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# **International Trade and Competitiveness Analysis in the European Union: the Case of Prepared Meat Sector**

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# International Trade and Competitiveness Analysis in the European Union: the Case of Prepared Meat Sector

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**Abstract.** The purpose of this paper is to analyse the competitive performance of the EU countries for the prepared swine meat sector during the period 1990- 2003. This sector has been chosen for the role that traditional products play in most EU countries. To assess competitiveness, the analysis evaluates several trade indices to compare the trends over the last fifteen years: Revealed Comparative Advantage, the Vollrath indices, Net Export Index, and Grübel- Lloyd index. The data source was the Eurostat data base, considering intra- EU export and import data referred to 17 sub- sectors with 8 digit codes. Moreover, cluster analysis has been applied to highlight groups of countries with similar features. Good competitive performance in the prepared swine meat sector is observed in Italy, Spain, Ireland and Austria, all of which were found to be specialised in the sector and export oriented. Germany and France show positive competitive performance, but a high level of intra- industry trade and low specialisation is also revealed. Denmark is characterized by negative dynamics of competitiveness even though there are high exports in the sector; a similar trend is observed in Belgium and the Netherlands. The rest of the countries show weak competitiveness for the analysed sector. Moreover, the type of exported product varies greatly: Italy and Spain export dried or smoked swine meat, whereas Germany and Denmark export mainly sausages and preserved swine meat.

**Keywords :** Competitiveness, International Trade, EU, Prepared Meat, RCA.

## 1. Introduction

The competitive features of the European food market have undergone pronounced modifications connected to various economic changes over the last fifteen years. Globalisation, the completion of a single European market and evolution in demand patterns are just some of the changes that have affected the degree of competitiveness of European countries in the food sector <sup>(2, 18)</sup>.

Globalisation and the single European market have led to growth in competition in the food industry, inducing firms to adjust strategies to maintain their position in the market. On the other hand, the stabilisation of food consumption in quantitative terms is another factor affecting competition in the market, although growing consumer interest in food quality <sup>(18)</sup>, observed in the last decade, offers opportunities to adopt strategies appropriate for the different firms. The evolution in demand in qualitative terms also concerns traditional food products and products linked to a specific geographic area, such as products with

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<sup>1</sup> Corresponding author: A. Banterle. The paper is the result of the collaboration of the authors. The text is attributed as follows: sections 1, 2, 3.1 and 5 to A. Banterle; sections 3.2, 3.3, 3.4 and 4 to L. Carraresi.

protected designation of origin (PDO) and protected geographical indication (PGI).

This paper focuses on the dynamic of the competitiveness in European countries over the last fifteen years, considering the prepared swine meat sector and the EU-15 market. Our purpose here has been to assess the competitive performance of EU countries for this sector, using several indices measuring trade in the European market and to compare trends over the period 1990- 2003.

We chose the prepared swine meat industry as this sector has traditional products and PDO-PGI products that play an important role in most European countries. Italy is the European country with the highest number of PDO-PGI products in the analysed sector (27 PDO-PGI in 2006, according to European Commission data), followed by Portugal (21), Spain (10), Germany (8), France (4), Belgium (2), Austria (2), Ireland (1) and Luxemburg (1). The other European countries do not have PDO-PGI products in this sector.

We chose the EU-15 market as this is a free trade area and there are no distortions due to tariff and non-tariff barriers, particularly since the completion of the single European market. For this reason we considered only intra-EU trade to outline the evolution of competitiveness in European countries. Even so, it must be noted that until the introduction of the Euro (January 2002) some countries had high monetary fluctuations, like for example Italy, and such fluctuation could have affected competitive performance.

The data source was the Eurostat database, and consideration was given to the export and import data for 17 sub-sectors with 8 digit codes relative to the sector analysed; these trade data do not permit the distinguishing of PDO-PGI products one from the other. Cluster analysis was used to highlight groups of countries with similar features.

The paper is organised as follows: the definition of competitiveness and the description of the indices used to assess competitiveness are presented in section 2; the results are analysed in section 3; cluster analysis is examined in section 4 and the concluding remarks are set down in section 5.

## **2. Concepts and assessments of competitiveness**

### **2.1. Concepts**

The economic approaches to the analysis of competitiveness differ greatly, and depend on the levels of the examined economy, namely individual firm level, sector level and whole economy level <sup>(3, 5, 19)</sup>. The definitions of competitiveness may also differ with respect to the level considered.

Approaches analysing firm level tend to focus mainly on the profitability, competitive strategy and competitive advantage achieved by the firm, in terms of cost advantage and differentiation advantage <sup>(8)</sup>. Instead, approaches analysing country level are directed towards national productivity growth, trade performance, composition of domestic

output, and so on <sup>(10, 11, 19)</sup>, while those analysing the sector level mainly address the competitive performance of the sector in the international market.

Whatever the level of analysis, competitiveness is a relative measure and should be assessed relative to a base value <sup>(5, 19)</sup>. Therefore, the assessment of competitiveness requires comparisons of cases and of trends. Another feature of competitiveness concerns the spatial dimension of the analysis <sup>(5, 19)</sup>. The assessment of competitiveness may regard a single country, comparing, for example, firms or regions in that country, or different countries <sup>(5)</sup>. Therefore, competitiveness may be assessed within a national context or in an international context, as in analyses at the sector level.

With regard to definition, as our aim is to analyse competitiveness at the sector level, we focus on definitions of competitiveness connected to the sector. A general definition is proposed by Pitts and Lagnevik who define competitiveness of industry as “the ability to profitably gain and maintain market share in domestic and/or foreign markets” <sup>(14)</sup>. A similar concept is expressed by Kim and Marion who consider competitiveness as “the sustained ability of a nation’s industries or firms to compete with foreign counterparts in foreign markets as well as in domestic markets under conditions of free trade” <sup>(9)</sup>.

