

INSURANCE MARKET DEVELOPMENT BEFORE AND AFTER THE FINANCIAL CRISIS IN THE CONTEXT OF ETHICS AND CORRUPTION

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Abstract

The financial crisis can generate instability in any field. High levels of perceived corruption, unethical behavior or high unemployment rate can be several relevant examples that can influence well-being. The purpose of this study is to group and compare EU countries in two important moments: before and after the financial crisis using clusters analysis.

Our contributions consist in a new effort to understand the life insurance market. For example, in 2006 countries such as: Cyprus, Denmark, Estonia, Finland, Spain, Sweden or the UK were remarked by the lowest perceived corruption and inflation, medium levels of the population growth and highest: ethical behavior of firms, human development, penetration rate and employment, while Romania and other countries were characterized by the lowest levels of development and highest perceived corruption and inflation. In 2014, Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Lithuania, Luxembourg, Spain, Sweden or the UK recorded the best values of our indicators. In addition, the situation of Romania has not improved significantly between 2006 and 2014.

Keywords: Insurance, Ethical behavior, Human Development, Corruption, cluster.

JEL Classification: C38, G02, G22.

Introduction

Economic development is an extensive, complex and topical subject which involves improvements in a variety of factors. The financial crisis has engulfed the world and its effects continue to occur from market to market, while other old issues were not resolved in some countries. The authors started the present research from the assumption that it is unethical and immoral to characterize a country as developed without considering, for example, the level of corruption. Corruption “has a dampening effect on the efforts of any nation to achieve political and economic development” (Nwabuzor, 2005). On the other hand, it represents “the abuse of public trust for private gain” (Todaro and Smith, 2003), recently, Mureșan and Armean (2016) show that trust is an important component of business ethics in terms of value and intangible asset.

Insurance market offers a great contribution to economic development, in this line, Chen *et al.*, (2012) obtained findings to confirm this positive impact. In the context of globalization, the authors will try to group the EU countries using cluster analysis to observe similarities between them. As it can be seen, this paper provides information on the most important findings from previous studies (Section 2: Literature review) in addition to the methodology, results and conclusions (Section 3, 4 and 5).

2. Literature review

According to Tyron and Bailey (1970) “understanding our world requires conceptualizing the similarities and differences between the entities that compose it”. Moreover, the cluster analysis was developed in 1939 by Tyron a behavioral psychologist. This type of data analysis was used in insurance studies such as Hollenstein (2003) or De Allegri *et al.*, (2008).

Currently, the insurance market must adapt after the financial crisis. It is no secret that the lowest human development, unethical behavior, highest level of corruption can have a major impact on the life insurance market. Hence, began the idea of grouping and compare EU countries in two important moments: before and after the financial crisis.

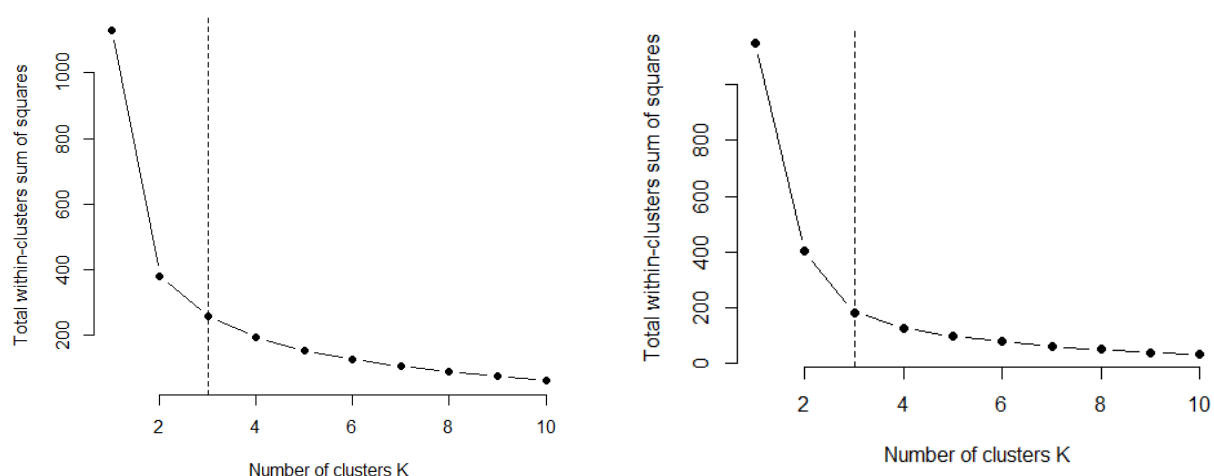
In a cross-sectional study, Outreville (1996) tested the relationship between financial development and the development of life, and used among others: insurance penetration, Human Development Index and population growth rate, Inflation. In the existing literature, there are studies that have found empirical evidence on the implications of inflation (Browne and Kim, 1993); Elango and Jones, 2011), corruption (Dragoș and Dragoș, 2013), employment rate (Mantis and Farmer, 1968, apud Zietz, 2003), population growth rate (Olayungbo and Akinlo, 2016).

