market size of the destination country.*

Lower export fixed cost by transfer of intangible inputs. We could extend our framework accounting for another purpose of vertical ownership: the transfer of intangible inputs

[10] In practice, this last case is highly unlikely and rarely emerges in our data.

within firms (see Atalay, Hortaçsu, and Syverson, 2014 for a remarkable description of this phenomenon). Owning a distribution network may also help a company to reduce sunk entry costs through standard cost savings, such as the mutualization of transports by wholesalers (boat uploading or downloading, containers); or the acquisition of information on foreign markets. Intermediaries such as wholesalers and retailers, by connecting producers with consumers, may have informational superiority about foreign markets. As underlined by Rey and Tirole (1986), informational asymmetries exist between producers and intermediaries distributing their products. Intermediaries are better informed than manufacturers about the state of uncertain demand because intermediaries are able to meet face-to-face with consumers. In addition, the motivations for the acquisition of an intermediary may also lie in intermediaries' faculty to facilitate trade by filling administrative tasks and managing more efficiently their distribution network. Hence, manufacturers can be motivated to use vertical integration as a business strategy to reduce fixed export costs.

We could assume that access costs to foreign markets may shrink by acquiring an intermediary. For example, sunk export costs could be given by $f_{ij}(\theta)$, where $f_{ij}(\theta)$ decreases with θ (for simplicity if $\theta = 1$, $f_{ij}(1) = f_{ij}^W$ with $f_{ij}^W < f_{ij}$) and the trade costs to reach foreign countries are given by $\tau_{ij}(\theta)$ (for simplicity if $\theta = 1$, $\tau_{ij}(1) = \tau_{ij}^W$ with $\tau_{ij}^W < \tau_{ij}$). With these specifications, the costs associated with exports are not only specific to the destination but depend also on whether the firm producing the traded variety controls its intermediary.

Under these circumstances, it is readily to check that the productivity cutoff for serving country j when a firm owns its distribution network becomes

$$\widetilde{\varphi}_{ij} = \frac{\varepsilon - 1}{\varepsilon} \left(\frac{f_{ij}^W}{f_{ij}} \right)^{\frac{1}{\varepsilon - 1}} \frac{\tau_{ij}^W}{\tau_{ij}} \varphi_{ij} < \varphi_{ij}. \tag{14}$$

where $\left(f_{ij}^W\right)^{\frac{1}{\varepsilon-1}} \tau_{ij}^W$ (resp., $\left(f_{ij}\right)^{\frac{1}{\varepsilon-1}} \tau_{ij}$) captures the access costs to foreign markets incurred by firms with (resp., no) financial participation in an intermediary. Hence, the difference in productivity cutoffs to export to country j between firms owning a distribution network and the others (φ_{ij}-$\widetilde{\varphi}_{ij}$) is specific to the destination country. It depends on the difference in export costs to the destination between the two types of firm organization.

2.5 Entry

Note that, in the model, there is no strategic interaction among manufacturers and each intermediary distributes the production of a single firm. Nevertheless, horizontal externalities among producers exist through price indices P_j expressed as

$$P_j^{1-\varepsilon} = \sum\nolimits_k \int_1^\infty p_{kj}(\theta, \varphi)^{1-\varepsilon} M_{kj} \mu_{kj}(\varphi) \mathrm{d}\varphi \tag{15}$$

where M_{kj} is the mass of variety produced in country k and consumed in country j and $\mu_{kj}(\varphi)$ is the *ex post* distribution of productivity conditional on a variety produced in country k and consumed in country j over a subset of $[1, +\infty)$. Hence, because manufacturers are indirectly connected through the price index, an ownership stake of a manufacturer in an intermediary affects the export sales of the other manufacturers (see Eq.(1)) and, in turn, the probability of producing and exporting.

To model the entry/exit firm dynamic, we follow closely Melitz (2003) except that we consider also downstream firms and the fact that manufacturers may have ownership stakes in an intermediary. Each manufacturer has to pay a sunk entry cost to produce equal to f_e units of labor, but manufacturers do not know *a priori* their productivity. Similarly, the intermediaries do not know *a priori* their supplier (and thus the productivity of the firm producing the product to be traded). We assume that φ is randomly drawn from a common distribution $g(\varphi)$ where $g(\varphi)$ is positive over $[1, +\infty)$ and has a continuous cumulative function $G(\varphi)$. As in Arkolakis, Demidova, Klenow, and Rodriguez-Clare (2008), we consider that φ is Pareto distributed on $[1, +\infty)$ with shape parameter γ (with $\gamma > \varepsilon - 1$), where high γ means that production is highly skewed across manufacturers. More precisely, the probability that manufacturer k exhibits a productivity higher than a value x can be written as $P(\varphi_k > x) = x^{-\gamma}$ with $x \geqslant 1$.

A manufacturer enters the market as long as the expected value of entry is higher than the sunk entry cost. The expected profit of a manufacturer before market entry is given by $[1-G(\varphi_{ii})]\overline{\Pi}_i$, where $[1-G(\varphi_{ii})]$ is the probability of entering market and $\overline{\Pi}_i$ is the expected profit conditional on successful entry. However, manufacturers have to take into account that an intermediary can serve the foreign market if and only if $\pi(0, \varphi) > 0$, or equivalently, its productivity is higher than φ_{ij}. Because the *ex post* productivity distribution of non-acquiring firms producing in country i is $g(\varphi)/[G(\overline{\varphi}_i) - G(\varphi_{ij})]$ and $g(\varphi)/[1 - G(\overline{\varphi}_i)]$ for acquiring firms, we have

$$\overline{\Pi}_i = \sum\nolimits_j \lambda_{ij} \int_{\varphi_{ij}}^{\overline{\varphi}_i} \Lambda_{ij}^m(0, \varphi) \frac{g(\varphi)}{G(\overline{\varphi}_i) - G(\varphi_{ij})} \mathrm{d}\varphi + \lambda_i^W \int_{\overline{\varphi}_i}^{\infty} \left[\Lambda_{ij}^r(1, \varphi) - f_{ij} - b(1)\right] \frac{g(\varphi)}{1 - G(\overline{\varphi}_i)} \mathrm{d}\varphi \tag{16}$$

where $\lambda_{ij} = [G(\overline{\varphi}_i) - G(\varphi_{ij})]/[1 - G(\varphi_{ii})]$ is the probability of serving country j without any equity shares in an intermediary and $\lambda_i^W = [1 - G(\overline{\varphi}_i)]/[1 - G(\varphi_{ii})]$ is the probability of acquiring an intermediary and exporting. For simplicity, we have assumed that $\overline{\varphi}_i > \overline{\varphi}_{ij}$ regardless of the destination. By using the same strategy adopted in Arkolakis, Demidova, Klenow, and Rodriguez-Clare (2008), we obtain the following expression of a firm's expected profit (see Appendix B.1 for details)

$$\overline{\Pi}_i = \frac{\varphi_{ii}^{\gamma}(\varepsilon - 1)}{\gamma - (\varepsilon - 1)} \sum\nolimits_j \left[f_{ij} \frac{\gamma}{\varepsilon} \varphi_{ij}^{-\gamma} + \overline{\varphi}_i^{-\gamma} \left(f_{ij} + b(1)\right) \right].$$

Hence, $[1 - G(\varphi_{ii})]\overline{\Pi}_i = w_i f_e$ is equivalent to

$$\frac{\varepsilon - 1}{\gamma - (\varepsilon - 1)} \sum\nolimits_j \left[f_{ij} \frac{\gamma}{\varepsilon} \varphi_{ij}^{-\gamma} + \overline{\varphi}_i^{-\gamma} \left(w_i f_{ij} + b(1) \right) \right] = f_e. \tag{17}$$

It appears also that $\partial \varphi_{ij} / \partial \overline{\varphi}_i < 0$. Indeed, for a given mass of firms, $\partial P_j / \partial \overline{\varphi}_i > 0$ because the fraction of manufacturers with a lower markup increases when $\overline{\varphi}_i$ decreases. Because price index diminishes, the demand for the non-acquiring firms ($q_{ij}(0, \varphi) = A_j p_{ij}(0, \varphi)^{1-\varepsilon}$) declines. Hence, the less productive manufacturers exit from the export market (φ_{ij} increases). This reallocation mechanism gives us the following proposition:

Proposition 4 *A higher share of acquiring firms ($\overline{\varphi}_i$ decreases) reduces the probability of exporting by non-acquiring firms.*

Given the high fixed costs of exporting, the strategy to integrate forward can act as a barrier to entry for low-productivity (small) manufacturers.

3 Data

Testing the main predictions of the model requires information on the financial linkages between manufacturers and intermediaries but also the export sales of firms. The information must be rich enough to trace all financial participations of a firm as well as the activity sector of its subsidiaries. In the following subsections, we first describe the original dataset we built and then we give some descriptive statistics on the samples considered hereafter.

3.1 Acquisitions by French food firms

We use an original database that compiles information on national and foreign acquisitions of French firms for the years 2008 and 2012. Data originate from the Amadeus database operated by Bureau van Dijk (2008), which records comparable financial and business information for public and private firms across Europe. The data are collected from company reports and balance sheets, and correspond to an almost complete record of French firms. The database is then composed for a large part of small firms. The accounting data include firm-level variables such as fixed assets, capital or value-added among others. The Amadeus database also provides information on ownership stakes between firms, which is of central importance for our study (see Appendix C.1 for a detailed description of the Amadeus database). For each firm, the Amadeus database lists its subsidiaries (if any) and reports their nationality as well as their main activity sector (at the 4-digit NACE level).

We choose to concentrate our study on the "food and beverage industry" (i.e., food firms) as this industry fits the study purpose well due to the prevalence of intermediaries in the flow of food products. Historically, food manufacturers sell to intermediaries (wholesalers or/and retailers)

who sell to end customers. However, the end of the 20th century has witnessed the evolution of supply chain management where some food manufacturers decided to perform distribution and/or retail functions within the distribution channel. This business strategy, far from being specific to this sector, is currently widespread in other activity sectors. Moreover, narrowing our analysis to a single industry limits the effects of contemporaneous shocks (e.g., domestic or foreign demand shocks) that may biais the measure of the *intermediary premium*.

Departing from the Amadeus database, we construct a pooled cross-section sample that provides information on ownership stakes of French food firms for the years 2008 and 2012. We built our original dataset following three steps. First, we recover the ownership structure of French food firms by using information on financial linkages between firms recorded in the Amadeus database. To mimic our theoretical model, we consider only acquisition transactions that originate directly from French food firms (i.e., direct acquisitions of subsidiaries), excluding all financial linkages through a third party. Doing so, we ensure that acquirers benefit from (potential) advantages of the target firm, but on the other hand, the failure to account for indirect acquisitions may understate the effect that we aim to measure. Following our procedure, we count 1520 French food firms that have ownership stakes in at least one company. Overall, this represents a total of 3953 direct links. Then, we match French food firms with their subsidiaries for both years. For each acquired firm, we know its nationality and its activity sector (at the 4-digit NACE level). It is worth noting that the lack of data over a longer period of time prevents us from identifying the date on which the transactions take place. This point is very important and will be discussed later when we detail our estimation strategy.

Second, we ground our definition of an intermediary on a firm's main activity. Departing from the NACE classification (Revision 2), we categorize acquired firms into 5 types of activity: (*i*) *upstream activities* (producers of agricultural goods processed by the food industry), (*ii*) *horizontal activities* (other food manufacturers), (*iii*) *intermediary activities*, (*iv*) *transport activities* and (*v*) *service activities*. We consider as an *intermediary* every firm that belongs to the wholesaling and retailing activity sectors as well as those that belong to the subsector "food and beverage service activities".[11] Unlike recent studies, we choose to include retailers in the definition of intermediaries because we argue that those firms facilitate trade by connecting sellers and buyers in exactly the same way as wholesalers. Further, the matchmaker role of retailers is highly magnified for food and beverage products owing to the substantial market power of retailers in the downstream market (see Basker and Van, 2010, for instance). Regarding the specificity of food and beverage products, we also include caterers and restaurants for the same

[11]There is no consensus in the literature on how to define an intermediary. For instance, Ahn, Khandelwal, and Wei (2011) identify Chinese intermediary firms based on a set of characters in the firm's name that usually give an indication in China about its main activity. Bernard, Jensen, Redding, and Schott (2010) use the share of firms' U.S. employment in wholesaling and retailing and define as a Pure Wholesaler or a Pure Retailer firms having 100 percent of their U.S. employment in one of these two categories. Recently, Bernard, Grazzi, and Tomasi (2014) also distinguish both categories of firms but used the main activity business of firms to categorize firms. Nevertheless, they only consider as intermediaries firms with wholesaling as their main activity, such as Akerman (2014) and Crozet, Lalanne, and Poncet (2013) too.

Table 1: Summary Statistics on Acquisitions by Activity Sector

	2008		2012	
Activity Sector	Frequency	Percentage	Frequency	Percentage
Upstream	115	4.16	44	3.71
Horizontal	1,150	41.56	446	37.61
Intermediary	1,033	37.33	477	40.22
Transport	35	1.26	24	2.02
Services	434	15.69	195	16.44
Total	**2,767**	**100.00**	**1,186**	**100.00**

Notes: The table reports the frequencies and the percentages of acquisitions by French food firms regarding the activity sector of the acquired firm. Overall we count 927 and 593 acquiring firms in 2008 and 2012, respectively. On average, each acquiring firm owns participations in 2.60 firms per year. Sources: Amadeus database.

reason. Details on the classification are reported in Appendix C.2. Table 1 displays the number of acquisitions by activity sector originating from food firms. We note that approximately 40% of ownership stakes concern an intermediary, a percentage roughly equivalent to financial participations within the same activity sector (i.e., horizontal activity sector).

Finally, we merge our dataset with the French Customs data for the years 2008 and 2012. This dataset is from the register of French Customs and records firm annual shipments by destination at the 8-digit product level (Combined Nomenclature CN8). This dataset provides almost complete information on export sales by French firms. Firms located in France must declare all export flows to non-EU countries exceeding €$1,000$ or €$150,000$ within the EU.[12] For the purpose of this study, we only consider export flows of animal products, vegetable products, and foodstuffs by French food firms (i.e., corresponding to $HS2$ chapters I to XXIV). It should be noted that, apart from the case of vertical integration (i.e., $\theta = 1$), the model supposes that firm export flows are entirely handled by intermediaries. Concretely, this means that the variable of interest for a firm choosing to export indirectly should be the shipment values reported in the Customs data by its intermediary (net of flows generated by other firms goods), while for a direct exporter the variable of interest corresponds to the firm export values. For the case of indirect exporting, we thus need to observe the transfers of goods between food firms and their intermediaries to compute the share of an intermediary's export flows originating from a food firm. Unfortunately, this information is unavailable and we are not able to recover it.[13] Although 90% of acquired intermediaries are owned by a single food firm in the data, we cannot attribute the totality of the export values reported by an acquired intermediary to its acquiring firm. A large majority of acquired intermediaries also export food products purchased from other firms. Further, for firms that export their products by contracting with an intermediary (i.e., $\theta = 0$), we cannot track their products once they have crossed the borders because the Customs data only report the name of the exporting firm (the name of the producer

[12] Actually, the threshold for intra-EU export flows rose to €460,000 in 2011, while for extra-EU export flows, declaration has been mandatory regardless of the value of shipment since 2009. However, these thresholds are not binding and the Customs data reports a significant number of export flows below these values.

