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Vertical Ownership and Export Performance

Firm-level evidence from France

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Motivation: Wholesalers and retailers facilitate international trade.

⇨ intermediaries play a central role in materializing the gains from exchange outlined by standard trade theories (*allows supply to meet demand*)

Intermediation magnifies the gains from trade because of
matching frictions between buyers and sellers (Antras & Costinot, AER, 11)
importance of incomplete information and networks (Rauch & Watson, JEMS, 04)

⇨ Intermediaries seem to face lower sunk costs of exporting and to be able to exploit economies of scope in exporting.

Intermediaries export more products and ship to more destinations, even though they are smaller than manufacturers in terms of export value (Ahn et al. JIE 2012; Akerman 2014)

International Trade Literature

Manufacturers either export directly (*no intermediation technology*) or contract with an intermediary

BUT, manufacturer can also reach end consumers through company-owned intermediary or acquiring equity in wholesalers/retailers

Why manufacturers can be motivated to use ***forward integration*** (or ***vertical ownership***) as a business strategy to reach foreign markets?

- ✓ *to align the interest of the target and the acquirer in a same goal,*
- ✓ *to reduce transaction costs and double marginalization (IO theory)*
- ✓ *to acquire intangible inputs (see Atalay & Syverson, 2014)*

  Distributors may be better informed than producers about the state of demand

Objective

We study theoretically and empirically the impact of acquiring equity shares in *intermediaries* on export performance of *manufacturers*

- ⇨ entry/exit decision (export markets)
- ⇨ Level of export sales

by taking account *strategic behavior*s of the intermediaries.

The food industry is well suited for evaluating the effects of vertical ownership on export performance at the firm level

- ✓ a large number of heterogeneous agri-food manufacturers selling differentiated products (*monopolistic competition*)

- ✓ Importance of intermediaries in the flows of food products

Wholesalers in the French food industry: 30% of purchases of agri-food products and 35 % of sales of agri-food sectors.

- ✓ Importance of forward integration in the food industry (*see the next table*)

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 agri-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.

Our contributions (trade theory)

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.

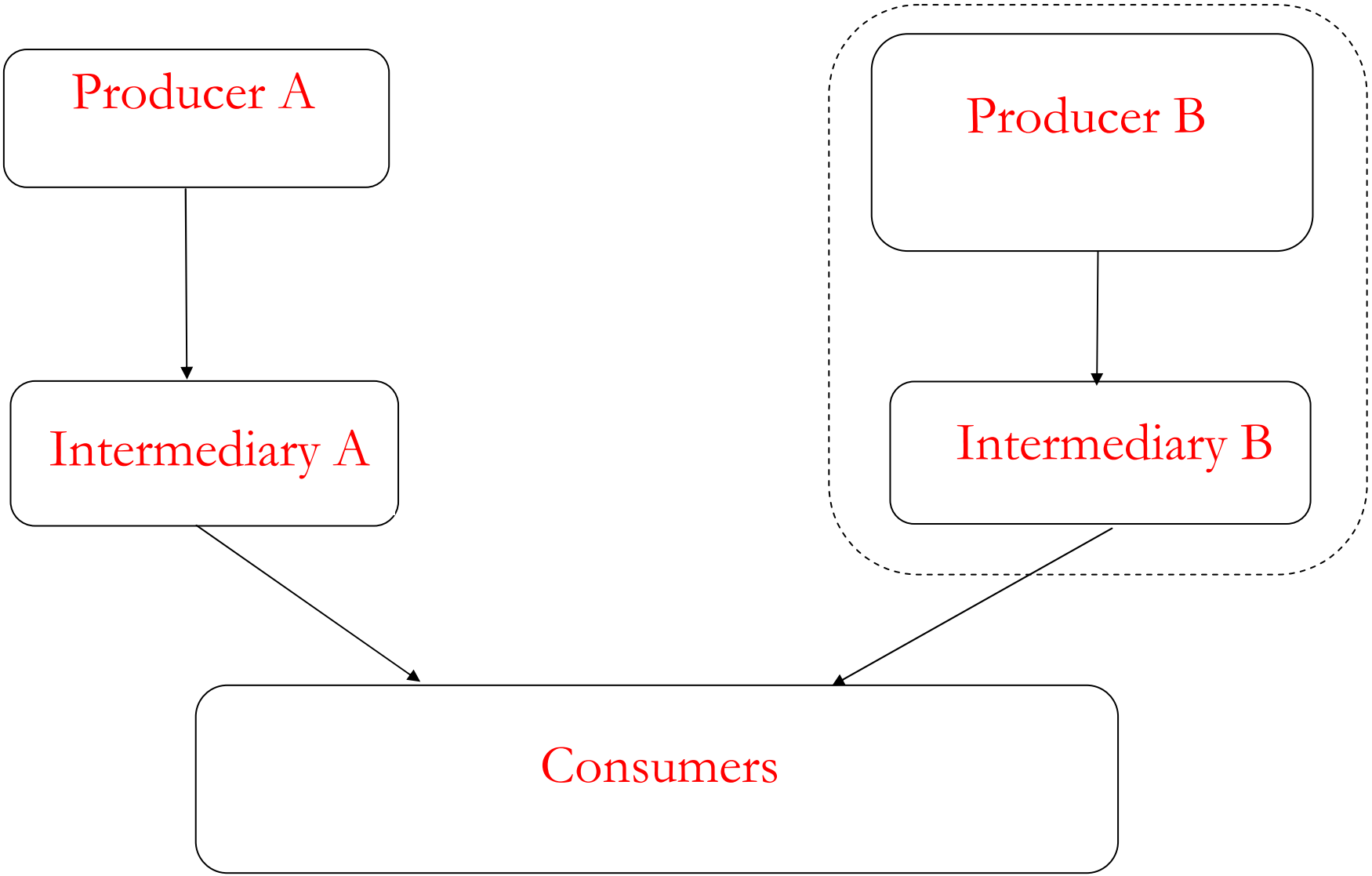
⇨a problem of double marginalization occurs because firms along each side of the vertical chain have market power and set a price above marginal cost (*vertical externality*)