3. Methodology and Dataset

The methodology used for the clustering is comprised of two K-means procedures for the years of 2006 and 2014. It focuses on the entire output of twenty-eight countries that form the European Union. The analysis was conducted by using the R v. 3.2.5 software, while the data used is presented as following; in accordance with the literature mentioned above. In order to present the conclusion in more approachable manner, a map comprising the cluster formation was created by using GeoDa (version 1.6.7). The authors have chosen to include variables such as:

- **Life insurance penetration** is a proxy for insurance development (source: Insurance Europe and fred.stlouisfed.org);
- **Ethical behavior of firms (EBF)** according to the World Economic Forum is the answer to the question: “In your country, how would you rate the corporate ethics of companies (ethical behavior in interactions with public officials, politicians and other firms)?”;
- **Corruption perceptions index (CPI)** measures the perceived levels of public sector corruption insured by Transparency International;
- **Human Development Index (HDI)** provided by United Nations Development Programme is “a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living”;
- **Employment rate** insured by The Organisation for Economic Co-operation and Development (OECD), studied by Mantis and Farmer (1968, apud Zietz, 2003);
- **Population growth rate** provided by Eurostat;
- **Inflation** measured by consumer price index (CPI) reachable from World Bank.

In order to establish the right number of clusters, three statistics were considered: the Pseudo F, Approximate Overall R^2 and the Cubic Clustering Criterion (CCC). The statistics underline that the best number of clusters is three, for both years considered, as stated by the *Figure no. 1*, via the CCC statistic. The largest drop between possible numbers of clusters is between the numbers two and three, as presented by the CCC. In addition, the same logic holds for the Overall R^2 and the Pseudo F. *Table no.1* presents the corresponding values of the latest two statistics for both years for k possible clusters. As it can be seen, the biggest drop is present between the numbers two and three for both statistics and both years. Therefore, the Pseudo R^2 and the Pseudo F underline the same aspect as the CCC; that the authors are indeed going to perform the K-means procedure knowing that three clusters are to be obtained.



Note: This figure reports the preliminary results of CCC statistic.

Source: own computations in R v. 3.2.5

Figure no. 1 – The results of the Cubic Clustering Criterion for the years 2006 (left) and 2014 (right)

The three statistics were obtained as following: $CCC = \ln \left[\frac{1-E[R^2]}{1-R^2} \right] * K$, with $E(R^2)$ being the expected R^2 and R^2 the observed R^2 , while K represents a transformation that stabilizes the variance.

$Pseudo F = \frac{(T-P_G)/(G-1)}{P_G/(N-G)}$, with T being the Total Sum of Squares, P_G – the within-group Sum of Squares, G – number of clusters and N – number of observations. While the latter would underline the fact that the larger its value would be, the better the clustering is, the former suggests that the best clustering is indicated by a larger difference from a uniform distribution.

