

The Turnover of e-Commerce of SMEs in Europe

It grew by 24.40% on average between 2016 and 2021 for Countries of the Desi Index.

The Desi Index calculates the percentage of turnover that SMEs make from e-commerce on the total turnover of e-commerce. The indicator therefore calculates the ability of SMEs to acquire market slices in e-commerce. The data are available between 2016 and 2021 for 27 countries. The fact that a small and medium-sized company manages to obtain a turnover from e-commerce is a synthetic indicator representative of the ability to use new technologies to generate profit.

Ranking of countries by turnover of E-commerce of SMEs in 2021. Ireland is in the first place for the value of the turnover of e-commerce in 2021 with a value equal to 10.907, followed by Denmark with an amount equal to 8.794 and by the Republic Czech with an amount equal to 8.669. In the middle of the standings there are Malta with a value of 5.5857, followed by Estonia with a value of 5,3729 and Spain with a value of 5,3688. Luxembourg close the ranking with a value of 3,0655 units, followed by Greece with a value of 2.43 and Bulgaria with an amount equal to 1,9099.

Ranking of countries by the value of the percentage variation of the turnover of SMEs deriving from e-commerce in the period between 2016 and 2021. Romania is in the first place for the value of the percentage variation of the turnover deriving from SMEs with an amount equal to 122, 73% equal to an amount of 2.28 units, followed by Greece with a value of 63.58% equivalent to an amount of 0.95 units, followed by Croatia with an amount of 50.94% equal to an amount of 2.42 units. In the middle of the standings there are the Netherlands with an amount equal to 28.55% equal to an amount of 1.42 units, followed by Latvia with a variation equal to an amount of 27.71% equal to an amount of 0, 76 units and from Hungary with an amount equal to 27.3% equal to an amount of 0.81 units. They close the Cyprus ranking with an amount equal to 4.24% equal to an amount of 0.16 units, followed by Germany with a value equal to -7.09% equal to an amount of -0.4 units and from France with A value equal to -9.16% equal to an amount of -0.44 units.

Clusterization with K-means algorithm optimized with the silhouette coefficient. Below is a clusterization with K-means algorithm optimized with the silhouette coefficient. The analysis shows the presence of three Clusters as indicated below or:

- Cluster 1: Luxembourg, Latvia, Poland, Greece, Italy, Bulgaria, Hungary, Cyprus, Romania.
- Cluster 2: Czech Republic, Belgium, Denmark, Ireland, Sweden;
- Cluster 3: Croatia, Slovenia, Malta, Portugal, Netherlands, Austria, Germany, Finland, France, Estonia, Spain, Lithuania, Slovakia.

Calculating the value of the median it is evident that $C2 = 8,66975 > C3 = 5,8059 > C1 = 3,68685$. From a geographical point of view, clusterization highlights the dominance of the Scandinavian countries on the countries of northern Europe and above all on the countries of southeast Europe except for Spain and Portugal. However, there are some exceptions such as, for example, the Czech Republic which, by turnover, deriving from the e-commerce, is in the head cluster, also being a country belonging to central-eastern Europe.

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Network Analysis with Manhattan's distance. A Network Analysis is created below using Manhattan's distance. The data show the presence of three complex structures of a complex network of a simplified network structure.

There is a complex network structure consisting of Luxembourg, Latvia, Italy, Bulgaria, Poland. In particular, the following connections are relevant:

- Luxembourg has a connection with Latvia with a value of 0.28 units, and with Poland with a value of 0.27 units;
- Latvia has a connection with Luxembourg for a value of 0.28 units, with Poland with a value of 0.16 and with Italy for a value of 0.25;
- Poland has a connection with Luxembourg with a value of 0.27 units, with Latvia with a value of 0.26 and with Italy for a value of 0.13.
- Bulgaria has a connection with Italy equal to 0.29 units.

In addition, a complex network structure is detected between Spain, Estonia, Ireland and Austria. Particularly:

- Spain has a connection with Estonia equal to an amount of 0.29 units;
- Estonia has a connection with Spain equal to an amount of 0.29 and with Ireland equal to an amount of 0.3 units;
- Ireland has a connection with Estonia equal to an amount of 0.3 units and with Austria equal to a value of 0.21 units;
- Austria has a connection with Ireland equal to an amount of 0.21 units.
- There is a complex network structure composed of Slovenia, Croatia and Malta. In particular:
- Slovenia is connected to Croatia for a value of 0.26;
- Croatia is connected to Slovenia for a value of 0.26 and with mortar for a value of 0.16;
- Malta is connected to Croatia with a value of 0.16.

Finally, there is a simplified network structure between Germany and Portugal with a value of 0.18.

Machine Learning and Predictions. Below is an analysis for the prediction of the future values of turnover deriving from e-commerce in European countries. Various algorithms are used according to their ability to maximize the R-Squared and to minimize the MSE, RMSE and Mae. The algorithms were trained using 80% of the data available with the cross validations method. The following system of algorithms was therefore obtained:

- Linear Regression with a payoff equal to 4;
- SGD with a payoff equal to 8;
- Random Forest with a payoff equal to 13;
- KNN with a payoff value of 15;
- Adaboost with a payoff value of 21;
- Gradient Boosting with a payoff value of 26;
- Tree with a payoff value of 28;
- SVM with a payoff value of 29;
- Neural Network with a payoff value of 36.

Therefore, by applying the most performing algorithm or the linear regression, it appears that on average the value of the turnover deriving from e-commerce is predicted growing with an absolute value of 0.026 and equal to a percentage variation of 0.47%. In particular, among the major winners in terms of turnover growth deriving from e-commerce, Bulgaria are indicated with a value of 16.75%

equal to 0.32, followed by Greece with a value of 15.82% equal to an amount of 0.385, and from Cyprus with a value of 14.32% equal to an amount of 0.56 units and from the Hungary with a value of +13.19% equal to an amount of 0.4965 unit. The countries that are Losers, or for which a very significant reduction of the turnover value deriving from e-commerce are predicted are Lithuania with a predicted value of -10.3% equal to -0.78 units, the Denmark with a value equal to -10.84% equal to -0.954 unit, Croatia with a variation of -20.688% equal to -1.48 units and from Romania with a value equal to -23.70% equal to - 0.982 Unit.

Comparison of algorithms in terms of accuracy. Below is a comparison between the algorithms in terms of accuracy to verify the ability to predict a country's performance compared to the European average. If a country exceeds in terms of turnover from e-commerce, the European average is attributed a value of 1. Over the contrary, a value of 0. The algorithms are trained with 80% of the data available through the cross-validation method. The analysis shows that in terms of accuracy the best algorithms are Tree, SGD, kNN, Logistic Regression and Random Forest with a predictive capacity of 96.3%. In second place in terms of accuracy there are CN2 Rule delay, AdaBoost, SVM, Neural Network, Gradient Boosting with a predictive capacity of 92.6%.

Conclusions. The ability of SMEs to create a turnover from e-commerce is a very relevant signal from the spread of digital skills at national level. The data show growth at the country level of the ability to create turnover in terms of e-commerce in the various European countries. A significant gap between Northern Europe and South-East Europe persists. Algorithms predict on average moderate growth in turnover from e-commerce for SMEs. Some countries could grow much more than others such as Bulgaria, Greece, and Cyprus. There are still many margins to increase the implementation of e-commerce in the SME business plans. SMEs have many profit margins from the use of e-commerce. European economic policies could intervene to promote the use of e-commerce especially in the countries of southern and eastern Europe.

