QUANTITATIVE ASPECTS OF ROMANIA'S EXPORTS BY DESTINATION AND THE CATEGORY OF EXPORTED GOODS

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Abstract
This paper aims at studying the statistical connections regarding the distribution of Romanian exports by destination country and the categories of exported goods.
Using the statistical method of the "factor analysis of correspondences", we included in our analysis two non-numerical variables, i.e. the countries where the goods are exported (from our country) and the categories of exported goods. Thus, we achieved statistical indicators calculated for line-points and column-points, and the graphical representation of these points in the system of factorial axes.

Keywords: Factor analysis of correspondences, exported goods, destination country.

JEL Classification: I20, C10, C38

Introduction

The statistical research on Romania's export value in EU countries, also by the categories of exported goods, according to the Combined Nomenclature, is based on the hypothesis that there are differences or similarities in terms of the export value between the exported goods and the country where these goods are exported.
Our study has the following objectives:

- identifying the structure of the export value by the country where the goods are exported and, at the same time, presenting the differences/ similarities in this respect, among the 27 countries where the goods are exported from Romania;
- identifying the structure of the export value by types of exported goods and the differences/ similarities between the 19 categories of exported goods;
- identifying the profile of the export value specific to each country where the goods are exported, by the categories of exported goods;
- identifying the profile of the export specific to each category of goods, by destination country.

The exports from Romania include free circulation goods, against payment or free of charge, leaving Romania's statistical territory, bound for another EU Member State.
The goods subject to international exchanges are classified according to the Combined Nomenclature (CN), which underpins the Community customs tariff. We focused our

research on EU member states because Romania's exports are carried out especially with European countries, representing 85.6% of the total export, of which the intra-Community trade with the 27 EU countries represents a share of 73.6% at export.

1. Methodology

The "factor analysis of correspondences" (FAC) is a descriptive method of data multivariate analysis that describes the connections between two nonnumeric (categorical) variables: the countries where our country is exporting goods and the categories of exported goods. The method highlights a factorial axis system that, based on a large data table, concentrates the initial information in a graphical form that can be readily interpreted. The graphical representation is carried out in a small Euclidean space (Spircu, 2005).

The axes are arranged downward, depending on their importance in explaining the total variance of the obtained point cloud (Pintilescu, 2007). The initial information contained in the table is concentrated in a system of factorial axes where there are projected the points represented by the categories of recorded variables. It aims at finding those unrelated orthogonal axes whereon the line point cloud and the column point cloud, respectively, will be projected. This aim is achieved by calculating the eigenvalues of the inertia matrix and the coordinates of the eigenvectors associated to each eigenvalue (Kachigan, 1982).

2. Data and results

The data used in the analysis are representative for the calendar year 2014 (which represents our reference period), the latest statistical data being processed, with finality, provided by the National Institute of Statistics of Romania (INS).

The data processing, the examination of the indicators' significance and the graphical representations were performed by means of the SPSS statistical software (Field, 2009).

After processing the data, we obtained the statistical indicators calculated for the line-points and the column-points, as well as the graphical representation of these points in the system of factorial axes. According to data contained in a correlation table of our country's exports, by destination country (where the goods are exported) and by the categories of exported goods, we can present their distribution by two representative graphs.

The values shown in the graph reveal that the top 10 destination countries for Romanian exports were: Germany (10,099 million Euros) with a share of 27% from total Romanian exports, Italy (6,242 million Euros) with a share of 17% from total Romanian exports, France (3,550 million Euros) with a share of 10%, Hungary (2,672 million Euros) with a share of 7%, UK (2,153 million Euros) with a share of 6%, Bulgaria (1,782 million Euros) with a share of 5%, Spain (1,393 million Euros) with a share of 4%, Netherlands (1,357 million Euros) with a share of 4%, Poland (1,316 million Euros) with a share of 4%, Austria (1,245 million Euros) with a share of 3%, the cumulative share of these countries being 87% of total exports among EU Member States.