[13] We are aware of very few studies observing intra-firm transactions between related parties of the same country. A notable exception is Atalay, Hortaçsu, and Syverson (2014).

Table 2: Number of Intermediaries Acquired per Food Firms

# of intermediaries per food firm	Domestic & foreign intermediaries 2008	Domestic & foreign intermediaries 2012	Domestic intermediaries 2008	Domestic intermediaries 2012	Intermediaries exclusively 2008	Intermediaries exclusively 2012
1	371	260	349	236	246	171
$[2, 4]$	118	72	109	67	44	28
5 & +	25	7	24	7	1	0
Total	**514**	**339**	**482**	**310**	**291**	**199**

Notes: The table reports the number of intermediaries acquired per food firms by year and for the three samples considered. The number of intermediaries acquired is broken up in three classes: one intermediary, between 2 and 4 intermediaries, and 5 and more intermediaries. Sources: Amadeus database.

of the good is not reported).

However, using food firms' export sales can be a credible alternative if the share of non-exporting food firms that own an intermediary that exports is low. Indeed, the higher is this proportion, the more we underestimate the effect of owning an intermediary. Considering the sample of acquiring firms, we only find 10.98% of firms corresponding to this case.[14] Therefore, using firms' export decisions slightly understates the intermediation effect on the probability of exporting because we do not account for firms that export uniquely through their intermediary.[15] The downward bias is, however, higher for the export sales analysis because we also have to account for exporting firms that own an intermediary that also exports.

3.2 Stylized facts on firms' ownership status

Our pooled cross-section sample provides information on $14,090$ food firms, of which 647 firms own equity shares in an intermediary. Observing the data, we find various situations behind this simple categorization. For instance, some firms have financial participations in both foreign and domestic intermediaries, whereas other firms only acquired domestic intermediaries. Further, in addition to these acquisitions, a substantial number of firms also have financial participations with firms operating in non-intermediary sectors. Consequently, by considering only the "raw" effect of owning participations in an intermediary, our estimate could be contaminated by concomitant effects arising from participations in non-intermediary firms. In order to isolate the *intermediary premium* from other confounding factors that may covary with firms' export performance, we consider in the rest of the paper three samples. First, we use the full sample of food firms in which we denote two types of firms: (1) firms with no financial participation in an intermediary (non-acquiring firms) and (2) firms having *at least* one financial participation in a downstream firm classified as an intermediary regardless of its nationality (ac-

[14] Among acquiring firms, 36.47% of firms export directly, 23.46% of firms export directly and own an exporting intermediary, and 29.09% of firms do not export as their intermediary.

[15] As a robustness check, we exclude from the analysis the non-exporting firms that own an intermediary that exports. The statistical significance of the results presented hereafter remains, while the magnitude of the effects changes marginally.

Table 3: Summary Statistics on Acquiring Firms According to their Ownership Status

Food firm's ownership status	Frequency	Employment	Productivity	Exporting (in %)	Export sales (in €100,000)	Mean # of countries	Mean # of products
Non-acquiring firms							
Single, acquired and other acquiring firms	13,237	24.58	0.94	21.69	47.16	7.62	6.17
Acquiring firms							
in D & F intermediaries sample	853	415.64	1.94	62.60	238.30	18.58	12.35
in D intermediaries sample	792	389.90	1.88	60.35	188.77	16.57	12.11
in the intermediaries exclusively sample	490	51.16	1.28	55.10	46.31	13.10	9.69

Notes: This table reports some descriptive statistics on food firms depending on whether or not they have equity shares in an intermediary. *Non-acquiring firms* refers to firms without any financial participations in an intermediary which includes firms with no participations at all (*single firms*), *acquired firms* and firms with participation in non-intermediary firms (*Other acquiring firms*). By contrast, *acquiring firms* denotes firms owning equity shares in an intermediary. This category of firms is decomposed regarding the sample considered. The productivity variable corresponds to the log of domestic sales per employee deviated from sector mean (defined at the 4-digit NACE level). Sources: Amadeus database and French Customs data.

quiring firms). This sample is labeled "*Domestic & foreign intermediaries*", hereafter. Second, we consider a more restrictive version of this sample in which firms having equity shares in a foreign intermediary are dropped. This sample is labeled "*Domestic intermediaries"*. Third, we control for concomitant effects on export performance arising from financial participations in non-intermediary firms by excluding from the sample all firms concerned by this type of ownership. This last sample, labeled "*Intermediaries exclusively*", only includes firms without subsidiaries and firms with financial participations uniquely in an intermediary.

Table 2 reports the number of intermediaries acquired per food firms for the three samples considered. We note that a large majority of food firms have financial participations in a single intermediary, and approximately 92% of the acquisitions are domestic. These findings give support to the assumption made in the model.

We provide in Table 3 some descriptive statistics on the size, productivity and export performance of firms whether they own an intermediary or not (i.e., acquiring vs. non-acquiring firms). In accordance with the predictions of the model, we find that acquiring firms are, on average, larger and more productive. To deepen the analysis, we check that firms self-select to acquire an intermediary based on their productivity (in line with Proposition 1) by running a Probit model where the probability of acquiring an intermediary is explained by firm productivity as well as control variables (firm size, capital intensity, the ratio of intangible assets on total fixed assets, year dummies, and 4-digit industry dummies). The results are reported in Appendix D. The estimates confirm that more productive and larger firms are more likely to acquire an intermediary (in line with Proposition 1).

It also appears that acquiring firms are more likely to export and export (on average) more products to a greater number of destinations than non-acquiring firms. However, it is less clear whether owning participations in an intermediary is correlated with export sales. Indeed, firms with financial participations exclusively in intermediaries have, on average, the same level of export sales than non-acquiring firms.

4 Empirical validation

The theoretical model offers a large number of predictions that we aim to verify. In particular, we are interested in testing the central prediction of the model which indicates that firms owning participation in an intermediary are more likely to export and benefit from higher export sales (see Proposition 2). We also test the predictions on the role played by the characteristics of destination country for the type of firms that export (Proposition 3) and on the reallocation effect (Proposition 4). The results and their analysis are reported in Sub-Section 4.1. In Sub-Section 4.2 we test whether the acquisition of intermediaries allows acquiring firms to reduce their access costs to foreign markets (see the discussion in Section 2.4).

Empirical strategy. Our main challenge is to address the lack of information on the date the firm first acquired an intermediary. Ideally, we would quantify the causal effect of owning an intermediary on a firm's export performance by using a method based on propensity score matching combined with a difference-in-difference estimator (Heckman, Ichimura, and Todd, 1997). By comparing changes in firm export performance before and after the acquisition of an intermediary relatively to a control group, we would be able to measure the impact of the acquisition on the evolution of firm export performance. Unfortunately, our cross-section data prevent us from conducting a difference-in-difference analysis as we only observe firms' ownership twice. Between 2008 and 2012, we only count 105 firms that take the leap and acquire an intermediary; and within this set of firms only 14 have participations exclusively in an intermediary. Because we do not know the acquisition date, we cannot elicit the causality effect of owning an intermediary on a firm's export outcome. Instead, we adopt alternative estimation strategies to investigate whether participation in intermediary increases the export performances of acquiring firms.

4.1 Does participation in an intermediary improve the export performances of acquirers?

First, we aim at identifying the existence of an *intermediary premium* (defined as the export performance gap between acquiring and non-acquiring firms). Our baseline specification follows closely the sizeable literature that explores the determinants of export market participation (see Roberts and Tybout, 1997; Bernard and Jensen, 2004, for instance). It relates a firm's export outcome to whether it has acquired an intermediary using a linear form as follows:

$$Y_{v,s,t} = \alpha \text{INTERMED}_{v,t} + X_{v,t-1}\beta + \sum_{l=1}^{l=3} \rho_l \text{EXP}_{v,t-l} + \text{FE}_s + \text{FE}_t + \eta_{v,t} \tag{18}$$

where $Y_{v,s,t}$ corresponds to the export outcome (either the export decision resumed by the dummy variable $\mathcal{E}_{v,t}$ or the log of export sales) of firm v operating in the 4-digit industry s at time t, $\text{INTERMED}_{v,t}$ is a binary variable indicating whether a firm owns an intermediary at time t, and $X_{v,t-1}$ is a vector of firm v characteristics.[16] Following the prediction yielded by the model, we expect that $\alpha > 0$. The regression also includes 4-digit industry and year fixed effects (FE_s and FE_t respectively) to control for industry- and year-specific unobserved shocks that may affect firms participation in export markets; and a mean-zero disturbance term $\eta_{v,t}$. In accordance with the literature on market entry costs, we include past exporting status of a firm (denoted $\text{EXP}_{v,t-l}$) as an indicator of its current export performance. The purpose is to account for hysteresis in exports generated by sunk entry costs; a phenomenon well-documented in the literature. By entering the export market, firms occur important sunk costs that diminish their

[16] To simplify the notation, we remove the susbscript i referring to the country of origin.

Table 4: Food Firms' Decision to Export (Linear Probability Model)

Dependent variable: Export decision $\Pr[\mathcal{E}_{v,t}=1]$			
	Domestic & foreign intermediaries (1)	Domestic intermediaries (2)	Intermediaries exclusively (3)
Intermediary	0.0680***	0.0553***	0.1112***
	(0.0151)	(0.0167)	(0.0221)
Productivity	0.0059	0.0261***	0.0203***
	(0.0046)	(0.0032)	(0.0037)
Employ. [2-4]	0.0332***	0.0449***	0.0328***
	(0.0096)	(0.0082)	(0.0077)
Employ. [5-19]	0.1098***	0.1235***	0.0896***
	(0.0302)	(0.0297)	(0.0265)
Employ. [20-50]	0.2255***	0.2347***	0.1702***
	(0.0426)	(0.0419)	(0.0461)
Employ. [>50]	0.3830***	0.3881***	0.2553***
	(0.0235)	(0.0232)	(0.0315)
Exported last year	0.6552***	0.6511***	0.6827***
	(0.0165)	(0.0157)	(0.0147)
Last exported two years ago	0.0418***	0.0391***	0.0703***
	(0.0123)	(0.0119)	(0.0182)
Last exported three years ago	0.0322	0.0309	0.0639
	(0.0235)	(0.0227)	(0.0386)
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
R^2	0.5387	0.5383	0.5248
Observations	14090	13963	10380

Notes: The producitivty variable corresponds to the log of domestic sales per employee deviated from sector mean (defined at 4-digit NACE level). Clustered standard errors (at 4-digit NACE level) reported in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Sector (defined at the 4-digit NACE level) and year fixed-effects are included.

current profitability. At the same time, these costs may be viewed as investments for future periods and so increase the likelihood to export for next years. Therefore, we control for having last exported up to three years ago. Finally, to limit endogeneity issues, we exploit the richness of the Amadeus database and we introduce firm characteristics (productivity and size) lagged one period to control for unobserved covariates both correlated to firm's export performance and ownership status.

Export market participation. We suppose that firms self-select into export markets following the resolution of a model in which current and expected revenues of exporting are compared to the current costs of exporting plus the sunk costs of entry. To estimate the probability of exporting (i.e., $\Pr[\mathcal{E}_{v,t}=1]$) based on Eq.(18), we run a linear probability model. The results are reported in Table 4 for the three samples considered (labeled as *Domestic & foreign intermediaries*, *Domestic intermediaries*, and *Intermediaries exclusively*). Regardless of the sample, larger and more productive firms are more likely to export, which is consistent with trade literature. In addition, we find that exporting last year (or two years ago) raises substantially the

probability of exporting today. However, the benefit of having been an exporter vanishes after two years without exporting.

Concerning our key variable, we find a significant and positive relationship between exporting and having equity shares in an intermediary regardless of the sample considered. For the *Domestic & foreign intermediaries* sample, we find that having equity shares in an intermediary raises by 6.80% the probability of exporting. In Column (2), we exclude financial participations in foreign intermediaries without changing the significance of the results. To ensure that the results are not driven by unobserved covariates that may go with financial participations in non-intermediary firms, we remove in a last specification firms having financial participations in non-intermediary firms. The results are reported in Columns (3) and still confirm the positive and significant correlation effect between exporting and owning an intermediary. Further, the magnitude of the effect almost doubles for this case (11.12%), suggesting that acquisitions of intermediaries favor more intensively export participation. All these findings are in accordance with the theoretical predictions and testify for the enhancing effect of owning an intermediary in the probability of exporting.[17]

Export sales. We also verify whether firms owning an intermediary benefit from higher export sales as predicted by the model. We then follow the specification described in Eq.(18) and take as a dependent variable the log of firm export sales. We estimate a Tobit model by maximum likelihood to control for the bias related to the frequency of zeros in our data. More precisely, we use a Tobit maximum likelihood estimator with a non-zero censoring threshold, in which the censoring threshold is the minimum positive export value at the 4-digit industry level, as suggested by Eaton and Kortum (2001).

We report the results in Table 5. We observe that the exclusion of foreign intermediaries (Column 2) yields a null effect of owning an intermediary on export sales, while a positive and significant relationship is observed with their inclusion (see Column 1). This contrasts with the prediction of the model, but when we consider only financial participations in intermediaries we obtain a positive and significant estimated coefficient (Column 3). For this last specification, we observe that firm export sales increased by 169% when it has ownership stakes in an intermediary (conditional on the manufacturer being an exporter). The difference between Columns (2) and (3) suggests that firms owning equity shares in an intermediary, along side with financial participations in other activity sectors, are less "export-oriented" than organizational structures concentrated on sales activity.

Is the *intermediary premium* higher for distant markets? We now test the predictions of our model related to the role played by the characteristics of a foreign market (its size and distance). According to Proposition 3, the ratio of acquiring firms to the entire set of firms serving

[17]The robustness for both results is confirmed when using alternative definition of firm productivity and when excluding firms that may bais the estimates downward.

