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The change in e-commerce in the context of the Coronavirus pandemic

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Abstract. *As COVID-19 had been posing unprecedented challenges, the economic agents as well as the individuals had to adapt to a new lifestyle. The preventing measures against the spread of the virus determined an increase in e-commerce activity in general, and in mobile commerce in particular. In this regard, sellers redefined their strategies revolving around smartphone applications for online shopping, which will gradually become the global shopping standard. Therefore, the aim of this paper is to evaluate the current situation of e-commerce, focusing on the main transformations since the beginning of the pandemic. The methods used in the paper consist in both qualitative research of the literature regarding e-commerce and a quantitative analysis that captures two aspects: on one hand it highlights the change determined by the pandemic in online commerce, and on the other hand it shows an X-ray of the EU states positioning in terms of e-commerce evolution. The latter consists in a comparative Hierarchical Cluster Analysis that aims to provide an image on the situation of EU states, before and after the pandemic has been installed. The Cluster Analysis was carried out in SPSS software and it is based on a series of chosen indicators from Eurostat database. This comparison provides an image of how changes among the clusters take place in terms of e-commerce indicators. It is noted that in countries where the digitization was more developed, the value of the change in online commerce was less considerable, comparing to the Eastern and Balkan states, which had a more significant increase. However, there are significant limitations based on the small number of indicators taken into consideration in this paper.*

Future work needs to be done in order to explore new ways to address the challenges identified in the development of e-commerce and online shopping.

Keywords: Covid-19 pandemic, e-commerce, online shopping, mobile apps, cluster analysis.

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Introduction

It is quite sure by now that in the last two years we have been witnessing a pandemic of global proportions. It is also clear that we know more now that we did back in 2019 when all this chaos started and even more than that, we learned how to fight it and to take advantage of this difficult situation. In this regard, we have seen that almost all activities carried out by individuals have been moved from on-site to on-line. From education, jobs, administrative related operations, to doctor appointments, banking transactions, shopping and so on.

During the pandemic crisis it was observed that the whole global economy was affected especially by severe disruption of the supply-demand balance. Even so, the most affected were low-income economies because of lack of resources to redistribute in order to support resilience and recovery. The developed economies were also affected, in real terms, much more than the lower-income ones, but developed countries or regions were capable to dislocate a huge financial support to overcome the crisis and quickly regaining the level before shock.

The Covid-19 pandemic has changed consumer purchasing behavior as consumers feared contagion. Therefore, consumption practices turned to e-commerce platforms to reduce the spread of the virus. This led to an increase in shopping efficiency, enabled new purchases and facilitated information access together with virtual communication between customer and seller (Flores et. al, 2021).

At the beginning of the pandemic, many EU countries have placed large parts of their economies in lockdown, hoping that, in this way, they will manage to reduce deaths, not without substantial negative consequences in terms of damage to national economies, businesses and individual jobs. The services sector such as retail, hospitality and tourism were particularly affected (e.g. Machová et. al, 2021). One of the consequences of the past containment measures was the change in consumer's way of shopping. The "scarcity effect" from the beginning of the lockdown had a dramatic impact on crowding, resulting in long queues to enter stores. Some grocery retailers limited the number of items to buy per consumer, implementing new types of online services and home delivery (Pantano et. al, 2020).

According to a study, the amount of online purchases during 2020 increased by 41%. In turn, the attendance of shopping centers decreased by 20-45% (depending on the country), if it is to compare the data for the six months of 2020 with the same period in 2019 (Dumanska et. al, 2021). The usage of smartphones has raised to the point that as of January 2020 there were almost 4.54 billion of internet users around the world, which translates into a total of 59% of the population (Pantelimon et. al, 2020).

When it comes to e-commerce sectors, Amazon is leading the global ranking of online retail stores in terms of traffic. The e-commerce giant registered more than 5.2 billion unique

visitors in June 2020. However, in terms of gross value of goods, Amazon ranks third after China, whose competitors are operated by Alibaba Group, Asia's leading online retailer. Such that, there is no surprise that m-commerce is especially popular in Asian countries: where up to 65 percent of total online transactions are generated through mobile traffic (Dumanska et. al, 2021).

While online grocery shopping has been stable though limited growth in the last decade, it has skyrocketed during the COVID-19 emergency. Some retailers had to create online queues or to take the online websites down to cope with excessive demand. Also, older and less digitally-savy consumers began to discover the benefits from services they had never used before. For instance, elderly consumers switched for the first time in their life to online purchases, discovering the safety and the benefits of home-deliveries, store pick-up, and cashless payment (Pantano et. al, 2020).

Literature review

The effects of the pandemic on e-commerce

The widely implemented social distancing measures to control the COVID-19 pandemic have brought unprecedented changes. As a result, different types of social interactions (e.g, shopping, banking, education, meetings or entertainment) moved from the dominantly offline world to the online world (Waliszewski & Warchlewska, 2021). The enforced social isolation in the physical world automatically increased the social interactions in the cyber space, which has become the global communication standard in almost all aspects of life (Yan, 2020; Liu et al. 2021; Mihalca, 2021).

Defined as commercial activities and transactions electronically conducted over the internet, e-commerce combines traditional economic behavior and the rapidly expanding cyber infrastructure and provides a linkage between the real world and cyberspace through flows of capital, ideas and goods (Guo et. al, 2021; Vargas & Budz, 2019).

