Price Versus Quality War – A Case Study of France and Germany

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Incorporating the new trade and the endogenous growth theories, this paper compares the competitiveness of France and Germany in terms of prices and quality differences. Using the unitary cost of labor as an original proxy for price differences and knowledge innovation (made up of patents and R&D expenditures) as another original proxy for quality, our paper attempts to explain the import volumes under the structure of disaggregated bilateral trade for 17 countries across 15 sectors for a period of 31 years (1980 to 2010). We find that knowledge innovation that improves product quality contributes positively and significantly to a country's trade performance and that this continual investment in innovation enables a country to gain an upper hand over one's competitor as in the case of Germany.

JEL Codes: F12, F13, F14 and F49

1. Introduction

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This article incorporates both the new trade and the endogenous growth theories to study the determinants of import volumes of France and Germany. In light of the recent concern of the loss of competitiveness in France, we reconsider France's trade competitiveness by looking backwards to explain France's competitive position today compared to that of Germany. Acknowledging the role of quality innovation in determining trade between countries (Fontagné, Freudenberg and Péridy, 1998), we incorporate quality innovation, alongside prices as determinants of import volumes for both France and Germany. This article differs from most studies in two aspects. Firstly, we use unitary cost of labor as a proxy for price of products while controlling for the effect of mark-ups on these prices. This proxy helps to eliminate the problem of price mis-measurement that often leads to underestimated import price elasticity. Secondly, we account for innovation efforts in our model in two ways – innovation efforts directed at product quality improvements and innovation efforts directed at creating numerous product varieties. In terms of quality improvements, we use an original proxy called the knowledge variable which is constructed using two variables – R&D expenditure and number of patent citations. This knowledge variable cleverly captures the role of product innovation in improving the quality of the products while reconciling the demand and supply side theories on quality innovation. This paper, in using disaggregated bilateral data for 17 countries across 15 distinctly classified sectors over a period of 31 years (between 1990 and 2010) compares the import volumes of France and Germany originating from 15 trading partner countries.

2. Exports, Imports and Trade Competitiveness

In the simplest empirical trade model, trade is portrayed as a demand function which is defined by prices and incomes of consumers. However, this narrow perspective of trade has evolved since then, to include various other determinants such as investment, R&D expenditure and human capital variables.

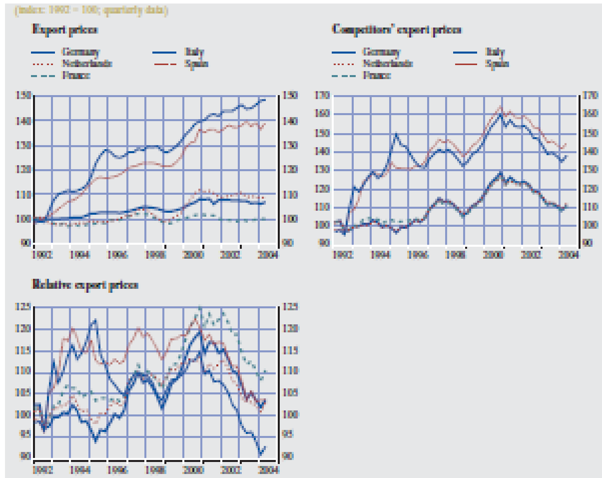
Hallak (2006) invokes the importance of quality in trade in determining the direction of trade, assuming that quality is the main factor that explains the difference in the unit values observed for highly detailed categories of products. In a study performed by Erkel-Rousse and Le Gallo (2002) overlooking the OECD countries, the authors concluded the comparative strengths of exporter countries in specific areas. For instance, they concluded that within the EU, Germany and, to a smaller extent, France perform better in terms of quality competitiveness while Italy and Spain are highly competitive in terms of prices. Finally, the Netherlands and the UK intermediate between quality and price competitiveness. Such studies highlight the contesting war between prices and quality for most countries. In addition, Bob Anderton (1999) supports the role of innovation, product quality and variety in contributing towards the relatively better performance of Germany as opposed to the United Kingdom. As such, this study aims to contribute to this field of research by introducing two main originalities, as raised in the introduction.