Table 5: Food Firms' Export Sales (Tobit Model)

Dependent variable: (ln) Export sales			
	Domestic & foreign intermediaries (1)	Domestic intermediaries (2)	Intermediaries exclusively (3)
Intermediary	1.4966***	0.9841	2.6367***
	(0.5114)	(0.6121)	(0.8563)
Productivity	0.2196	1.0226***	1.0568***
	(0.1424)	(0.1840)	(0.3148)
Employ. [2-4]	2.1649***	3.0599***	2.7602***
	(0.5947)	(0.5295)	(0.7781)
Employ. [5-19]	7.2437***	8.2325***	7.4682***
	(0.7232)	(0.7001)	(0.8642)
Employ. [20-50]	11.9355***	12.7746***	11.3998***
	(0.7939)	(0.7583)	(0.7440)
Employ. [> 50]	16.8470***	17.5552***	14.7618***
	(0.9326)	(0.9552)	(0.9308)
Exported last year	20.2683***	19.8546***	20.7822***
	(0.9119)	(0.7973)	(0.9389)
Last exported two years ago	1.6987***	1.6572***	2.8777***
	(0.4881)	(0.4678)	(0.7918)
Last exported three years ago	1.7387**	1.7458**	3.0851**
	(0.7875)	(0.7801)	(1.3919)
σ	8.9576***	8.8702***	9.3587***
	(0.2698)	(0.2482)	(0.3473)
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Pseudo-R^2	0.2327	0.2361	0.2514
Observations	14090	13963	10380
Left-censored obs.	10686	10669	8742

Notes: The producitivty variable corresponds to the log of domestic sales per employee deviated from sector mean (defined at 4-digit NACE level). Clustered standard errors (at 4-digit NACE level) reported in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Sector (defined at the 4-digit NACE level) and year fixed-effects are included.

country j at time t ($r_{j,t}$) varies with respect to the characteristics of the destination country. More precisely, our theory predicts that $r_{j,t}$ is expected to increase with the distance to reach the destination country and to decrease with its size (see Proposition 3). The negative effect on export performance resulting from the double marginalization problem is higher when the foreign country has a low market size and is distant from the country of origin. Concretely, this ratio corresponds to the number of firms both serving a destination j and owning an intermediary over the total number of firms serving j. We then run the following OLS regression

$$r_{j,t} = \beta_1 \text{DIST}_j + \beta_2 \text{GDP}_{j,t} + C_j + \text{FE}_t + \eta_{j,t}$$

where DIST_j is the distance between country j and France (used as a proxy of international trade costs), GDP_{jt} is the Gross Domestic Product of country j (used as a proxy for country size), and C_j is a set of control variables defined at the country j level. In accordance with the prediction, we expect that $\beta_1 > 0$ and $\beta_2 < 0$.

Table 6: "Intermediary Premium" and Foreign Market Characteristics

Dependent variable: ratio of exporting acquiring firms over the total number of exporting firms for a given destination at time t (i.e., $r_{j,t}$).			
	Domestic & foreign intermediaries	Domestic intermediaries	Intermediaries exclusively
	(1)	(2)	(3)
Contiguity	-0.0086	0.0428	0.0560
	(0.0266)	(0.0306)	(0.0460)
Common language	-0.0796**	-0.0286	-0.2169***
	(0.0311)	(0.0386)	(0.0595)
Colony	-0.0340	-0.0543	0.0949*
	(0.0274)	(0.0346)	(0.0564)
Distance	0.0437***	0.0361***	0.0370**
	(0.0105)	(0.0104)	(0.0152)
GDP	-0.0387***	-0.0330***	-0.0449***
	(0.0058)	(0.0060)	(0.0095)
Costs to import	0.0743***	0.0828***	0.0523
	(0.0197)	(0.0206)	(0.0350)
Year FE	Yes	Yes	Yes
R^2	0.40	0.30	0.29
Observations	322	320	272

Notes: Robust standard errors in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. The distance between France and firm destination countries are computed using Mayer and Zignago (2011)'s data where the distance between two countries is calculated using the great circle formula based on the geographic coordinates of the largest cities/agglomerations (in terms of population) of countries.

The dependent variable, $r_{j,t}$, is computed from the data. It is defined by destination country and by year. It varies from 0 to 1 for 166 markets each year. For a given market, $r_{j,t} = 0$ means that no acquiring firm exports to this market. Conversely, $r_{j,t} = 1$ means that all firms exporting to the market have equity shares in an intermediary. In 2008, the ratio is 0 for 6 countries and 1 for 8 countries; the rest of the values are between 0 and 1. The mean value of the ratio is 0.47. In 2012, the ratio is 1 for 9 destinations and is never 0. The mean value is 0.49.

Distances to foreign countries are calculated using the CEPII Geodist database, and data on GDP are from the World Bank's World Development Indicators Database. The control variables C_j include a dummy variable for geographical contiguity and variables controlling for historical links between France and its partner countries (common colonial ties - *Colony* - and *Common language* from the CEPII Geodist database). We also include a control variable related to the costs of serving a country (*Costs to import*) from the World Bank's Doing Business dataset.[18] All the continuous explanatory variables are taken in log.

The results for the three samples considered are reported in Table 6. For all of them, we find that the share of exporting firms owning an intermediary rises significantly for small and distant countries. Further, we note that for Columns (1) and (2), countries with high market entry

[18]We also used other variables such as the number of documents required to import in the destination country and the delay to import. Our results remain unchanged.

Table 7: Testing Horizontal Negative Externalities
(Linear Probability Model)

Dependent variable: Export decision		
	(1)	(2)
$\text{Share}^{w}_{s,t}$	-0.3652	-31.6199***
	(0.7266)	(0.9121)
$\text{Share}^{w}_{s,t}$ × NACE 4		Not reported
Productivity	0.0284***	0.0279***
	(0.0033)	(0.0031)
Employ. [2-4]	0.0474***	0.0479***
	(0.0099)	(0.0101)
Employ. [5-19]	0.1228***	0.1201***
	(0.0307)	(0.0303)
Employ. [20-50]	0.2355***	0.2258***
	(0.0431)	(0.0429)
Employ. [> 50]	0.3814***	0.3669***
	(0.0229)	(0.0249)
Exported last year	0.6572***	0.6944***
	(0.0164)	(0.0128)
Last exported two years ago	0.0487***	0.0480***
	(0.0125)	(0.0117)
Last exported three years ago	0.0582**	0.0606**
	(0.0226)	(0.0225)
Sector FE	Yes	Yes
Year FE	Yes	Yes
R^2	0.5319	0.5460
Observations	13237	13237

Notes: The sample is composed exclusively of non-acquiring firms. The variable *NACE 4* stands for dummy variables at the 4-digit NACE level. Clustered standard errors (at 4-digit NACE level) reported in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Sector (defined at the 4-digit NACE level) and year fixed-effects are included.

costs (i.e.,*Costs to import*) distort trade in favor of acquiring firms. Therefore, the advantage of having its own distribution network is amplified when a firm serves foreign countries with a low market potential and important market entry costs; a result that corroborates our prediction.

Does owning an intermediary hurt less productive firms? By acquiring equity shares in an intermediary, a firm boosts its export sales. We have shown in Section 2 that this creates a market externality among manufacturers due to a reallocation of market shares from small firms to large firms (see Proposition 4). In other words, the reduction of the negative vertical externalities for more productive firms magnifies the negative horizontal externalities among manufacturers. By controlling an intermediary, large firms hurt small firms because the latter lose market shares or exit from foreign markets, while the former enjoy higher foreign demand. Hence, the probability of exporting for non-acquiring firms appears negatively correlated with the number of acquiring firms. To confront this prediction with the data, we follow Eq.(18), and we relate the probability of exporting *for non-acquiring firms* with the share of acquiring

firms. More precisely, we define a linear probability model such as

$$\Pr\left[\mathcal{E}_{v,s,t}=1\right]=\alpha_0 \textsc{Share}^{W}_{s,t}+\varphi_{v,t}+X_{v,t-1}\beta+\sum_{l=1}^{l=3}\rho_l \textsc{Exp}_{v,t-l}+\textsc{FE}_s+\textsc{FE}_t+\eta_{v,t}$$

where $\textsc{Share}^{W}_{s,t}$ is the share of acquiring firms defined at the 4-digit industry level, and $\varphi_{v,t}$ is the productivity of firm v at time t. The results are reported in Table 7. On average, we do not find statistical significance between the share of acquiring firms and the probability of exporting for non-acquiring firms (Column 1). This absence of significance may result from important disparities among sectors. In a second regression (Column 2), we interact the share of firms owning an intermediary with the industry dummy variable. Due to space limitations, we do not report the interaction terms but note that all are statistically significant (at a 1% significance level) and more than half of the sectors have negative estimated coefficients. This means that the negative externality predicted is observed for some but not all the sectors. Hence, for these sectors, non-acquiring firms are hurt *twice* by their relatively low productivity because not only do they face fierce competition from more productive firms, but they also bear the double marginalization problem.

4.2 Does participation in an intermediary reduce market-access costs?

As indicated previously, the purpose of vertical ownership can also be related to the transfer of intangible inputs within firms (see Section 2.4). Owning a distribution network may reduce the access costs for foreign countries because intermediaries manage their network more efficiently to reach foreign consumers. Manufacturers can thus be motivated to use forward integration to reduce fixed export costs. To test this assumption, we follow the methodology developed by Chevassus-Lozza and Latouche (2012), and we estimate the productivity cutoff to serve foreign market j based on market-access costs and a set of control variables. By comparing the estimated market-access costs according to firms' ownership status (i.e., acquiring vs. non-acquiring firms), we will be able to observe whether owning an intermediary reduces market-access costs. Concretely, the methodology followed proceeds in three steps.

Assuming that the distribution of firm productivity follows a Pareto law, we need first to estimate the curvature of the Pareto distribution (i.e., γ). To that end, we rank *all* firms from the highest to the lowest productivity, and we run the following OLS regression model:

$$\ln \textsc{Rank}_{v,t}=\gamma \ln(\varphi_{v,t})+\eta_{v,t} \tag{19}$$

where $\textsc{Rank}_{v,t}$ is the rank of firm v according to its level of productivity.

In the second step, we estimate the productivity cutoff to serve country j using a maximum likelihood estimator. Knowing that the productivity of the firms follows a Pareto distribution with a curvature given by $\widehat{\gamma}$ and that there exists a productivity cutoff above which firms are

able to export to country j, the likelihood is given by

$$\mathcal{L}\left(\mathcal{E}_{v,j,t};\textsc{Intermed}_{v,t};\theta\right)=\prod_{t}\prod_{v}\prod_{j}\left[\Pr\left(\mathcal{E}^{*}_{v,j,t}>0\right)\right]^{\mathcal{E}_{v,j,t}}\times\left[1-\Pr\left(\mathcal{E}^{*}_{v,j,t}>0\right)\right]^{(1-\mathcal{E}_{v,j,t})}$$

where $\mathcal{E}^{*}_{v,j,t}$ is the latent variable associated with the firm export decision problem in year t. Assuming that firms self-select into export markets according to their productivity and that the productivity of firms is distributed according to a Pareto law, it is possible to rewrite the likelihood as follows

$$\mathcal{L}\left(\mathcal{E}_{v,j,t};\textsc{Intermed}_{v,t};\theta\right)=\prod_{t}\prod_{v}\prod_{j}\left(\frac{\varphi^{*}_{v,j,t}}{\varphi_{\min}}\right)^{-\widehat{\gamma}\mathcal{E}_{v,j,t}}\times\left[1-\left(\frac{\varphi^{*}_{v,j,t}}{\varphi_{\min}}\right)\right]^{-\widehat{\gamma}(1-\mathcal{E}_{v,j,t})} \tag{20}$$

where the productivity cutoff is expressed as

$$\begin{aligned}\ln\varphi^{*}_{v,j,t} &= \zeta_{1t}\textsc{Intermed}_{v,t}+\zeta_{2,t}\left(1-\textsc{Intermed}_{v,t}\right)+\sum\nolimits_{j}\delta^{W}_{j,t}\textsc{Country}_{j,t}\times\textsc{Intermed}_{v,t}\\ &\quad+\sum\nolimits_{j}\delta_{j,t}\textsc{Country}_{j,t}\times\left(1-\textsc{Intermed}_{v,t}\right)+\eta_{v,j,t}\end{aligned}$$

where $\zeta_{1,t}$ and $\zeta_{2,t}$ are year-specific constant terms for acquiring and non-acquiring firms, respectively, $\textsc{Country}_{j,t}$ is a set of country fixed effects interacted with the dummy variable $\textsc{Intermed}_{v,t}$, and $\eta_{v,j,t}$ is an error term that is assumed to be i.i.d. according to a normal distribution.

Remember that, according to Eq.(12) and Eq.(14), we can express the productivity cutoff for exporting as

$$\ln\varphi_{i,j}=\ln\left(\frac{\varepsilon}{\varepsilon-1}\frac{\varepsilon}{\varepsilon-1}\varepsilon^{\frac{1}{\varepsilon-1}}\right)+\frac{1}{\varepsilon-1}\ln A_{j}+\ln f_{i,j}^{\frac{1}{\varepsilon-1}}\tau_{i,j} \tag{21}$$

for non-acquiring firms and for acquiring firms as

$$\ln\tilde{\varphi}_{i,j}=\ln\left(\frac{\varepsilon}{\varepsilon-1}\varepsilon^{\frac{1}{\varepsilon-1}}\right)+\frac{1}{\varepsilon-1}\ln A_{j}+\ln f_{i,j}^{W\frac{1}{\varepsilon-1}}\tau_{i,j}^{W}. \tag{22}$$

Hence, the first term in the RHS of Eq.(21) and Eq.(22) is captured by the constant terms $\zeta_{1,t}\textsc{Intermed}_{v,t}$ and $\zeta_{2,t}\left(1-\textsc{Intermed}_{v,t}\right)$, whereas the second and third terms on the RHS of Eq.(21) and Eq.(22) are captured by destination country fixed effects specific to the ownership status of the firms (i.e., $\sum_{j}\delta^{W}_{j,t}\textsc{Country}_{j,t}\times\textsc{Intermed}_{v,t}+\sum_{j}\delta_{j,t}\textsc{Country}_{j,t}\times\left(1-\textsc{Intermed}_{v,t}\right)$) for a given year. The coefficients $\delta^{W}_{j,t}$ and $\delta_{j,t}$ then quantify market-access costs for both types of firms. Please note that due to estimation constraints, Belgium is taken as the country of reference; hence $\delta^{W}_{Belgium,t}$ and $\delta_{Belgium,t}$ are considered to be zero.

In a last step, we compute the difference $\widehat{\delta}_{j,t}-\widehat{\delta}^{W}_{j,t}\equiv\widehat{\Gamma}_{j,t}$ over the years 2008 and 2012, which corresponds to a measure of the *intermediary premium* on market-access costs specific

Table 8: Descriptive statistics on $\widehat{\Gamma}_{j,t}$

	Domestic & foreign intermediaries	Domestic intermediaries	Intermediaries exclusively
Mean	1.14	0.53	0.82
Std. Deviation	1.13	1.10	2.19
1st Quartile	0.65	0.22	0.23
2nd Quartile	1.02	0.48	0.64
3rd Quartile	1.50	0.89	1.11
Observations	274	252	169
# of negative values	4	22	18
Min. value	-0.26	-13.98	-15.2
Max. value	16.53	2.90	16.14

to each destination. Remember that the destination country fixed effect controls for the access cost to export markets ($f_{i,j}^{W\frac{1}{\varepsilon-1}}\tau_{i,j}^{W}$) and also for the foreign potential demand (A_j). However, the difference between $\delta_{j,t} - \delta_{j,t}^{W}$ depends only on the wedge in market-access costs between acquiring and non-acquiring firms. Hence, we expect that (i) markup is higher for firms with no intermediary – i.e., $\zeta_{2,t} > \zeta_{1,t}$ – and (ii) the access costs for serving a foreign market are lower for firms having their own distribution network or, equivalently, $\widehat{\Gamma}_{j,t} > 0$.

