Cost, innovation and quality competitiveness : What lessons for international trade of OECD countries ?

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French Competitiveness : New challenges, New measures

Paris, 16/12/2015

Plan

Several factors explain the competitiveness gap between developed countries

The most common causes cited in the literature :

- Unsuccessful sector specialisation (Cheptea et al., 2014) and unfavorable geographical location (Felettigh et ali., 2006)
- resources misallocation (Bas et ali, 2015)
- Price competitiveness (labor, capital, intermediate consumption, mark-up, etc.) (Le Moigne et Ragot, 2015)
- Non-price competitiveness (Khandelwal, 2010)

The determinants of the non-price competitiveness (quality, innovation, design, brand image, distribution networks, customer service, etc.) also contribute to explain the export performances.

Price competitiveness VS non-price competitiveness

European Commission (2010) shows that the price-competitiveness explains less than 40% of the change in export performances of the Euro zone countries.
Similarly, INSEE (2013), indicates that most of the export change of the European economies is explained by non-price competitiveness

Issues :

- Most of the studies focus on one of these two types of competitiveness
- The non-price competitiveness is not easily measurable concept

Methodologies :

- Revealed preference theory (Aiginger, 1997) $\Rightarrow$ Drawback : limited on countries pair flows.
- Export price indices as quality indices (Hallak, 2006) $\Rightarrow$ Drawback : reflect production costs, amongst other things
- Residual approach : Quality is the idiosyncratic term of the import demand function (Khandelwal, 2010) $\Rightarrow$ Drawback : Prices reflect also quality

Innovation as a measure of quality

- Innovation is one of the three subindexes used to calculate the Global Competitiveness Index of the annual Global competitiveness Report.
- Chen (2013) shows that innovation (proxy of product quality) increases exporters' intensive and extensive margins
- Hall, Lotti & Mairesse (2009) show that the most innovative Italian SMEs have the highest turnover of new products introduced on the national market over the 1995-2003 period
- Different measures of innovation (R&D, Patents, etc.) have similar effects on trade (Wakelin, 1998 ; Anderton, 1999)
- Similar effects of quality image and innovation image (Crozet and Erkel-Rousse, 2004)

Issues and methodology

Issues

- Analyse the effects of the cost competitiveness and quality competitiveness linked to innovation (R&D) on trade of the OECD countries over the 1998-2012 period.
- Quality is present both in prices and quantities
  - What is the the share of quality in export price for the OECD countries-sectors ?
  - What are the cost (quality-adjusted price) and quality elasticities of import demand within the OECD countries ?

Methodology : 2 stages

- Determine the export price adjusted for quality linked to innovation (ISIC rév4 - 2Digit R&D expenditures)
- Estimate the influence of quality linked to innovation and the cost competitiveness on bilateral trade.

Econometric strategy

First stage

$$LogP_{ist} = \alpha_2 LogR\&D_{ist-1} + \alpha_1 Dummy\_LogR\&D_{ist-1} + \alpha_0 + f_{is} + \omega_{ist}$$

$$LogP^{AQ}_{ist} = LogP_{ist} - LogP^{Q}_{ist} \text{ where}$$
$$LogP^{Q}_{ist} = \hat{\alpha}_2 logR\&D_{ist-1} + \hat{\alpha}_1 Dummy\_logR\&D_{ist-1}$$

- The contribution of **net quality** in prices is effective if $\hat{\alpha}_2 > 0$

  Two other possible cases :

  - $\hat{\alpha}_2 = 0 \Rightarrow$ No quality in prices
  - $\hat{\alpha}_2 < 0 \Rightarrow$ Process innovation

Model

Second step

Second stage

Maximize the utility of a representative consumer under budget constraint. The utility function is an augmented version of Dixit-Stiglitz (1977) structure of preferences.