The use of proxies to reflect variables that cannot be measured or quantified is a respected convention among economists. Yet, contention begins over the proxies themselves. Much literature on trade and specifically, in the area of estimating import price elasticities, raises a common problem related to the estimation of these import prices as well as the specification of the empirical models of trade. Notably, Erkel-Rousse and Mirza (2001) show that econometric estimations of import price elasticities tend to be under-estimated due to an econometric misspecification of these equations, measurement errors in import price indexes as well as endogeneity between prices and trade quantities. By adjusting for these errors, they find a significant increase in these estimates. Another venture in this field by Crozet and Erkel-Rousse (2004) prove that by taking into account quality effects in products that are traded, one can reconcile estimated import price elasticities with the theoretical ones under the ‘new’ trade theory. Thus, the pertinence of using a good proxy for prices and including quality in our study cannot be underestimated.

In such studies, we are usually interested in the export or import prices which reflect the cost of production of the corresponding products coming from the respective countries. Yet, import and export price indices are not always easily obtained. Thus, our study proposes the use of unitary labor costs as a proxy for prices. The unitary labor cost, otherwise known as the productivity adjusted labor cost, is defined as the ratio of the nominal labor costs over the nominal value added of the products. By adjusting for the mark-ups that are apparent in the imperfectly competitive market setting (Didier and Koleda, 2001), these values reflect the prices of the products related to the production costs and mark-ups of the corresponding products.

Our study also makes an original contribution towards the determination of the quality proxy. Many economists have opted to use direct R&D expenditures, number of patent citations and human capital variables as proxies for quality (Greenhalgh, Taylor and Wilson, 1994; Ioannidis and Schreyer, 1997; Eaton and Kortum, 2002). Other economists have opted to use trade unit values as quality proxies (Aiginger, 2001; Fieler, 2011). Finally, a few economists have created their own quality measures using micro data like Crozet, Head and Mayer (2011) and notably, Crozet and Erkel-Rousse (2004) who used a quality perceptions survey to determine the preferences of consumers for quality products coming from particular exporting countries. Indirect measures of product quality serve to capture very specific dimensions of product quality, like technological differentiation while ignoring the demand-side aspects that define quality via consumer preferences. Hence, our study tries to reconcile the demand-push and technology-push debate encircling innovation theory by constructing an indirect measure of product quality, based on both R&D expenditure and patent citations.

Figure 2.1: Determinants of Price Competitiveness (index, 1992 =100, quarterly data)



Source: Eurostat and ECB (adopted from ECB Paper Series, Vol 30, June 2005)[1]

The figure from Figure 2.1 refers to total trade in goods and services. The relative export prices, from the bottom graph, are obtained through a weighted average of the competitors' export prices divided by the domestic export prices. Thus, an increase in the trend reflects a gain in price competitiveness. From the figure, we note that the increase in relative export prices for France is much more pronounced that those of Germany. This reflects a gain in price competitiveness for France during the period between 1992 and 2004. After 2003, we note a sharp drop in these prices for all the countries whilst the French prices continue to be relatively higher and thus more competitive relative to its competitors.

In fact, the weak German competitiveness can be explained by the unification of Germany during the first half of the 1990s and the restructuring of the economy right after the unification. This led to German products being much more expensive in contrast to its French counterparts due to German workers being paid wages that were far above the productivity level. Given the climate of political change in Germany at that time, France was able to perform better than Germany in terms of price competitiveness. Yet, according to the ECB Paper Series (2005), German exports over the period of 1985

[1] Task Force of Monetary Policy Committee of the European System of Central Banks (2005) "Competitiveness and the Export Performance of the Euro Area", European Central Bank Occasional Paper Series, Vol 30, June 2005

and 2001 were oriented towards medium-tech products whereas French exports were specialized in low and medium-tech products. In that sense, Germany was able to gain a stronger foothold over exportations in the medium-tech products as opposed to France and this is a phenomenon that we observe even today. Thus, our study aims to capture the beginnings of the establishment of France and German trade competencies as early as 1980 so as to derive insights on the trade policies adopted by these countries to arrive to their current trade positions vis-à-vis one another. We hope that this study can provide insights on the loss of competitiveness in France and that it can help us to make a well-informed decision on how these countries should proceed in the future in order to strengthen their trade positions.

3. Theoretical Model

Our model parallels the empirical trade model by Bob Anderton (1999) which invokes an import demand model where competition is between domestic and foreign-produced differentiated product. This product can be differentiated horizontally, meaning the product has various variety counterparts, or vertically, meaning the quality of a particular product variety. Adapting from the trade model by Ioannidis and Schreyer (1997), the producers make a two-stage decision on production. Firstly, they choose the degree of product differentiation which relates to deciding whether to enter the market and hence compete using horizontal differentiation, while simultaneously choosing on the quality aspect of their product, thereby competing via vertical differentiation.