We report in Table 8 some descriptive statistics on the difference $\widehat{\Gamma}_{j,t}$.[19] As expected, we observe an *intermediary premium* on market-access costs (i.e., $\widehat{\Gamma}_{j,t} > 0$), regardless of the sample considered.[20] For the *Domestic and foreign intermediaries* sample, we find that owning an intermediary reduces by 114% (on average) market-access costs. The result of the existence of an *intermediary premium* is particularly robust as we obtain only one single negative coefficient for all the destinations considered. When we exclude firms owning foreign intermediaries (*Domestic intermediaries* sample) or firms having financial participations in other activity sectors (*Intermediary exclusively* sample), the difference reaches lower values but remains positive (only 6% to 8% of observations have a negative sign). As a consequence, owning an intermediary allows firms to reduce on average the access costs to foreign markets.

Concerning the coefficients capturing the markup of acquiring and non-acquiring firms ($\zeta_{1,t}$ and $\zeta_{2,t}$), the maximization of the likelihood defined in Eq.(20) gives significantly lower estimates for the markups of acquiring firms than for non-acquiring firms in 2008 and 2012 for the three samples. As highlighted in the model, non-acquiring firms set higher markups due to the double marginalization problem.

[19] Due to space limitations, we do not report all the estimated coefficients from the model. The estimates are available from the authors upon request.

[20] Equality tests between estimated parameters $\widehat{\delta}_{j,t}^{W}$ and $\widehat{\delta}_{j,t}$ for a given market and a given year were performed. For the *Domestic and foreign intermediaries* sample, 239 tests out of 274 were significantly different. When we exclude firms owning foreign intermediaries (*Domestic intermediaries* sample) or firms having financial participation in other activity sectors (*Intermediary exclusively* sample), the number of significant differences between estimated parameters is, respectively, 103 out of 252 tests and 85 out of 169 tests.

5 Conclusion

In this paper, we have analyzed theoretically and empirically the impact of acquiring an intermediary on export decisions and export sales at the firm level. We have developed a general model with two vertically related industries in which heterogeneous manufacturers produce a differentiated product distributed by intermediaries and where manufacturers and intermediaries may be linked by financial arrangements (*vertical ownership*). In this paper, we have identified the existence of an "*intermediary premium*", defined as the export performance gap between firms owning a distribution network and the firms with no financial participation in an intermediary. We have showed that manufacturers that own an intermediary are more likely to serve countries with small potential markets than non-acquiring firms. In addition, because only more productive or larger firms are able to acquire equity shares in an intermediary, this induces a negative market externality among manufacturers due to a reallocation of market shares from small firms to large firms. Hence, by controlling an intermediary, large firms enjoy higher foreign demands and hurt small firms that lose market shares or exit from foreign markets.
The results call for two comments. The first comment addresses the concentration of intermediaries in destination markets. In Europe, as in many developed countries, concentration in the distribution sector is at play. This fact should impact our results. Extension of our model shows that the higher the concentration of the distribution sector in a destination country, the higher is the market share of firms owning or controlling intermediaries. Once again, the need for better understanding and measurement of the concentration process at play should be performed. This could help public authorities to support some exporters in specific sectors to maintain their foreign sales.
Second, our study shows the role of owning or controlling firms in export performance *via* a neutralization of the double marginalization in a vertical chain or a reduction in the access costs to foreign markets. An incentive for owning an intermediary is also to acquire information on foreign markets held by intermediaries. This is a crucial area for future research.

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Appendix

A Extensions of the theoretical model

We discuss on the robustness of our theoretical predictions.

A.1 Multi-product retailers with local monopoly power

Let consider the case where the entire set of products imported in a market from a country is distributed by a single multi-product intermediary. In other words, each intermediary has an exclusive territory like in Rey and Stiglitz (1995), in which it distributes all the imports from a country and it competes with local distributors and other importers. As in Mathewson and Winter (1987), we assume that intermediaries have a small share of the product i sales justifying they do not behave as a monopsony. In this configuration, an intermediary can be owned by several producers. The sequence of events is identical to the case studied in Section 2. The profit for an intermediary serving country j and importing products v from country i becomes

$$\pi_j(\theta,\varepsilon) = \int_{\Omega_{ij}} [1-\theta_{ij}(v)](\Lambda^r_{ij} - w_i f_{ij})\mathrm{d}v + \int_{\Omega_{ij}} b[\theta_{ij}(v)]\mathrm{d}v$$

where Ω_{ij} is the set of varieties consumed in country j and produced in country i and for manufacturer i is

$$\Pi_i(\theta,\varepsilon) = \sum\nolimits_j \Lambda^m_{ij} + \sum\nolimits_j \theta_{ij}(v)(\Lambda^r_{ij} - w_i f_{ij}) - \sum\nolimits_j b[\theta_{ij}(v)].$$

This configuration corresponds to the case of monopolistic competition with multi-product firms (Feenstra and Ma, 2008). Hence, the profit maximizing price set by the intermediary is given by

$$p_{ij} = \left[\frac{1}{(\varepsilon-1)(1-s_j)} + 1\right] z_{ij} \quad \text{with} \quad s_j \equiv \int_{\Omega_{ij}} p_{ij}^{1-\varepsilon}\mathrm{d}v \Big/ \int_{\Omega_j} p(v)^{1-\varepsilon}\mathrm{d}v$$

where s_j is the market share of its products in country j. For the manufacturer, P_j and s_j are given so that the wholesale price maximizing the profit of the manufacturer is now

$$z_{ij} = \frac{\varepsilon(1-s_j)}{(\varepsilon-1)(1-s_j)+\theta_{ij}} \frac{\tau_{ij}}{\varphi}$$

with $\partial z_{ij}/\partial s_j < 0$ and $\partial p_{ij}/\partial s_j < 0$. As a result, the operating profits arising from the

distribution of product i are

$$\Lambda_{ij}^{r}(\theta_{ij},\varphi,s_j)=\frac{[(\varepsilon-1)(1-s_j)+\theta_{ij}]^{\varepsilon-1}}{[\varepsilon(1-s_j)+s_j]^{\varepsilon}}\left(\frac{\varepsilon}{\varepsilon-1}\right)^{1-\varepsilon}\frac{\varphi^{\varepsilon-1}E_jP_j^{\varepsilon-1}}{\tau_{ij}^{\varepsilon-1}}$$

with $\partial\Lambda_{ij}^{r}/\partial s_j>0$ if and only if $\varepsilon(\theta_{ij}-s_j)+s_j>0$ and the operating profits of each producer are

$$\Lambda_{ij}^{m}(\theta_{ij},\varphi,s_j)=\frac{(1-s_j-\theta_{ij})(\varepsilon-1)}{\varepsilon}\Lambda_{ij}^{r}(\theta_{ij},\varphi,s_j)$$

with $\partial\Lambda_{ij}^{m}/\partial s_j<0$. Hence, when $s_j\to 0$, we fall back on the benchmark case. Starting from low values of s_j, a marginal increase in s_j reduces export sales of non-acquiring firms and force the less productive firms to exit. Stated differently, *the probability of serving a country decreases with the market power of its intermediary*. In contrast, export sales of acquiring firms increase when s_j rises marginally. Hence, *ceteris paribus*, *market shares of more productive exporters are higher in foreign countries where the distribution sector is highly concentrated.*

A.2 Two monopolists with a linear demand

We consider a framework where the markup is not constant when there is no forward integration. To ease the burden of notation, let consider a market structure with a single intermediary and a single manufacturer as well as a single foreign country to be served. The profit of the intermediary is given by

$$\pi\left(\theta,\varepsilon\right)=(1-\theta)[(p-z)q-f]+b(\theta) \tag{23}$$

where q is the foreign demand, p is the price prevailing in the foreign market, z is the price of the manufactured product paid by the intermediary and f is a fixed cost of distribution whereas the profit of the manufacturer is

$$\Pi\left(\theta,\varepsilon\right)=(z-1/\varphi-t)q+\theta[(p-z)q-f]-b(\theta) \tag{24}$$

where φ is labor productivity of the manufacturer, t is the trade cost to export the product.
We assume that demand is expressed as $q=a-p$ where a is a measure of the maximum size of the foreign country. Maximizing π with respect to p leads to $p^*=(a+z)/2$. Knowing $q=a-p^*$, the price of manufacturer maximizing its profit is given by

$$z^*=\frac{a(1-\theta)+1/\varphi+t}{2-\theta}$$

with $\partial z^*/\partial\theta<0$. Hence, the profit of the intermediary becomes

$$\pi(z^*)=(1-\theta)\left[\frac{(a-1/\varphi-t)^2}{4(2-\theta)^2}-f\right]+b(\theta). \tag{25}$$

At the first stage, the profit of the manufacturer is $\Pi(z^*(\theta),\theta)$. We determine θ^* the equity share maximizing the profit of the manufacturer. Knowing $b(\theta)$ and $z^*(\theta)$, $\partial\Pi(\theta)/\partial\theta = 0$ is equivalent to

$$-b^{'}(\theta) - f + \frac{(a-1/\varphi-t)^2}{4(2-\theta)^2} = 0 \tag{26}$$

An interior solution exists if and only if $b^{''}(\theta) > (a-1/\varphi-t)^2/2(2-\theta)^3$. In this case, by using the implicit function theorem, we have $\partial\theta^*/\partial a > 0$ and $\partial\theta^*/\partial\varphi > 0$ as well as $\partial\theta^*/\partial t < 0$. In addition, $\Pi(1) - \Pi(0) > 0$ if and only if $(a-1/\varphi-t)^2/8 - b^{'}(\theta) - f > 0$. In other words, *the acquisition of an intermediary is more likely to occur when labor productivity and foreign market size are high*. In addition, *trade liberalization promotes the acquisition of the intermediary*. Note that the profit achieved by the intermediary is positive when $\theta = \theta^*$. By introducing θ^* in $\pi(z^*(\theta),\theta)$ (more precisely Eq.(26) in Eq.(25)) when $0 < \theta^* < 1$ leads to $\pi(\theta^*) = (1-\theta)b^{'}(\theta) + b(\theta)$ which is positive. In addition, we have $\pi(\theta^*) > \pi_0$ where π_0 is the profit of an independent intermediary when it is not acquired ($\theta = 0$). We have $\pi(\theta^*) > \pi_0$ if and only if

$$f\left(\theta^* - \frac{\theta^{*2}}{4}\right) + b(\theta^*) - \frac{b^{'}(\theta^*)\theta^{*2}}{4} > 0$$

where $\theta^* - \theta^{*2}/4 > 0$ (remember that $0 \leq \theta \leq 1$). Note that b is a linear function with θ is a sufficient condition for $\pi(\theta^*) > \pi_0$.

A.3 Vertical restraints with bargaining

A manufacturer contracting with an intermediary to sell its variety can also use vertical restraints. To reduce the double marginalization or to increase the sales effort of its intermediary, a manufacturer can adopt different pricing schemes such as two-part tariffs, for instance. If the manufacturer does not own its intermediary, a two-part tariff is applied instead of a linear tariff. It charges its intermediary one unit-price for its product, z_{ij}, and a second price for the right to sell it, Φ, i.e., a franchise fee.

We apply the sequence of events prevailing in Section 2. In stage 3, intermediaries and manufacturers are randomly matched and bargain bilaterally over two-part wholesale price (z_{ij},Φ) which consists in a per-unit price z_{ij} and a fixed fee Φ. In stage 4, intermediaries choose final prices p_{ij} and markets clear. As in section 4, we have $p_{ij} = \varepsilon z_{ij}/(\varepsilon-1)$.

Let $\zeta \in [0,1]$ denote the manufacturer's bargaining power (which is assumed to be constant across firms for simplicity). The manufacturer and the intermediate negotiate a two-part tariff which consists in a fixed fee Φ and a per-unit price z_{ij}. The bargaining solution between a manufacturer and an intermediary then maximizes the Nash product

$$\max_{\Phi_i, z_{ij}} \mathcal{N}(\Phi_i, z_{ij}) \equiv \left[\sum\nolimits_j \Lambda_{ij}^m + \theta\sum\nolimits_j \left(\Lambda_{ij}^r - w_i f_{ij} - \Phi_i\right) + \Phi_i\right]^{\zeta} \left[(1-\theta)\sum\nolimits_j \left(\Lambda_{ij}^r - w_i f_{ij} - \Phi_i\right)\right]^{1-\zeta}. \tag{27}$$

After simplification the bargaining equilibrium is given by

$$z_{ij}^{*} = \frac{w_i \tau_{ij}}{\varphi} \quad \text{and} \quad \Phi_i^{*} = \frac{\zeta - \theta}{1 - \theta} \sum\nolimits_j \left(\frac{z_{ij}^{*} q_{ij}^{*}}{\varepsilon - 1} - w_i f_{ij} \right) \tag{28}$$

so that $p_{ij}^{*} = \frac{\varepsilon}{\varepsilon - 1} \frac{w_i \tau_{ij}}{\varphi}$.We thus obtain the standard result that manufacturers set their wholesale price (z_{ij}) to marginal cost to avoid the double marginalization problem, and then recoup a share of the intermediary's profit via the fixed fee. In addition, Φ_i^{*} decreases with θ as long as $\zeta < 1$. The resulting profits for the manufacturer can be expressed as follows:

$$\Pi_B^m(\varphi, \theta) = \zeta \sum\nolimits_j \left(\frac{z_{ij}^{*} q_{ij}^{*}}{\varepsilon - 1} - w_i f_{ij} \right) - b(\theta). \tag{29}$$

Observe that the profit of the manufacturer depends on the its bargaining power ζ and decreases with θ so that, under two-part tariffs, the best strategy for the manufacturer is to have no participation in its intermediary ($\theta^{*} = 0$). However, the profits of manufacturers are not equal under both regimes.