Declarations

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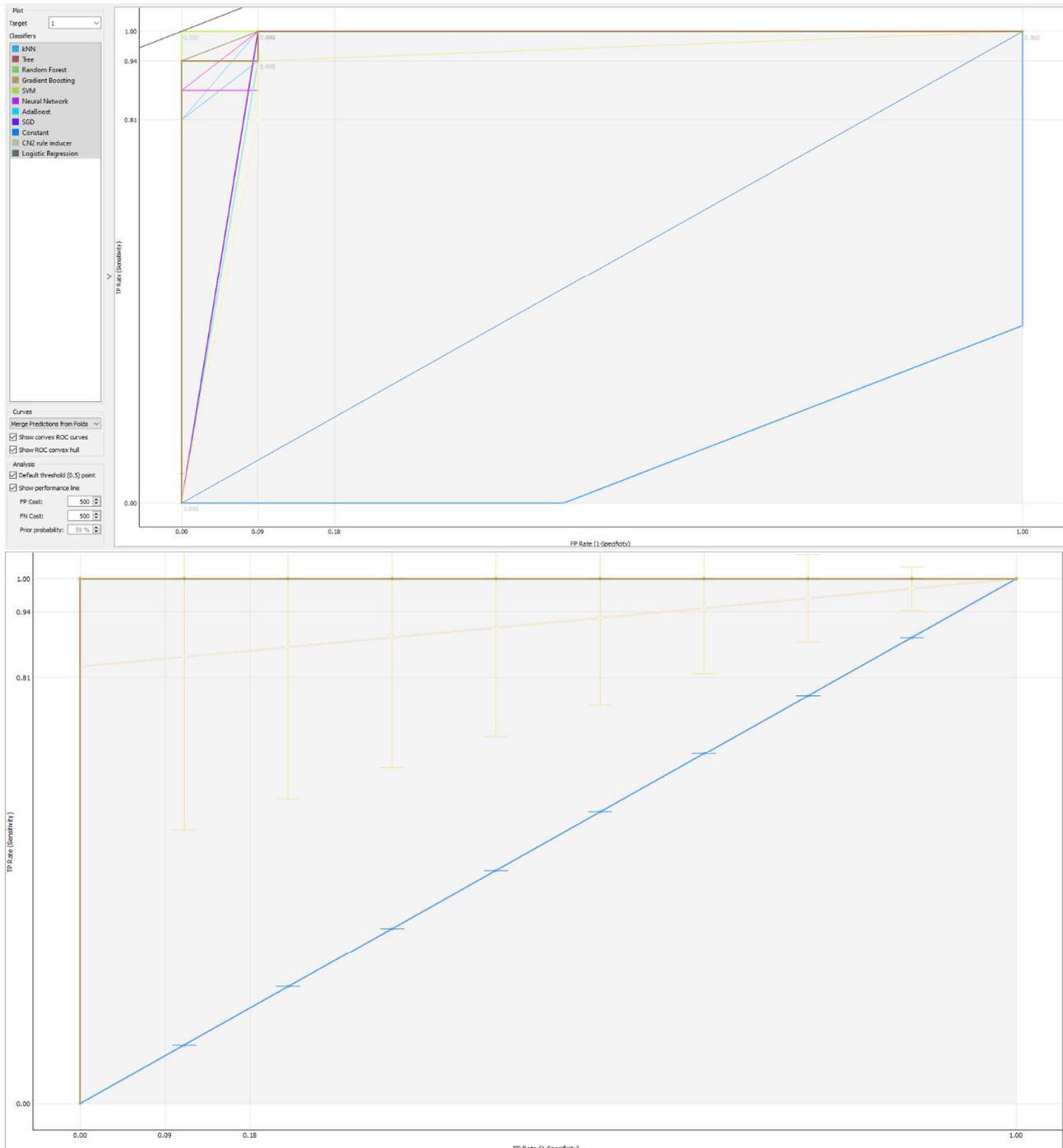
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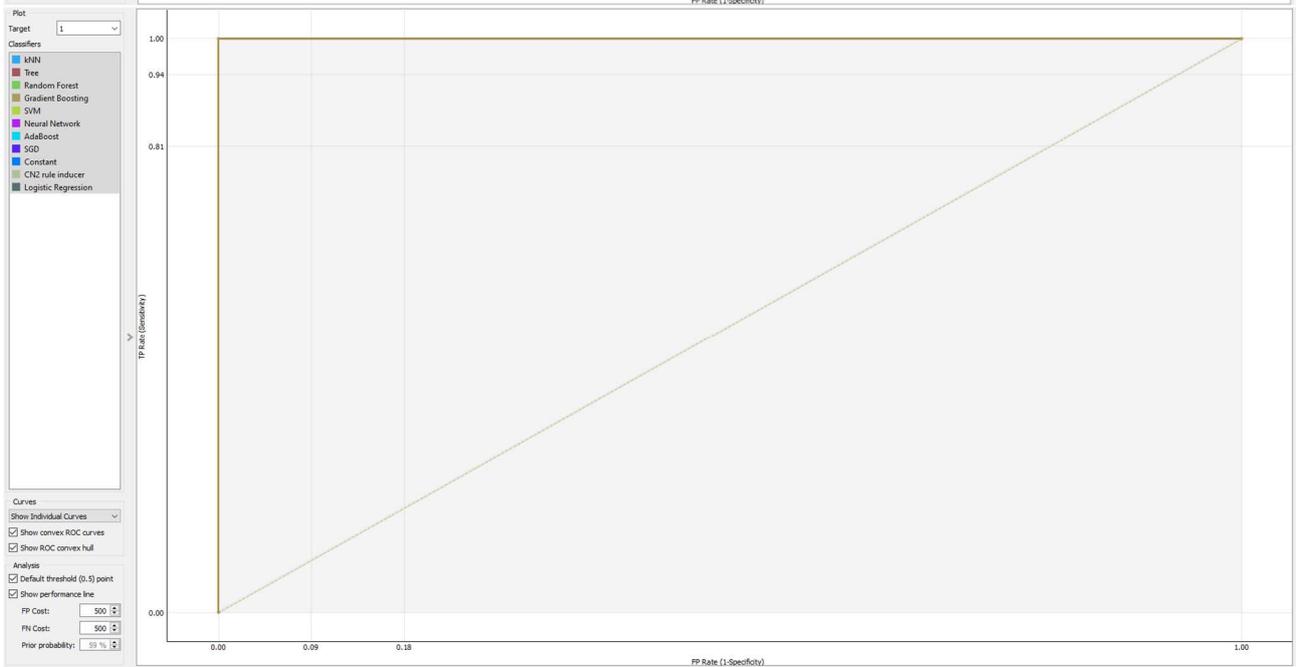