Our contributions (IO theory)

Contrary to industrial organization theory, we consider *heterogeneous firms* producing in monopolistic competition as well as fixed and variable trade costs in a *general equilibrium model*.

⇨Our model generates not only vertical externalities between the producer and its retailers but also *horizontal externalities* between the different firms producing a differentiated product.

Figure 1: M interdependent successive monopolies



Our contribution (empirical results)

(1) Probability of acquiring an intermediary increases with the size and the productivity of firms.

(2) Existence of "***intermediary premium***" : The probability of exporting and export sales are higher for firm owning its intermediary.

(3) Manufacturers that own an intermediary are more likely to serve countries with small potential market than firms without participation in intermediaries.

(4) By controlling an intermediary, large firms enjoy higher foreign demands and hurt small firms that loose market shares or exit from foreign markets.

I/ A multi-country general equilibrium model with trade and two vertically related industries

A continuum of

- Consumers with CES preferences (mass L)
- *Heterogeneous* manufacturers (mass M) producing a differentiated product under monopolistic competition
- Intermediaries operating under imperfect competition

Manufacturers and intermediaries are linked

- Intermediaries distribute the differentiated products in the domestic and foreign markets ($\Rightarrow$ *double marginalization*)
- Financial arrangements (*vertical ownership*), involving the acquisition of assets or an ownership share of profit , or both.

Benchmark case:
Each intermediary distributes a single variety whereas each manufacturer supplies its product to a single intermediary.

Extensions:

- Multi-product retailers/wholesalers with local monopoly power

- Forward *and* backward integration

-Vertical restrictions with bargaining

- The purpose of vertical ownership can be also related to transfer intangible inputs within firms (acquiring information on foreign market).

Sequence of Events:

1. Manufacturers and intermediaries decide to enter/exit or not.

2. Upstream suppliers may offer to buy a fraction $\theta_i \in [0,1]$ of the downstream firm at price $b(\theta_i)$ with $b = 0$ when $\theta = 0$ and $\partial b / \partial \theta > 0$.