If the manufacturer owns its intermediary (i.e., *vertical integration*), then its profits is given by

$$\Pi_V^m(\varphi, 1) = \sum\nolimits_j \left[\left(p_{ij} - \frac{w_i \tau_{ij}}{\varphi} \right) q_{ij} - w_i f_{ij} \right] - b(1).$$

Under this configuration, the profit-maximizing final price is also $p_{ij}^{*} = \frac{\varepsilon}{\varepsilon - 1} \frac{w_i \tau_{ij}}{\varphi}$ so that

$$\Pi_V^m(\varphi, 1) = \sum\nolimits_j \left(\frac{z_{ij}^{*} q_{ij}^{*}}{\varepsilon - 1} - w_i f_{ij} \right) - b(1)$$

As a result, we have $\Pi_V^m(\varphi, 1) > \Pi_B^m(\varphi, 0)$ if and only if

$$\sum\nolimits_j \left(\frac{z_{ij}^{*} q_{ij}^{*}}{\varepsilon - 1} - w_i f_{ij} \right) > \frac{b(1)}{1 - \xi}$$

Hence, *the more productive firms choose to acquire its intermediary while the less productive firms apply a two-part tariff.*

A.4 Forward and backward integration

Consider now that the intermediary has equity shares in its supplier. For simplicity, we consider that each intermediary is specialized in one product (as in the benchmark case). The profit of the intermediary located in country i becomes

$$\pi_i(\theta, \varepsilon) = (1 - \theta) \sum\nolimits_j (\Lambda_{ij}^r - w_i f_{ij}) + \gamma \sum\nolimits_j \Lambda_{ij}^m + b(\theta) - h(\gamma)$$

where γ is the shares acquired by the intermediary in supplier i and $h(\gamma)$ is the price paid by the intermediary, whereas the profit of manufacturer i is expressed as follows

$$\Pi_i(\theta,\varepsilon) = (1-\gamma)\sum\nolimits_j \Lambda_{ij}^m + \theta\sum\nolimits_j \left(\Lambda_{ij}^r - w_i f_{ij}\right) - b(\theta) + h(\gamma)$$

Under this configuration, prices set by the intermediaries in country j are given by

$$p_{ij} = \left[\frac{\varepsilon}{\varepsilon-1} - \frac{\varepsilon\gamma}{(\varepsilon-1)(1-\theta)}\left(z_{ij} - \frac{w_i\tau_{ij}}{\varphi}\right)\frac{1}{z_{ij}}\right] z_{ij}. \tag{30}$$

Markup also varies among intermediaries. Within each foreign country, markup in distribution activities decreases with γ and θ as long as $z_{ij} > \tau_{ij}/\varphi$ while markup increases with z_{ij} if and only if $1-\gamma-\theta > 0$. As a result, wholesale price is now such that

$$z_{ij} - \frac{w_i\tau_{ij}}{\varphi} = \frac{(1-\theta)^2}{(1-\gamma-\theta)(\varepsilon-1+\theta)}\frac{w_i\tau_{ij}}{\varphi} \tag{31}$$

if $1-\gamma-\theta > 0$, otherwise $z_{ij} = w_i\tau_{ij}/\varphi$. Hence, the equilibrium price paid by the end consumer is expressed as follows:

$$p_{ij} = \frac{\varepsilon}{\varepsilon-1}\frac{\varepsilon}{\varepsilon-1+\theta}\frac{w_i\tau_{ij}}{\varphi}.$$

It follows that $\partial z_{ij}^*/\partial\gamma > 0$ and $\partial p_{ij}^*/\partial\gamma = 0$. Stated differently, a rise in γ does not affect the demand for the variety (q_{ij}) but increases the operating profits of the manufacturers (Λ_{ij}^m). In other words, *the probability of exporting and export sales increases with γ for firms controlled by an intermediary*.

B Theoretical model

B.1 Determination of expected profit

Remember that from Eq.(16)

$$\overline{\Pi}_i = \sum\nolimits_j \left[\lambda_{ij}\int_{\varphi_{ij}}^{\overline{\varphi}_i} \frac{\Lambda_{ij}^m(0,\varphi)g(\varphi)}{G(\overline{\varphi}_i) - G(\varphi_{ij})}\mathrm{d}\varphi + \lambda_i^W\int_{\overline{\varphi}_i}^{\infty} \frac{\left[\Lambda_{ij}^r(1,\varphi) - f_{ij} - b(1)\right]g(\varphi)}{1-G(\overline{\varphi}_i)}\mathrm{d}\varphi\right]$$

where $g(\varphi)/[G(\overline{\varphi}_i) - G(\varphi_{ij})]$ is the *ex post* productivity distribution of non-acquiring firms producing in country i and serving country j, and $g(\varphi)/[1-G(\overline{\varphi}_i)]$ the *ex post* productivity for acquiring firms, $\lambda_{ij} = [G(\overline{\varphi}_i) - G(\varphi_{ij})]/[1-G(\varphi_{ii})]$ the probability of serving country j and being a non-acquiring firm, and $\lambda_i^W = [1-G(\overline{\varphi}_i)]/[1-G(\varphi_{ii})]$ the probability to be an acquiring firm and to export.

In addition, we have shown that

$$\Lambda_{ij}^{m}(0,\varphi)=\frac{\varepsilon-1}{\varepsilon}\frac{\varphi^{\varepsilon-1}}{\varphi_{ij}^{\varepsilon-1}}f_{ij}\quad\text{and}\quad\Lambda_{ij}^{r}(1,\varphi)=\left(\frac{\varepsilon}{\varepsilon-1}\right)^{\varepsilon-1}\frac{\varphi^{\varepsilon-1}}{\varphi_{ij}^{\varepsilon-1}}f_{ij}$$

where we have introduced Eq.(12) in $\Lambda_{ij}^{m}(0,\varphi)$ and $\Lambda_{ij}^{r}(1,\varphi)$. Note also that

$$\sum\nolimits_{j}f_{ij}\frac{\overline{\varphi}_{i}^{\varepsilon-1}}{\varphi_{ij}^{\varepsilon-1}}=\Phi\sum\nolimits_{j}[f_{ij}+b(1)]\quad\text{with }\Phi\equiv\left[\left(\frac{\varepsilon}{\varepsilon-1}\right)^{\varepsilon-1}-\frac{\varepsilon-1}{\varepsilon}\right]^{-1}.$$

Assuming that the productivity of a firm is distributed according to a Pareto distribution with $g(\varphi)=\gamma\varphi_{\min}^{\gamma}/\varphi^{\gamma+1}$ and $G(\varphi)=1-\varphi_{\min}^{\gamma}/\varphi^{\gamma}$ (where $\varphi_{\min}=1$), we can write the expected profit of a firm as:

$$\begin{aligned}\overline{\Pi}_{i} &= \frac{\gamma}{\Delta}\frac{\varepsilon-1}{\varepsilon}\sum\nolimits_{j}\varphi_{ii}^{\gamma}\varphi_{ij}^{1-\varepsilon}\left(\varphi_{ij}^{-\Delta}-\overline{\varphi}_{i}^{-\Delta}\right)f_{ij}\\ &\quad+\frac{\gamma}{\Delta}\left(\frac{\varepsilon}{\varepsilon-1}\right)^{\varepsilon-1}\sum\nolimits_{j}\varphi_{ii}^{\gamma}\varphi_{ij}^{1-\varepsilon}\overline{\varphi}_{i}^{-\Delta}f_{ij}-\sum\nolimits_{j}\varphi_{ii}^{\gamma}\overline{\varphi}_{i}^{-\gamma}[f_{ij}+b(1)]\end{aligned}$$

with

$$\Delta\equiv\gamma-(\varepsilon-1).$$

Some arrangements imply

$$\begin{aligned}\overline{\Pi}_{i} &= \frac{\varphi_{ii}^{\gamma}\gamma}{\Delta}\sum\nolimits_{j}f_{ij}\left(\frac{\varepsilon-1}{\varepsilon}\varphi_{ij}^{-\gamma}+\Phi^{-1}\frac{\overline{\varphi}_{i}^{\varepsilon-1}}{\varphi_{ij}^{\varepsilon-1}}\overline{\varphi}_{i}^{-\gamma}\right)-\frac{\varphi_{ii}^{\gamma}}{\overline{\varphi}_{i}^{\gamma}}\sum\nolimits_{j}[f_{ij}+b(1)]\\ &= \frac{\varphi_{ii}^{\gamma}\gamma}{\Delta}\frac{\varepsilon-1}{\varepsilon}\sum\nolimits_{j}f_{ij}\varphi_{ij}^{-\gamma}+\frac{\varphi_{ii}^{\gamma}\gamma}{\Delta\overline{\varphi}_{i}^{\gamma}}\sum\nolimits_{j}[f_{ij}+b(1)]-\frac{\varphi_{ii}^{\gamma}}{\overline{\varphi}_{i}^{\gamma}}\sum\nolimits_{j}[f_{ij}+b(1)]\\ &= \frac{\varphi_{ii}^{\gamma}\gamma}{\Delta}\frac{\varepsilon-1}{\varepsilon}\sum\nolimits_{j}f_{ij}\varphi_{ij}^{-\gamma}+\frac{\varphi_{ii}^{\gamma}(\varepsilon-1)}{\Delta\overline{\varphi}_{i}^{\gamma}}\sum\nolimits_{j}[f_{ij}+b(1)]\end{aligned}$$

where the second term of the RHS tends to 0 when $\overline{\varphi}_{i}\to\infty$. Hence, we obtain

$$\overline{\Pi}_{i}=\frac{\varphi_{ii}^{\gamma}(\varepsilon-1)}{\Delta}\left[\frac{\gamma}{\varepsilon}\sum\nolimits_{j}f_{ij}\varphi_{ij}^{-\gamma}+\overline{\varphi}_{i}^{-\gamma}\sum\nolimits_{j}[f_{ij}+b(1)]\right].$$

In addition, we have to take into account that intermediary does know *a priori* its supplier (and, thus, its productivity). An intermediary enters the market as long as the expected value of entry is higher than the sunk entry cost. The expected profit of an intermediary prior to enter the market is given by $[1-G(\varphi_{ii})]\overline{\pi}_{i}$ where $[1-G(\varphi_{ii})]$ is the probability to enter market and $\overline{\pi}_{i}$ is the expected profit conditional on successful entry given by

$$\overline{\pi}_{i}=\sum\nolimits_{j}\lambda_{ij}\int_{\varphi_{ij}}^{\overline{\varphi}_{i}}\frac{\left[\Lambda_{ij}^{r}(0,\varphi)-wf_{ij}\right]g(\varphi)}{G(\overline{\varphi}_{i})-G(\varphi_{ij})}\mathrm{d}\varphi+\sum\nolimits_{j}\lambda_{i}^{W}\int_{\overline{\varphi}_{i}}^{\infty}\frac{b(1)}{G(\overline{\varphi}_{i})-G(\varphi_{ij})}\mathrm{d}\varphi$$

After simplifications, we obtain

$$\begin{aligned}
\overline{\pi}_i &= \frac{\gamma\varphi_{ii}^{\gamma}}{\Delta}\sum\nolimits_j \frac{\varphi_{ij}^{-\Delta}-\overline{\varphi}_i^{-\Delta}}{\varphi_{ij}^{\varepsilon-1}} f_{ij} - \sum\nolimits_j \varphi_{ii}^{\gamma}\left(\varphi_{ij}^{-\gamma}-\overline{\varphi}_i^{-\gamma}\right) f_{ij} + \varphi_{ii}^{\gamma}\overline{\varphi}_i^{-\gamma} b(1) \\
&= \frac{\varphi_{ii}^{\gamma}(\varepsilon-1)}{\Delta}\sum\nolimits_j \varphi_{ij}^{-\gamma} f_{ij} - \frac{\gamma}{\Delta}\frac{\varphi_{ii}^{\gamma}}{\overline{\varphi}_i^{\gamma}}\sum\nolimits_j \frac{\overline{\varphi}_i^{\varepsilon-1}}{\varphi_{ij}^{\varepsilon-1}} f_{ij} + \frac{\varphi_{ii}^{\gamma}}{\overline{\varphi}_i^{\gamma}}\sum\nolimits_j [f_{ij}+b(1)] \\
&= \frac{\varphi_{ii}^{\gamma}(\varepsilon-1)}{\Delta}\sum\nolimits_j \varphi_{ij}^{-\gamma} f_{ij} - \frac{\gamma}{\Delta\Phi}\frac{\varphi_{ii}^{\gamma}}{\overline{\varphi}_i^{\gamma}}\sum\nolimits_j [f_{ij}+b(1)] + \frac{\varphi_{ii}^{\gamma}}{\overline{\varphi}_i^{\gamma}}\sum\nolimits_j [f_{ij}+b(1)] \\
&= \frac{\varphi_{ii}^{\gamma}(\varepsilon-1)}{\Delta}\sum\nolimits_j \varphi_{ij}^{-\gamma} f_{ij} + \Upsilon\varphi_{ii}^{\gamma}\overline{\varphi}_i^{-\gamma}\sum\nolimits_j [f_{ij}+b(1)]
\end{aligned}$$

with

$$\Upsilon \equiv \frac{\Delta-\Phi\gamma}{\Delta}$$

Hence, we have

$$\begin{aligned}
\overline{\Pi}_i &= \frac{\varphi_{ii}^{\gamma}(\varepsilon-1)}{\Delta}\frac{\gamma}{\varepsilon}\sum\nolimits_j \varphi_{ij}^{-\gamma} f_{ij} + \frac{\varepsilon-1}{\Delta}\frac{\varphi_{ii}^{\gamma}}{\overline{\varphi}_i^{\gamma}}\sum\nolimits_j [f_{ij}+b(1)], \\
\overline{\pi}_i &= \frac{\varphi_{ii}^{\gamma}(\varepsilon-1)}{\Delta}\sum\nolimits_j \varphi_{ij}^{-\gamma} f_{ij} + \Upsilon\frac{\varphi_{ii}^{\gamma}}{\overline{\varphi}_i^{\gamma}}\sum\nolimits_j [f_{ij}+b(1)].
\end{aligned}$$

Because $\varphi_{ii}^{-\gamma}\overline{\Pi}_i = w_i f_e$ and $\varphi_{ii}^{-\gamma}\overline{\pi}_i = w_i f_e$, we obtain

$$\frac{\gamma-\varepsilon}{\varepsilon}\sum_j \varphi_{ij}^{-\gamma} f_{ij} = \frac{\Delta-\Phi\gamma-(\varepsilon-1)}{\varepsilon-1}\sum_j \overline{\varphi}_i^{-\gamma}[f_{ij}+b(1)]. \tag{32}$$

Thus, by using Eq.(32), $\varphi_{ii}^{-\gamma}\overline{\Pi}_i = w_i f_e$ is equivalent to

$$\frac{(\Delta-\Phi\gamma)\gamma-\varepsilon(\varepsilon-1)}{\Delta-\Phi\gamma-(\varepsilon-1)}\frac{\varepsilon-1}{\varepsilon\Delta}\sum\nolimits_j \varphi_{ij}^{-\gamma} f_{ij} = f_e \tag{33}$$

$$\frac{\varepsilon}{\Delta(\gamma-\varepsilon)}\left[\frac{(\Delta-\Phi\gamma)\,\gamma}{\varepsilon}-(\varepsilon-1)\right]\sum\nolimits_j \overline{\varphi}_i^{-\gamma}[f_{ij}+b(1)] = f_e. \tag{34}$$

Thus, using (33) and (34) yield

$$\overline{\varphi}_i^{-\Delta} = \left\{\frac{f_e\Delta(\gamma-\varepsilon)}{[\gamma\Delta\Upsilon-\varepsilon(\varepsilon-1)]\sum_j [f_{ij}+b(1)]}\right\}^{\frac{\Delta}{\gamma}}. \tag{35}$$