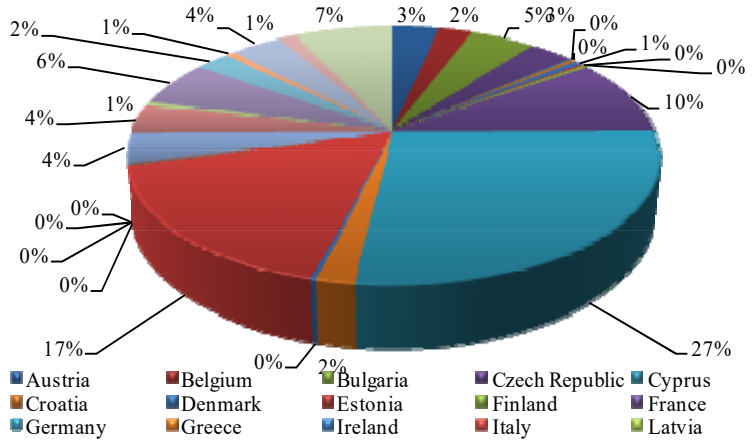

Figure no. 1: The share of exports by the country where the goods are exported
Source: Data provided by the National Institute of Statistics

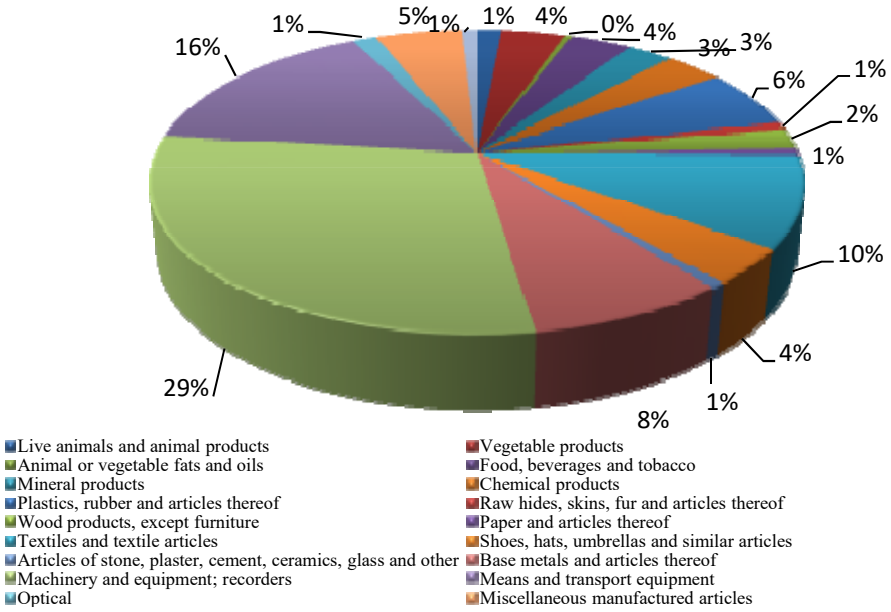

Figure no. 2: The share of exports by categories of exported goods
Source: Data provided by the National Institute of Statistics

Structurally, the distribution of exports per goods is as follows: the goods category "Vehicles, apparatus and electric equipment; recorders", amounting to 10,915 million Euros and representing a share of 29% from total exports, dominates Romania's portfolio for the export to EU countries. This category is followed by the categories "Transport

means and equipment", amounting to 5,858 million Euros and representing a share 16%; "Textiles and textile articles" amounting to 3,562 million Euros and representing a share of 10%; "Base metals and articles thereof" amounting to 3,146 million Euros and representing a share of 8%; "Plastics, rubber and articles thereof", amounting to 2,308 million Euros and representing a share of 6%; "Miscellaneous manufactured articles", amounting to 1,923 million Euros and representing a share of 5% etc.

In order to apply the factor analysis of correspondences, it is necessary to test the hypothesis of the independence of variables. This test is based on the value calculated for χ^2 statistics and it requires the formulation of the following statistical hypotheses:

- The null hypothesis, H_0: the hypothesis of independent variables (there is no connection between statistical variables);
- The alternative hypothesis, H_1: the hypothesis of dependent variables (there are connections between statistical variables) (Dimitrios, Stephen, 2011).