Competitiveness is linked, as theoretical references, mainly to comparative advantage and to competitive advantage <sup>(10)</sup>. Comparative advantage is connected to the Heckscher and Ohlin theory on international trade, in which the specialisation of the countries in exports depends on resources endowments and the relative costs. Competitive advantage is connected to the Porter diamond model which explains the source of competitiveness in the international market in terms of factors of advantage <sup>(15)</sup>.

## **2.2. The Revealed Comparative Advantage and the Relative Trade Advantage**

The analysis of the competitive performance of the European countries for the prepared swine meat sector is carried out through the assessment of several indices measuring trade in the EU-15 market, to compare the trends during the period 1990- 2003.

The first index analysed is the revealed comparative advantage (RCA) of Balassa <sup>(1)</sup>. This evaluation of comparative advantage offers a solution to the problems found in testing the Heckscher- Ohlin theory. The analysis of country trade patterns reveals the comparative advantage that reflects both relative costs and differences in non price factors <sup>(6, 12)</sup>. The RCA index may be defined as a country’s share of the international market for a product or a sector divided by its share of the international market for all products <sup>(14)</sup>. In other words, the RCA index represents the relation between the export market share of a country for a product or a sector and its export market share for total trade in a group of countries. The index is expressed as:

$$RCA_{ij} = \frac{X_{ij} / \sum_{j=1}^n X_{ij}}{\sum_{i=1}^m X_{ij} / \sum_{i=1}^m \sum_{j=1}^n X_{ij}} * 100 \quad (1)$$

where  $X_{ij}$  denotes the exports of sector  $i$  from country  $j$ ,  $n$  the number of considered countries and  $m$  the total number of sectors.

The values can be more or less than 100. Values greater than 100 show a country's export market share for a sector to be higher than the export market share for total trade, revealing the country's specialisation in exports for that sector. Therefore, that sector is competitive in the economic system of the country, with respect to other sectors. Values less than 100 indicate that a country is not specialised in that sector, and comparative advantage is not revealed.

The index depends on a number of factors: how widely a sector is defined, how reference countries are defined and how a market is defined <sup>(13)</sup>. Moreover, the total exports of a country influence the RCA values, as for the same export market share of a sector the RCA values may be lower or higher depending on the dimension of the export market share of total trade. To limit this problem, the RCA trends may be compared over a period <sup>(14)</sup>.

The RCA can be interpreted in three ways: dichotomous, ordinal and cardinal <sup>(4, 6)</sup>. In the first case RCA is utilised to assess the existence of comparative advantage in a sector, the second way is useful to rank countries or sectors based on RCA values, whereas the third interpretation is used to measure the dimension of RCA.

A different interpretation of comparative advantage is furnished by the Vollrath indices, which offer three alternative specifications of revealed comparative advantage <sup>(6)</sup>. They are relative export advantage (RXA), relative import advantage (RMA) and relative trade advantage (RTA), expressed as <sup>(4, 6, 20)</sup>:

$$RXA_{ij} = \frac{X_{ij} / X_{nj}}{X_{ir} / X_{nr}} \quad (2)$$

$$RMA_{ij} = \frac{M_{ij} / M_{nj}}{M_{ir} / M_{nr}} \quad (3)$$

$$RTA_{ij} = RXA_{ij} - RMA_{ij} \quad (4)$$

where  $X$  are the exports and  $M$  are the imports of sector (or product)  $i$  of country  $j$ ,  $n$  is the rest of products and  $r$  the rest of the countries.

The major difference between the Balassa index and the Vollrath indices is that the second ones eliminate country and product double-counting <sup>(4, 6)</sup>. Moreover, the Vollrath indices may consider all traded goods and all

countries, rather than sub-groups, referring to global trade intensity <sup>(4)</sup>. Nevertheless, the Vollrath indices utilised in our analysis consider a set of countries, i.e. the European countries.

The RXA index underlines a comparative advantage when it is greater than 1 and comparative disadvantage when the values are between 0 and 1. The values of the RMA index may also be less or greater than 1. The values of RTA may be positive in the case of comparative advantage or negative in the opposite case.

Actually, there is another index formulated by Vollrath, namely revealed competitiveness (RC), which is the difference between RXA and RMA in logarithmic form. The results of this index become symmetric through the origin, but there are some limitations, as the application of this index is limited when either export or import is zero, and it is also very sensitive to small values of exports and imports <sup>(4, 6)</sup>.

### 2.3. Trade balance indices

To consider the role of exports and imports in the assessment of competitiveness, we analysed the net export index (NEI), an index that takes into account the exports of a sector, or product, of a country minus the imports, divided by the total value of trade that is the addition of exports and imports. The index is expressed as:

$$NEI_{ij} = \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}} \quad (5)$$

where  $X$  are the exports and  $M$  are the imports of a sector (or product)  $i$  of country  $j$ .

The values are included between -1, for imports only, and +1, for exports only. In case of equality of imports and exports the value is zero. Pitts and Lagnevik underline that “the net export index does not take account of the overall level of trade in a commodity. Only the relative value of exports and imports for the individual commodity are taken into account. A country, which is relatively self sufficient, with a small exportable surplus and no imports, would have a NEI of 100 and thus appear to be extremely competitive even though it hardly trades at all” <sup>(14)</sup>.

Lastly, it is interesting to understand the kind of trade which characterises the prepared swine meat sector, if such trade is inter-industry or intra-industry. The former concerns the international trade of unrelated goods, so such trade provides the country with products it lacks. Instead intra-industry trade is founded on product differentiation: a country provides the other countries with goods in which it specialises; intra-industry trade is associated with markets where companies produce differentiated products that are close substitutes <sup>(6, 16)</sup>.