B.2 The mass of firms

Labor market clearing in country i:

$$L_i = \ell_i + 2M_e f_e + \sum\nolimits_j M_i\varphi_{ii}^{\gamma}\varphi_{ij}^{-\gamma} f_{ij}$$

with $M_e = M_i \varphi_{ii}^{\gamma}$,

$$\sum\nolimits_j \varphi_{ij}^{-\gamma} f_{ij} = \frac{f_e \Delta \varepsilon \Upsilon}{\gamma \Delta \Upsilon - \varepsilon(\varepsilon - 1)},$$

and

$$\begin{aligned}
\ell_i &= \sum\nolimits_j M_i \varphi_{ii}^{\gamma} \left[\int_{\varphi_{ij}}^{\overline{\varphi}_i} \frac{\tau_{ij} q_{ij}(0,\varphi)}{\varphi} g(\varphi) \mathrm{d}\varphi + \int_{\overline{\varphi}_i}^{\infty} \frac{\tau_{ij} q_{ij}(1,\varphi)}{\varphi} g(\varphi) \mathrm{d}\varphi \right] \\
&= (\varepsilon - 1) M_i \sum\nolimits_j \varphi_{ii}^{\gamma} \left[\int_{\varphi_{ij}}^{\overline{\varphi}_i} \frac{z(0,\varphi) q(0,\varphi)}{\varepsilon} g(\varphi) \mathrm{d}\varphi + \int_{\overline{\varphi}_i}^{\infty} \frac{p(1,\varphi) q(1,\varphi)}{\varepsilon} g(\varphi) \mathrm{d}\varphi \right] \\
&= (\varepsilon - 1) M_i \left[\overline{\Pi}_i + \sum\nolimits_j \varphi_{ii}^{\gamma} \overline{\varphi}_i^{-\gamma} [f_{ij} + b(1)] \right].
\end{aligned}$$

Using the expression of $\overline{\Pi}_i$ and Eq.(34) imply

$$\begin{aligned}
L_i^v &= (\varepsilon - 1) M_i \frac{\varphi_{ii}^{\gamma} \gamma}{\Delta} \left[\frac{\varepsilon - 1}{\varepsilon} \sum\nolimits_j f_{ij} \varphi_{ij}^{-\gamma} + \frac{\gamma - \varepsilon}{\varepsilon} \left(\frac{\Delta}{\varepsilon - 1} \Upsilon - 1 \right)^{-1} \sum\nolimits_j \varphi_{ij}^{-\gamma} f_{ij} \right] \\
&= \frac{\gamma(\varepsilon - 1)^2}{\varepsilon \Delta} \frac{\Delta \Upsilon + \Delta - \varepsilon}{\Delta \Upsilon - (\varepsilon - 1)} M_i \varphi_{ii}^{\gamma} \sum\nolimits_j f_{ij} \varphi_{ij}^{-\gamma} = M_i \varphi_{ii}^{\gamma} f_e \frac{(\Delta \Upsilon + \Delta - \varepsilon) \gamma(\varepsilon - 1)}{\gamma \Delta \Upsilon - \varepsilon(\varepsilon - 1)}.
\end{aligned}$$

Hence,

$$L_i = M_i \varphi_{ii}^{\gamma} f_e \Psi$$

with

$$\Psi \equiv \frac{(\Upsilon + \Delta - \varepsilon) \gamma(\varepsilon - 1)}{\gamma \Delta \Upsilon - \varepsilon(\varepsilon - 1)} + 2 + \frac{\varepsilon}{\varepsilon - 1} \frac{\Delta [\Delta \Upsilon - (\varepsilon - 1)]}{\gamma \Delta \Upsilon - \varepsilon(\varepsilon - 1)}$$

so that

$$M_i = \frac{L_i}{\varphi_{ii}^{\gamma} f_e \Psi} \tag{36}$$

B.3 Price index

We have

$$\begin{aligned}
P_i^{1-\varepsilon} &= \sum\nolimits_k \left[M_k \lambda_{ki} \int_{\varphi_{ki}}^{\overline{\varphi}_k} \frac{p_{ki}(0,\varphi)^{1-\varepsilon} g(\varphi)}{G(\overline{\varphi}_k) - G(\varphi_{ki})} \mathrm{d}\varphi + M_k \lambda_k^M \int_{\overline{\varphi}_k}^{\infty} \frac{p_{ki}(1,\varphi)^{1-\varepsilon} g(\varphi)}{1 - G(\overline{\varphi}_k)} \mathrm{d}\varphi \right] \\
&= \sum\nolimits_k \frac{\gamma L_k \left(\frac{\varepsilon}{\varepsilon - 1} \frac{\varepsilon}{\varepsilon - 1} \tau_{ki} \right)^{1-\varepsilon}}{f_e \Psi \Delta} \varphi_{ki}^{-\Delta} + \sum\nolimits_k \frac{\gamma L_k \left(\frac{\varepsilon}{\varepsilon - 1} \tau_{ki} \right)^{1-\varepsilon}}{f_e \Psi \Delta} \overline{\varphi}_k^{-\Delta} \left[1 - \left(\frac{\varepsilon}{\varepsilon - 1} \right)^{1-\varepsilon} \right] \\
&= \sum\nolimits_k \frac{\gamma L_k \left(\frac{\varepsilon}{\varepsilon - 1} \frac{\varepsilon}{\varepsilon - 1} \tau_{ki} \right)^{1-\varepsilon}}{f_e \Psi \Delta} \varphi_{ki}^{-\Delta} \left\{ 1 + \frac{\overline{\varphi}_k^{-\Delta}}{\varphi_{ki}^{-\Delta}} \left[\left(\frac{\varepsilon}{\varepsilon - 1} \right)^{\varepsilon - 1} - 1 \right] \right\}.
\end{aligned}$$

Because

$$\varphi_{ki}^{-\Delta} = \left(\frac{\varepsilon}{\varepsilon - 1} \frac{\varepsilon}{\varepsilon - 1} \tau_{ki} \right)^{-\Delta} \left(\frac{\varepsilon f_{ki}}{L_i} \right)^{\frac{-\Delta}{\varepsilon - 1}} P_i^{-\Delta},$$

we get

$$P_i^{-\gamma} = L_i^{\frac{\Delta}{\varepsilon-1}} \sum\nolimits_k \eta_k \left\{ 1 + \frac{\overline{\varphi}_k^{-\Delta}}{\varphi_{ki}^{-\Delta}} \left[\left(\frac{\varepsilon}{\varepsilon - 1} \right)^{\varepsilon-1} - 1 \right] \right\}$$

with

$$\eta_k \equiv \frac{\gamma L_k \left(\frac{\varepsilon}{\varepsilon-1} \frac{\varepsilon}{\varepsilon-1} \tau_{ki} \right)^{-\gamma} (\varepsilon f_{ki})^{\frac{-\Delta}{\varepsilon-1}}}{f_e \Psi \Delta}.$$

Note that

$$\begin{aligned} \overline{\varphi}_k^{\varepsilon-1} &= \left(\frac{\varepsilon}{\varepsilon-1} \frac{\varepsilon}{\varepsilon-1} \right)^{\varepsilon-1} \Phi \frac{\varepsilon \sum_j [f_{kj} + b(1)]}{\sum_j A_j \tau_{kj}^{1-\varepsilon}} \\ &= \frac{\gamma - \varepsilon}{\varepsilon} \Phi \frac{\overline{\varphi}_k^{\gamma} \sum_j \varphi_{kj}^{-\gamma} f_{kj}}{\sum_j \varphi_{kj}^{1-\varepsilon} f_{kj}} \end{aligned}$$

so that

$$\overline{\varphi}_k^{-\Delta} = \frac{\gamma - \varepsilon}{\varepsilon} \Phi \sum_j \varphi_{kj}^{-\Delta}$$

we obtain

$$P_i = L_i^{-\frac{\Delta}{(\varepsilon-1)\gamma}} \Theta_i^{-\frac{1}{\gamma}} \tag{37}$$

with

$$\Theta_i \equiv \sum_k \eta_k \left\{ 1 + \frac{\gamma - \varepsilon}{\varepsilon} \left[\left(\frac{\varepsilon}{\varepsilon - 1} \right)^{\varepsilon-1} - 1 \right] \Phi \frac{\sum_j \varphi_{kj}^{-\Delta}}{\varphi_{ki}^{-\Delta}} \right\}.$$

C Data

C.1 The Amadeus database

The Amadeus database is a commercial database published by Bureau van Dijk (2008). It records comparable financial and business information for public and private firms across Europe. The data are collected from company reports and balance sheets, and are updated weekly. Firms are identified both by an identification number specific to Amadeus and their official national ID (i.e, SIREN in France). The accounting data are available for the year prior the release and go back to ten years ago. The accounting data include firm-level variables such as sales, value-added or employment among others. The database also informs about current financial linkages between firms by listing the name of the subsidiaries of a firm, their nationality, and their main activity sector (at the 4-digit NACE level). Third-party acquisitions up to ten levels are also listed. Nevertheless, the Amadeus database does not report the date of the acquisitions. Our dataset is the result of two online extractions of the Amadeus database for distinct years. The data cover the whole set of French food firms and their subsidiaries. The online extractions were realized at the beginning of 2009 and 2013, which corresponds to accounting data for fiscal years 2008 and 2012.

One of the advantages of the Amadeus database is that it provides an almost complete record of French firms, and so surveys numerous small firms that are not always observable in other databases. Hence, for the specific case of the food sector, firms with less than 4 employees represents alone 45% of all firms. However, a large number of these small firms corresponds to a single activity that is largely represented in France: bakeries. This activity covers 58% of French food firms in the AMADEUS database, and bakeries represent roughly 98% of firms within the *manufacture of bakery and farinaceous products* activity sector (NACE code 1071). Given that these small firms do not either acquire intermediaries or export, we choose to exclude this 4-digit NACE activity from our sample. Accounting for the *manufacture of bakery and farinaceous products* activity do not change the significance of the results presented in this paper.[21] After eliminating this 4-digit NACE activity as well as observations with missing information, we obtain a pooled cross-section sample covering 14,090 French food firms. Table 9 reports summary statistics of the accounting data used in the econometric analysis.

C.2 Classification of activity sectors

Since we are interested to qualify the nature of the acquisition, we create 5 classes of activity sector based on the NACE (Revision 2) classification: upstream activities, horizontal activities, intermediary activities, transport activities and service activities.[22] In addition, we split these activity sectors into several subsectors. We present in Table 10 the classification of the financial acquisitions according to the NACE classification.

[21] The econometric analyses carry on with the whole sample of firms are available upon request from the authors.

[22] As Hijzen, Görg, and Manchin (2008), we define "horizontal" acquisition as an acquisition between firms within the same industry.

Table 9: Summary Statistics on Food Firms

Variable	Units	Obs.	Mean	S.D.	P10	P25	P50	P75	P90	Min	Max
Sales	th. €	14,090	15,786.05	204,748.90	116.00	283.00	884.00	3,714.00	15,814.00	0.00	1.65×10^7
Employment	# of employees	14,090	48.25	928.56	1.00	2.00	6.00	18.00	50.00	1.00	76,044.00
Sales/capita$_{NACE4}$	–	14,090	1.00	2.93	0.17	0.38	0.67	1.11	1.83	0.00	286.59
Value added	th. €	8,593	5,028.70	119,538,90	86.00	198.00	463.00	1,305.00	3,673.00	-7,436	8,393,000.00
Labor productivity	–	8,593	82.69	226.84	26.17	36.38	50.40	78.03	138.33	-1,246.25	13,209.00
Intangible fixed assets	th. €	11,716	3,320.37	198,901.10	0.00	0.00	14.00	81.00	237.00	0.00	1.72×10^7
Capital	th. €	11,716	1,339.06	19,236.56	8.00	8.00	39.00	169.00	854.00	-1,520	955,026.00
Costs of employees	th. €	11,716	2,032.51	46,830.16	35.00	85.00	219.00	653.00	1,846.00	1.00	4,669,000.00
Long-term debt	th. €	11,716	19.13	945.95	0.00	0.00	0.28	1.51	6.06	-10.13	98,550.00
Capital intensity		11,716	2.52	130.73	0.04	0.08	0.20	0.49	1.19	-4.14	10,724.00
Net current assets	th. €	11,716	1,761.36	43,187.26	-130.00	-19.00	52.00	422.00	1,827.00	-2419,000	2,705,000.00
Fixed assets	th. €	11,716	7,548.38	287,273.10	22.00	64.00	192.00	733.50	3,048.00	1.00	2.32×10^7
Liquidity ratio	–	11,716	2.01	18.55	-0.62	-0.16	0.36	1.41	3.77	-136.00	1,298.50
Intangible assets ratio	–	11,716	0.23	0.31	0.00	0.00	0.04	0.42	0.79	0.00	1.00

Notes: S.D. denotes standard deviation. P10, P25, P50, P75, P90 correspond to the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} percentiles, respectively. Sources: Amadeus database.

[h]

Table 10: Classification of NACE codes in activity sectors and subsectors

Activity sector	**Subsectors**	**NACE**	**Heading**
Section A: Agriculture, Forestry and fishing			
Upstream	Agricultural	01	Crop and animal production, hunting and related service activities
Upstream	Agricultural	02	Forestry and logging
Upstream	Agricultural	03	Fishing and aquaculture
Section B: Mining and quarrying			
Upstream	Non-Agricultural	05	Mining of coal and lignite
Upstream	Non-Agricultural	06	Extraction of crude petroleum and natural gas
Upstream	Non-Agricultural	07	Mining of metal ores
Upstream	Non-Agricultural	08	Other mining and quarrying
Upstream	Non-Agricultural	09	Mining support service activities
Section C: Manufacturing			
Horizontal	Agricultural	10	Manufacture of food products
Horizontal	Agricultural	11	Manufacture of beverages
Upstream	Agricultural	12	Manufacture of tobacco products
Upstream	Non-Agricultural	13	Manufacture of textiles
Upstream	Non-Agricultural	14	Manufacture of wearing apparel
Upstream	Non-Agricultural	15	Manufacture of leather and related products
Horizontal	Non-Agricultural	16	Manufacture of wood and of products of wood and cork, except furniture, manufacture of articles of straw and plaiting materials
Horizontal	Non-Agricultural	17	Manufacture of paper and paper products
Horizontal	Non-Agricultural	18	Printing and reproduction of recorded media
Horizontal	Non-Agricultural	19	Manufacture of coke and refined petroleum products
Horizontal	Non-Agricultural	20	Manufacture of chemicals and chemical products
Horizontal	Non-Agricultural	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations

Continued on next page

Table 10 - Classification of NACE codes in activity sectors and subsectors (*continued from previous page*)

