BANQUE DE FRANCE
EUROSYSTÈME

Export markets as Olympic games: It's not only how high you jump but also whether you jump higher than others!

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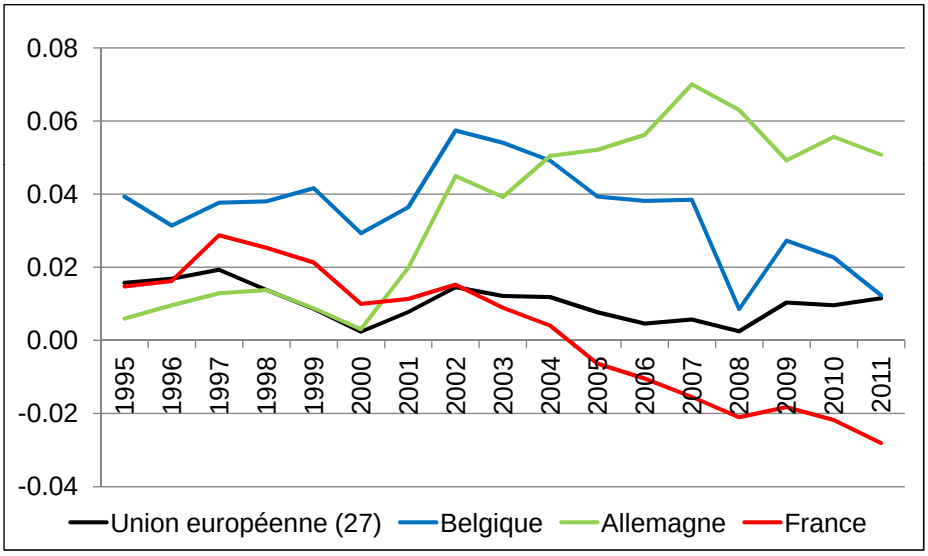
Motivation

- French firms' competitiveness has strongly deteriorated since the mid-1990's

Current account as % of GDP



Source: Eurostat: Main Economic Indicators

Analyzing the competitiveness on export markets (1)

The literature has shown, extensively, that export performance has to be analyzed along two dimensions (e.g. see Eaton, Kortum and Kramarz, 2004) :

- The *extensive margin* = propensity to export to a market , where a market is usually defined as a destination country and/or by the product sold. It is often defined, in a broader way, as all products sold abroad.

=> Better firms export a larger number of products to a larger number of destinations.

- The *intensive margin* = how much you export, conditionally on being an exporter to a market.

=> Better firms export larger quantities (?)

Analyzing the competitiveness on export markets (2). The extensive margin

- The theoretical literature has shown that the combination of *firms' performances heterogeneity* with *fixed / sunk costs of exporting*, induces a strong link between firms' propensity to export and their performances: only the best firms can afford paying that cost (Dixit (1989), Baldwin and Krugman (1989), Melitz (2003), among others).
- The *performance is most often taken to be indexed on productivity* (Melitz, 2003), sometimes on the ratio of productivity to the input cost (Helpman, Melitz and Rubinstein, 2008)
- The (unobserved) fixed cost of exporting is assumed to depend on:

- *destination country characteristics* : distance from the exporting country, size of that country (often defined as its income level/GDP), common language, colonial ties, currency union, trade agreements, etc. (=> Gravity models).

- *product market characteristics*: barriers to entry (norms,etc.)

Analyzing the competitiveness on export markets (3). The intensive margin

- The analysis of the intensive margin on export markets relies on an « extended » demand function.

- The demand addressed, in a country *l,* for a product *j* produced by a firm *i* located in a country *m* depends on:

- the *level of income* (country's GDP) of country *l* or the aggregate demand in that product (=total expense).

- the *price of that exported product relative to the prices of its local and other foreign competitors* (including the role of exchange rates).

- the *non-price characteristics associated with differenciation* (quality of the product, reputation, etc.).

- *frictions* associated with macroeconomic conditions induce transaction costs that have also been emphasized (distance, etc.).

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Analyzing the competitiveness on export markets (4) : Microeconometric studies on the propensity to export

- There is a huge number of microeconometric studies that consider the link between firms' performances and their export status (e.g. Roberts and Tybout, 1997; Bernard and Wagner, 1998; Bernard and Jensen, 2001; Mayer and Ottaviano, 2007 ; Crozet et al., 2011; etc.).
- We shall not consider here the debate regarding the direction of causality between productivity and exports. We assume that this link goes from productivity to export propensity.
- The main conclusion of this empirical literature is that, on average, exporters are « better » that non-exporters *within the same country*.
- This does not say much about the relative performances of firms from different countries that compete on a foreign market. This is due to data limitations (there are a few exceptions; e.g. Bellone et al., 2013).
- But there are some studies at the macro/country level (e.g. Helpman et al., 2008).