The widely used index to assess the entity of intra-industry trade is the Gröbel- Lloyd index, expressed as:

$$GL_i = 1 - \left( \frac{|X_i - M_i|}{X_i + M_i} \right) \quad (6)$$



The values range from zero to 1: if the index is next to zero the trade consists only of imports or exports, so there is inter-sector trade, whereas if the index approaches 1 exports equal imports and we find intra-industry trade <sup>(17)</sup>. To classify the trade as intra or inter-industry, it is very important to determine a cut-off value of the index; Qasmi and Fausti propose a classification in four groups <sup>(16)</sup>:

- $0.00 < GL \leq 0.25$ : strong inter-industry trade tendencies;
- $0.25 < GL \leq 0.50$ : weak inter-industry trade tendencies;
- $0.50 < GL \leq 0.75$ : weak intra-industry trade tendencies;
- $0.75 < GL \leq 1.00$ : strong intra-industry tendencies.

#### **2.4. The source of data**

The data source for this study is the database of Eurostat. The figures for exports and imports of prepared swine meats are collected for each European country (Belgium and Luxembourg are combined), defining prepared swine meats as codes of the Combined Nomenclature (8 digits). The 17 products forming the prepared swine meat sector are summarised in table 1. Unfortunately, these trade data do not permit the distinguishing of one PDO-PGI product from another.

We considered only intra-EU trade flows as the analysis addresses the assessment of the relative competitive performance of member states in the EU market. No consideration is given to the position of the extra-European countries in the EU market or to extra-EU trade. The collected data are for the 1990 to 2003 period.

### **3. Results**

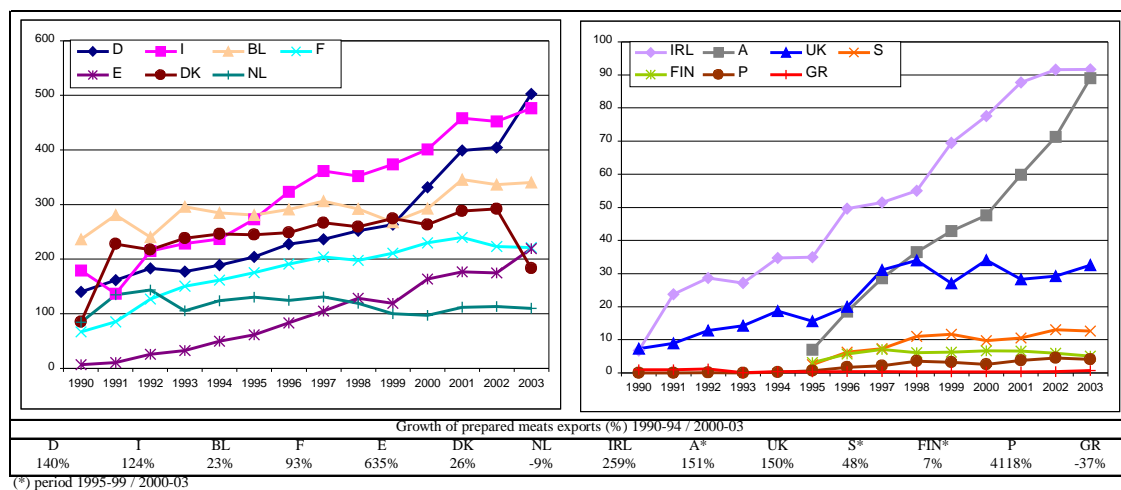
#### **3.1. The market share analysis**

The global increase in intra-EU exports of the prepared swine meat sector is valued at 90% for the period 1990-94 / 2000-03. The countries with high export values are Germany, Italy, Belgium-Luxembourg, France, Spain, Denmark and the Netherlands, all of which have values of more than 100 million Euro in 2003 (figure 1). Indeed, Germany and Italy show the best positions with 502 million Euro and 476 million Euro, respectively, and the growth of both is more than the EU average.

**Table 1.** Product codes and names in the prepared swine meat sector

02090019	Dried or smoked subcutaneous pig fat
02101131	Swine hams and cuts thereof dried or smoked with bone in
02101139	Swine shoulders and cuts thereof dried or smoked with bone in
02101219	Bellies "strekty" and cuts thereof domestic swine dried or smoked
02101970	Swine loins and cuts thereof dried or smoked
02101981	Dried or smoked boneless swine meat (excl.bellies and cuts thereof)
02101989	Other dried or smoked swine meat with bone in
16010010	Liver sausages and similar products
16010091	Uncooked sausages of meat offal or blood (excl.liver)
16010099	Sausages and similar products of meat offal or blood (excl.liver sausages and uncooked sausages)
16024110	Hams and cuts thereof of swine prepared or preserved
16024210	Prepared or preserved shoulders and cuts thereof of swine
16024911	Prepared or preserved swine loins and parts thereof (incl.mixtures of loins or hams, excl.collars)
16024913	Prepared or preserved swine collars and parts thereof (incl.mixtures of collars and shoulders)
16024915	Prepared or preserved mixtures of swine hams, shoulders, loins, collars and parts thereof
16024919	Other prepared or preserved meats or offal
16024930+16024950	Other preparations of meats and offal

Source: Eurostat



**Figure 1.** Trend of prepared meats exports (million €)  
Source: own calculations based on Eurostat database

It is interesting to underline that Spain increased its exports from 6.5 in 1990 to 219.5 million Euro in 2003. On the contrary, the Netherlands decreased its exports (-9%), whereas Belgium- Luxembourg and Denmark grew less than the European average.

In the countries with low export values increasing trends can be noted, except for Greece. Very high growth is found in Portugal (4118%), Ireland (259%), Austria (151%), and the United Kingdom (150%).

Focusing on the dimension of the trading positions, the countries with the major export market shares (EMS) in 2000- 03 are Italy (20.6%), Germany (18.8%), Belgium- Luxembourg (15.2%), Denmark (11.9%), and France (10.6%), which represent 77% of total exports of the sector (table 2).