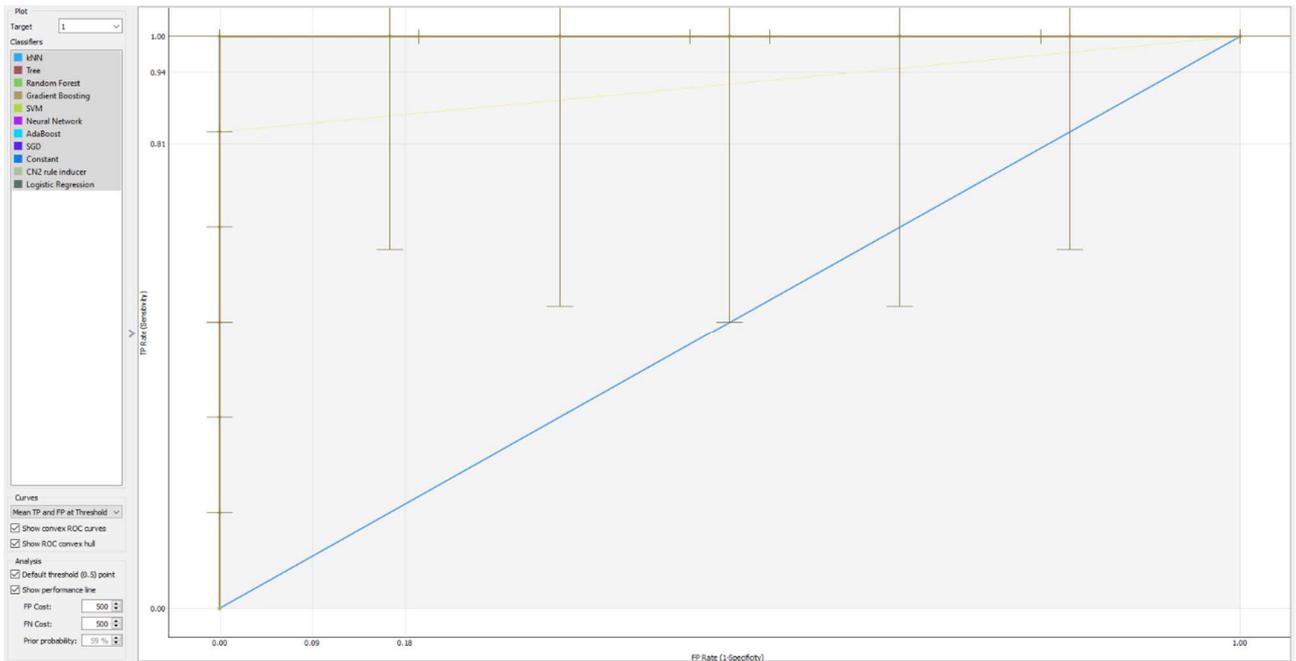
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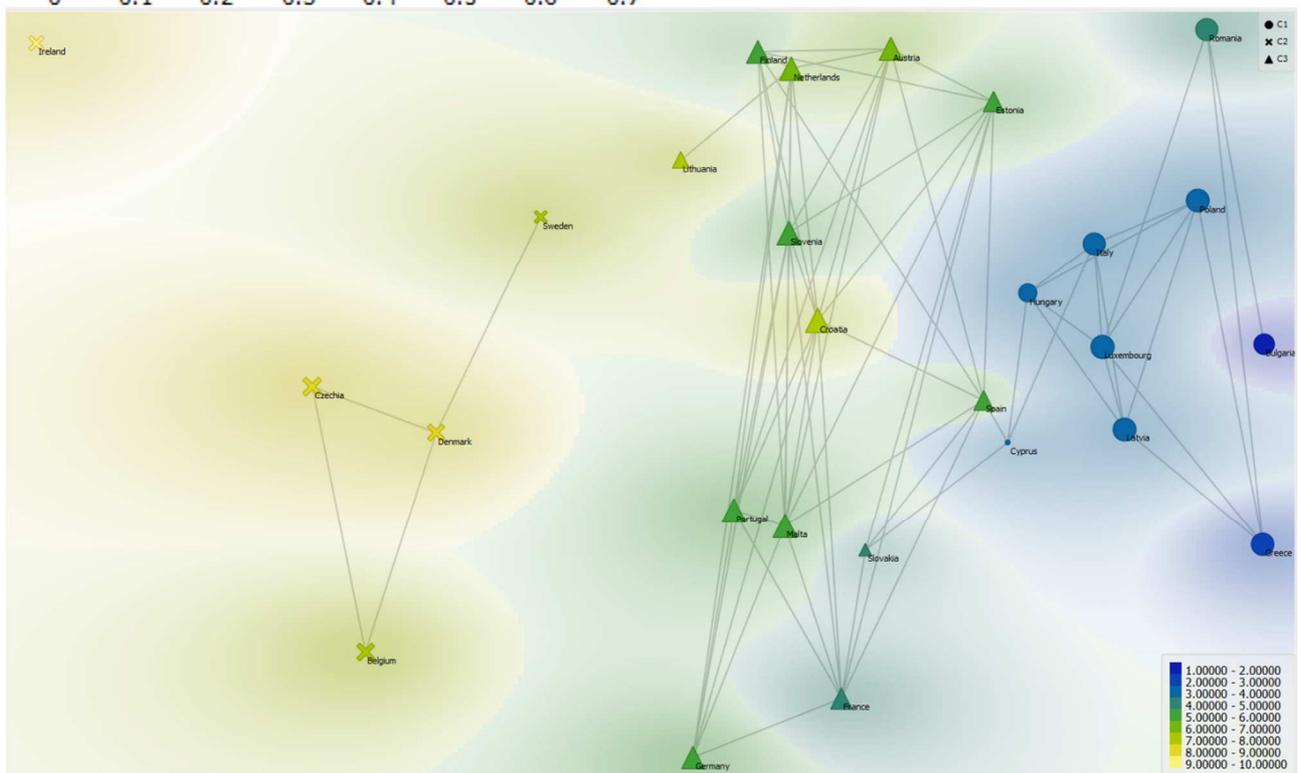
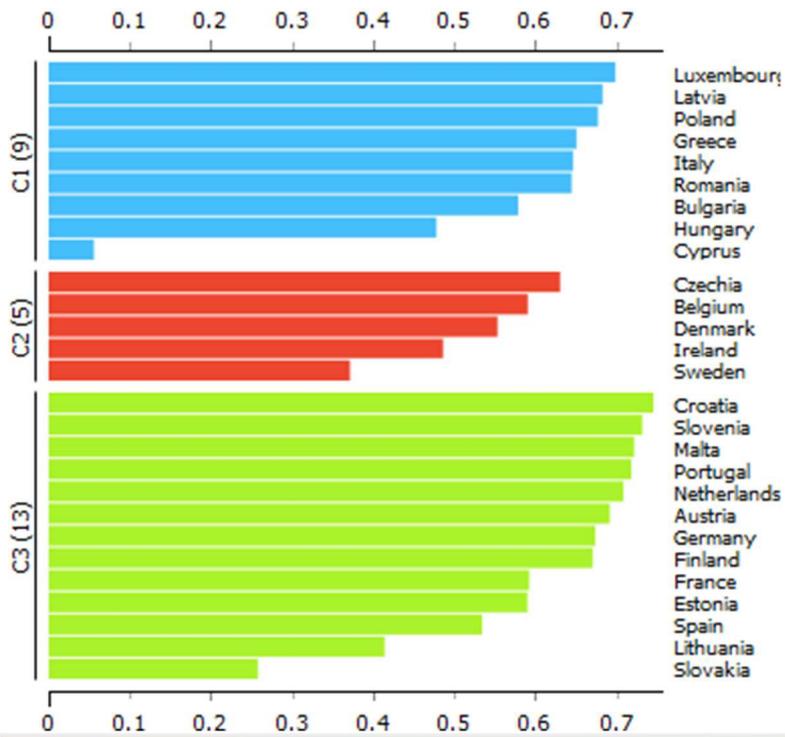
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