Activity sector	Subsectors	NACE	Heading
Horizontal	Non-Agricultural	22	Manufacture of rubber and plastic products
Horizontal	Non-Agricultural	23	Manufacture of other non-metallic mineral products
Horizontal	Non-Agricultural	24	Manufacture of basic metals
Horizontal	Non-Agricultural	25	Manufacture of fabricated metal products, except machinery and equipment
Horizontal	Non-Agricultural	26	Manufacture of computer, electronic and optical products
Horizontal	Non-Agricultural	27	Manufacture of electrical equipment
Horizontal	Non-Agricultural	28	Manufacture of machinery and equipment n.e.c.
Horizontal	Non-Agricultural	29	Manufacture of motor vehicles, trailers and semi-trailers
Horizontal	Non-Agricultural	30	Manufacture of other transport equipment
Horizontal	Non-Agricultural	31	Manufacture of furniture
Horizontal	Non-Agricultural	32	Other manufacturing
Horizontal	Non-Agricultural	33	Repair and installation of machinery and equipment
Section D: Electricity, gas, steam and air conditioning supply			
Horizontal	Non-Agricultural	35	Electricity, gas, steam and air conditioning supply
Section E: Water supply, sewerage, waste management and remediation activities			
Horizontal	Non-Agricultural	36	Water collection, treatment and supply
Horizontal	Non-Agricultural	37	Sewerage
Horizontal	Non-Agricultural	38	Waste collection, treatment and disposal activities, materials recovery
Horizontal	Non-Agricultural	39	Remediation activities and other waste management services
Section F: Construction			
Horizontal	Non-Agricultural	41	Construction of buildings
Horizontal	Non-Agricultural	42	Civil engineering
Horizontal	Non-Agricultural	43	Specialised construction activities
Section G: Wholesale and retail trade, repair of motor vehicles and motorcycles			
Intermediary	Non-Agricultural	45	Wholesale and retail trade and repair of motor vehicles and motorcycles
		46	Wholesale trade, except of motor vehicles and motorcycles
		46.1	Wholesale on a fee or contract basis

Continued on next page

Table 10 - Classification of NACE codes in activity sectors and subsectors (*continued from previous page*)

Activity sector	Subsectors	NACE	Heading
Intermediary	Agricultural	46.11	Agents involved in the sale of agricultural raw materials, live animals, textile raw materials and semi-finished goods
Intermediary	Non-Agricultural	46.12	Agents involved in the sale of fuels, ores, metals and industrial chemicals
Intermediary	Non-Agricultural	46.13	Agents involved in the sale of timber and building materials
Intermediary	Non-Agricultural	46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft
Intermediary	Non-Agricultural	46.15	Agents involved in the sale of furniture, household goods, hardware and ironmongery
Intermediary	Non-Agricultural	46.16	Agents involved in the sale of textiles, clothing, fur, footwear and leather goods
Intermediary	Agricultural	46.17	Agents involved in the sale of food, beverages and tobacco
Intermediary	Non-Agricultural	46.18	Agents specialised in the sale of other particular products
Intermediary	Non-Agricultural	46.19	Agents involved in the sale of a variety of goods
Intermediary	Agricultural	46.2	Wholesale of agricultural raw materials and live animals
Intermediary	Agricultural	46.3	Wholesale of food, beverages and tobacco
Intermediary	Non-Agricultural	46.4	Wholesale of household goods
Intermediary	Non-Agricultural	46.5	Wholesale of information and communication equipment
Intermediary	Non-Agricultural	46.6	Wholesale of other machinery, equipment and supplies
Intermediary	Non-Agricultural	46.7	Other specialised wholesale
Intermediary	Non-Agricultural	46.9	Non-specialised wholesale trade
		47	Retail trade, except of motor vehicles and motorcycles
Intermediary	Agricultural	47.1	Retail sale in non-specialised stores
Intermediary	Non-Agricultural	47.3	Retail sale of automotive fuel in specialised stores
Intermediary	Non-Agricultural	47.4	Retail sale of information and communication equipment in specialised stores
Intermediary	Non-Agricultural	47.5	Retail sale of other household equipment in specialised stores
Intermediary	Non-Agricultural	47.6	Retail sale of cultural and recreation goods in specialised stores
		47.7	Retail sale of other goods in specialised stores
Intermediary	Non-Agricultural	47.71	Retail sale of clothing in specialised stores
Intermediary	Non-Agricultural	47.72	Retail sale of footwear and leather goods in specialised stores
Intermediary	Non-Agricultural	47.73	Dispensing chemist in specialised stores

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Table 10 - Classification of NACE codes in activity sectors and subsectors (*continued from previous page*)

Activity sector	Subsectors	NACE	Heading
Intermediary	Non-Agricultural	47.74	Retail sale of medical and orthopaedic goods in specialised stores
Intermediary	Non-Agricultural	47.75	Retail sale of cosmetic and toilet articles in specialised stores
Intermediary	Agricultural	47.76	Retail sale of flowers, plants, seeds, fertilisers, pet animals and pet food in specialised stores
Intermediary	Non-Agricultural	47.77	Retail sale of watches and jewellery in specialised stores
Intermediary	Non-Agricultural	47.78	Other retail sale of new goods in specialised stores
Intermediary	Non-Agricultural	47.79	Retail sale of second-hand goods in stores
Intermediary	Agricultural	47.81	Retail sale via stalls and markets of food, beverages and tobacco products
Intermediary	Non-Agricultural	47.82	Retail sale via stalls and markets of textiles, clothing and footwear
Intermediary	Non-pertinent	47.9	Retail trade not in stores, stalls or markets
Section H: Transportation and storage			
		49	Land transport and transport via pipelines
Transport	Passenger	49.1	Passenger rail transport, interurban
Transport	Freight	49.2	Freight rail transport
Transport	Passenger	49.3	Other passenger land transport
Transport	Freight	49.4	Freight transport by road and removal services
Transport	Freight	49.5	Transport via pipeline
		50	Water transport
Transport	Passenger	50.1	Sea and coastal passenger water transport
Transport	Freight	50.2	Sea and coastal freight water transport
Transport	Passenger	50.3	Inland passenger water transport
Transport	Freight	50.4	Inland freight water transport
		51	Air transport
Transport	Passenger	51.1	Passenger air transport
Transport	Freight	51.2	Freight air transport and space transport
Transport	Freight	52	Warehousing and support activities for transportation
Services	Postal	53	Postal and courier activities
Section I: Accomodation and food service activities			

Continued on next page

Table 10 - Classification of NACE codes in activity sectors and subsectors (*continued from previous page*)

Activity sector	Subsectors	NACE	Heading
Services	Accomodation	55	Accommodation
Services	Agricultural	56	Food and beverage service activities
Section J: Information and communication			
Services	Communication	58	Publishing activities
Services	Communication	59	Motion picture, video and television programme production, sound recording and music publishing activities
Services	Communication	60	Programming and broadcasting activities
Services	Communication	61	Telecommunications
Services	Communication	62	Computer programming, consultancy and related activities
Services	Communication	63	Information service activities
Section K: Financial and insurance activities			
Services	Finance – Insurance	64	Financial service activities, except insurance and pension funding
Services	Finance – Insurance	65	Insurance, reinsurance and pension funding, except compulsory social security
Services	Finance – Insurance	66	Activities auxiliary to financial services and insurance activities
Section L: Real estate activities			
Services	Real estate	68	Real estate activities
Section M: Professional, scientific and technical activities			
Services	Business services	69	Legal and accounting activities
Services	Business services	70	Activities of head offices, management consultancy activities
Services	Business services	71	Architectural and engineering activities, technical testing and analysis
Services	Business services	72	Scientific research and development
Services	Business services	73	Advertising and market research
Services	Business services	74	Other professional, scientific and technical activities
Services	Business services	75	Veterinary activities
Section N: Administrative and support service activities			
Services	Business services	77	Rental and leasing activities
Services	Business services	78	Employment activities

Continued on next page

Table 10 - Classification of NACE codes in activity sectors and subsectors (*continued from previous page*)

Activity sector	Subsectors	NACE	Heading
Services	Business services	79	Travel agency, tour operator and other reservation service and related activities
Services	Business services	80	Security and investigation activities
Services	Business services	81	Services to buildings and landscape activities
Services	Business services	82	Office administrative, office support and other business support activities
Section O: Public administration and defense, compulsory social security			
Services	Other	84	Public administration and defence, compulsory social security
Section P: Education			
Services	Other	85	Education
Section Q: Human health and social work activities			
Services	Other	86	Human health activities
Services	Other	87	Residential care activities
Services	Other	88	Social work activities without accommodation
Section R: Arts, entertainment and recreation			
Services	Other	90	Creative, arts and entertainment activities
Services	Other	91	Libraries, archives, museums and other cultural activities
Services	Other	92	Gambling and betting activities
Services	Other	93	Sports activities and amusement and recreation activities
Section S: Other service activities			
Services	Other	94	Activities of membership organisations
Services	Other	95	Repair of computers and personal and household goods
Services	Other	96	Other personal service activities
Section T: Activities of households as employers, undifferentiated goods and services producing activities of households for own use			
Services	Other	97	Activities of households as employers of domestic personnel
Services	Other	98	Undifferentiated goods- and services-producing activities of private households for own use
Section U: Activities of extraterritorial organisations and bodies			
Services	Other	99	Activities of extraterritorial organisations and bodies

D Probability of acquiring an intermediary.

In order to testify from the explanatory power of firm characteristics on the decision to acquire an intermediary, we run a Probit model of the form $P\left(Intermed_v\right) = \Phi\left(X_{v,t-1}, FE_s, FE_t\right)$. The choice of the explanatory variables was made in accordance with the main insights of the theoretical model. Hence, we include as determinants of intermediary acquisition firm productivity, firm size, capital intensity, the ratio of intangible assets on total fixed assets, and two variables informing about the financial health of the firm. Several alternative definitions of firm productivity were used but our preferred proxy is the log of domestic sales per employee deviated from sector mean (defined at the 4-digit NACE level, see Verhoogen, 2008).[23] The size of the firm is proxied by the number of employees broken down into five classes to account for the specific case of very small business (i.e., small firms with less than five employees and micro-firm with one employee). We also control for year dummies and 4-digit industry dummies. The financial variables correspond to a liquidity ratio calculated as log net current assets divided by log total fixed assets, and the log of long-term debt. The expected sign of the estimated coefficients is negative for the liquidity variable and positive for the long-term debt of the firm. Indeed, we presume that firms finance their acquisitions by incurring debts which in turn impact negatively their liquidity.

The results of the Probit model are reported in Table 11. Column (1) presents the estimates obtained with the "Domestic & foreign intermediaries" sample, whereas Columns (2) and (3) reproduce the estimates for the "Domestic intermediaries" and "Intermediaries exclusively" samples, respectively. In line with Proposition 1, we find that more productive firms and larger firms are more likely to acquire equity shares in an intermediary. These results echo previous findings enounced in the "horizontal" M&A literature (Stiebale and Trax, 2011; Spearot, 2012). As expected, we find a negative relationship between acquiring an intermediary and the measure of cash flows of a firm (i.e., liquidity ratio) while the opposite sign is observed for the long-term debt of a firm.

[23] We also conduct robustness tests using other proxies like the log of material costs per employee, the "Approximate Total Factor Productivity" (ATFP) measure of Griliches and Mairesse (1990), or the more standard proxy of labor productivity. For this last proxy, we interact the productivity of firms with the number of employees to account for the importance of small firms in our sample.

Table 11: Determinants of Intermediaries Acquisition

Dependent variable: Intermediary acquisition			
	Domestic & foreign intermediaries	Domestic intermediaries	Intermediaries exclusively
	(1)	(2)	(3)
Productivity	0.0682**	0.0631**	0.1521***
	(0.0278)	(0.0284)	(0.0205)
Employ. [2-4]	-0.0848	-0.1035	-0.0177
	(0.1052)	(0.1121)	(0.1240)
Employ. [5-19]	0.5382***	0.5213***	0.7392***
	(0.0888)	(0.0923)	(0.0860)
Employ. [20-50]	1.1659***	1.1434***	1.5450***
	(0.1093)	(0.1120)	(0.1059)
Employ. [> 50]	1.7001***	1.5552***	2.3641***
	(0.1062)	(0.1111)	(0.1574)
Capital intensity	-0.0001*	-0.0001**	0.0087
	(0.0001)	(0.0001)	(0.0070)
Intangible assets ratio	-0.2991**	-0.3211**	-0.2863**
	(0.1226)	(0.1252)	(0.1118)
Liquidity ratio	-0.0081***	-0.0073***	-0.0112***
	(0.0023)	(0.0025)	(0.0027)
Long-term debt	0.0014***	0.0008**	0.0027***
	(0.0004)	(0.0004)	(0.0005)
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Pseudo-R^2	0.2843	0.2469	0.3199
Observations	11716	11604	8540

Notes: The producitivty variable corresponds to the log of domestic sales per employee deviated from sector mean (defined at 4-digit NACE level). Clustered standard errors (at 4-digit NACE level) reported in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Sector (defined at the 4-digit NACE level) and year fixed-effects are included.

Supplemental Materials for Gaigné, Latouche and Turolla, "Vertical Ownership and Export Performance Firm-level evidence from France".

A Alternative proxies for productivity measures

These additional materials reproduce the estimates performaed in Tables 4, 5, 11 using alternative proxies for firm productivity. Table 12 reports the estimates on the decision to acquire an intermediary. Column (1) reports for comparison purposes the estimates displayed in Table 11 for the *Domestic & foreign intermediaries* sample. In Columns (2) to (5), we change the proxy of the firm productivity while leaving unchanged the significance of the estimates. Column (2) uses labor productivity while controlling for interaction effects with firm size. Column (3) uses log sales per capita as a proxy. Column (4) reports the results with log materials per capita as a proxy. Finally, the estimate in Column (5) is computed using the "Approximate Total Factor Productivity" (ATFP) measure of Griliches and Mairesse (1990). Tables 13 and 14 report the estimates for the *Domestic intermediaries* sample and *Intermediary exclusively* sample, respectively.

Next, we check that using labor productivity as a proxy for firm productivity does not change the results when we estimate the impact of owning equity shares in an intermediary on the export decision and export sales (see Tables 15 and 16).

B Horizontal negative externality

Table 17 reports all the estimated coefficients of interaction terms $Share^{w}_{s,t} \times$ NACE 4 not shown in Table 7.

Table 12: Probit estimates (Domestic & Foreing Intermediaries sample)

Dependent variable: Intermediary acquisition					
	(1)	(2)	(3)	(4)	(5)
Productivity	0.0682**				
	(0.0278)				
Labor prod.		0.0009***			
		(0.0001)			
Sales/capita			0.0001**		
			(0.0001)		
Materials/capita				0.0001**	
				(0.0001)	
ATFP					0.0670*
					(0.0378)
Labor prod. × Employ. [2-4]		-0.0005			
		(0.0009)			
Labor prod. × Employ. [5-19]		0.0002			
		(0.0006)			
Labor prod. × Employ. [20-50]		-0.0009			
		(0.0005)			
Labor prod. × Employ. [>50]		0.0014**			
		(0.0006)			
Employ. [2-4]	-0.0848	0.1758	-0.0539	-0.0741	-0.1810**
	(0.1052)	(0.1134)	(0.1439)	(0.1154)	(0.0781)
Employ. [5-19]	0.5382***	0.6872***	0.5714***	0.5777***	0.3515***
	(0.0888)	(0.0753)	(0.1333)	(0.0964)	(0.0683)
Employ. [20-50]	1.1659***	1.3569***	1.1958***	1.2077***	0.9257***
	(0.1093)	(0.1043)	(0.1478)	(0.1229)	(0.0861)
Employ. [>50]	1.7001***	1.7638***	1.7423***	1.7583***	0.9902***
	(0.1062)	(0.1189)	(0.1403)	(0.1227)	(0.2036)
Capital intensity	-0.0001*	0.0113	-0.0001**	-0.0001**	-0.0000
	(0.0001)	(0.0086)	(0.0001)	(0.0001)	(0.0000)
Intangible assets ratio	-0.2991**	-0.2266	-0.3112**	-0.2712**	-0.3465***
	(0.1226)	(0.1457)	(0.1232)	(0.1276)	(0.0902)
Liquidity ratio	-0.0081***	-0.0082***	-0.0077***	-0.0071***	-0.0080***
	(0.0023)	(0.0028)	(0.0024)	(0.0026)	(0.0024)
Long-term debt	0.0014***	0.0013***	0.0014***	0.0014***	0.0027***
	(0.0004)	(0.0005)	(0.0004)	(0.0004)	(0.0004)
Sector FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.2843	0.2555	0.2840	0.2854	0.2207
Observations	11716	8642	11716	11572	12412

Notes: Clustered standard errors (at 4-digit NACE level) reported in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Sector (defined at the 4-digit NACE level) and year fixed-effects are included.