$$
\begin{aligned}
log(import_{ijst}) &= \underbrace{\beta_1 log(dist_{ij}) + \beta_2 + log(D_{ij}) + \beta_3 log(PIB_{it}) + \beta_4 log(PIB_{jt})}_{\text{Control variables}} \\
&+ \beta_5 log(P^{AQ}_{ist}) + \beta_6 (log P^{AQ}_{ist})^2 + \beta_7 log(R\&D_{ist}) + \beta_8 (log R\&D_{ist})^2 \\
&+ \underbrace{\beta_9 log(P^{AQ}_{jst}) + \beta_{10} (log P^{AQ}_{jst})^2 + \beta_{11} log(R\&D_{jst}) + \beta_{12} (log R\&D_{jst})^2}_{\text{Variables of interest}} \\
&+ \underbrace{\beta_{13} DummX + \beta_{14} DummM + \beta_{15} DummS + \beta_{16} DummT}_{\text{Dummy variables}} + \varepsilon_{ijst}
\end{aligned}
$$

BACI - CEPII

- Bilateral trade in volume (tonne) and export unite value (FOB) at the HS 6-digit products disaggregation (5000)
- Distance, Border, common language, etc.

ANBERD - OCDE

- Private R&D expenditures (Thousand US$)
- ISIC/CITI rév4 nomenclature at 2 Digit (24% of missing data)
- Keep observations collected for at least 3 consecutive years

World Bank

- GDP (Thousand US$)

Overall, a non-balanced panel of 146261 observations (28 OECD countries, 20 sectors, over the 1998-2012 period)

First step : The share of quality in prices

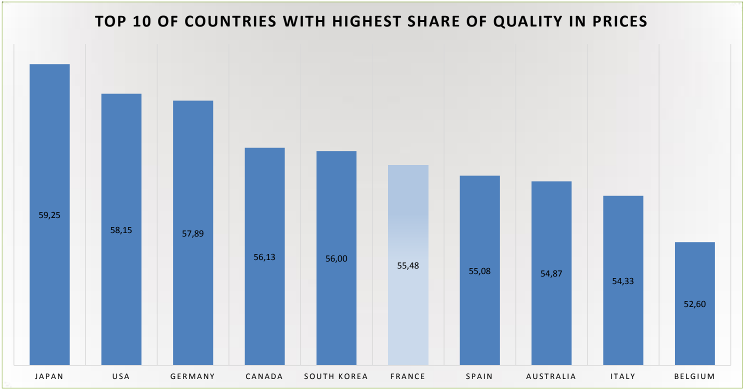
Results

- The share of the quality in prices is about 40%, on average
- The share of the quality in prices is significative in 14 sectors out of 20

  - Namely, in 8 out of 13 sectors of low and medium technology and 6 out of 7 sectors of high and medium-high technology

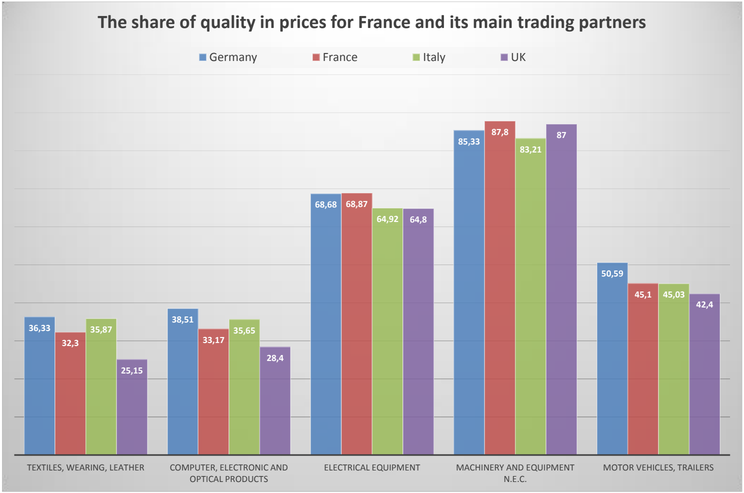
- On average, the share is less important in low and medium technology sectors (24%) than in high and medium-high technology sectors (51%)