3. Each manufacturer announces the wholesale price, $\boldsymbol{z_{ij}}$ knowing the price determined by the intermediary

4. The intermediaries take the wholesale price as given and maximizes its profits by choosing price $\boldsymbol{p_{ij}}$

Preference and demand

Consumers with CES preferences (a love for variety)

⇨ each firm producing a variety *v* in country *i* faces a demand in country *j* for its variety *v*:

$$p_{ij}(\nu)q_{ij}(\nu) = E_j P_j^{\varepsilon-1} p_{ij}(\nu)^{1-\varepsilon}$$

where $p_{ij}(\nu)$ is the price, $q_{ij}(\nu)$ is the quantity, $\varepsilon > 1$ is the elasticity of substitution (constant), E_j is the share of income of households for the differentiated good, and

$$P_j = \left[\int_{\Omega_j} p_{kj}(\nu)^{1-\varepsilon} \mathrm{d}\nu \right]^{\frac{1}{1-\varepsilon}} \text{ (the price index)}$$

Some remarks on demand

$$p_{ij}(\nu)q_{ij}(\nu) = E_j P_j^{\varepsilon-1} p_{ij}(\nu)^{1-\varepsilon} \text{ with } P_j = \left[\int_{\Omega_j} p_{kj}(\nu)^{1-\varepsilon} \mathrm{d}\nu\right]^{1/(1-\varepsilon)}$$

- the sum of demand in country *j*: $\int_{\Omega_j} p_{ij}(\nu)q_{ij}(\nu)\mathrm{d}\nu = E_j$
- If prices are identical $p_{ij} = p_j$ regardless of the country of origin and there are N_j varieties, then $p_{ij}(\nu)q_{ij}(\nu) / E_j = 1 / N_j$
- If prices differ among manufacturers (because of heterogeneity in productivity), then

$$\frac{p_{ij}(\nu_A)q_{ij}(\nu_A)}{p_{ij}(\nu_A)q_{ij}(\nu_B)} = \left[\frac{p_{ij}(\nu_B)}{p_{ij}(\nu_B)}\right]^{\varepsilon-1}$$

Technology, profits and prices

Intermediary distributing variety v located in country i:

$$\pi_i = (1-\theta_i)\sum_j \left[(p_{ij} - z_{ij})q_{ij} - w_i f_{ij}\right] + b(\theta_i)$$

Manufacturer distributing variety v located in country i:

$$\Pi_i = \sum_j \left(z_{ij} - \frac{w_i \tau_{ij}}{\varphi} \right) q_{ij} + \theta_i \sum_j [(p_{ij} - z_{ij})q_{ij} - w_i f_{ij}] - b(\theta_i)$$

Equilibrium prices:

$$p_{ij}^* = \frac{\varepsilon}{\varepsilon - 1} z_{ij} \qquad \text{with} \qquad z_{ij}^* = \frac{\varepsilon}{\varepsilon - 1 + \theta_i} \frac{w_i \tau_{ij}}{\varphi}$$

Remarks: Similar conclusions with

✓ Multiproduct intermediary with local monopoly power:

$$p_{ij}^* = \frac{\varepsilon}{\varepsilon - 1} z_{ij} \qquad \text{with} \qquad z_{ij}^* = \frac{\varepsilon(1 - s_j)}{(\varepsilon - 1)(1 - s_j) + \theta_i} \frac{w_i \tau_{ij}}{\varphi} \quad \text{where} \quad \frac{\partial z_{ij}^*}{\partial s_j} < 0$$

with s_j the market share of the intermediary located in country j

✓ Bargaining with a two-part tariff

$$p_{ij}^* = \frac{\varepsilon}{\varepsilon - 1} z_{ij} \qquad \text{with} \qquad z_{ij}^* = \frac{w_i \tau_{ij}}{\varphi} \quad \textit{and} \quad \Phi_i = \frac{\xi - \theta_i}{1 - \theta_i} \sum_j \left(\frac{z_{ij}^* q_{ij}^*}{\varepsilon - 1} - w_i f_{ij} \right)$$

with ξ the manufacturer's bargaining power and Φ_i the franchise fee where $\partial \Phi_i / \partial \theta_i < 0$.

Equilibrium vertical ownership $\theta_i(v)$

✓ By increasing its equity share in its intermediary, the manufacturer raises the consolidated operating profits

The positive impact of θ_i increases with labor productivity of manufacturer (φ) and decreases with trade costs (τ_{ij}).

✓ A rise in θ_i induces a higher cost of acquisition $b_i(\theta_i)$ and a higher fraction of distribution costs to be incurred by the manufacturer(f_{ij}) .