There are two forms of innovation induced by technology namely process and product innovation. Process innovation leads to a product being produced more efficiently and thereby reduces the costs of production. Product differentiation leads to the creation of a new or a higher quality product. In the second stage of decision-making, the producer sets prices and quantities for a given level of process and product innovations. This implies that product innovations will directly affect the demand for imports while process innovations will affect the prices of these imports. Thus, the consumer chooses between domestic and foreign-produced product, based on their relative prices and quality.

Equation (1) gives the import specification of country i (France or Germany)

$$(1) In\ M_{kt}^{ij} = \alpha_0 + \alpha_1 InRP_{kt}^{ij} + \alpha_2 In\ D_{kt}^{i} + \alpha_3 In\ RQ_{kt}^{ij} + \alpha_4 In\ RV_{kt}^{ij} + \alpha_5 In\ Dist^{ij} + Fixed\ effects$$

where

M_{kt}^{ij} is the import volume of our country of interest (France or Germany) from exporter country j for a particular product k over time t

RP_{kt}^{ij} is product price of France or Germany for a particular product k relative to that of the same good from country j

D_{kt}^{i} is the internal demand of France or Germany for a particular product k (proxied by aggregate total real final expenditure)

RQ_{kt}^{ij} is the quality variable for French or German quality of a particular good k relative to the quality of the same product k from country j

RV_{kt}^{ij} is the variety variable for French or German variety of a particular good k relative to the variety of the same product k from country j

$Dist^{ij}$ is the distance between the trading partners i and j and it helps to control for barriers to trade that are not accounted for through relative prices (Anderson and Marcouiller, 1999)

Fixed effects (country, time and sectoral) are used to control for effects in both trading countries

Our model considers five variables as determinants for imports namely relative product prices which are proxied using unitary labor costs, relative quality which is proxied using knowledge, relative variety which is proxied by sectoral GDP, internal demand of the importing country and the distance between the trading partners.

Our coefficients of interest are α_1, α_3 and α_4 which correspond to relative product price, quality and variety coefficients of France and Germany. Based on intuition, we expect $\alpha_1 > 0$, $\alpha_3 < 0$ and $\alpha_4 < 0$. If the cost of production for a particular product k is much higher in France or Germany, as opposed to that of the exporter country j, the imports coming in should increase. Similarly, if the domestic product quality (and variety) of k is higher than the foreign-produced k coming from country j, consumers would choose to buy from domestic producers, due to their preference for higher quality (and variety) and lower priced products, leading to a fall in imports coming from country j.

We use data compiled for a group of 17 countries namely Austria, Belgium, Denmark, Germany, Spain, the United States, Finland, France, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Sweden and the United Kingdom, over the period of 1980 to 2010 for a total of 15 manufacturing goods sectors. We obtained the import volumes from the Chelem database, worked on by CEPII. The database provides trade data disaggregated across 72 product categories which were re-organized to fit our 15 product sectors. [2]

Unitary labor costs are used as a proxy for prices of the tradable goods. The unitary labor costs are obtained by dividing the nominal cost of labor by the nominal value added produced. Thus, we obtain a ratio between 0 and 1 for the unitary cost of labor. The nominal cost of labor was obtained using the STAN and the Labor Costs database.

Distance is obtained from GeoDist from Mayer and Zignago (2010). GeoDist provides bilateral distances between the major cities of the countries, using city-level data in a bid to assess the geographic distribution of the population inside each country and is measured in kilometers.

The variety data and the internal demand variables are obtained from the OECD website. Similar to Anderton, we use final demand expenditure as our internal demand variable. But unlike Anderton, we include a separate variable for variety which we proxy using the sectoral GDP due to the existence of intermediate consumption, as proposed by Crozet and Erkel-Rousse (2004).

The quality data is constructed using data on R&D expenditure, taken from OECD and Eurostat, as well as the Johnson (2002) matrix that helps to account for the externalities resulting from research and development conducted in other sectors and countries that could potentially spillover to a particular sector.

The quality proxy that we have constructed attempts to alleviate, to some extent, the long-standing contention between demand-pull and technology-push theories regarding innovation. In order to represent quality effects in products, we have created a proxy variable known as the knowledge variable. Our

[2] Special acknowledgement to Gabriel Galand for constucting the disaggregated bilateral trade flow database by compiling these various databases listed in the text to eliminate missing trade values. In addition, he is also responsible for creating the extensive and complete database used for the purpose of this study.