Table no. 1: The calculated value of χ^2 statistics, the eigenvalues and the inertia explained by each factorial axis (Summary output)

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.448	.201			.374	.374	.000	.009
2	.387	.150			.280	.654	.000	
3	.256	.066			.122	.776		
4	.176	.031			.058	.834		
5	.142	.020			.037	.871		
6	.133	.018			.033	.904		
7	.112	.013			.024	.927		
8	.097	.009			.017	.945		
9	.090	.008			.015	.960		
10	.086	.007			.014	.974		
11	.070	.005			.009	.983		
12	.057	.003			.006	.989		
13	.049	.002			.005	.993		
14	.037	.001			.003	.996		
15	.037	.001			.003	.999		
16	.020	.000			.001	.999		
17	.015	.000			.000	1.000		
18	.010	.000			.000	1.000		
Total		.536	20006559.284	.000[a]	1.000	1.000		

a. 468 degrees of freedom

Source: SPSS processing, based on data from the National Institute of Statistics

- The calculated value of test statistics, shown in Table no. 1, column Chi Square, is χ^2= 20006559.284, higher than the tabulated value $\chi^2_{0.05;468}$ (for the risk of 0.05 and v=468 degrees of freedom) or Sig. = 0.000 <0.05, which shows that H_0 hypothesis is rejected. Thus, with a probability of 95%, we can guarantee that, in terms of Romania's "export" value, there are connections between the variables considered, i.e. between the country where the goods are exported and the categories of exported goods. These connections will be described by the results achieved subsequent to the application of the factor

analysis of correspondences, for line-profiles and column-profiles, respectively.

- The highest eigenvalue (column *Inertia*) shows the variance of the first factorial axis and the sum of eigenvalues measures the total inertia of the point cloud.
- For the output shown in Table no. 1, the highest eigenvalue (column *Inertia*) is 0.201. The sum of eigenvalues is 0.536 (total variance). The inertia (variance) explained by each factorial axis is shown in the column *Proportion of Inertia*. The first factorial axis explains 37.4% of the total variance. The choice of the number of factorial axes is made, in FAC, according to Benzécri's criterion (Benzecri, 1992): we will choose those factorial axes that explain at least 70% of the total variance. In this situation, we will need 3 factorial axes that explain together 77.6% of the total variance.

For each category of variables, we will calculate the coordinates on factorial axes, the contributions of points to the inertia of an axis and the contributions of axes to the inertia of a point (no table 2) (Everitt, Dunn, 2001).

The coordinates of line-points on factorial axes show their position in the space represented by the axes. Considering the distribution "country where the goods are exported" and "categories of exported goods" (Table no. 2), the output *Overview Row Points* is as follows:

Table no 2. The results regarding LINE-points (the country where the goods are exported)

Overview Row Points[a]

Country	Mass	Score in Dimension		Inertia	Contribution				
		1	2		Of Point to Inertia of Dimension		Of Dimension to Inertia of Point		
					1	2	1	2	Total
Austria	.033	-.147	-.510	.021	.002	.022	.016	.163	.178
Belgium	.024	-.183	.248	.004	.002	.004	.080	.127	.207
Bulgaria	.048	1.965	.133	.088	.412	.002	.936	.004	.940
Czech Republic	.032	-.184	.600	.008	.002	.029	.057	.521	.578
Cyprus	.002	.804	-1.097	.006	.002	.005	.078	.125	.203
Croatia	.004	.992	-.330	.009	.008	.001	.182	.017	.199
Denmark	.006	.057	-.209	.003	.000	.001	.003	.031	.034
Estonia	.002	1.121	-.065	.010	.005	.000	.114	.000	.114
Finland	.004	-.405	.743	.003	.001	.005	.100	.292	.392
France	.095	-.385	.237	.016	.031	.014	.387	.126	.513
Germany	.271	-.418	.519	.057	.106	.188	.374	.497	.871
Greece	.020	2.287	.103	.051	.231	.001	.913	.002	.915
Ireland	.003	-.272	.069	.002	.000	.000	.041	.002	.044
Italy	.167	-.152	-1.267	.108	.009	.693	.016	.963	.979
Latvia	.001	-.029	-.717	.001	.000	.001	.000	.161	.161
Lithuania	.001	.539	-.513	.002	.001	.001	.072	.056	.129
Luxembourg	.000	-.002	-.889	.001	.000	.001	.000	.113	.113
Malta	.001	2.523	.405	.003	.010	.000	.663	.015	.678
Netherlands	.036	-.076	.062	.020	.000	.000	.005	.003	.007
Poland	.035	-.027	.207	.009	.000	.004	.001	.066	.067
Portugal	.005	.086	-.059	.018	.000	.000	.001	.000	.001
UK	.058	-.401	-.029	.017	.021	.000	.243	.001	.244
Slovakia	.025	.205	.096	.006	.002	.001	.073	.014	.087
Slovenia	.007	.037	.403	.002	.000	.003	.002	.184	.186