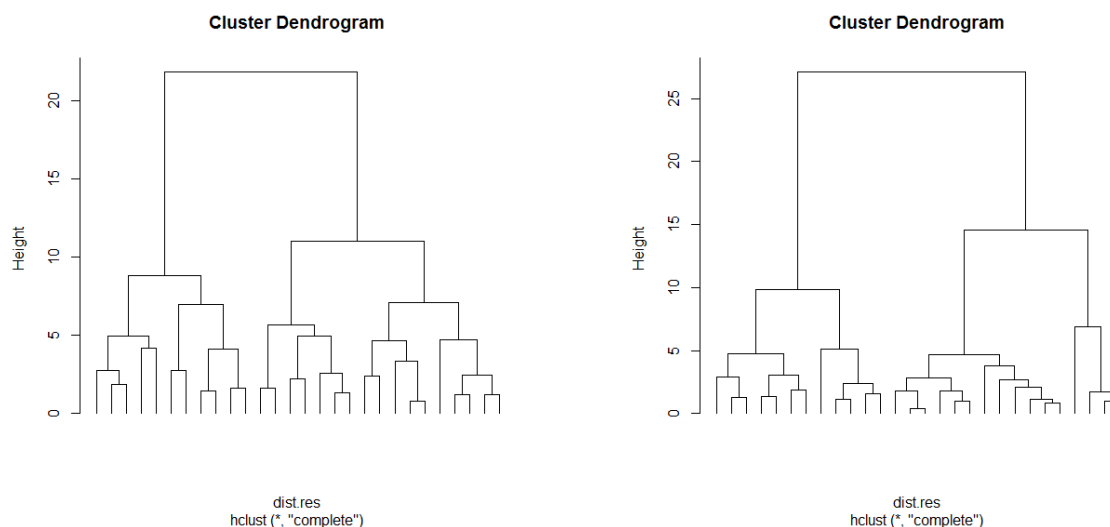
The Overall R^2 is represented by the between Sum of Squares/ Total Sum of Squares ratio.

Table no. 1

The results of Pseudo F and Approximate Overall R^2							
2006							
Cluster	2	3	4	5	6	7	8
Pseudo F	13.228	3.7280	1.9286	0.9125	0.5995	0.3939	0.2569
Approximate Overall R^2	0.6628	0.7703	0.8057	0.8630	0.8801	0.8988	0.9175
2014							
Cluster	2	3	4	5	6	7	8
Pseudo F	13.964	2.3571	1.2041	0.5893	0.3152	0.2829	0.1520
Approximate Overall R^2	0.6506	0.8413	0.8692	0.9070	0.9331	0.9252	0.9495

Source: own computations in R v. 3.2.5

As opposite to the previous three statistics used in order to determinate the number of clusters, it is emphasized by the dendrograms in the figure *Figure no. 2* that the optimal number of clusters is two. Although the dendrograms suggest that the appropriate number of clusters is two, three clusters will still be considered. An aspect that fosters this decision were also the considerations of Sarle (1983), that underlined the fact that the selection criteria do not impose the use of a certain number of clusters, and that the decision comes down to the researcher.



Note: This figure presents the Cluster Dendrograms.