Analyzing the competitiveness on export markets (5): Microeconometric studies on the export intensity

- There is a quite huge number of macroeconomic or industry-level studies regarding export volumes. They essentially rely on gravity equations.
- The available micro literature most often considers:

- At the firm level: firms' total exports, where exports products are unidentified and the impact of relative prices ignored.

- At the product level: industry-level total exports by product. Firms' characteristics are not considered.

- Indeed, due to data limitations, the microeconometric literature regarding trade volumes/intensity at the firm x product level is quite sparse.

⇒ Larger, older firms, firms with foreign ownership, tend to have a higher export intensty (e.g. Iyer, 2010; Muuls, 2008) but results are mixed regarding the impact of productivity (Crino and Epifani (2012), Hiep and Nishijima(2009)

The Olympic Games parabole

- Export markets as Olympic games :

1) A 2-stage process

- Being able to export (extensive margin) can be seen as equivalent to getting qualified for the Olympic games.
- Exporting large quantities of a product (intensive margin) can be seen as getting onto the podium of the Olympic games

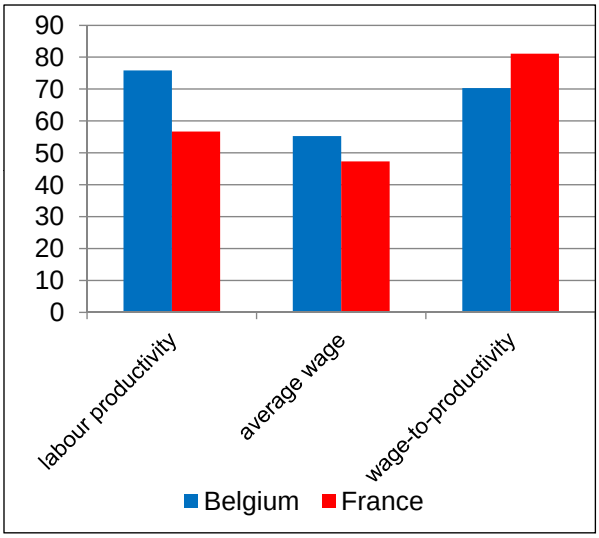
2) Being good in its own country is important but not necessarily sufficient:

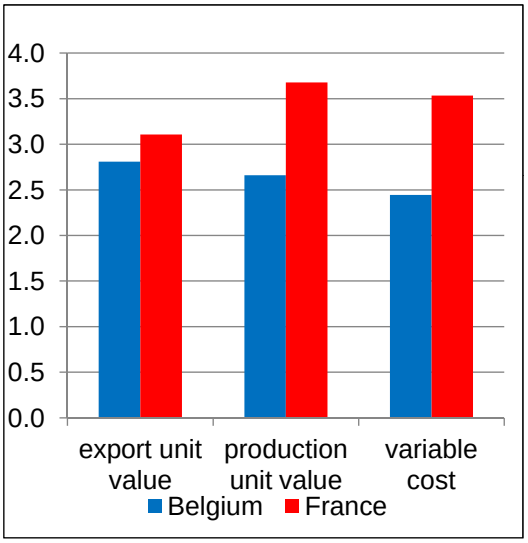
- Being better than the national competitors may not be sufficient to be able to export: Qualifying for the Olympic Games requires being better than the national competitors *and* reaching a minimum performance, defined on a "non-domestic" basis (Olympic minima)
- Exporting large quantities requires being better than all the competitors on the foreign market : as for getting onto the Olympic podium.

What we do in this ~~paper~~ / research project (1)

We empirically analyse the competitiveness of French exporters on the Belgian market.

French competitiveness with respect to Belgium - aggregate figures for 2010





Sources: Eurostat: 2-digit sectors

Eurostat: 8-digit products

What we do in this ~~paper~~ / research project (2)

- We use microeconomic Belgian and French data to empirically analyse the competitiveness of French exporters in Belgium.

- We do not merge the two datasets but use them to compute fractiles of the distributions of firms' performances (productivity, average labour cost, unit values of the Belgian domestic production and imports, etc.)