Proposition 1. *The probability of acquiring equity in an intermediary by a manufacturer increases with its productivity and trade liberalization.*

Proposition 2. *The probability of exporting and export sales are higher for a firm with a participation in its intermediary.*

Entry (case where $\theta_i^* = \{0,1\}$)

Each firm has to pay a *sunk entry cost* equal to f_e units of labor.

but manufacturers do not know *a priori* their productivity φ and intermediaries do not know *a priori* their supplier (and thus the productivity of the firm producing the product to be traded).

A manufacturer enters the market iff *expected profit* is higher than f_e

$$\Pi_i^e = \sum_j \int_{\varphi_{ij}}^{\bar{\varphi}_i} \Pi_{ij}^m(0,\varphi) g(\varphi) \mathrm{d}\varphi + \int_{\bar{\varphi}_i}^{\infty} \Pi_{ij}^m(1,\phi) g(\varphi) \mathrm{d}\varphi \geq f_e$$

AND manufacturers have to take into account that intermediary can serve profitably the foreign market if and only if

$$\pi_{ij}(0,\varphi) = \left[p_{ij}^*(0,\varphi) - z_{ij}^*(0,\varphi) \right] q_{ij}^*(0,\varphi) - w_i f_{ij} \geq 0$$

Proposition 3. *A higher share of firms with equity shares ($\bar{\varphi}_i$ decreases) reduces the probability of exporting of firms with no participation (small firms).*

Data

- ✓ Financial links : Amadeus 2008 and 2012
  - ⇨ national and foreign acquisitions (by industry *4-digit industry*)
  - ⇨ whether the firm is acquired by other firms.
  - ⇨ We can identify 5 types of activity: (i) upstream activities (producers of agricultural goods processed by food industry), (ii) horizontal activities (other food manufacturers), (iii) intermediary activities, (iv) transport activities and (v) service activities.
  - ⇨ **No** information on the date the firm first acquire an intermediary
- ✓ Characteristics of firms
  - ⇨ *sales*, *value added*, *employment*,… (Amadeus 2008)
  - ⇨ *export sales, # of products, # of countries* (French customs dataset)

⇒ 14 000 French agri-food firms (2008 & 2012)

Table 2: Number of Intermediaries Acquired per Agri-Food Firms

# of intermediaries per agri-food firm	Domestic & foreign intermediaries		Domestic intermediaries		Intermediaries exclusively	
	2008	2012	2008	2012	2008	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 intermediaires acquired per agri-food firms by year and for the three sample 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.

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

Firm's ownership status	Frequency	Employment	Productivity	Exporting (in %)	Export sales (in €100,000)	Mean # of countries	Mean # of products
Firms with none intermediary acquisition							
Single, acquired and other acquiring firms	13,237	24.58	0.94	21.69	47.16	7.62	6.17
Firms with an intermediary							
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

Probability of acquiring an intermediary (probit model)

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

Does participation in intermediary improve the export performances of acquirers?

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

Does participation in intermediary improve the export performances of acquirers?

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

Does "intermediary premium" is higher for distant markets?

Dependent variable: ratio of exporting firms owning an intermediary over the total number of exporting firms			
	Domestic & foreign intermediaries (1)	Domestic intermediaries (2)	Intermediaries exclusively (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

Does owning an intermediary hurt less productive firms?

Probability of exporting of firms with no equity share in an intermediary

Dependent variable: Export decision		
	(1)	(2)
$\text{Share}^{w}_{s,t}$	-0.2266	-31.4327***
	(0.7047)	(0.8919)
$\text{Share}^{w}_{s,t}$ × NACE 4		Not reported
$\text{Share}^{w}_{s,t}$ × Productivity	-0.1880***	-0.1780***
	(0.0506)	(0.0467)
Productivity	0.0382***	0.0371***
	(0.0051)	(0.0048)
Employ. [2-4]	0.0472***	0.0476***
	(0.0090)	(0.0093)
Employ. [5-19]	0.1222***	0.1196***
	(0.0294)	(0.0291)
Employ. [20-50]	0.2352***	0.2256***
	(0.0422)	(0.0420)
Employ. [> 50]	0.3796***	0.3652***
	(0.0220)	(0.0239)
Exported last year	0.6569***	0.6941***
	(0.0166)	(0.0129)
Last exported two years ago	0.0482***	0.0475***
	(0.0122)	(0.0115)
Last exported three years ago	0.0574**	0.0599**
	(0.0232)	(0.0231)
Sector FE	Yes	Yes
Year FE	Yes	Yes
R^2	0.2822	0.5466
Observations	13237	13237

Does participation in intermediary reduces market-access costs?