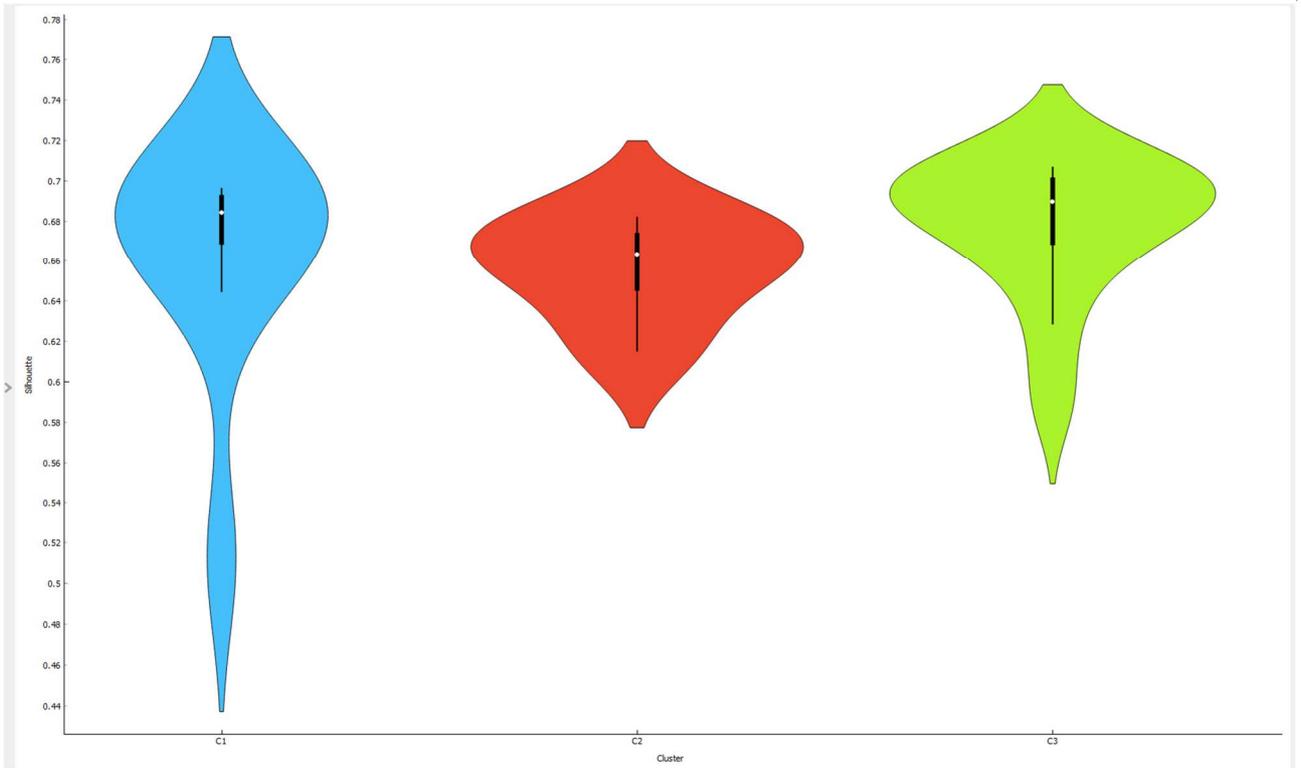
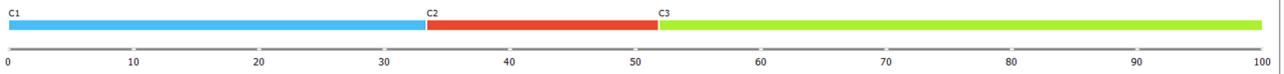
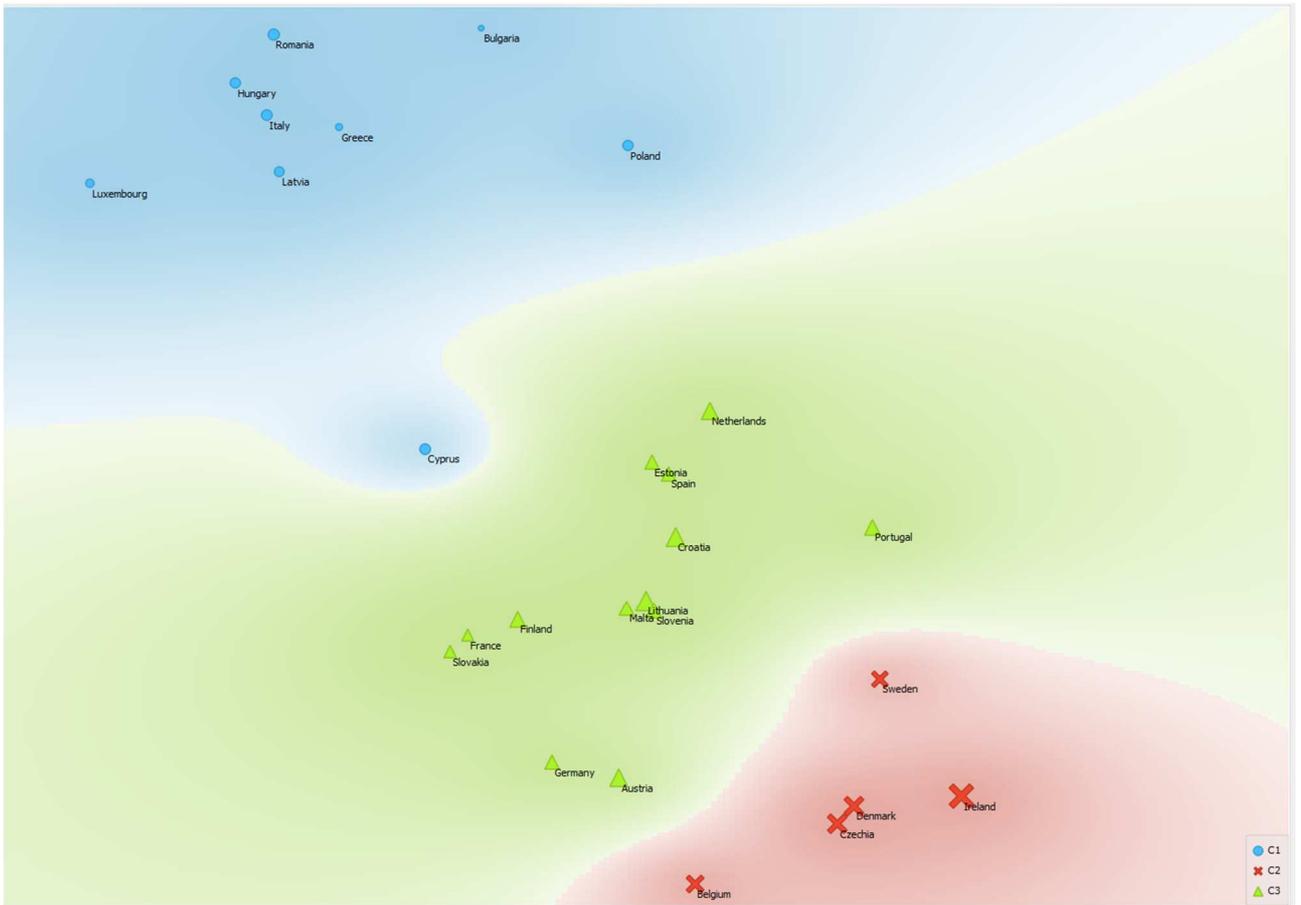
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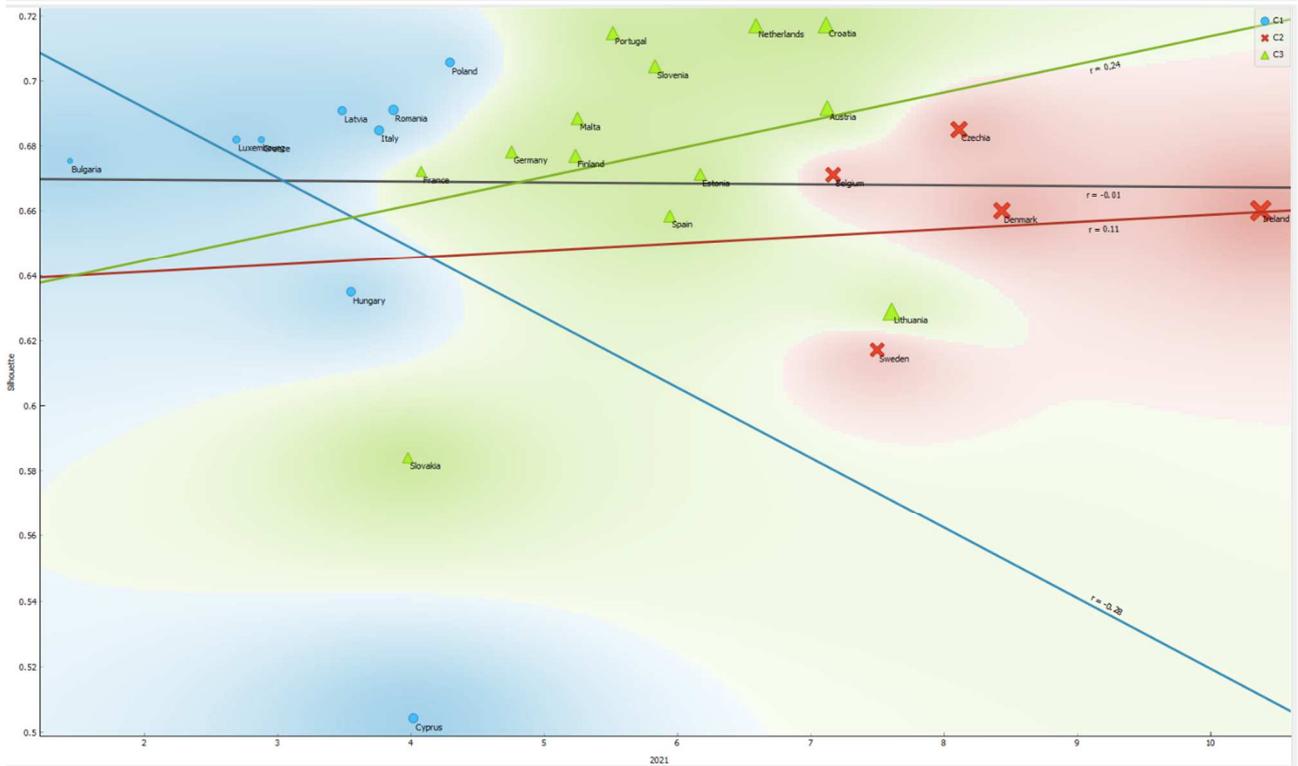