**Table 2.** Export and import market shares of EU countries in the prepared meat sector  
(% - average values)

	1990-1994		1995-1999		2000-2003		Var.% 90-94 / 00-03		Var. % 95-99 / 00-03	
	EMS	IMS	EMS	IMS	EMS	IMS	EMS	IMS	EMS	IMS
France	10.1	23.6	11.8	19.4	10.6	17.9	4.4	-23.9	-10.7	-7.5
Belgium-Luxembourg	24.0	7.9	17.5	10.9	15.2	13.1	-36.8	66.2	-13.3	20.0
Netherlands	10.5	9.1	7.4	8.5	5.0	8.0	-52.5	-11.9	-32.4	-5.6
Germany	15.1	25.1	14.3	22.8	18.8	18.1	24.3	-27.7	31.6	-20.3
Italy	17.7	4.5	20.3	4.0	20.6	3.9	16.6	-14.3	1.6	-3.6
United Kingdom	1.1	22.7	1.5	18.7	1.4	19.7	35.4	-13.3	-5.3	5.4
Ireland	2.0	1.1	3.1	1.5	4.0	2.3	97.2	117.8	28.8	56.2
Denmark	17.4	1.2	15.7	2.0	11.9	2.8	-31.5	146.0	-24.0	42.0
Greece	0.1	2.2	0.0	1.6	0.0	1.5	-69.8	-32.9	-1.0	-5.2
Portugal	0.0	0.8	0.1	1.8	0.2	2.6	2271.0	232.6	30.0	43.0
Spain	2.0	2.0	5.9	2.8	8.5	3.2	315.3	61.2	42.8	14.7
Sweden	-	-	0.5	3.0	0.5	3.3	-	-	15.7	8.4
Finland	-	-	0.3	0.5	0.3	0.5	-	-	-16.5	5.3
Austria	-	-	1.6	2.6	3.1	3.0	-	-	96.1	17.5
EU	100.0	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0

Source: own calculations based on Eurostat database

Among these countries only Italy and Denmark have small import market share (IMS), so they appear export oriented for the products analysed, but Denmark shows negative dynamics over the last fifteen years due to the growth in IMS and decrease in EMS.

The other countries (with high EMS) show high IMS values, so they are also big importers in the sector. Germany, in particular, shows good performance, with an increase in EMS and a decrease in IMS for the considered period.

Moreover, very good performance, though the EMS are not so high, is noted in Austria, Spain and Ireland, due to a big increase of EMS (96.1%, 42.8% and 28.8% from 1995- 99 to 2000- 03, respectively).

### 3.2. The comparative advantage analysis

An analysis of the revealed comparative advantage index (RCA) and Vollrath indices (RXA, RMA and RTA) outlined the trading specialisation of the EU countries in the prepared swine meat sector.

According to the RCA values, the most specialised countries are Denmark, Italy, Spain, Belgium- Luxembourg and Ireland, which have values of more than 100 for the average of 2000- 2003 (table 3). The strong position of Italy is confirmed, as is that of Spain and Ireland which, over the last fifteen years, have improved their competitive position very much. Instead, Denmark and Belgium- Luxembourg show a loss of competitiveness, revealed by the decreased RCA values (-32% and -36% respectively from 1990 to 2003).

It is interesting to note that Germany is characterised by remarkable growth in RCA (39%), in accordance with the export trend, even though it appears not to be specialised in this sector as the RCA values are less than 100; this fact may be explained by the influence of the high value of total exports on RCA.

Among the other countries with an RCA less than 100, Austria has high competitive performance (80%), reaching an RCA value close to 100, France presents positive dynamics, particularly in 1990s, but the Netherlands show a decreasing trend.

**Table 3.** RCA of EU countries in the prepared meat sector (average values)

	1990-1994	1995-1999	2000-2003	Var. % 90-94 / 00-03	Var. % 95-99 / 00-03
France	60	83	77	29.6	-7.1
Belgium-Luxembourg	222	176	142	-35.9	-19.5
Netherlands	88	62	40	-54.9	-36.3
Germany	61	65	85	39.0	31.0
Italy	153	203	227	48.7	12.0
United Kingdom	9	14	14	51.8	0.0
Ireland	86	109	116	34.6	6.1
Denmark	723	639	492	-31.9	-23.0
Greece	11	5	6	-42.0	33.4
Portugal	0	9	13	2,488.1	37.4
Spain	39	111	147	272.1	31.7
Sweden	-	13	18	-	34.7
Finland	-	20	17	-	-13.7
Austria	-	55	98	-	80.1