Table 13: Probit estimates (Domestic Intermediaries sample)

Dependent variable: Intermediary acquisition					
	(1)	(2)	(3)	(4)	(5)
Productivity	0.0631**				
	(0.0284)				
Labor prod.		0.0009***			
		(0.0001)			
Sales/capita			0.0001*		
			(0.0001)		
Materials/capita				0.0001**	
				(0.0001)	
ATFP					0.0619
					(0.0404)
Labor prod. × Employ. [2-4]		-0.0006			
		(0.0009)			
Labor prod. × Employ. [5-19]		-0.0002			
		(0.0003)			
Labor prod. × Employ. [20-50]		-0.0009*			
		(0.0006)			
Labor prod. × Employ. [>50]		0.0004			
		(0.0008)			
Employ. [2-4]	-0.1035	0.1708	-0.0687	-0.0879	-0.2103***
	(0.1121)	(0.1120)	(0.1498)	(0.1219)	(0.0751)
Employ. [5-19]	0.5213***	0.7059***	0.5572***	0.5658***	0.3457***
	(0.0923)	(0.0679)	(0.1366)	(0.0996)	(0.0690)
Employ. [20-50]	1.1434***	1.3595***	1.1754***	1.1928***	0.9175***
	(0.1120)	(0.1079)	(0.1501)	(0.1260)	(0.0853)
Employ. [>50]	1.5552***	1.7031***	1.5991***	1.6189***	0.8582***
	(0.1111)	(0.1273)	(0.1435)	(0.1311)	(0.2112)
Capital intensity	-0.0001**	0.0107	-0.0001**	-0.0001**	-0.0002
	(0.0001)	(0.0086)	(0.0001)	(0.0001)	(0.0011)
Intangible assets ratio	-0.3211**	-0.2469*	-0.3319***	-0.2880**	-0.3588***
	(0.1252)	(0.1484)	(0.1265)	(0.1290)	(0.1013)
Liquidity ratio	-0.0073***	-0.0071**	-0.0070***	-0.0064**	-0.0072***
	(0.0025)	(0.0032)	(0.0026)	(0.0028)	(0.0025)
Long-term debt	0.0008**	0.0008*	0.0008**	0.0008**	0.0021***
	(0.0004)	(0.0005)	(0.0004)	(0.0004)	(0.0004)
Constant	-2.5963***	-2.7214***	-2.5975***	-2.5797***	-2.3243***
	(0.1144)	(0.1086)	(0.1428)	(0.1208)	(0.1493)
Sector FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.2469	0.2180	0.2474	0.2519	0.1915
Observations	11604	8532	11604	11465	12300

Notes: Clustered standard errors (at 4-digit NACE level) reported in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Sector (defined at the 4-digit NACE level) and year fixed-effects are included.

Table 14: Probit estimates (Intermediaries exclusively sample)

Dependent variable: Intermediary acquisition					
	(1)	(2)	(3)	(4)	(5)
Productivity	0.1521***				
	(0.0205)				
Labor prod.		0.0010***			
		(0.0001)			
Sales/capita			0.0002***		
			(0.0000)		
Materials/capita				0.0002***	
				(0.0000)	
ATFP					0.0211
					(0.0458)
Labor prod. × Employ. [2-4]		0.0004			
		(0.0003)			
Labor prod. × Employ. [5-19]		-0.0000			
		(0.0006)			
Labor prod. × Employ. [20-50]		0.0012			
		(0.0017)			
Labor prod. × Employ. [>50]		-0.0009			
		(0.0025)			
Employ. [2-4]	-0.0177	-0.0077	-0.0112	-0.0473	-0.2513***
	(0.1240)	(0.0779)	(0.1383)	(0.1111)	(0.0893)
Employ. [5-19]	0.7392***	0.7440***	0.7393***	0.7258***	0.3870***
	(0.0860)	(0.0903)	(0.0986)	(0.0694)	(0.0613)
Employ. [20-50]	1.5450***	1.4412***	1.5455***	1.5351***	1.1044***
	(0.1059)	(0.2160)	(0.1128)	(0.1142)	(0.0933)
Employ. [>50]	2.3641***	2.4042***	2.3655***	2.3795***	0.7128**
	(0.1574)	(0.2924)	(0.1612)	(0.1895)	(0.2975)
Capital intensity	0.0087	0.0098	0.0094	0.0084	-0.0024
	(0.0070)	(0.0088)	(0.0070)	(0.0064)	(0.0081)
Intangible assets ratio	-0.2863**	-0.2159	-0.3073***	-0.2837**	-0.4143***
	(0.1118)	(0.1396)	(0.1083)	(0.1183)	(0.0956)
Liquidity ratio	-0.0112***	-0.0110***	-0.0100***	-0.0091***	-0.0100***
	(0.0027)	(0.0027)	(0.0028)	(0.0028)	(0.0022)
Long-term debt	0.0027***	0.0021***	0.0027***	0.0025***	0.0137***
	(0.0005)	(0.0007)	(0.0006)	(0.0005)	(0.0030)
Constant	-3.0250***	-2.8504***	-2.9236***	-2.8276***	-2.3034***
	(0.0970)	(0.1777)	(0.0989)	(0.1220)	(0.1474)
Sector FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.3199	0.2833	0.3178	0.3209	0.2212
Observations	8540	5760	8540	8426	9179

Notes: Clustered standard errors (at 4-digit NACE level) reported in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Sector (defined at the 4-digit NACE level) and year fixed-effects are included.

Table 15: Food Firms' Decision to Export (Linear Probability Model)

Dependent variable: Export decision			
	Domestic & foreign intermediaries	Domestic intermediaries	Intermediaries exclusively
Intermediary	0.0591***	0.0515**	0.1008***
	(0.0184)	(0.0200)	(0.0260)
Labor prod.	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)
Labor prod. × Employ. [2-4]	-0.0000	0.0001*	0.0001
	(0.0000)	(0.0001)	(0.0001)
Labor prod. × Employ. [5-19]	0.0003	0.0003	0.0004*
	(0.0002)	(0.0002)	(0.0002)
Labor prod. × Employ. [20-50]	0.0003*	0.0003*	0.0002
	(0.0001)	(0.0001)	(0.0005)
Labor prod. × Employ. [$>$ 50]	-0.0002**	0.0003	0.0006
	(0.0001)	(0.0003)	(0.0009)
Employ. [2-4]	0.0339***	0.0253**	0.0150
	(0.0110)	(0.0098)	(0.0109)
Employ. [5-19]	0.1029***	0.1022***	0.0661**
	(0.0332)	(0.0332)	(0.0274)
Employ. [20-50]	0.2133***	0.2114***	0.1527**
	(0.0459)	(0.0453)	(0.0578)
Employ. [$>$ 50]	0.4156***	0.3856***	0.2369***
	(0.0239)	(0.0320)	(0.0672)
Exported last year	0.6564***	0.6603***	0.6748***
	(0.0173)	(0.0169)	(0.0180)
Last exported two years ago	0.0266**	0.0276**	0.0654***
	(0.0123)	(0.0123)	(0.0175)
Last exported three years ago	0.0302	0.0318	0.0701
	(0.0268)	(0.0276)	(0.0443)
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
R^2	0.5235	0.5180	0.5158
Observations	9676	9567	6573

Notes: The producitivty variable corresponds to the log of domestic sales per employee deviated from sector mean (defined at 4-digit NACE level). Clustered standard errors (at 4-digit NACE level) reported in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Sector (defined at the 4-digit NACE level) and year fixed-effects are included.

Table 16: Food Firms' Export Sales (Tobit Model)

Dependent variable: (ln) Export sales			
	Domestic & foreign intermediaries	Domestic intermediaries	Intermediaries exclusively
Intermediary	1.3807**	1.0764*	2.6748***
	(0.5400)	(0.5960)	(0.8256)
Labor prod.	0.0024***	0.0025***	0.0022***
	(0.0003)	(0.0003)	(0.0003)
Labor prod. × Employ. [2-4]	-0.0003	0.0087***	0.0078***
	(0.0005)	(0.0013)	(0.0014)
Labor prod. × Employ. [5-19]	0.0086	0.0086	0.0133**
	(0.0059)	(0.0061)	(0.0059)
Labor prod. × Employ. [20-50]	0.0055*	0.0053*	0.0017
	(0.0029)	(0.0028)	(0.0116)
Labor prod. × Employ. [> 50]	-0.0049**	0.0032	0.0026
	(0.0023)	(0.0070)	(0.0209)
Employ. [2-4]	1.9044***	1.0198	0.6011
	(0.6959)	(0.7957)	(0.9066)
Employ. [5-19]	5.7718***	5.7704***	4.6574***
	(1.0516)	(1.0661)	(0.9433)
Employ. [20-50]	10.2396***	10.2256***	8.8806***
	(0.8945)	(0.9028)	(0.7435)
Employ. [> 50]	16.0309***	15.5147***	12.6053***
	(1.0882)	(0.9859)	(1.3855)
Exported last year	19.4016***	19.5476***	20.0121***
	(0.9757)	(0.9849)	(1.0807)
Last exported two years ago	1.1165**	1.1282***	2.4822***
	(0.4348)	(0.4294)	(0.7352)
Last exported three years ago	1.4611*	1.5340*	2.8978*
	(0.8359)	(0.8663)	(1.4941)
σ	8.6165***	8.6930***	9.0893***
	(0.2940)	(0.2972)	(0.3876)
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Pseudo-R^2	0.2060	0.2045	0.2225
Observations	9676	9567	6573
Left-censored obs.	6645	6632	5135

Notes: The producitivty variable corresponds to the log of domestic sales per employee deviated from sector mean (defined at 4-digit NACE level). The Distance$_{Non-EU27}$ and GDP$_{Non-EU27}$ variables are computed based on the non-EU27 countries where the firm exports. Clustered standard errors (at 4-digit NACE level) reported in parentheses.*, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Sector (defined at the 4-digit NACE level) and year fixed-effects are included.

Table 17: Testing Horizontal Negative Externalities (Linear Probability Model)

Dependent variable: Export decision		
	(1)	**(2)**
$\text{Share}^{w}_{s,t}$	-0.3652	-31.6199***
	(0.7266)	(0.9121)
$\text{Share}^{w}_{s,t}$ × NACE 1012		35.9615***
		(1.2034)
$\text{Share}^{w}_{s,t}$ × NACE 1013		30.3938***
		(1.5444)
$\text{Share}^{w}_{s,t}$ × NACE 1020		-36.8521***
		(0.8881)
$\text{Share}^{w}_{s,t}$ × NACE 1031		-293.2898***
		(6.4698)
$\text{Share}^{w}_{s,t}$ × NACE 1032		-41.3131***
		(0.9882)
$\text{Share}^{w}_{s,t}$ × NACE 1039		24.3003***
		(0.8026)
$\text{Share}^{w}_{s,t}$ × NACE 1041		38.0268***
		(1.0339)
$\text{Share}^{w}_{s,t}$ × NACE 1051		24.1011***
		(0.6635)
$\text{Share}^{w}_{s,t}$ × NACE 1052		45.1061***
		(2.1616)
$\text{Share}^{w}_{s,t}$ × NACE 1061		39.1806***
		(1.2330)
$\text{Share}^{w}_{s,t}$ × NACE 1062		36.0918***
		(0.9200)
$\text{Share}^{w}_{s,t}$ × NACE 1072		72.6733***
		(1.6920)
$\text{Share}^{w}_{s,t}$ × NACE 1073		37.6300***
		(0.9973)
$\text{Share}^{w}_{s,t}$ × NACE 1081		48.1915***
		(1.1944)
$\text{Share}^{w}_{s,t}$ × NACE 1082		55.5566***
		(1.4861)
$\text{Share}^{w}_{s,t}$ × NACE 1083		29.0112***
		(0.6194)
$\text{Share}^{w}_{s,t}$ × NACE 1084		-7.0831***
		(0.2734)
$\text{Share}^{w}_{s,t}$ × NACE 1085		37.4861***
		(1.2798)
$\text{Share}^{w}_{s,t}$ × NACE 1086		40.4524***
		(1.0673)
$\text{Share}^{w}_{s,t}$ × NACE 1089		25.3933***

Continued on next page

Table 17 - Testing Horizontal Negative Externalities (*continued from previous page*)

	(1)	(2)
		(0.7445)
$\text{Share}^{w}_{s,t} \times$ NACE 1091		25.0112***
		(0.7876)
$\text{Share}^{w}_{s,t} \times$ NACE 1092		37.2979***
		(1.0274)
$\text{Share}^{w}_{s,t} \times$ NACE 1101		-2.09e+03***
		(52.6035)
$\text{Share}^{w}_{s,t} \times$ NACE 1102		19.3300***
		(0.5956)
$\text{Share}^{w}_{s,t} \times$ NACE 1103		-199.4369***
		(4.5140)
$\text{Share}^{w}_{s,t} \times$ NACE 1104		31.3438***
		(0.8911)
$\text{Share}^{w}_{s,t} \times$ NACE 1105		33.0731***
		(0.8566)
$\text{Share}^{w}_{s,t} \times$ NACE 1106		29.6502***
Productivity	0.0284***	0.0279***
	(0.0033)	(0.0031)
Employ. [2-4]	0.0474***	0.0479***
	(0.0099)	(0.0101)
Employ. [5-19]	0.1228***	0.1201***
	(0.0307)	(0.0303)
Employ. [20-50]	0.2355***	0.2258***
	(0.0431)	(0.0429)
Employ. [> 50]	0.3814***	0.3669***
	(0.0229)	(0.0249)
Exported last year	0.6572***	0.6944***
	(0.0164)	(0.0128)
Last exported two years ago	0.0487***	0.0480***
	(0.0125)	(0.0117)
Last exported three years ago	0.0582**	0.0606**
	(0.0226)	(0.0225)
Sector FE	Yes	Yes
Year FE	Yes	Yes
R^2	0.5319	0.5460
Observations	13237	13237

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