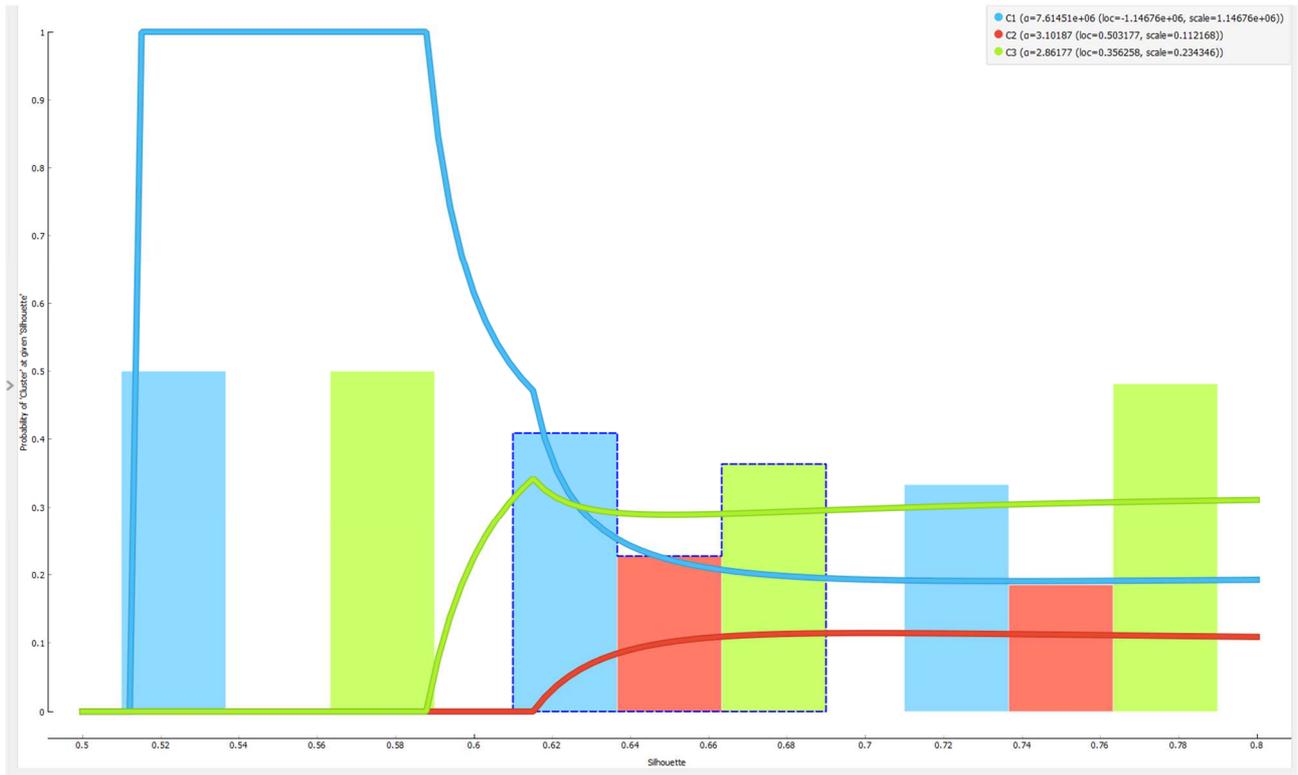
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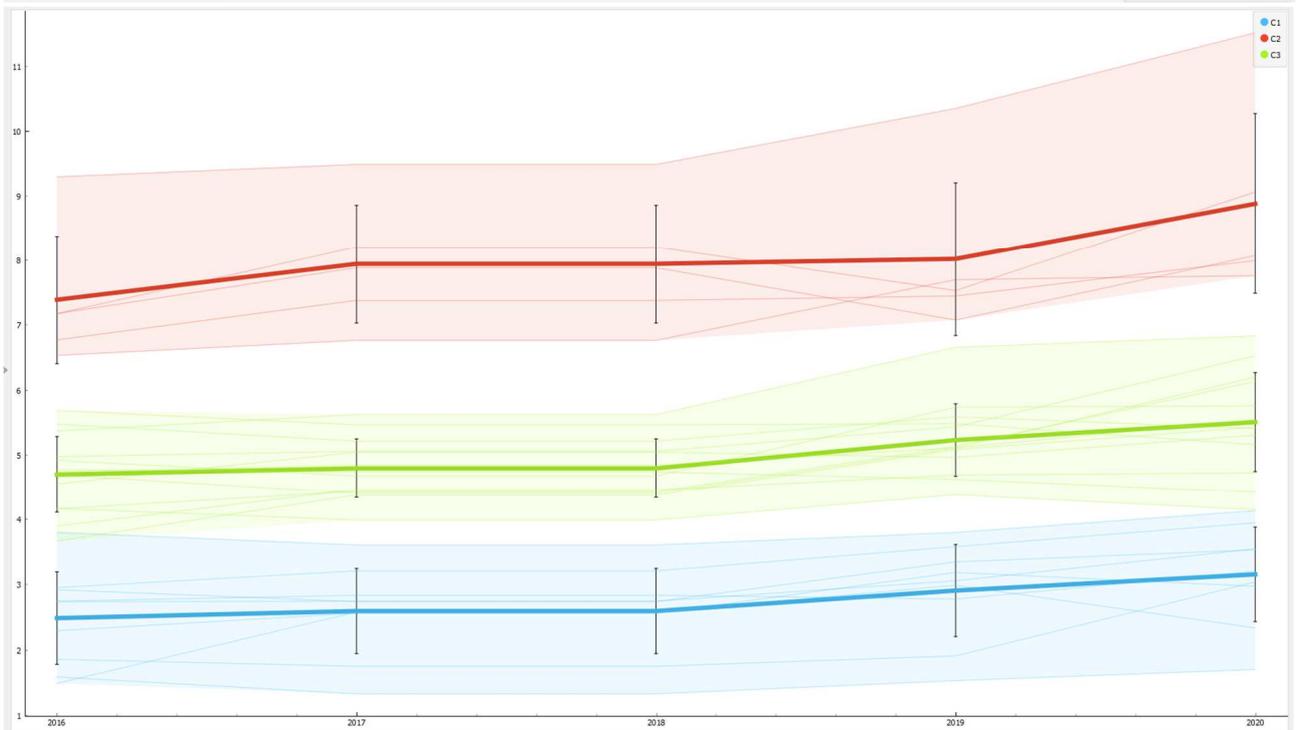
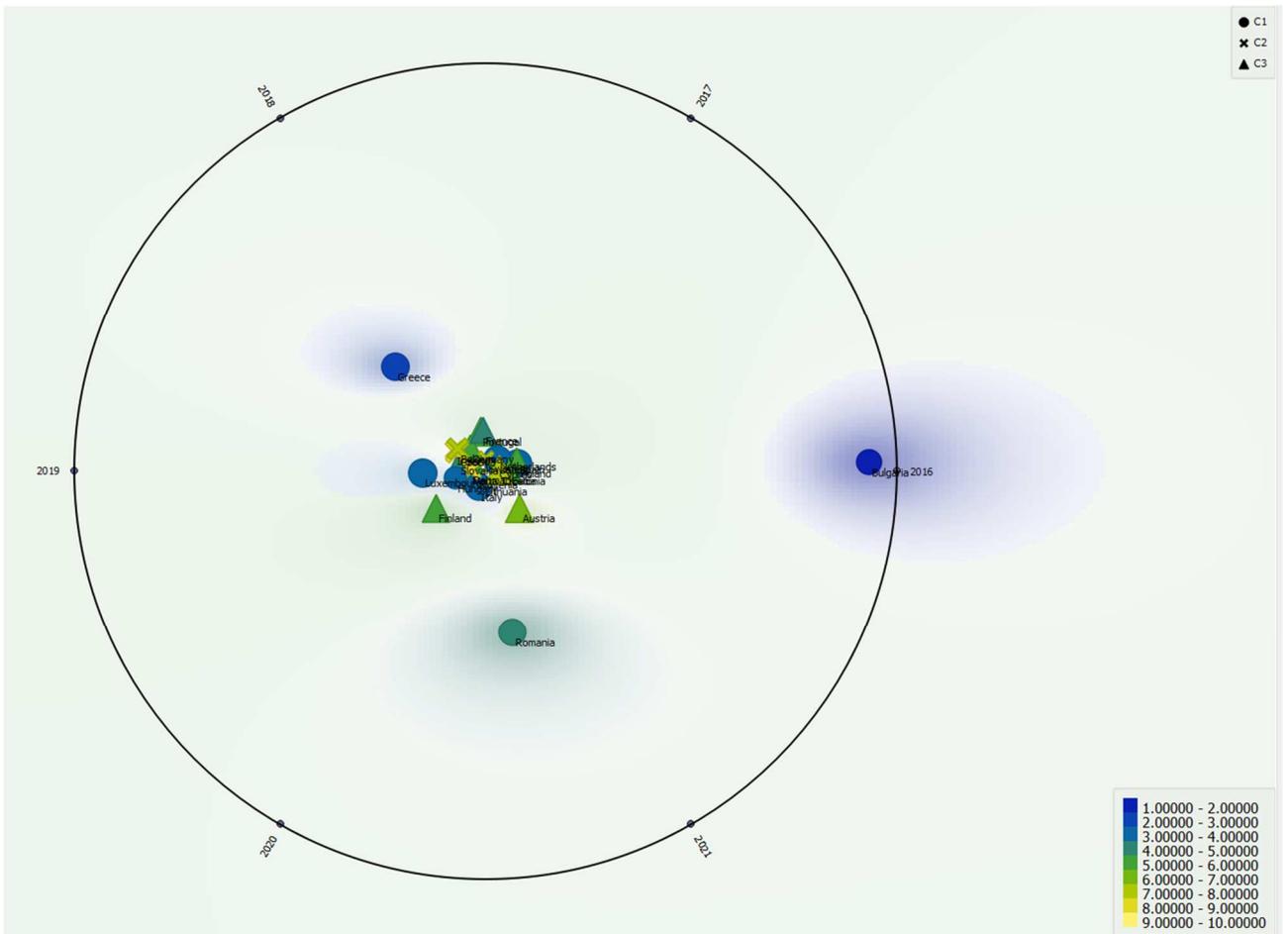