Source: own calculations based on Eurostat database

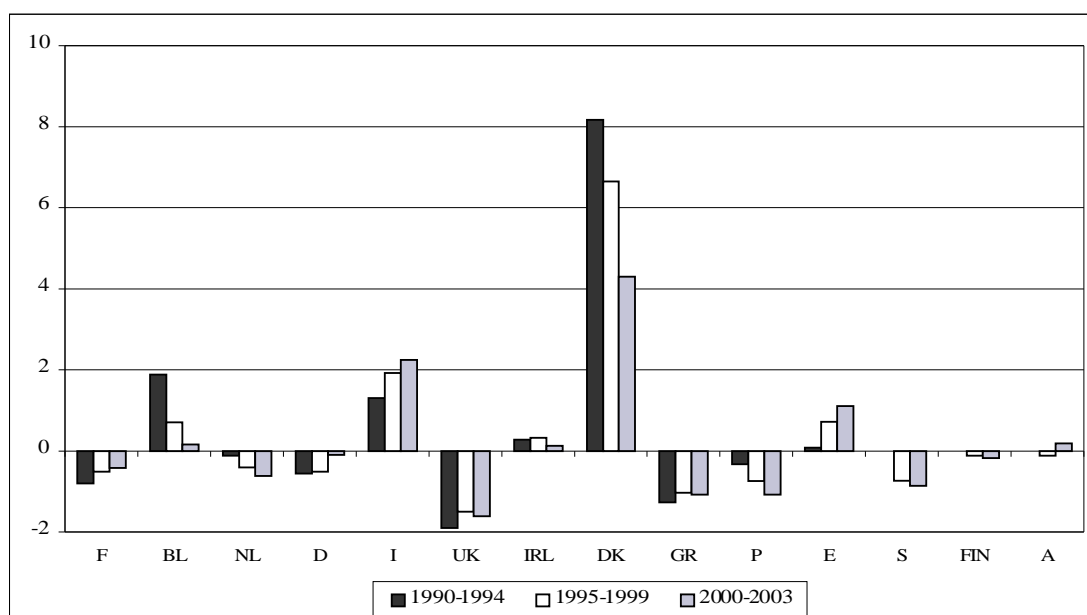
Considering the Vollrath indices, the relative export advantage index (RXA) confirms the results found with RCA, both in the absolute values and the dynamics over the analysed period (table 4). A peculiar case is represented by Austria, which shows an RXA value equal to one, denoting a trading specialisation in the sector, with high growth (82%) in the 1995- 2003 period; in this case the difference between RCA and RXA is due to the elimination of “double counting”.

**Table 4.** Relative export and import advantage of EU countries in the prepared meats sector (average values)

	1990-1994		1995-1999		2000-2003		Var.% 90-94 / 00-03		Var. % 95-99 / 00-03	
	RXA	RMA	RXA	RMA	RXA	RMA	RXA	RMA	RXA	RMA
France	0.6	1.4	0.8	1.3	0.7	1.2	35.1	-13.9	-7.8	-11.3
Belgium-Luxembourg	2.6	0.7	1.9	1.2	1.5	1.3	-43.1	80.3	-22.6	8.9
Netherlands	0.9	1.0	0.6	1.0	0.4	1.0	-58.0	-0.3	-38.6	-1.2
Germany	0.5	1.1	0.6	1.1	0.8	0.9	50.7	-17.5	38.4	-17.7
Italy	1.7	0.4	2.3	0.4	2.6	0.4	57.6	2.9	13.5	-2.6
United Kingdom	0.1	2.0	0.1	1.6	0.1	1.7	54.6	-12.9	0.6	6.7
Ireland	0.9	0.6	1.1	0.8	1.2	1.0	35.6	75.4	6.4	32.8
Denmark	8.7	0.6	7.5	0.8	5.5	1.2	-36.8	119.5	-26.1	51.8
Greece	0.1	1.4	0.0	1.1	0.1	1.2	-41.9	-16.8	33.6	6.3
Portugal	0.0	0.3	0.1	0.8	0.1	1.2	2,496.9	257.8	37.6	44.9
Spain	0.4	0.3	1.1	0.4	1.5	0.4	294.3	32.7	34.6	-2.1
Sweden	-	-	0.1	0.9	0.2	1.0	-	-	35.4	20.7
Finland	-	-	0.2	0.3	0.2	0.3	-	-	-13.7	7.0
Austria	-	-	0.5	0.7	1.0	0.8	-	-	82.1	21.8

Source: own calculations based on Eurostat database

The relative import advantage index (RMA) shows that most European countries have RMA values of more than one (table 4). The highest value is observed in the United Kingdom, which represents the major importing country in this sector, as demonstrated by the IMS value. On the contrary, low RMA values are found in Italy, Spain and Austria. Analysing the results of these indices in the relative trade advantage index (RTA), we can see competitiveness gain in Italy and Spain, confirming their strong export vocation in the prepared swine meat sector (figure 2). On the other hand, there is a loss of competitiveness in Denmark and Belgium-Luxembourg. Moreover, Austria passes from negative to positive RTA values, though the figures are still low, and Germany almost reaches equality in RXA and RMA. The lowest RTA value is found in United Kingdom.



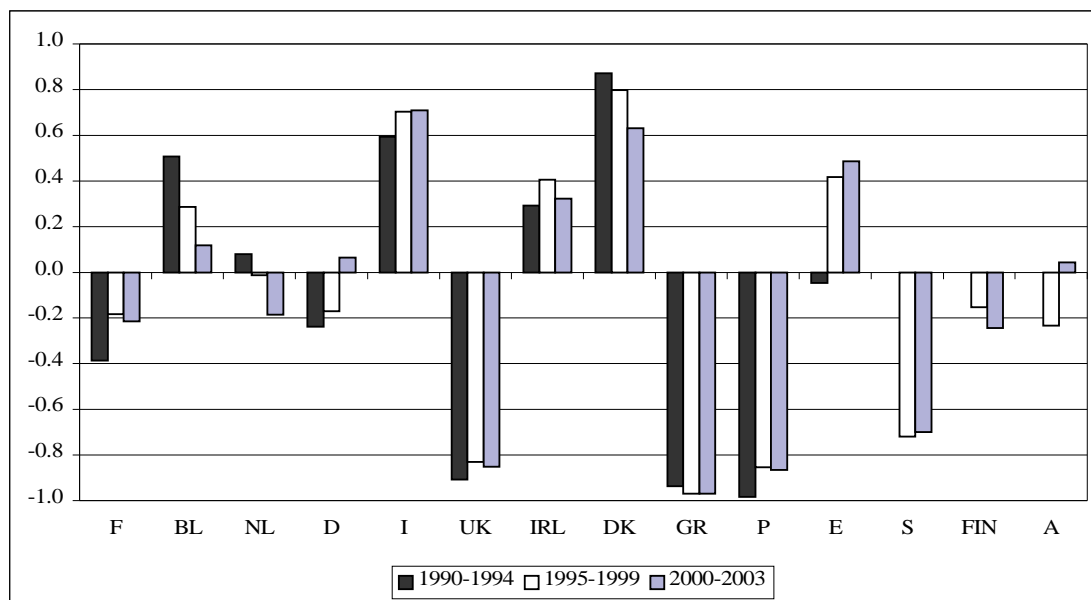
**Figure 2.** Relative trade advantage (RTA) of EU countries in the prepared meats (average values)

Source: own calculations based on Eurostat database

### 3.3. The trade balance analysis

Considering the net export index (NEI), it is possible to underline that the countries with positive values in 2000-03 are Italy, Denmark, Spain, Ireland, Belgium-Luxembourg, Germany and Austria (figure 3). The performances of these countries over the last fifteen years confirm the results presented earlier: Italy, Spain and Ireland show positive NEI dynamics; there is a shift from negative to positive values in Germany and Austria while Belgium-Luxembourg and Denmark are revealed to have negative dynamics.