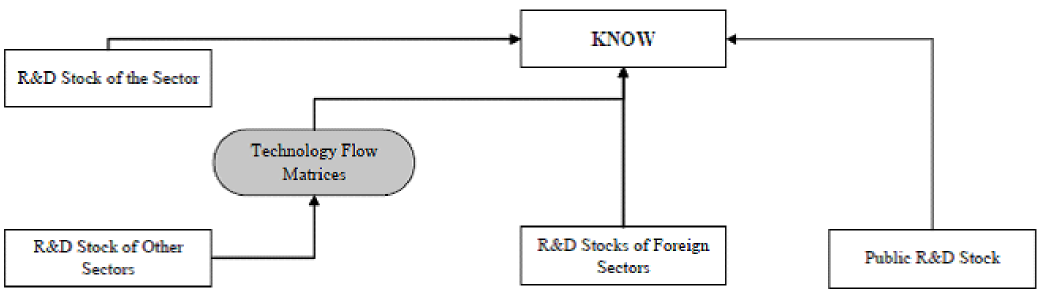
knowledge variable attempts to capture both the R&D expenditure on a particular good as well as other knowledge spillovers arising from innovation performed on other sectors.

According to demand-pull theory, innovation is the outcome of the market. Changes in market condition incite firms to invest in innovation to so as to meet increasing demand for higher quality goods or higher variety goods (Mairesse and Sassenou, 1991). On the other hand, technology-push theory accounts for scientific progress as the engine of innovation. Many critics have criticized one or the other theory, raising the claim that both supply and demand side factors are necessary for innovation to take place. In addition, it is the interaction of these two factors that creates the breeding ground for innovation (Arthur, 2007). In an industry-level study, Pavitt (1984) supported the idea of the interacting demand and supply side factors by showing that industry specific attributes affect the relative importance of each. The adoption of one technology, in general, depends on the complementary innovations and the potential of one may stimulate investment in the other (Mowery and Rosenberg, 1989). Thus, our proxy encapsulates the essence of this interaction between the demand and the supply side factors by merging the actual R&D expenditure by one industry which is a demand-side factor with the patent citations in other industries which is the supply-side factor. We argue that consumers relate the amount of technology invested in a product with the quality of the product. Consumers perceive Apple products as higher quality products due to the technology that is invested in producing them. In this way, we are able to proxy consumers' perceptions of quality via our unique knowledge variable.

Thus, our paper is unique is presenting quality of the product being represented by the accumulation of R&D expenditures and other knowledge spillovers. In addition, this proxy aims to show the link between how the knowledge of producing one product has increasing returns on the knowledge required to produce another product. In this way, our knowledge variable which is a demand- side variable for the consumer is derived from the supply- side variable for the producers, that is, the technological know-how.

The construction of the knowledge variable is slightly complex. We use the value of R&D expenditures in a particular sector as well as the R&D expenditures in other sectors. We convert the R&D expenditures from other sectors via technology flow matrices. These matrices were constructed under the methodology developed by Johnson for the OECD with sectoral differentiation (Johnson, 2002; Meijiers, 2010). Figure 3.1 charts the construction of the knowledge variable as a quality proxy.

Figure 3.1: Constructing the Knowledge Variable



Source: Chevallier, Fougeyrollas, Le Mouel and Zagamé , 2006

The knowledge variable considers the quality of the domestic product with respect to that f the imported one. If the quality of the domestic product is higher than that of the imported product, this will decrease the demand for these imports. So, we expect a negative coefficient for our knowledge variable in our model.

4. Main Econometric Results

Table 4.1: General estimation results

	Equation (1)			
Estimation Method	OLS	OLS	2SLS	2SLS
α_1	0.288*** (0.010)	0.225* (0.014)	0.311*** (0.011)	0.234** (0.015)
α_2	1.440*** (0.007)	1.201*** (0.004)	1.434*** (0.007)	1.199*** (0.004)
α_3	-0.496*** (0.003)	-0.431*** (0.004)	-0.490*** (0.005)	-0.426*** (0.005)
α_4	-0.218*** (0.006)	-0.242*** (0.005)	-0.201*** (0.003)	-0.245*** (0.004)
α_5	-1.330*** (0.010)	-1.306*** (0.007)	-1.330*** (0.010)	-1.305*** (0.007)
α_0	5.934*** (0.097)	1.857*** (0.052)	13.676*** (0167)	1.874*** (0.053)
Fixed effects	Yes	No	Yes	No
R^2	0.77	0.48	0.77	0.47
Observations	126480	126480	122400	122400