Spain	.037	-.031	-.117	.016	.000	.001	.001	.012	.013
Sweden	.013	-.292	.205	.013	.002	.001	.037	.016	.052
Hungary	.072	.973	.338	.041	.151	.021	.733	.077	.809
Active Total	1.000			.536	1.000	1.000			
a. Symmetrical normalization									

Source: SPSS processing, based on data from the National Institute of Statistics

By analyzing the values of the coordinates of the points on the factorial axes in Table 2, we highlighted the countries among which there are the greatest differences in terms of exported goods, namely between Bulgaria and Germany, Germany and Greece, Italy and Bulgaria and so on. These points will be situated at the ends of the graph and in different quadrants. Regarding the structure of exported goods, we notice similarities between Austria, Italy, UK, Spain, and between France, Germany, Finland, and Sweden.

Table no 3: The results regarding LINE-points (categories of exported goods) Overview Column Points[a]

Categories of exported goods	Mass	Score in Dimension		Inertia	Contribution				
		1	2		Of Point to Inertia of Dimension		Of Dimension to Inertia of Point		
					1	2	1	2	Total
Live animals and animal products	.015	1.555	-.138	.026	.078	.001	.611	.004	.615
Vegetable products	.038	.359	-.298	.059	.011	.009	.038	.023	.060
Animal or vegetable fats and oils	.004	1.577	.016	.007	.021	.000	.605	.000	.605
Food, beverages and tobacco	.036	.602	-1.253	.031	.029	.146	.188	.705	.892
Mineral products	.027	2.916	.548	.112	.515	.021	.920	.028	.948
Chemical products	.034	.808	.282	.020	.049	.007	.503	.053	.556
Plastics, rubber and items thereof	.062	.161	.199	.007	.004	.006	.104	.138	.242
Rawhides, tanned hides, fur and items thereof	.008	-.299	-1.940	.014	.002	.076	.023	.836	.859
Wood products, except furniture	.021	.205	-.542	.013	.002	.016	.032	.195	.227
Paper and items thereof	.007	1.237	.272	.007	.025	.001	.693	.029	.722
Textiles and textile items	.095	-.417	-.790	.045	.037	.154	.167	.518	.685
Shoes, hats, umbrellas and similar items	.038	-.236	-1.892	.065	.005	.347	.015	.806	.820
Articles of stone, plaster, cement, ceramics, glass and other	.006	.710	.149	.003	.007	.000	.450	.017	.467
Base metals and articles thereof	.084	.500	.017	.019	.047	.000	.491	.001	.491
Machinery, apparatuses and electric equipment; recorders	.293	-.308	.421	.043	.062	.134	.292	.473	.765
Transport means and equipment	.157	-.502	.391	.033	.088	.062	.537	.281	.818
Optical instruments and apparatuses	.014	-.175	.374	.006	.001	.005	.031	.121	.152
Miscellaneous goods and products	.052	-.373	.134	.012	.016	.002	.275	.031	.306
Other products unmentioned elsewhere	.008	.124	-.717	.016	.000	.011	.004	.104	.108
Active Total	1.000			.536	1.000	1.000			
a. Symmetrical normalization									

Source: SPSS processing, based on data from the National Institute of Statistics

By analyzing the values of the coordinates of the points on factorial axes, we highlighted the goods among which there are the greatest differences and similarities, respectively, in terms of the country where the goods are exported.
It is noteworthy that the greatest differences are recorded between the categories "Live animals and animal products", "Rawhides, tanned hides, fur and articles thereof" and so on. Similarities, rapprochements were highlighted between the categories "Rawhides, tanned hides, fur and articles thereof", "Textiles and textile items", "Shoes, hats, umbrellas and similar items" and between the categories "Mineral products", "Chemical products", "Paper and items thereof".