The countries with strong negative values are Greece, Portugal, the United Kingdom and Sweden, where the variation during the analysed period is not significant. Finland, France and the Netherlands present NEI values close to -0.2, but in dynamic terms France improves its performance, whereas the Netherlands shows a change from positive to negative values.



**Figure 3.** Net export index (NEI) of prepared meats trade in the EU countries (average values)

Source: own calculations based on Eurostat database

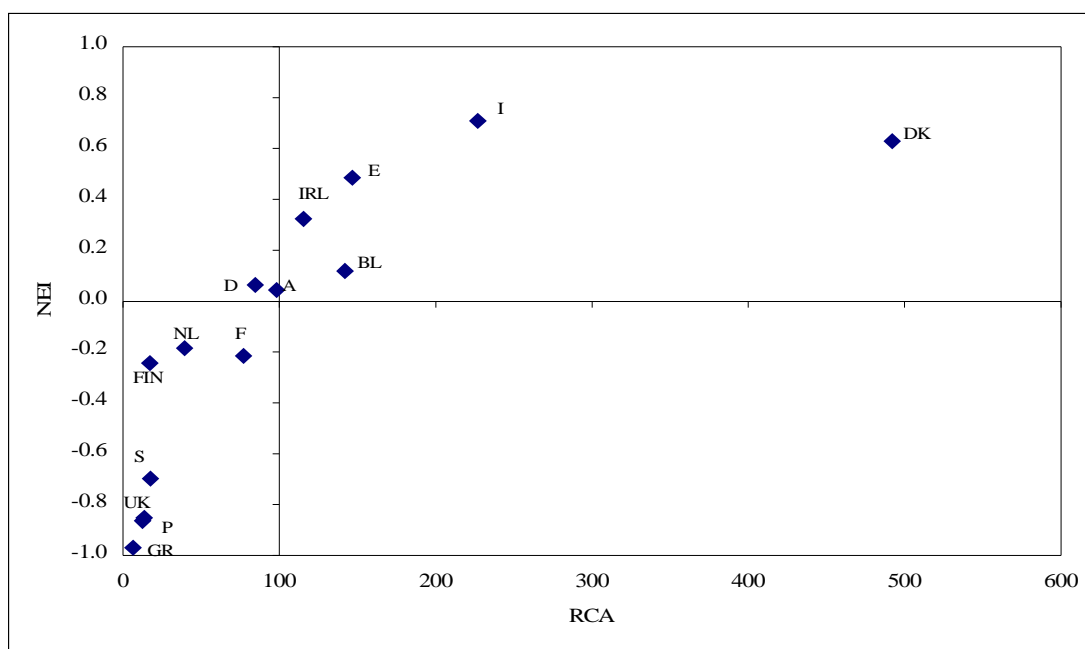
Figure 4 shows a statical analysis of NEI and RCA for the average values of 2000-2003. The axes are shifted to the zero NEI value and a RCA value of 100. Four areas become evident:

- the first one has countries with positive NEI and RCA more than 100: they are Denmark, Italy, Spain, Ireland and Belgium-Luxembourg, which are competitive and specialised in the prepared swine meat sector;
- the second one, characterised by negative NEI and RCA more than 100, contains no countries;
- the third one has countries with negative NEI and RCA less than 100, such as France, the Netherlands, Finland, Sweden, United Kingdom, Portugal and Greece: they are not competitive and not specialised in this sector;
- the fourth one contains Germany and Austria, which have positive NEI and RCA less than 100, so they have good export flows but are not specialised. In any case they are close to the axis origins and, as we saw before, their trends increase in the analysed period.

With regard to the Grùbel- Lloyd index (GL) Italy and Denmark, which have positive NEI, show GL values less than 0.5 in 2000- 2003, denoting the inter- industry trade situation in relation to the comparative advantage theory (table 5). The dynamics during the analysed period outline an enforcement of this situation for Italy due to export growth, whereas the opposite happens for Denmark.

A particular case is Spain which has GL values of 0.51 in 2000- 03, so its trade is weak intra- industry, but the trend is decreased approaching the previous countries.

Low GL values in 2000- 2003 are observed in the United Kingdom, Portugal, Sweden and Greece, but in this case the trading flows are represented only by imports.