Note: *, **, *** refers to significance testing under 10%, 5% and 1% significance level

Table 4.1 shows the regressions pooled over both France and Germany with their 16 trading partners. We also include the bilateral trade between France and Germany in this pooled regression. We group all the sectoral trade for this pooled regression, thus the results are not heterogeneous across the sectors. We perform simple Ordinary Least Squares (OLS) estimation and Two Stage Least Squares (2SLS) estimation, alternating between fixed and no fixed effects. The Two Stage Least Squares estimation method is an Instrumental Variable method that helps to eliminate the problem of price endogeneity and mis-measurement. We use lagged relative prices as our instruments to obtain the results of Table 4.1.

From Table 4.1, we note that the relative price, quality and variety coefficients, denoted by α_1, α_3 and α_4 are highly significant and of the correct signs, with the price coefficient α_1 being positive and the quality and variety coefficients, α_3 and α_4, being negative. The demand coefficient α_2 is positive as well implying that the imports are an increasing function of the demand of the domestic consumers. And finally, distance, denoted by α_5 is negatively related to the imports.

We also note that the sum of quality and variety coefficients is larger than the individual price coefficient, implying that the impact of quality and variety effects is more important in import volume determination than prices, itself. Also, the coefficients are relatively robust across all types of regressions, be it under fixed or no fixed effects. The impact of quality on imports is larger than that of variety on imports.

Table 4.1 serves as a confirmation of our model in terms of signs and magnitudes of our key coefficients of interest. Thus, we expect to obtain similar results when we do a sectoral analysis of the same dataset.

Table 4.2: Sectoral Results

Sector	Name	α_1	α_3	Product differentiation by Rauch	Product differentiation by OMSP
1	Agriculture and Fishing	1.364*** (0.068)	-0.212 (0.005)	HOM	HOM
2	All extractions	1.192*** (0.039)	-0.661** (0.009)	HOM	HOM
3	Distribution of water, gas and electricity	0.761*** (0.168)	-0.466 (0.050)	HOM	HOM
4	Refined Oil	0.790* (0.078)	-0.134 (0.030)	HOM	HOM
5	Non Metallic Mineral Products	0.508*** (0.146)	-0.452 (0.046)	DIF	HOM
6	Chemicals	0.311*** (0.031)	-2.511*** (0.062)	DIF	HOM
7	Metal Products	0.410*** (0.014)	-1.123*** (0.048)	DIF	DIF
8	Agricultural and Industrial Machines	0.259*** (0.010)	-3.281*** (0.018)	DIF	DIF
9	Office Machines and Electrical Goods	0.120*** (0.006)	-3.699*** (0.060)	DIF	DIF
10	Transport Equipment	0.260*** (0.006)	-1.875*** (0.018)	DIF	DIF
11	Food, Drink and Tobacco	0.373*** (0.007)	-0.280* (0.007)	HOM	HOM
12	Textiles, Cloth and Footwear	0.389*** (0.007)	-0.693*** (0.001)	DIF	HOM
13	Paper and Printing Products	0.282*** (0.001)	-0.618*** (0.002)	DIF	HOM
14	Rubber and Plastic	0.560*** (0.005)	-0.982*** (0.009)	DIF	HOM
15	Other Manufactures	0.224*** (0.008)	-1.987*** (0.008)	DIF	DIF

Note: *, **, *** refers to significance testing under 10%, 5% and 1% significance level