Conclusions

The graphical representation, which is actually a review of the previous results, allows viewing the position of the variables in the system of the factorial axes, identifying the direction and the intensity of the relationships between variables. The graphs highlight easier the position of variables in the system of factorial axes and identify the direction and the intensity of the connections between the analyzed variables.

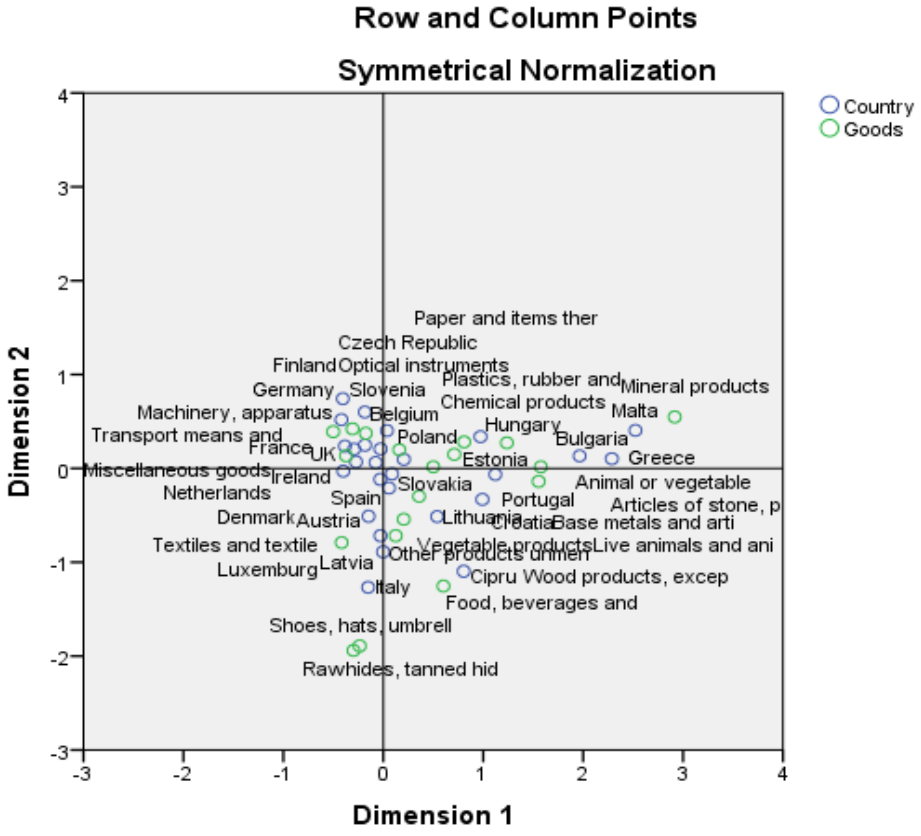

Figure no. 3: The graphical representation of the variables' position in the system of factorial axes using option Column Principal Normalization

We believe that using the FAC method in our study provided us the opportunity to formulate the following statements:

- With a probability of 95%, we found that, in terms of Romania's export value, there are connections between the variables considered, namely between the country where the goods are exported and the category of exported goods;
- We could identify the countries among which there are the greatest differences, in terms of the category of required goods;
- By analyzing the values of the coordinates of the points on factorial axes, we have identified the categories of goods among which there are the greatest differences at country level;
- We noticed that, by grouping the countries with a similar distribution (a similar structure), we achieved, in fact, a segmentation of the export market; this allowed us to identify the main segments of countries with similar structures, through which similar or identical promotion strategies can be devised for each segment.

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