$\Rightarrow$ we can assess that a French firm *i* that produces a product *j* has a productivity level that is in the 1st (or the 5th, or the 9th) decile of the Belgian firms producing the same product *j,*

or that the same firm sells its product *j* in Belgium at a price which is in the 1st, 5th or 10th decile of prices of the Belgian producers and importers of the same product.

What we do in this ~~paper~~ / research project (3)

- We estimate a two-step model / the Olympic games parabole:

1) The qualification stage: Probit model / exporting towards Belgium at the firm-level.

We make explicit the respective roles of firms' characteristics and those of the market they may wish to serve for explaining their propensity to export to Belgium.

2) Getting onto the podium: Export quantities, at the firm-product level, controlling for selection.

We try to assess the relative competitiveness of French firms at the firm x product level by considering the position of these firms in the distribution of their Belgian/other foreign competitors.

The model (1)

This analysis is conducted within a framework inspired from Helpman, Melitz and Rubinstein (QJE, 2008):

- Each firm *I* in country *j* produces a differenciated product with a bundle of inputs.

- The unit production cost is defined as $c_j\, a_I$ where c_j is the (country specific) input price and a_I the firm specific quantity of inputs required for producing the good ($1/a_I$ can be seen as reflecting firm *I*'s productivity).

- When exporting, firms face variable and fixed trade costs:
  - a transport cost, $c_j\,(\tau_{ij}-1)$, of the melting iceberg type ($\tau_{ij}>1$)
  - a fixed cost $c_j\, f_{ij}$ where f_{ij} are fixed cost parameters

The model (2)

The demand from country *i* for a product of a category h, produced by a firm *l* located in country *j* is given by:

$$X_{ijh}(l) = [\, p_{ijh}^{x}(l) / P_{ih} \,]^{-\varepsilon} [\, Y_{ih} / P_{ih} \,]$$

where

- $p_{ijh}^{x}(l)$ is the price of firm l's product of category h sold in country i,
- P_{ih} is a measure of the average price of firm l's competitors in i,
- Yih is the total expense of country i in product h.

The model (3)

Combining these elements leads to the following optimal price for the price, in country i, of (located in j) firm l's product of category h :

$p_{ijh}^{x}(l) = \tau_{ij}\, c_j\, a_l / \alpha_{lhi}$ where $1/\alpha_{lhi}$ represents the mark-up of firm l on the product market h in country *i*.

Then, a firm l located in country j will export its product to country i if this is profitable, i.e. if

$$(1- \alpha_{lhi}) [\, \tau_{ij}\, c_j\, a_l / \alpha_{lhi}\; P_{ih} \,]^{1-\varepsilon}\; Y_{ih} > c_j\, f_{ij}$$

The model (4)

The extensive margin :

a firm l located in j is more likely to export to country i if:

- its productivity ($1/a_l$) is high
- its input costs (c_j) are low
- its mark-up ($1/\alpha_{lhi}$) when exporting to country i is high
- the average price of the product category (P_{ih}) on the destination market is high
- the total demand (Y_{ih}) for the group of products h is large
- the transport costs and fixed costs of exporting ([τ_{ij} and f_{ij}) are low.

+ controls (size, affiliation to a corporate group, previous export status)

The model (5)

The intensive margin:

the quantity exported if the firm exports to i is given by the previous demand equation:

$$X_{ijh}(l) = [\, p_{ijh}^{x}(l) / P_{ih} \,]^{-\varepsilon} [\, Y_{ih} / P_{ih} \,]$$

where the relative prices are accounted for through the position of French firms' prices in the distribution of Belgian firms' prices at a very detailed level (Prodcom6).

We extend the specification by:

- allowing for a product quality effect
- Including controls (size, affiliation to a corporate group, year, product and industry dummies).

The data (1)

- French dataset
  - French customs -> export status, export values and quantities
  - BRN (Bénéfices Réels Nominaux) tax forms -> value added, employment, average wage, total assets
  - BdF dataset on corporate groups
  - INSEE: 2-digit NACE value added deflators
- Belgian dataset
  - Survey on Industrial Production (Prodcom) -> Production values and quantities of Belgian producers
  - Transaction Trade dataset -> import values and quantities on the Belgian market.
  - Balance Sheet dataset -> value added, employment, average wage

The data (2)

- Data issues
  - Harmonization of customs product classification over time
  - Conversion of customs product classification into Prodcom classification (1-to-1 correspondence)
  - Trimming / Outliers
  - Matching between French firms and the corresponding industry / product category in Belgium

The data (3)