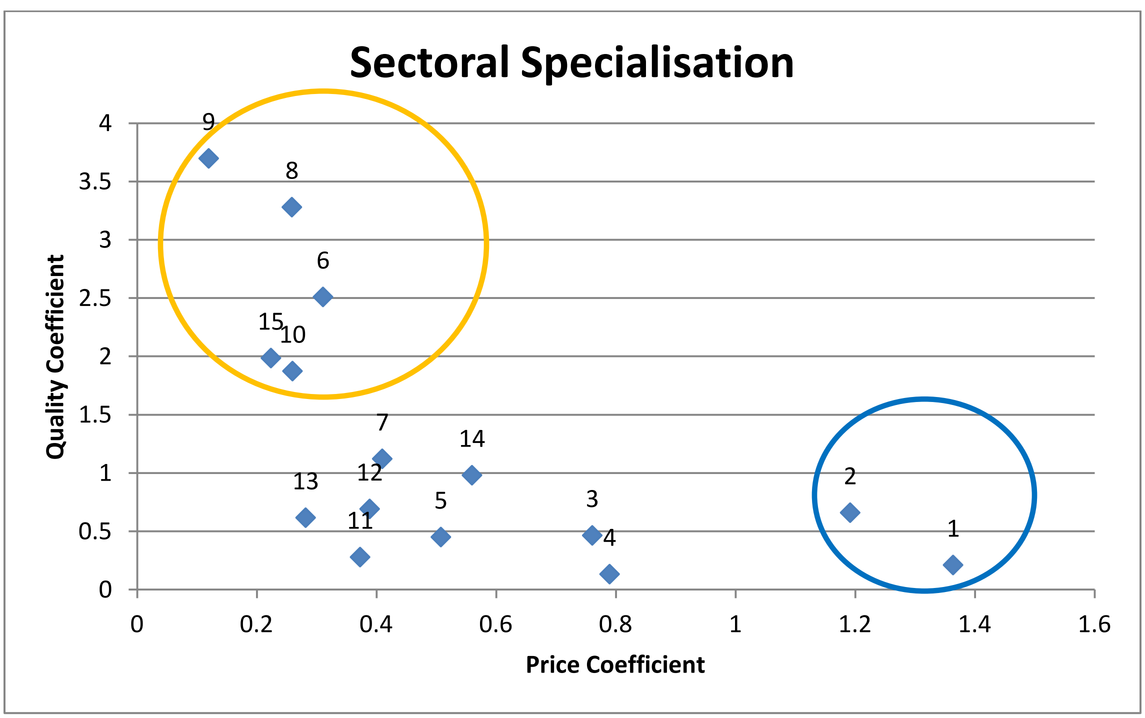
The results in Table 4.2 were obtained by regressing Equation (1) using the 0LS estimator with fixed effects even though the results were robust for the 2SLS estimation.

The last two columns of Table 4.2 record the type of product classification, be it homogenous (HOM) or differentiated (DIF). This product classification is based on Rauch's calculations (1999) as well as the work of Oliveira-Martins, Scarpetta and Pilat (OMSP, 1996) on STAN sectors. We observe that industries with low product differentiation have relatively higher price coefficients when compared to the industries with high product differentiation. Under the OMSP classification, the industries with relatively higher price coefficients are mostly homogenous goods producing sectors or non-industrialized sectors like Agriculture and Fishing, All Extractions and Metal Products where the estimated price coefficients range between 0.7 and 1.3. The sectors with high product differentiation or largely industrialized sectors had relatively lower price coefficients ranging between 0.1 and 0.5.

The opposite characteristic is true for the quality coefficient. Industries which produce highly differentiated products, like Chemicals and Office Machines and Electrical Goods, record higher quality coefficients as there is greater scope for quality improvement and differentiation in these industries as compared to industries producing highly homogeneous products. These high quality coefficients range between 1.1 and 3.7 in magnitude.

We can graphically summarize the respective specification of sectors, be it differentiated or homogenous, using the quality and price coefficients (in absolute values) as shown in Figure 4.3 below.

Figure 4.3: Sectoral Specialisation in terms of Price and Quality Elasticity



The figure above plots all the sectoral relative price and quality coefficients. The sectors in the top left hand corner of the graph, points within the orange circle, denote the sectors that produce highly differentiated products such as Chemicals sector, Agricultural and Industrial Machines sector, Office Machines and Electrical Goods sector, Transport Equipment sector and Other Manufactures sector. Points encircled by the blue circle are sectors that produce highly homogenous products such as the Agriculture and Fishing sector and All Extractions sector. The other sectors are intermediate in which they have scope to produce both differentiated yet similar products. Our own classification ties in with the classification by OMSP and Rauch in defining these sectors. This definition helps us to characterize the sectoral specialization of France and Germany in the following parts.