First step : The share of quality in prices



Author's calculation

First step : The share of quality in prices

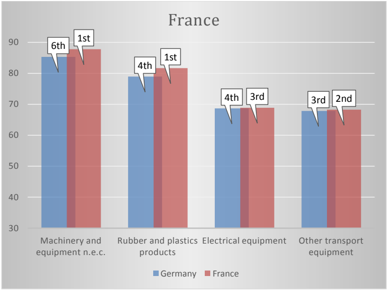


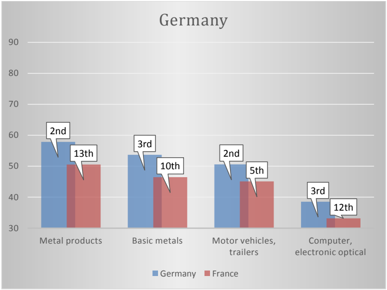
Author's calculation

First step : The share of quality in prices

First step

Top 3 of sectors for which France VS Germany are leaders in terms of quality





Author's calculation

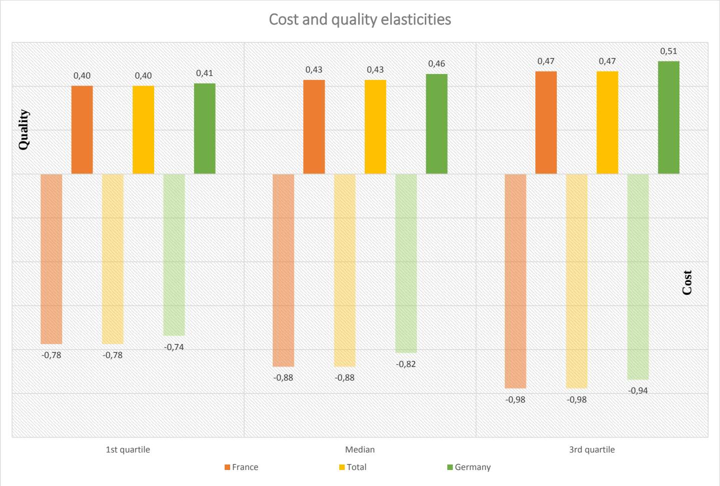
Second step : Cost and quality competitiveness

Return

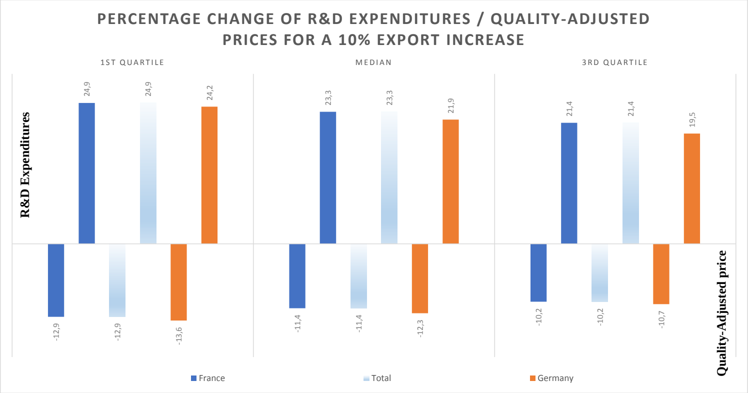
	(1)	(2)	(3)
$\log P^{NQ}_{ist}$	-0.794***	-0.802***	-0.610***
	(-6.019)	(-14.888)	(-7.483)
$\left(\log P^{NQ}_{ist}\right)^2$	-0.046***	-0.047***	-0.104***
	(-2.783)	(-2.927)	(-2.608)
$\log P^{NQ}_{jst}$	-0.073	-	-
	(-1.590)	-	-
$\left(\log P^{NQ}_{jst}\right)^2$	0.025***	0.031***	-
	(3.883)	(3.714)	-
$\log R\&D_{ist-1}$	-0.101	-	-0.214
	(-1.138)	-	(-0.946)
$\left(\log R\&D_{ist-1}\right)^2$	0.021***	0.017***	0.017*
	(6.274)	(10.015)	(1.752)
$\log R\&D_{jst-1}$	0.401*	0.429***	-
	(1.862)	(2.820)	-
$\left(\log R\&D_{jst-1}\right)^2$	-0.019*	-0.020***	-
	(-1.917)	(-3.013)	-
Dummy_ $\log R\&D_{ist-1}$	1.593***	2.185***	0.477
	(2.816)	(9.998)	(0.339)
Dummy_ $\log R\&D_{jst-1}$	2.043*	2.197**	-
	(1.795)	(2.550)	-
$\overline{logP^{NQ}_{\iota\jmath s}}$	-	-	-1.082***
	-	-	(-8.794)
$\overline{logR\&D_{\iota s}}$	-	-	0.014***
	-	-	(7.376)
Country FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Country/sector/year FE	No	No	Yes
Observations	145708	145708	146,261
R^2	0,773	0,772	0.461