- Trimming
  - French exports: at 6-digit level
    - 1000 € < values < 100 million €,1kg < quantities < 1000 tons
    - [Q3 + 5*(Q3-Q1)] < unit values < [Q3 + 5*(Q3-Q1)]
    - Inconsistencies excluded: total exports reported in customs > exports in balance sheets.
  - French annual accounts
    - drop negative value- added (after the computation of productivity deciles),
    - [Q3 + 5*(Q3-Q1)] < prodt, wage < [Q3 + 5*(Q3-Q1)]
    - 0 < wage bill / turnover < 1
  - focus on 4-digit nace sectors and 6-digit products with at least 50 observations

The data (4)

- Trimming
  - Belgian annual accounts
    - annualisation
    - keep firms with once total assets and employmet >0 tangible fixed assets > 100 €
  - Belgian unit values
    - unit values on the domestic market : unit values of Belgian producers on the domestic market (sales-net export) and prices from imported products
    - keeping 6-digit products for which all 8-digit products are in the same units
    - keeping only positive unit values

The data (5)

- Matching of French and Belgian data
  - focus on 4-digit nace sectors and 6-digit products with at least 50 observations in France and 100 in Belgium (deciles)
  - exclude products for which median(unit value)FR > 3* median(unit value)BE
- Final dataset - 1999-2009

- 566,811 firm x year (x 4-digit product) level observations for the estimation of the propensity to export

  (of which 134564 = exports to Belgium)

- 93694 observations firm x year x 6-digit product level observations for the estimation of the export quantities

The econometric model (1)

1. Probit model for the probability to export towards Belgium

- List of explanatory variables :

  - ratio of firms' labour productivity to its average wage

  - Belgian industry price index (NACE 2digits)

  - Number of firms (producers + importers) in the industry (Nace 4 digits)

  - Prodcom4 dummies for trade costs

  - Previous export status:

    - Export to BE = 1 if the firm exports towards Belgium in the preceding year,
    - Export to other = 1 if the firm exports towards an another country but not to Belgium in the preceding year;

The econometric model (2)

1. Probit model for the probability to export towards Belgium (cont.d)

- size classes:
  1 - small : assets <= 500,000 euros
  2 - medium : 500,000 < assets <= 2,500,000 euros
  3 - large : 2,500,000 < assets <= 10,000,000 euros
  4 -very large : assets > 10,000,000 euros

- Corporate group affiliation:
  - independent firm
  - affiliated to a Belgian group,
  - affiliated to a French group,
  - affiliated to another group

- year dummies + first_observation (y0)

The econometric model (3)

2. Export (volumes) equation, controlling for export selection

- List of explanatory variables

  - product x firm export price (=unit value)

  - a product (firm) “quality index”, being alternatively defined as:

    - log of productivity in real terms

    - log of ratio (firms’ wage / French median wage - NACE4 industry)

    - log of ratio (firms’ wage / Belgian median wage - NACE4 industry)

  - size dummies (as before)

  - group affiliation dummies (as before)

The econometric model (4)

2. Export (volumes) equation, controlling for export selection (cont.d)

- position of the French firm's export price in the distribution of Belgian prices for the same Prodcom6 category:

4 positions associated with the four Belgian quartiles

- position of the French firm's "quality index" (wage) in the distribution of Belgian wages for the same Prodcom6 category:

4 positions associated with the four Belgian quartiles

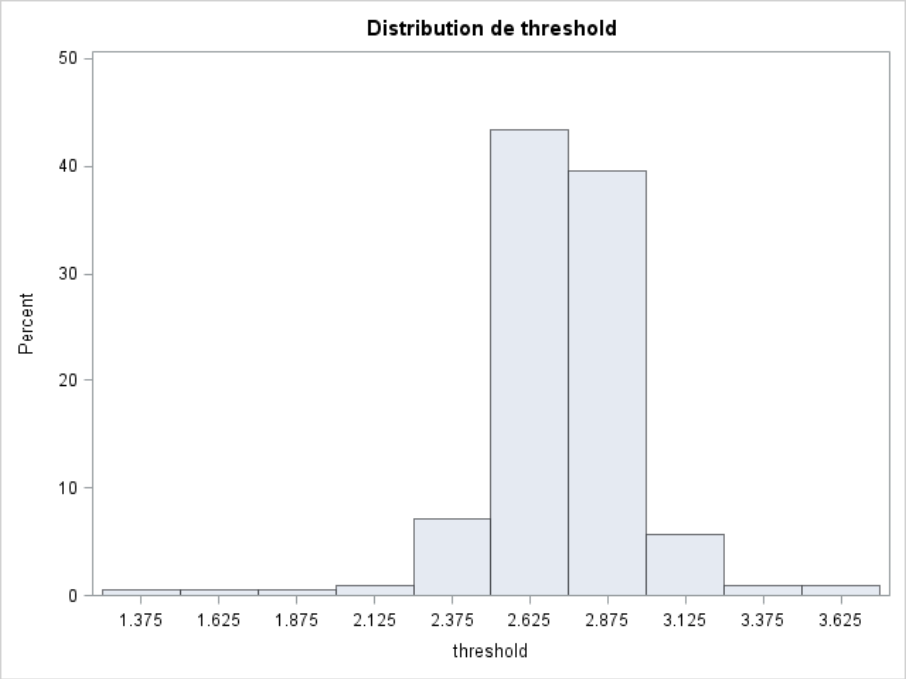
- Inverse of Mills ratio (selection correction)