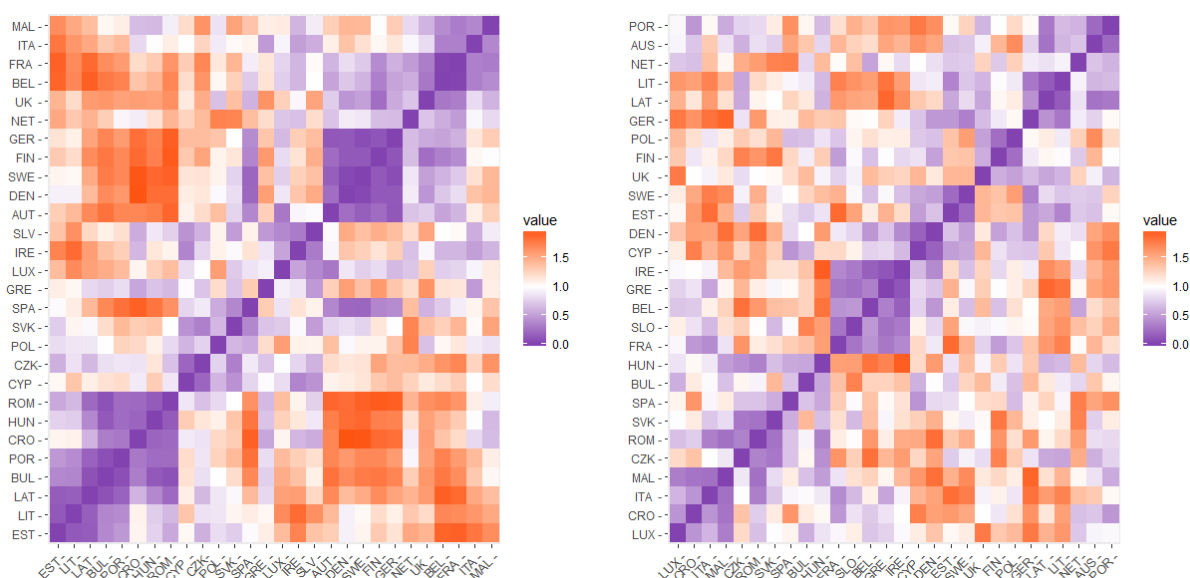
Source: own computations in R v. 3.2.5

Figure no. 2 – Cluster Dendrogram for the years 2006 (left) and 2014 (right)

4. Results

4.1. Distance analysis

In order to foster the clusters' formation, it is mandatory to measure the distance between each country in the sample. This way, the similarities and dissimilarities will be showcased and used onwards. The distances between the twenty-eight countries are displayed by the *Figure 3*.



Note: This figure reports the preliminary results of the distance between observations.

Source: own computations in R v. 3.2.5

Figure no. 3 – The distance between each country for the years 2006 (left) and 2014 (right)

As it can be seen in the *Figure no. 3*, the largest distance between observations is underlined by dark orange, while the lowest distance is presented by dark purple. For instance, for the year 2006 it can be seen that Estonia is placed the furthest from countries such as Belgium or France, therefore it is highly unlikely that this Baltic state would be in a cluster comprised by itself and one of the two. A medium distance is displayed between the same state and countries such as Cyprus or Denmark, while it is the closest to its Baltic neighbors – Latvia and Lithuania. Therefore, it is expected that Estonia would be included in a cluster that would include at least one of the four aforementioned countries.

Similarly, for the year 2014, Italy seems to be closer to countries such as Croatia, France, Malta or Slovenia, while being at considerable distances from the Baltic countries or Germany. As such, it is highly unlikely that it would form a cluster with some of the latter, while sharing more similarities with the former group.

4.2. Formation of clusters

For the year 2006, the K-means procedure returns three clusters of sizes eleven, ten and seven countries, respectively. *Table no. 2* presents several characteristics of each cluster for the year 2006, in addition to their composition.

Table no. 2.

The components of cluster analysis for the year 2006

Cluster 1: Belgium, Bulgaria, Croatia, France, Greece, Hungary, Italy, Malta, Netherlands, Portugal, Romania
Lowest human development, ethical behavior of firms, population growth and employment rate; Medium levels of the life insurance penetration rate; Highest levels of inflation and perceived corruption;
Cluster 2: Austria, Czech Republic, Germany, Ireland, Latvia, Lithuania, Luxembourg, Poland, Slovakia, Slovenia
Lowest levels of the life insurance penetration rate; Medium levels of the human development, perceived corruption, inflation, employment rate and ethical behavior of firms; Highest population growth;
Cluster 3: Cyprus, Denmark, Estonia, Finland, Spain, Sweden, UK
Lowest perceived corruption and inflation; Medium levels of the population growth; Highest ethical behavior of firms, human development, penetration rate and employment.

Source: own computations according to the results returned by R v. 3.2.5

The first cluster presents countries that share a raised level of perceived corruption, doubled by a similar level of the inflation rates. In addition, the life insurance penetration rate is at a medium level, while the human development and the ethical behavior are the lowest. The second cluster, presents the lowest levels of life insurances penetration rates,

but the highest population growth. All the other variables are at medium levels, as presented also by their means (see Table no. 2 for more details).