Second step : Cost and quality competitiveness

▸ Cost and quality



Second step : Cost and quality competitiveness



Conclusion

Main results of the paper

1. In average, quality linked to innovation explains 40% of prices
2. Price and quality effects are non linear :
   - cumulative positive effect for quality
   - opposite effect for quality-adjusted price
3. French products are less comparative in cost and quality than the German products

Thank you for your attention

First step : The share of quality in prices

Return

	France	German	UK	Italy
Agriculture, forestry and fishing	25,70 7ème	28,25 2ème	22,33 13ème	17,13 21ème
Food, beverage, tobacco	63,00 4ème	62,80 5ème	61,10 10ème	60,37 11ème
Textile, fur, leather	32,30 11ème	36,33 3ème	25,15 23ème	35,87 5ème
Pharmaceutical products	100,00 5ème	93,62 18ème	100,00 5ème	92,36 20ème
Rubber and plastics products	81,67 1ère	78,97 4ème	77,50 5ème	76,55 8ème
Basic metals	46,47 10ème	53,69 3ème	38,20 18ème	46,28 12ème
Metal products, except machinery and equipment	50,53 13ème	57,84 2ème	46,65 19ème	52,40 8ème
Ordinateurs, articles électroniques et optiques	33,17 12ème	38,51 3ème	28,40 21ème	35,65 7ème
Computer, electronic and optical products	68,87 3ème	68,68 4ème	64,80 8ème	64,92 7ème
Machinery and equipment n.e.c.	87,80 1ère	85,33 6ème	87,00 3ème	83,21 8ème
Motor vehicles, trailers and semi-trailers	45,10 5ème	50,59 2ème	42,40 10ème	45,03 6ème
Other transport equipment	68,27 2ème	67,84 3ème	64,90 6ème	65,57 4ème

Second step : cost and quality elasticities

Return

$$\varepsilon_{D^{IMP}/Pi} = -0.802 - 0.094 \times logP_i^{AQ}$$
$$\varepsilon_{D^{IMP}/Quali} = 0.034 \times logR\&D_i$$

	ε_{m/P_i}	ε_{m/RD_i}
Total		
1st quartile	-0,767	0,413
Median	-0,867	0,460
3rd quartile	-0,954	0,501
France		
1st quartile	-0,775	0,402
Median	-0,878	0,429
3rd quartile	-0,977	0,468
German		
1st quartile	-0,737	0,413
Median	-0,815	0,456
3rd quartile	-0,937	0,514
Italy		
1st quartile	-0,763	0,377
Median	-0,848	0,410
3rd quartile	-0,935	0,450
United-Kingdom		
1st quartile	-0,804	0,371
Median	-0,892	0,412
3rd quartile	-0,985	0,460