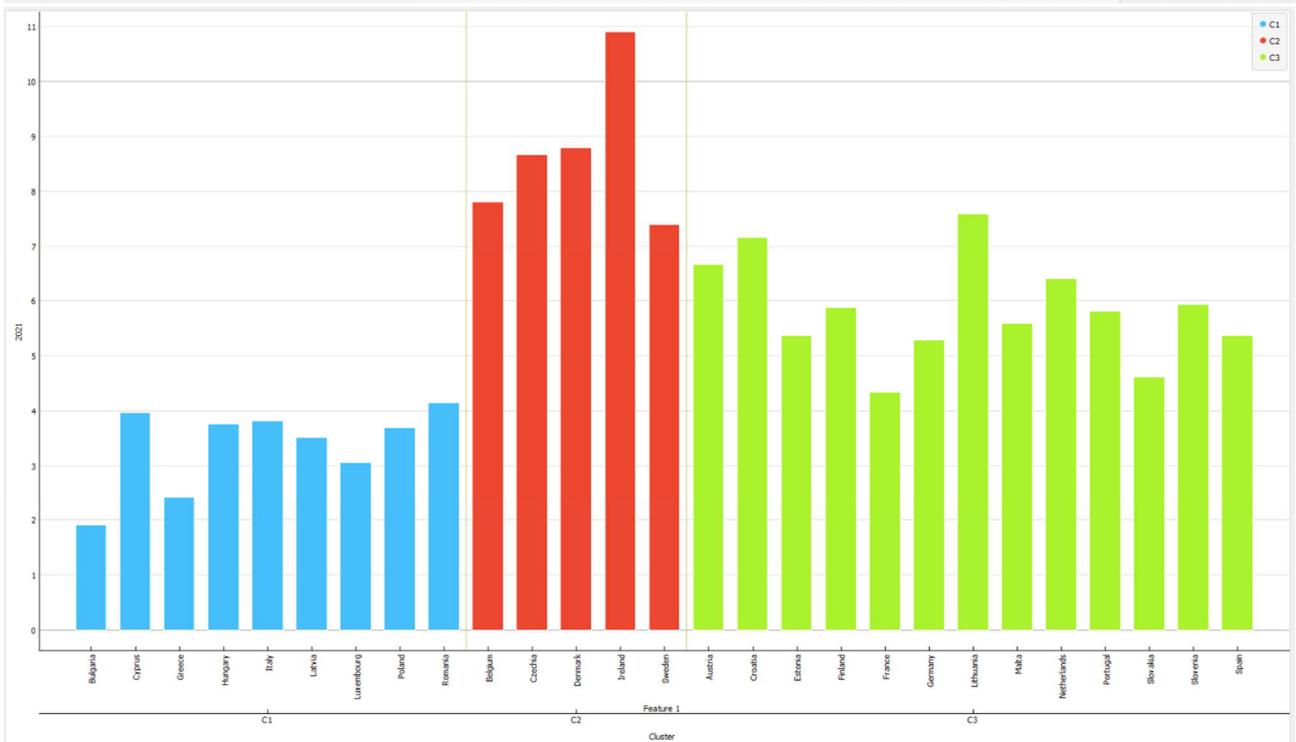
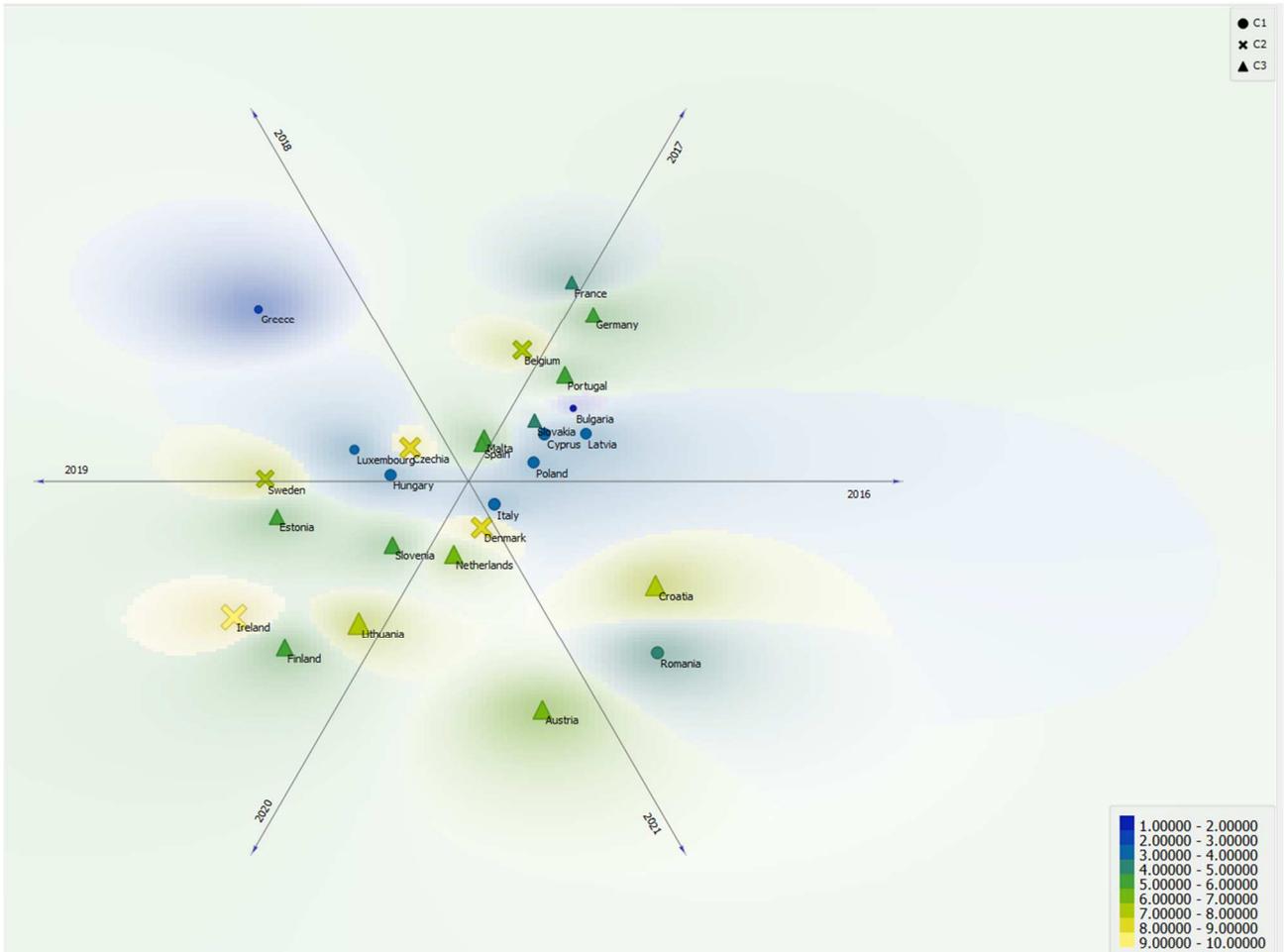