The final cluster, that holds the lowest number of countries, unites the observations with the lowest inflation level and also presents the lowest perceived corruption. Their business ethics are the highest, and so are the employment and human development. The average of the HDI was 0.938, slightly higher than the average of the second cluster (0.922) and importantly above the one of the first cluster (0.896).

Particularly, the second cluster displayed an average of 4.41% for the population growth, while the business ethics index averaged the lowest for the first cluster (4.52 vs. 4.92 and 5.6 for the second and third cluster, respectively). However, at 2.55%, the second cluster displayed the lowest life insurance penetration rate, while the highest leveled at 5.07%.

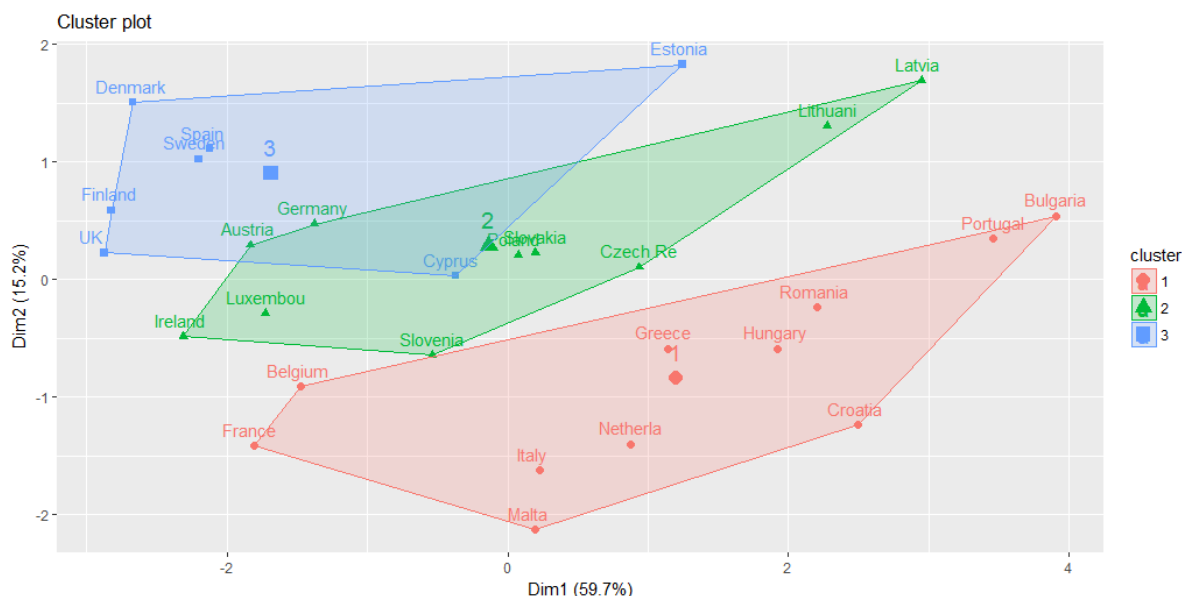
Table no. 3.

The results of cluster analysis for the year 2006

Variables	Cluster 1	Cluster 2	Cluster 3
CDI	4.95	6.67	8.27
EBF	4.52	4.92	5.6
Employment	63.21%	71.4%	76.47%
HDI	0.896	0.922	0.938
Inflation	3.45%	3.11%	2.24%
Penetration	3.02%	2.55%	5.07%
Population	0.06%	4.41%	4.08%

Source: own computations according to the results returned by R v. 3.2.5

Using multidimensional scaling and principal components the authors can represent each of the twenty-eight countries in a two-axis system, in order to cater for a better visualization and understanding of the cluster formation. Figure no. 4 presents the three clusters for the year 2006. As theorized before, Estonia found itself in the same cluster with Cyprus and Denmark, while countries such as Belgium and France were placed particularly far from it. However, despite its closeness to the other two Baltic neighbors, the K-means algorithm did not place them in the same partition.



Note: This figure presents the countries placement in a two-dimensional system.