Table 4.4: Pooled regression between France and Germany

	France		Germany	
Estimation Method	OLS1	OLS2	OLS1	OLS2
α_1	0.662*** (0.054)	0.853*** (0.064)	0.388*** (0.047)	0.290*** (0.058)
α_2	0.937*** (0.084)	0.962*** (0.043)	0.847*** (0.087)	0.840*** (0.038)
α_3	-0.370*** (0.026)	-0.468*** (0.021)	-0.417*** (0.028)	-0.582*** (0.019)
α_4	-0.144*** (0.014)	-0.203*** (0.017)	-0.218*** (0.015)	-0.233*** (0.019)
α_5	-1.065*** (0.027)	-1.092*** (0.025)	-1.108*** (0.025)	-1.302*** (0.024)
α_0	4.307*** (0.977)	3.784*** (0.512)	4.829*** (0.953)	6.200*** (0.446)
Fixed effects	Yes	No	Yes	No
R^2	0.70	0.44	0.74	0.44
Observations	7740	7740	7740	7740

Note: *, **, *** refers to significance testing under 10%, 5% and 1% significance level

Table 4.4 looks at the results of the regression using Equation (1) for the case of Germany and France. We display only the results under OLS here. The full results under 2SLS fixed and random effects for both France and Germany can be made available, upon request. We are interested in the coefficients of the relative price, quality and variety coefficients of Germany so as to compare with those of France.

All the coefficients in Table 4.4 are of the correct sign and highly significant, thereby adding credibility to our model. Through comparison across both countries, we note that the price coefficients of France are much higher than those of Germany. This means that for a 1% increase in the domestic costs of production (and hence prices) relative to import prices, the rise of imports to France is higher than the rise of imports to Germany. This implies that the German products are much more differentiated than those of its exporting competitors. As such, Germany is able to resist competition coming from similar products of foreign origins despite these products being cheaper than their German counterparts. In contrast, French products are not able to withstand competition from their foreign counterparts as their products tend to be more substitutable. This result corresponds to the economic literature on the loss of French price competitiveness due to its higher labor costs and hence higher costs of products (Artus and Fontagné, 2006). This shows the improvement of Germany in this area as they were previously weaker in terms of price competitiveness right after the fall of the Berlin Wall (Koleda and Didier, 2001 and ECB Paper Series, 2005).

When we compare the quality and variety coefficients between these two countries, we observe that both quality and variety coefficients are higher in absolute values for France than for Germany. This implies that the French imports are highly sensitive to quality improvements. When the quality of the domestic products rises by 1% relative to the quality of its foreign counterparts, the German consumers prefer of foreign imports by a larger proportion than those of the French consumers. In other words, the Germans are able to withstand against higher quality foreign imports. These results correspond to the wide-spread knowledge that German products are of a higher quality. In particular, a report on French and German relative comparative advantages by the Trésor (Trésor-Economics, 2009) revealed that "*Germany benefits from concentration and intensification of its comparative advantages in automobile and high-technology machinery*". This translates loosely to the idea that Germany performs better than France when competing in terms of quality. To further support these conclusions, we proceed to confirm conclusions by previous studies on France and Germany, at a sectoral level.

Table 4.5: Comparison of Import Price, Quality and Variety Coefficients between France and Germany

Sector	α_1^{France}	α_3^{France}	α_4^{France}	$\alpha_1^{Germany}$	$\alpha_3^{Germany}$	$\alpha_4^{Germany}$
1	1.510*** (0.123)	-0.189** (0.021)	-0.077 (0.129)	1.273** (0.130)	-0.099* (0.133)	-0.034* (0.022)
2	1.635*** (0.008)	-0.168*** (0.004)	-0.052 (0.014)	1.255*** (0.049)	-0.131*** (0.030)	-0.002* (0.009)
3	2.905** (0.550)	-1.015** (0.533)	-0.463*** (0.133)	1.185*** (0.555)	-0.826* (0.548)	-0.397*** (0.132)
4	1.817*** (0.158)	-0.464*** (0.090)	-0.147*** (0.046)	1.480*** (0.170)	-0.302*** (0.083)	-0.109*** (0.041)
5	1.489*** (0.120)	-0.340* (0.096)	-0.143** (0.042)	1.431*** (0.127)	-0.165*** (0.099)	-0.107*** (0.044)
6	0.379*** (0.096)	-0.692*** (0.114)	-0.595*** (0.032)	0.125*** (0.121)	-0.589** (0.145)	-0.265*** (0.041)
7	0.454** (0.093)	-0.408*** (0.050)	-0.215*** (0.032)	0.197*** (0.096)	-0.385*** (0.051)	-0.179*** (0.034)
8	0.687*** (0.143)	-1.258*** (0.123)	-1.152* (0.047)	0.258*** (0.095)	-2.182*** (0.078)	-1.075*** (0.032)
9	0.186*** (0.063)	-1.363*** (0.055)	-1.117*** (0.043)	0.070*** (0.055)	-2.308*** (0.050)	-1.885*** (0.040)
10	0.248** (0.141)	-1.380*** (0.048)	-1.295*** (0.111)	0.219*** (0.159)	-3.988*** (0.096)	-2.866*** (0.042)
11	1.632*** (0.170)	-0.886*** (0.167)	-0.787*** (0.069)	0.989*** (0.144)	-0.497*** (0.139)	-0.298*** (0.060)
12	0.715*** (0.115)	-0.412*** (0.076)	-0.182*** (0.022)	0.691*** (0.105)	-0.657*** (0.024)	-0.514*** (0.084)
13	0.318*** (0.124)	-0.270*** (0.079)	-0.138*** (0.023)	0.259*** (0.098)	-0.487*** (0.101)	-0.266*** (0.029)
14	0.189* (0.097)	-0.435*** (0.101)	-0.250*** (0.028)	0.152*** (0.115)	-0.262*** (0.114)	-0.118*** (0.033)
15	0.434*** (0.132)	-0.264*** (0.106)	-0.166*** (0.028	0.166*** (0.129)	-0.483*** (0.119)	-0.249*** (0.029)