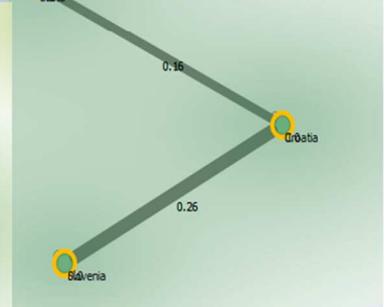
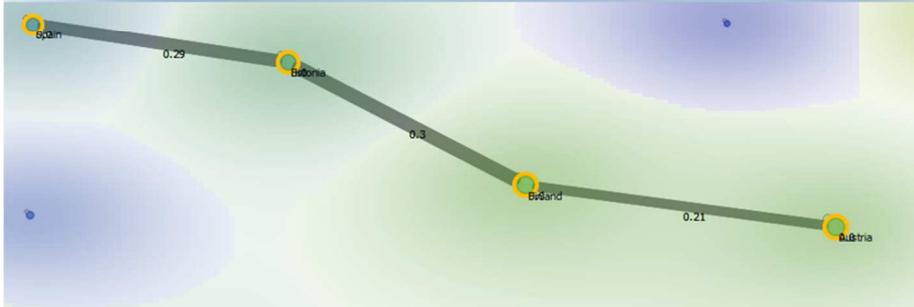
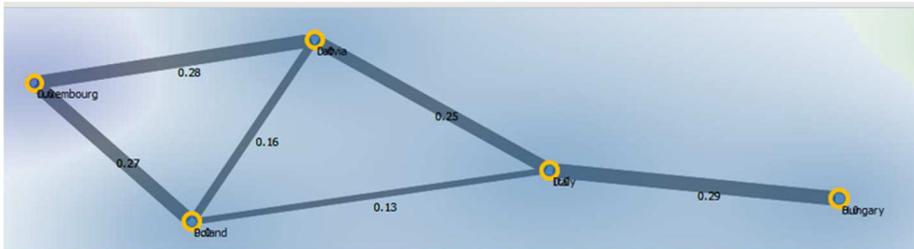
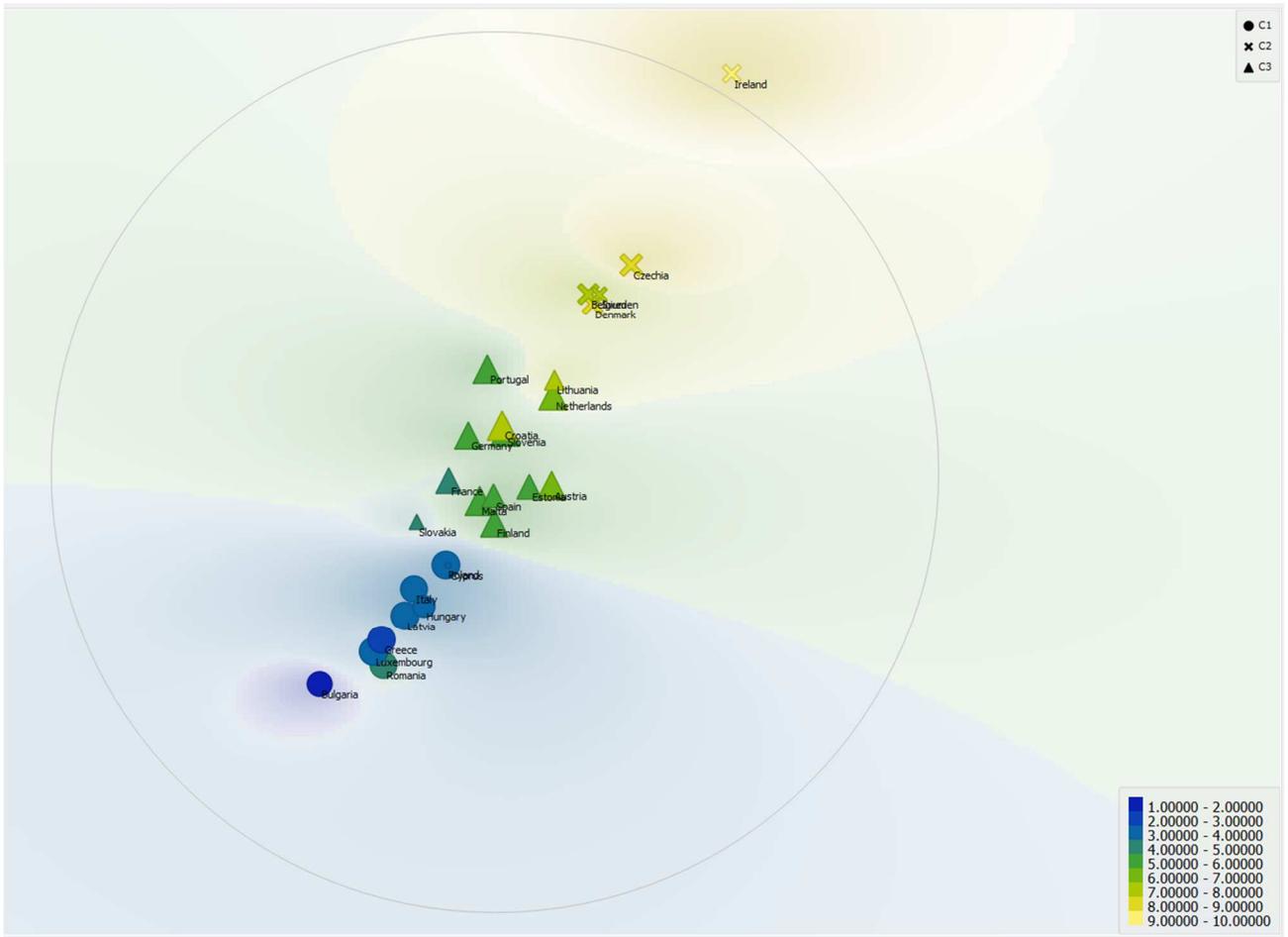