- year, 4-digit sector dummies, 6-digit product dummies

Estimates (1) : probability to export to Belgium

Variable	Coef.	Std-Err	Khi-squared
Log(prodte / wage)	0,087	0,008	115,80
Log(price index)	0,045	0,016	7,71
lnb_firms	-0,028	0,004	40,58
Export to BE in t-1	3,503	0,017	44315,20
Export to other in t-1	0,951	0,017	3293,24
size 4	0,406	0,020	419,93
size 3	0,218	0,020	116,80
size 2	0,124	0,022	32,31
size 1	ref.		
indep	-0,378	0,044	75,64
groupe_OTH	-0,253	0,044	32,97
groupe_FR	-0,188	0,043	18,98
groupe_BE	ref.		
first_id_export	1,071	0,010	11709,50
Year dummmies	Yes		
Prodcom4 dummies	Yes		
Nobs	556811		
Log L	-49845		

Estimates (2) : probability to export to Belgium



Correlation with observed propensity to export by prodcom4 = -0.63

Estimates (3): firm-product-level export volumes

	Quality = Prodte	Quality = wage / wage FR	Quality = wage / wage_BE	Quality = wage / wage_BE	Quality = wage / wage FR
Intercept	3,01	2,85	2,88	3,20	3,18
lpr_x	-1,06	-1,07	-1,07	-0,97	-0,97
quality	0,00	0,11	0,07	0,05	0,08
mills_BE	-0,31	-0,31	-0,31	-0,31	-0,31
size_assets 1	-0,88	-0,86	-0,86	-0,85	-0,85
size_assets 2	-0,59	-0,58	-0,58	-0,57	-0,57
size_assets 3	-0,27	-0,26	-0,26	-0,25	-0,25
size_assets 4	ref.	ref.	ref.	ref.	ref.
group_BE	0,31	0,31	0,31	0,29	0,29
group_FR	0,07	0,07	0,07	0,07	0,07
group_OTH	0,25	0,24	0,24	0,23	0,23
Indep	ref.	ref.	ref.	ref.	ref.
price in Q1-BE				0,41	0,41
price in Q2-BE				0,21	0,21
price in Q3-BE				0,03	0,03
price in Q4-BE				ref.	ref.
Wage (Quality) in Q1-BE				-0,09	-0,08
Wage (Quality) in Q2-BE				-0,10	-0,10
Wage (Quality) in Q3-BE				-0,07	-0,06
Wage (Quality) in Q4-BE				ref.	ref.
Year dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Product dummies	Yes	Yes	Yes	Yes	Yes
Nobs	93694	93694	93694	93694	93694
R^2	0.546	0.547	0.547	0.548	0.548

Conclusion

- We propose a way to assess firms' competitiveness on foreign markets at the very micro level by looking at the position of several relevant characteristics (productivity, wage, prices) in the distribution of these characteristics for their competitors on that foreign market.
- This alllows a microeconometric analysis of competitiveness without merging the micro datasets.
- Our results show that the factors outlined in Helpman, Melitz and Rubinstein (2008) indeed play a significant role:

- the productivity to wage ratio, the average price on the foreign market, the mark-up (degree of competition) on that market, do explain firms' propensity to export.

- relative prices and relative quality explain the quantities exported

Conclusion

- Remaining issues:

  - robustness checks to be done (trimming, nature of products, etc.)

  - endogeneity of prices

  - quality “measurement) and role of wages

  - market size?

  - other determinants of mark-ups on foreign markets

  - firms’ unobserved heterogeneity

- Extensions to other countries?

THANK YOU FOR YOUR ATTENTION