Note: *, **, *** refers to significance testing under 10%, 5% and 1% significance level

At a sectoral level, we notice the same trend across both countries, namely that the price, quality and variety coefficients are relatively larger in magnitude in France than those in Germany. We also notice that the price coefficients in both countries are higher in homogenous goods categories while the quality and variety coefficients are higher in differentiated goods categories.

Our results tally with the conclusions in most literature about trade performance in France and Germany. We notice that Germany is strong in terms of price competition in all sectors compared to France. In addition, we note that Germany performs well in terms of quality in most differentiated products sectors namely automobiles and high-technology machinery (sectors 8, 9, 10, 13 and 15). In contrast, France performs well in sectors that produce highly homogenous products namely Agriculture, Extractions, Food, Drinks and Tobacco and Textiles, Clothes and Footwear with the exception of Chemicals and Metal Products which produce highly differentiated products. France is renowned to produce better quality products in cosmetics and pharmaceuticals (sector 7) which corresponds with our results (Artus and Fontagné, 2006). Even though, France seems to do well in terms of quality competition than Germany in most sectors, the impact of German quality competition in its "champion" sectors namely automobiles and high-technology machinery remain larger in magnitude than the French "champion" sectors.

In recent literature, it has been noted that Germany continues to do better in terms of quality competition as German products have established themselves in the market as being high quality products. On the other hand, France has been losing its competitiveness in terms of price competition due to various political initiatives such as the 35-hour work week, resulting in higher costs of production, translating into higher product prices. Germany out performs France in terms of both price and quality competitiveness on general, meaning that Germany is able to protect its domestic market from foreign product counterparts as well as capture its domestic demand using its better quality products and lower priced products. On the other hand, France does perform well in terms of producing better quality products in mostly homogenous and some differentiated products sectors. In order for France to improve its current trade performance, it should continue investing more in innovation in sectors in which it already has a quality advantage so as to reinforce its status as a strong quality competitor in these sectors. In addition, it should also venture in innovation to improve production processes so as to lower production costs to compete much better in terms of prices. Germany, on the other hand, should continue to improve its trade performance in both price and quality competition. In order to continue its good performance, it should not relegate its innovation efforts and could focus to capture more homogenous products markets by improving their homogenous product quality. Like France, it should also focus on expanding its innovation efforts in lowering production costs to continue its stronghold on price competition while also working on expanding variety as the variety coefficient does seem to potentially contribute significantly to trade.

Currently, Europe is facing tough trade competition from low-cost and low-wage countries. As such, price competitiveness no longer seems a viable option for either France or Germany. The only recluse to resist competition from each other as well as from these developing economies is to invest in innovation so as to produce more differentiable, variable and higher quality products so as to effectively resist competition from low-cost and low-wage countries.

5. Conclusion

Overall, the paper shows the innovation efforts directed at quality improvements and expanding varieties provide a strong incentive to improve the trade performance of a country. Whether the country is inward looking wherein it focuses on protecting its domestic market from external competition or whether the country is outward looking in trying to procure external markets as in the case of Germany, the rule of the game is simple – it is to continue investing in innovation so as to gain an upper hand over one's competitors. The future path for these strong European countries is quality competition rather than price competition.

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