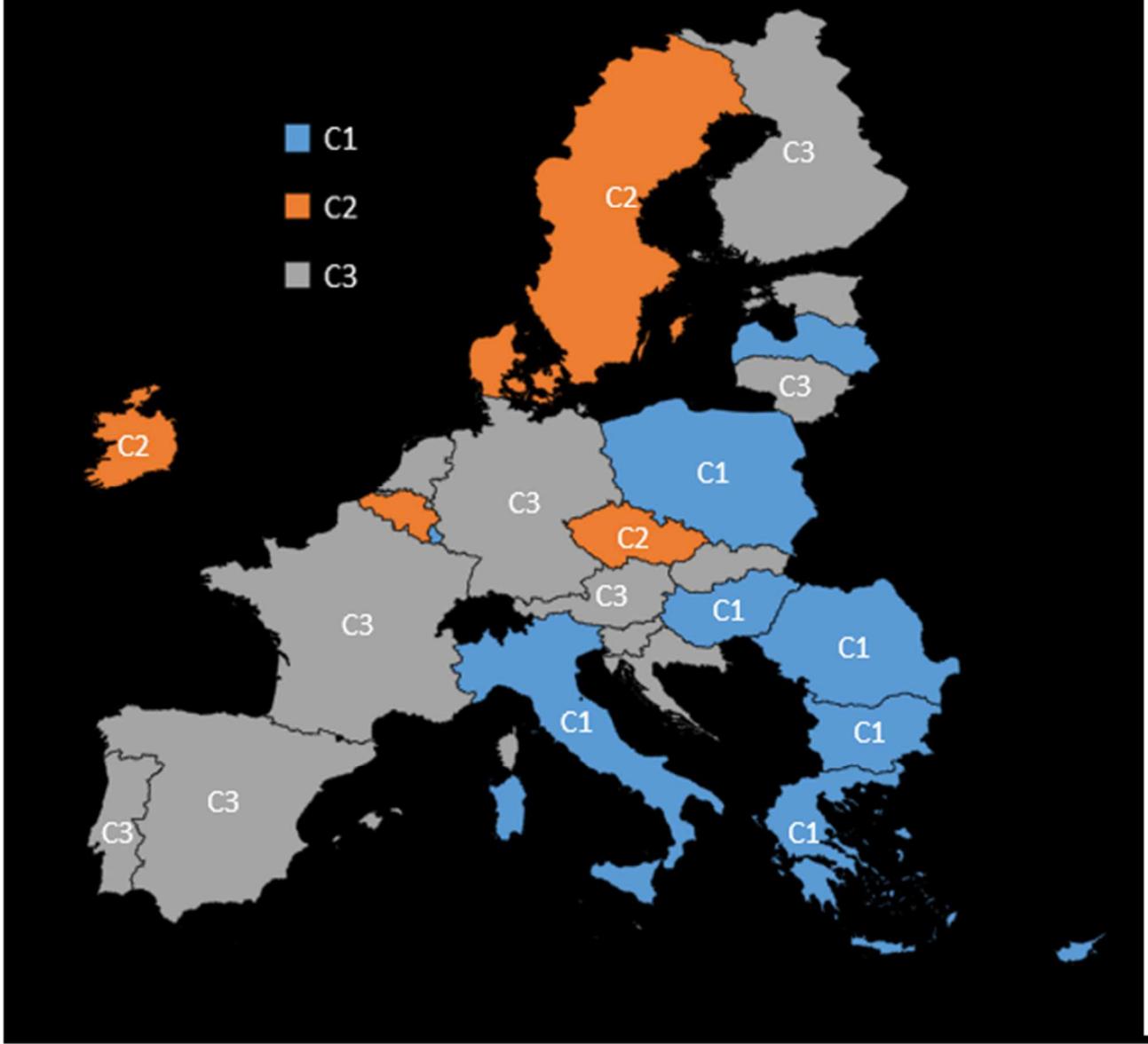








Clusterizzazione: C2>C3>C1



Country	2016	2017	2018	2019	2020	2021
Austria	★ 4,696	☆ 4,409	☆ 4,409	★ 5,109	★ 6,203	★ 6,662
Belgium	★ 7,178	★ 7,886	★ 7,886	★ 7,079	★ 8,073	★ 7,806
Bulgaria	★ 1,59	★ 1,331	★ 1,331	★ 1,533	★ 1,703	★ 1,91
Croatia	★ 4,745	★ 4,847	★ 4,847	★ 5,113	★ 5,549	★ 7,162
Cyprus	☆ 3,801	☆ 3,608	☆ 3,608	☆ 3,8	☆ 4,134	☆ 3,962
Czechia	★ 7,176	★ 8,205	★ 8,205	★ 7,533	★ 9,064	★ 8,67
Denmark	★ 6,774	★ 7,382	★ 7,382	★ 7,449	★ 7,995	★ 8,794
Estonia	☆ 3,667	☆ 4,378	☆ 4,378	★ 5,087	★ 5,432	★ 5,373
Finland	☆ 4,163	☆ 4,434	☆ 4,434	★ 5,136	★ 6,134	★ 5,876
France	★ 4,778	★ 4,742	★ 4,742	☆ 4,626	☆ 4,425	☆ 4,341
Germany	★ 5,688	★ 5,468	★ 5,468	★ 5,485	★ 5,163	★ 5,285
Greece	★ 1,488	★ 2,581	★ 2,581	★ 2,992	★ 2,34	★ 2,435
Hungary	☆ 2,956	☆ 3,212	☆ 3,212	☆ 3,584	☆ 3,948	☆ 3,764
Ireland	★ 9,296	★ 9,488	★ 9,488	★ 10,35	★ 11,51	★ 10,91
Italy	☆ 2,923	☆ 2,742	☆ 2,742	☆ 3,35	☆ 3,534	☆ 3,822
Latvia	☆ 2,748	☆ 2,839	☆ 2,839	☆ 2,781	☆ 3,207	☆ 3,51
Lithuania	★ 5,372	★ 5,626	★ 5,626	★ 6,66	★ 6,836	★ 7,593
Luxembourg	☆ 2,296	☆ 2,564	☆ 2,564	☆ 3,188	☆ 2,975	☆ 3,065
Malta	☆ 4,557	★ 5,047	★ 5,047	★ 4,966	★ 5,307	★ 5,586
Netherlands	★ 4,978	★ 5,059	★ 5,059	★ 5,436	★ 6,529	★ 6,399
Poland	☆ 2,739	☆ 2,749	☆ 2,749	☆ 3,061	☆ 3,549	☆ 3,687
Portugal	★ 5,478	★ 5,216	★ 5,216	★ 5,593	★ 5,41	★ 5,806
Romania	★ 1,86	★ 1,753	★ 1,753	★ 1,911	☆ 3,043	☆ 4,142
Slovakia	☆ 4,17	☆ 3,992	☆ 3,992	☆ 4,38	☆ 4,148	☆ 4,616
Slovenia	★ 4,921	☆ 4,679	☆ 4,679	★ 5,738	★ 5,758	★ 5,93
Spain	☆ 3,896	☆ 4,463	☆ 4,463	★ 4,694	★ 4,725	★ 5,369
Sweden	★ 6,535	★ 6,767	★ 6,767	★ 7,701	★ 7,762	★ 7,394

Il fatturato da e-Commerce in Europe

Rank	Countries	2021	Rank	Countries	2021
1	<i>Ireland</i>	10,907	15	<i>Spain</i>	5,3688
2	<i>Denmark</i>	8,794	16	<i>Germany</i>	5,2847
3	<i>Czechia</i>	8,6698	17	<i>Slovakia</i>	4,6164
4	<i>Belgium</i>	7,8059	18	<i>France</i>	4,3407
5	<i>Lithuania</i>	7,5928	19	<i>Romania</i>	4,1421
6	<i>Sweden</i>	7,3938	20	<i>Cyprus</i>	3,9623
7	<i>Croatia</i>	7,1616	21	<i>Italy</i>	3,8219
8	<i>Austria</i>	6,6625	22	<i>Hungary</i>	3,7635
9	<i>Netherlands</i>	6,3991	23	<i>Poland</i>	3,6869
10	<i>Slovenia</i>	5,9295	24	<i>Latvia</i>	3,5101
11	<i>Finland</i>	5,8757	25	<i>Luxembourg</i>	3,0655
12	<i>Portugal</i>	5,8059	26	<i>Greece</i>	2,4347
13	<i>Malta</i>	5,5857	27	<i>Bulgaria</i>	1,9099
14	<i>Estonia</i>	5,3729			

Variazione Percentuale ed Assoluta del Fatturato Derivante dall'E-commerce tra il 2016 ed il 2021

Rank	Country	Var Ass	Var Per	Rank	Country	Var Ass	Var Per
1	Romania	2,28	122,73	15	Hungary	★ 0,81	★ 27,3
2	Greece	★ 0,95	★ 63,58	16	Malta	★ 1,03	★ 22,58
3	Croatia	★ 2,42	★ 50,94	17	Czechia	★ 1,49	★ 20,82
4	Estonia	★ 1,71	★ 46,53	18	Slovenia	★ 1,01	★ 20,5
5	Austria	★ 1,97	★ 41,89	19	Bulgaria	★ 0,32	★ 20,14
6	Lithuania	★ 2,22	★ 41,34	20	Ireland	★ 1,61	★ 17,32
7	Finland	★ 1,71	★ 41,16	21	Sweden	★ 0,86	★ 13,14
8	Spain	★ 1,47	★ 37,82	22	Slovakia	★ 0,45	★ 10,7
9	Poland	★ 0,95	★ 34,59	23	Belgium	★ 0,63	★ 8,75
10	Luxembourg	★ 0,77	★ 33,49	24	Portugal	★ 0,33	★ 5,98
11	Italy	★ 0,9	★ 30,74	25	Cyprus	★ 0,16	★ 4,24
12	Denmark	★ 2,02	★ 29,83	26	Germany	★ -0,4	★ -7,09
13	Netherlands	★ 1,42	★ 28,55	27	France	★ -0,44	★ -9,16
14	Latvia	★ 0,76	★ 27,71				