Source: own computations in R v. 3.2.5

Figure no. 4 – Cluster plot for the year 2006

For the year 2014 the three clusters are shown in the Table no. 4. The first cluster is comprised of only four countries, all being Mediterranean countries: Croatia, Greece, Italy and Slovenia. It is shown that this cluster presents the highest level of perceived corruption, its mean being placed at 4.85 out of 10 units, considerably lower than the other two clusters (5.87 and 7.63, respectively). The cluster also underlined that the four countries present, collectively, the lowest levels of employment rate (with a mean of 58.07%) and the lowest ethical behavior of firms (at 3.75 out of 10 units, as opposite to 4.43 for the second cluster, and 5.25, respectively).

Table no. 4.

The components of cluster analysis for the year 2014

Cluster 1: Croatia, Greece, Italy, Slovenia
Lowest levels of employment rate, inflation rate (negative) and ethical behavior of firms; Medium human development, population growth and life insurance penetration rate; Highest levels of perceived corruption;
Cluster 2: Belgium, Bulgaria, Cyprus, France, Hungary, Ireland, Latvia, Malta, Netherlands, Poland, Portugal, Romania, Slovakia
Lowest levels of human development, life insurance penetration rate and population rate; Medium levels of perceived corruptions, employment rate, inflation rate (negative) and ethical behavior of firms;
Cluster 3: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Lithuania, Luxembourg, Spain, Sweden, UK
Lowest levels of perceived corruption; Highest employment rate, human development, inflation rate (positive), life insurance penetration rate, population growth and ethical behavior of firms;

Source: own computations according to the results returned by R v. 3.2.5

The second cluster presents a set of thirteen countries, which present the lowest collective level of human development (considering the mean of the HDI of 0.846 for the cluster), while also having the lowest population growth. Moreover, as presented by the Table no. 5, the life insurance penetration rate is also the lowest for the second cluster, as its mean of 2.47% is considerably lower than the 4.08% of the third cluster below the 2.8% of the first one. Finally, the third cluster, comprised of eleven countries, presents the lowest level of perceived corruption. In addition, the human development is the highest, as presented by the mean of 0.891 and also the highest employment rate, with almost 75% of the active population being present in the work field. Also, the business ethics are the best in the entire sample, as shown by the mean of 5.25 out of 10 units, as opposite to 3.75 (Cluster 1) and 4.43 (Cluster 2).

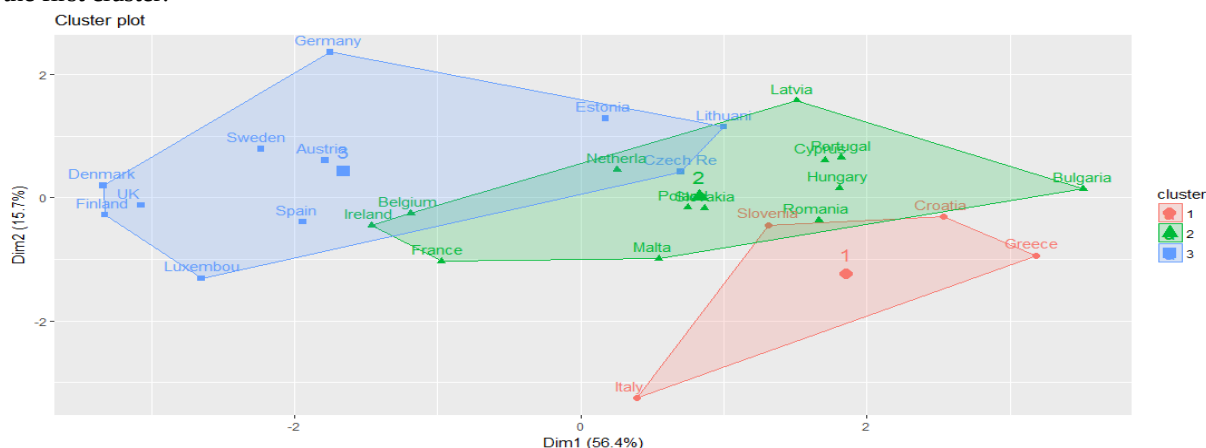
Table no. 5.