In a second step, we estimate the probability that a firm serves country j in year t using a maximum likelihood estimator. The likelihood is then given by

$$\mathcal{L}\left(\mathcal{E}_{vjt};\theta\right) = \prod_t \prod_v \prod_j \left[\Pr\left(\mathcal{E}^*_{vjt} > 0\right)\right]^{\mathcal{E}_{vjt}} \times \left[1 - \Pr\left(\mathcal{E}^*_{vjt} > 0\right)\right]^{(1-\mathcal{E}_{vjt})}$$

where $\mathcal{E}^*_{vjt}$ is the latent variable associated to the firm export decision problem for destination country j in year t, and θ a set of parameters. 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 with a curvature given by $\widehat{\gamma}$, it is possible to rewrite the likelihood as follows

$$\begin{aligned}\mathcal{L}\left(\mathcal{E}_{vjt};\theta\right) &= \prod_t \prod_v \prod_j \left[\Pr\left(\varphi_{vjt} > \varphi^*_{vjt}\right)\right]^{\mathcal{E}_{vjt}} \times \left[1 - \Pr\left(\varphi_{vjt} > \varphi^*_{vjt}\right)\right]^{(1-\mathcal{E}_{vjt})} \\ &= \prod_t \prod_v \prod_j \left(\frac{\varphi^*_{vjt}}{\varphi_{\min}}\right)^{-\widehat{\gamma}\mathcal{E}_{vjt}} \times \left[1 - \left(\frac{\varphi^*_{vjt}}{\varphi_{\min}}\right)\right]^{-\widehat{\gamma}(1-\mathcal{E}_{vjt})} \qquad (19)\end{aligned}$$

where the latent productivity threshold is expressed as

$$\begin{aligned}\ln \varphi^*_{vjt} &= \zeta_{1t}\textsc{Intermed}_{vt} + \zeta_{2t}\left(1 - \textsc{Intermed}_{vt}\right) + \sum\nolimits_j \delta^W_{jt}\textsc{Country}_{jt} \times \textsc{Intermed}_{vt} \\ &\quad + \sum\nolimits_j \delta_{jt}\textsc{Country}_{jt} \times \left(1 - \textsc{Intermed}_{vt}\right) + \eta_{vjt}\end{aligned}$$

Assuming that the distribution of firm productivity follows a Pareto law, we first 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:

$$\ln \text{RANK}_{vt} = \gamma \ln(\varphi_{vt}) + \eta_{vt} \tag{18}$$

threshold for serving country j in a given year is expressed as

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

for firms without participations in an intermediary and

$$\ln \tilde{\varphi}_{ij} = \ln \left(\frac{\varepsilon}{\varepsilon - 1} \varepsilon^{\frac{1}{\varepsilon - 1}} \right) + \frac{1}{\varepsilon - 1} \ln A_j + \ln f_{ij}^{W \frac{1}{\varepsilon - 1}} \tau_{ij}^{W}.$$

in a last step, we compute the difference $\widehat{\delta}_{jt} - \widehat{\delta}_{jt}^{W} \equiv \widehat{\Psi}_{jt}$

Table 9: Descriptive statistics on $\widehat{\Psi}_{jt}$- with fixed effects

	Domestic & foreign intermediaries	Domestic intermediaries	Intermediaries exclusively
Mean	1.22	0.62	0.89
Std. Deviation	0.64	1.03	2.32
1st Quartile	0.78	0.30	0.30
2nd Quartile	1.15	0.57	0.70
3rd Quartile	1.63	0.99	1.17
Observations	274	252	169
N of negative observations	1	16	14
Min. value	-0.16	-12.46	-16.02
Max. value	17.2	3.00	17.19

Summary Impact of acquiring equity shares in intermediaries on exports?

A general equilibrium model of trade with vertically linked industries where the decisions to export and to own its intermediary are endogenous

Forward acquisition enables manufacturers to manage the double marginalization problem and/or to enjoy lower costs to foreign market access

French data at the Agri-food firm level (2008 & 2012)

⇨ The probability of exporting and export sales are higher for a firm with a participation in intermediaries.

⇨ Vertical ownership creates a market externality due to a reallocation of market shares from small firms to large firms forcing some low-productivity firms to exit from foreign markets.