**Figure 4.** Relation between RCA and NEI for prepared meat trade in the EU – average 2000- 2003

Source: own calculations based on Eurostat database

**Table 5.** Grùbel- Lloyd index of prepared meats sector in the EU countries

	1990-1994	1995-1999	2000-2003	Var. % 90-94/ 00-03	Var. % 95-99/ 00-03
France	0.61	0.82	0.78	27.8	-3.9
Belgium-Luxembourg	0.49	0.71	0.88	78.8	23.5
Netherlands	0.91	0.96	0.81	-10.5	-15.2
Germany	0.76	0.83	0.91	19.2	9.5
Italy	0.41	0.30	0.29	-28.3	-2.1
United Kingdom	0.09	0.17	0.15	60.4	-12.3
Ireland	0.64	0.59	0.68	5.8	13.9
Denmark	0.13	0.20	0.37	186.4	83.2
Greece	0.06	0.03	0.03	-50.6	-1.1
Portugal	0.02	0.15	0.13	662.4	-7.2
Spain	0.77	0.58	0.51	-33.3	-12.0
Sweden	-	0.28	0.30	-	7.4
Finland	-	0.85	0.76	-	-10.6
Austria	-	0.77	0.94	-	23.0

Source: own calculations based on Eurostat database

The other countries are characterised by intra- industry trade ( $GL > 0.5$ ), so are specialised in some products within the sector and they exchange these with other substitutes. In 2000- 2003, within this group, positive NEI values are found for Belgium- Luxembourg, Germany, Ireland and Austria, whereas France, the Netherlands and Finland have negative NEI values.

### 3.4. Specialisation in the prepared meat sub- sectors

To analyse the trading specialisation in the prepared swine meat sub- sectors we chose EU country samples with the best EMS and RCA. We calculated the percentage incidence of the prepared swine meat sub- sector exports on the total sector exports and the RCA for 2003 (table 6). It must be pointed out here that there are differences among the countries in the kinds of products exported. Mediterranean countries like Italy and Spain are highly specialised in dried or smoked boneless hams and salami, products that are linked very closely to national food traditions and specific to geographic areas, several products being classified PDO and PGI.

The exports of France include salami, prepared hams, sausages, and other preparations of meats, so the specialisation level within the sector is less developed than in Italy and Spain. Instead, Germany and Austria are specialised in sausages, with an incidence of 33.7% and 42.9%, respectively.

The exports of Ireland are concentrated in the prepared hams sub- sector, whereas Denmark and Belgium- Luxembourg are not so much specialised and the percentages are distributed at a similar level in the various sub- sectors.

**Table 6.** Incidence of exports (%) and RCA of prepared meat sub- sectors in the major EU exporting and specialised countries - 2003



		F		H		D		I		DK		E		IRL		A	
		Inc.%	RCA	Inc.%	RCA	Inc.%	RCA	Inc.%	RCA	Inc.%	RCA	Inc.%	RCA	Inc.%	RCA	Inc.%	RCA
Died or smoked products	Subcutaneous pig fat	0.3	402	00	97	00	37	00	4	0.0	0	01	295	0.0	0	00	23
	Swine skins with bone	2.3	56	33	153	00	1	61	486	0.0	1	60	325	0.0	1	64	26
	Swine skins with bone	0.0	10	00	8	00	97	00	0	0.0	0	01	605	0.0	0	00	9
	Bacon 'Streak' of domestic swine	4.1	100	62	280	20	66	29	226	0.2	23	34	181	0.0	2	07	27
	Swine skins	0.4	27	25	325	08	78	00	4	4.3	1360	00	6	0.0	0	06	67
	Breasthans	9.5	31	14	89	12	54	57	561	11.5	171	36	255	0.0	0	12	63
	Other swine not with bone	0.0	13	05	507	00	0	00	21	0.0	0	05	597	0.0	0	00	0
Sausages	Liver sausages	0.1	12	07	178	13	238	00	15	0.1	53	00	13	0.7	172	06	14
	Salami	32.0	126	14	85	18	97	182	232	19.4	353	28	244	3.7	26	17	11
	Sausages and similar products	15.1	53	14	94	33	156	95	107	10.9	175	14	111	12.6	79	42	24
Prepared or preserved	Ham of swine	17.7	91	19	185	15	105	72	119	14.8	350	51	58	44.9	412	10	86
	Smoked swine	0.6	19	64	360	16	65	02	20	5.6	770	09	60	9.1	484	01	5
	Swine skins	0.2	20	02	27	14	152	03	81	0.8	292	04	71	4.9	728	20	27
	Swine claws	0.1	42	01	167	03	303	00	13	0.0	18	00	1	0.0	0	01	12
	Mixtures	0.2	26	03	52	00	6	01	40	0.0	0	01	21	8.6	1673	01	13
	Other meats or offal	6.1	77	36	86	34	58	14	56	21.4	244	35	98	12.4	278	62	12
	Other preparations of meats and offal	11.2	98	16	266	91	106	04	12	11.1	445	11	22	3.2	50	10	14
Repackings	100.0	72	100	134	100	95	100	23	100	0329	100	157	100	0128	100	11	