The results of cluster analysis for the year 2014

Variables	Cluster 1	Cluster 2	Cluster 3
CDI	4.85	5.87	7.63
EBF	3.75	4.43	5.25
Employment	58.07%	66.77%	74.93%
HDI	0.86	0.846	0.891
Inflation	-0.358%	-0.0007%	0.629%
Penetration	2.8%	2.47%	4.08%
Population	0.8%	-0.12%	2.73%

Source: own computations according to the results returned by R v. 3.2.5

For the year 2014 Estonia remains in the same cluster, while being joined by Lithuania. Also, the K-means method found that some of the initial hypotheses regarding the closeness of Italy to countries in its vicinity were accurate. This is sustained by the placing of Italy in the same cluster as Balkan countries such as Croatia or Slovenia, as presented by the Figure no. 5. Austria and Germany join the cluster with the highest values for most indicators, while Greece joins the first cluster.



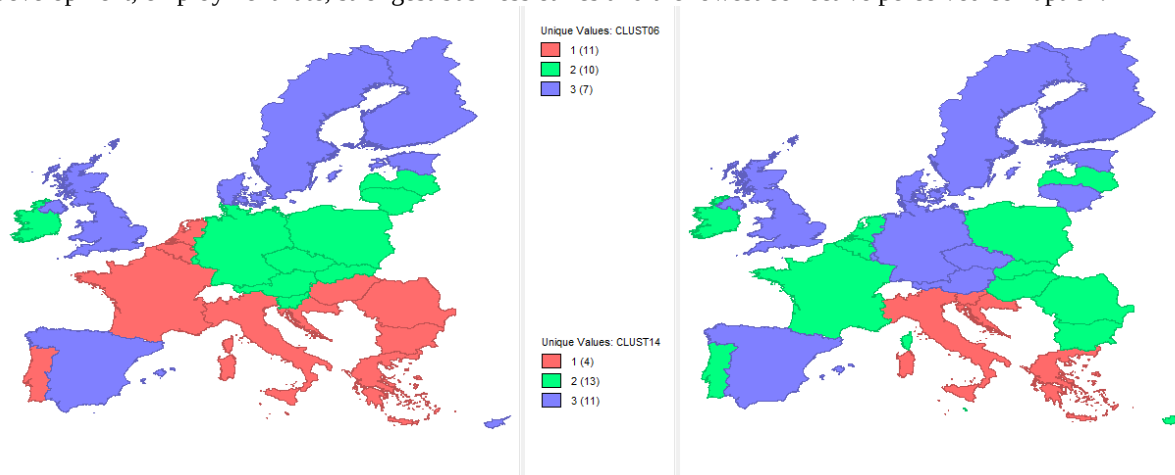
Note: This figure presents the countries placement in a two-dimensional system.

Source: own computations in R v. 3.2.5

Figure no. 5 – Cluster plot for the year 2014

5. Conclusions

The *Figure no. 6* summarizes the evolution of the three clusters between 2006 (left side) and 2014 (right side). The first cluster, represented by the red color, underlines mainly a low level of the variables in question or the most unfavorable situation in the sample. As it can be recalled, the first cluster is characterized by a high level of perceived corruption, low business ethics and human development. The second cluster, presented in green, notes an average level of development for the indicators used. Meanwhile, the third, in blue, underlines mainly the highest levels of human development, employment rate, strongest business ethics and the lowest collective perceived corruption.



Note: This figure presents the cluster evolution from 2006 (left) to 2014 (right).

Source: own computations in GeoDa v. 1.6.7

Figure no. 6 – Cluster placement for the years 2006 (left) and 2014 (right)

As presented above, countries such as France, Malta and Portugal move from the first cluster in the middle one. A homonymous move is made also by Bulgaria, Hungary and Romania. In addition, a similar upwards move is scored also by the German-speaking part of Europe, the Czech Republic and Lithuania (countries that move from the second to the third cluster, as a result of their improvements in the variables that the authors took into account). Unfortunately, countries such as Slovenia experience a decrease in moving from one cluster to another, retreating from the second to the first one.

Acknowledgements

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