Source: own calculations based on Eurostat database

#### 4. The application of cluster analysis

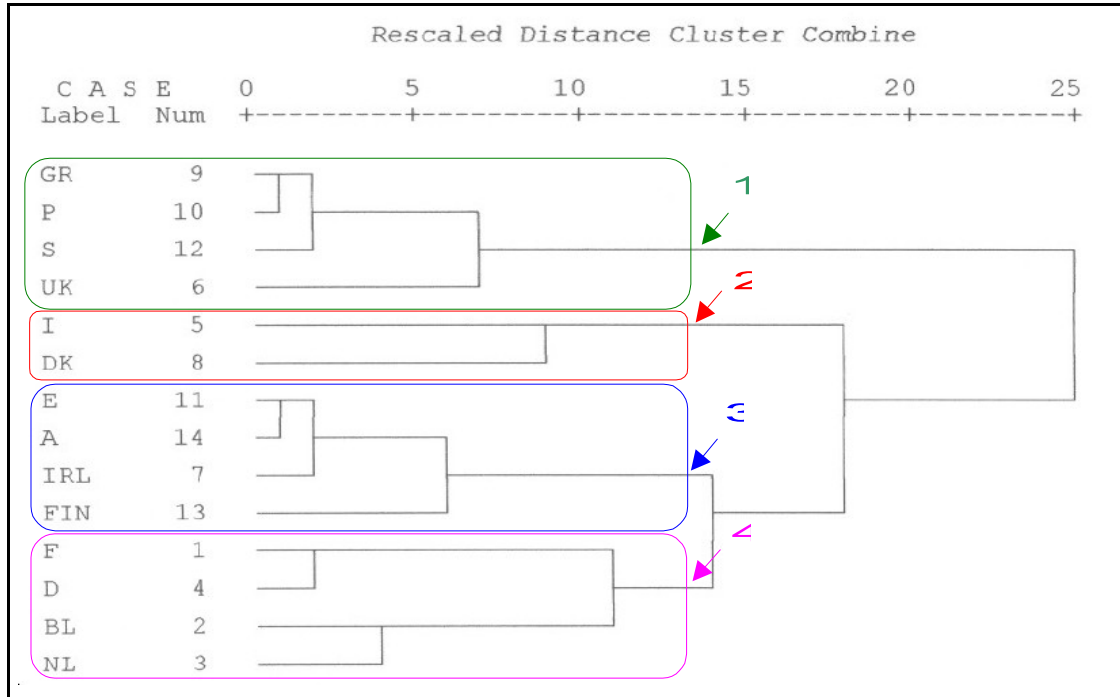
Cluster analysis is an exploratory data analysis tool which encompasses several algorithms and methods for joining cases of similar type into respective clusters <sup>(7)</sup>. In our work we applied hierarchical analysis, which aims to group cases into successively larger clusters, using a measure of distance. The result of this kind of clustering is the hierarchical tree (dendrogram): at the beginning, each case is classified by itself; then, step by step, more and more cases are linked together in larger clusters of increasingly dissimilar elements; in the last step, all the cases are in the same cluster.

This method uses the distances between cases as principles for grouping items and a linkage rule to determine when two clusters are sufficiently similar to be linked together. In our case we chose the Minkowski distance as the criteria for grouping cases and the Ward method as the linkage rule.

The cases examined are fourteen European countries (Belgium and Luxembourg are connected), whereas the variables are represented by the average values for 1990-2003 of the indices of competitiveness considered in our analysis, and dummy variables indicating the trends.

The dendrogram allows the identification of four clusters (figure 5).

- 1) The first one includes Greece, Portugal, Sweden and United Kingdom, which are not specialised in the prepared swine meat sector (RCA<100), and have a low level of competitiveness due to small RXA values and negative RTA and NEI values. These countries are big importers of prepared meats, in fact they reveal strong inter-industry trade.



**Figure 5.** Dendrogram using Ward method and Minkowski distance  
 Source: own calculations made with SPSS statistical package

- 2) In the second cluster we find the most competitive countries Italy and Denmark, which are really export oriented in the prepared meat sector; they have high EMS values and small IMS values. Moreover the kind of trade is inter- industry, so in this case it consists especially of exports. The good competitive position is underlined also by the major RCA value, more than 100, and positive values of RXA, RTA and NEI. It must be pointed out that the performance over the analysed period worsened for Denmark and improved for Italy.
- 3) In the third cluster we have Ireland, Spain, Austria and Finland. They are in an intermediate position because their index values are not very high, but are growing over the analysed period. Spain, Ireland and Austria, especially, showed the best competitive performance in the EU over the years, with a big growth in their indices as a result of the increase in exports. They are also specialised in the sector, with, in fact, an RXA of more than 1.
- 4) The fourth cluster consists of France, the Netherlands, Belgium-Luxembourg and Germany. They are not very specialised in the prepared meats sector ( $RCA < 100$  for three of them) and do not have a real comparative advantage because the RTA values are very low, but they do have good EMS and RXA, these being close to 1. So they are big exporters, but also have big import volumes (NEI close to zero), in fact they have high IMS. Moreover they make strong intra-

industry trade, exchanging substitute products with the other countries.

## **5. Concluding remarks**

In the context of the important modifications that have occurred in the competitive features of the European food market over the last fifteen years, the analysis has shown considerable changes in the degree of competitiveness of the EU-15 countries, for the prepared swine meat sector, during the 1990- 2003 period.

The countries which present the best competitive performance and reach high levels of competitiveness are Italy, Spain, Ireland and Austria. They appear specialised in exports for this sector, revealing comparative advantage, and show positive values of net export index in 2000-03. Nevertheless, the kind of trade is inter- industry in the case of Italy, a country that is really export oriented, weak intra- industry in Spain, and intra- industry in Ireland and Austria. Moreover, considerable export market shares are observed in Italy and Spain.

Good competitive performance is also revealed in Germany and France, but these countries are not specialised in exports for the considered sector, even if market shares are high. The relative level of imports is also high, denoting a situation of intra- industry trade.

The opposite case is represented by Denmark, which is the country with the highest values of RCA, RXA, and RTA, but competitiveness has declined over the last fifteen years although its level is still high and the net export index is strongly positive, with inter- industry trade.

Negative competitive performance is observed also in Belgium- Luxembourg and the Netherlands, which present different degrees of specialisation in their exports: Belgium- Luxembourg shows high RCA values (and a considerable market share), whereas the Netherlands does not. Both reveal significant import flows which affect their intra- industry trade.

The last group is composed by the importing countries in the sector, namely Finland, Greece, Portugal, Sweden, and the United Kingdom. These countries present low values of RCA and a negative net export index. Some show an improvement in the index values, like Portugal and the United Kingdom, but the level of competitiveness remains very low considering that the United Kingdom is the major European importer for the analysed sector.

It is interesting to underline that traditional products and the PDO-PGI products may have influenced the dynamics of the competitiveness analysed. As mentioned earlier, it was not possible in our analysis to separate the exports of PDO-PGI products from the other exports, nevertheless we can suppose that this kind of product may have contributed to an improvement in the competitive performance of some countries. For example, in Italy, traditional and PDO-PGI products play a significant role in the exports of the considered sector. This fact underlines that, in general, the qualitative aspects of products are currently a considerable competitive factor within the analysed sector.

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