During the lockdown, online purchases and home delivery have experienced an unprecedented rise, as a result, some companies have transformed the COVID-19 outbreak threat into an opportunity by increasing their business volume. Recent figures show a 60% increase of Internet traffic from December 2019 to May 2020, standing out that videoconference traffic has increased around 120% compared to levels before the outbreak (Soto-Acosta, 2020).

In order to reduce physical contact during the pandemic, e-commerce became particularly important in ensuring the food supply for residents as well as have it delivered to their home (Chang and Meyerhoefer, 2021). Moreover, takeaway and home delivery have become an alternate to closed restaurants (Bakalis et. al, 2020). Another solution to reduce the risk of infection, it was minimizing the use of transactions with physical money. In this regard, many e-commerce platforms launched "contactless delivery" services, which gained unprecedented attention and developed rapidly (Guo et. al, 2021).

Prior to Covid-19, online shopping was increasing at a steady rate as platforms became more user friendly, making it difficult to separately identify the increase in shopping due to Coronavirus from longer term trends. However, it is expected that many consumers who were motivated to use online platforms for the first time due to COVID-19, shall continue to use them in the future. As we can see in Figure 1, the pandemic led to increased spending and, therefore to increased sales, suggesting that online platforms could raise prices in the

future, particularly if their advantage in online food delivery over traditional retailers persists (Chang and Meyerhoefer, 2021).

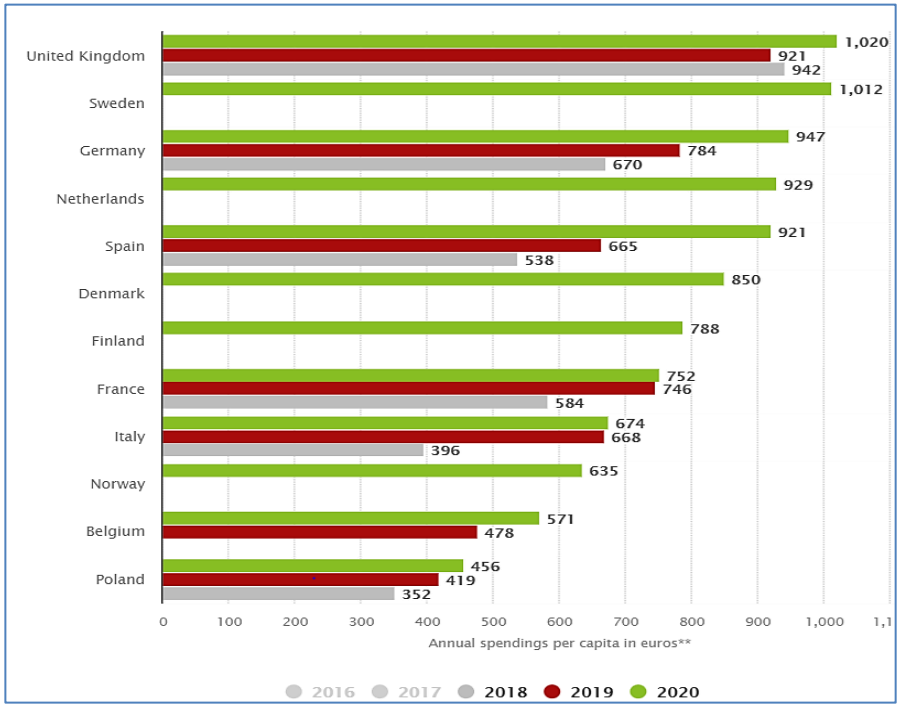


Figure 1. Average annual spending per capita for online shopping in Europe from 2018 to 2020, by country (euro)

Source: statista.com.

The development of e-commerce is based on digital innovation. In this regard, Lee and Malerba distinguish in their 2017 study three types of opportunity windows: (a) new core technologies, such as digitization; (b) a new type of demand or a major shake-up in the existing demand; and (c) institutional windows induced by public intervention. Digitization during the Covid-19 crisis could be such a change in demands (online shopping) and political intervention ("stay at home" measure) (Dannenberg et. al, 2020).

Today's e-commerce platforms offer various online products and services, from electronic devices and high-tech products, to health, beauty, fashion, sports or travel (Tran, 2021). Some important features of e-commerce are that people can easily pay their bills, transfer money to their relatives or friends, make donations or effortlessly order medicines from specialized medical stores that can be found online (Bhavya, 2020). In this context, Svatosova (2020) said, that all the determinants of online shopping behavior are part of the strategic management process in e-commerce, and all play a key role in designing and implementing e-commerce strategy in the long-term development of companies primarily focused on e-commerce.

Steps towards m-commerce

It is crystal clear that the pandemic has triggered a change in online purchases whereas raising the important role of e-commerce platforms. However, in addition to this

achievement, we must also highlight that this pandemic has also accelerated and intensified the shift from the usual e-commerce to mobile commerce (m-commerce) in particular.

M-commerce refers to the activities related to retail stores, online banking, booking services or money transfer carried out by using a portable device such as a phone, a tablet or even newer devices such as smart wearables (Pantelimon et. al, 2020). Consumers in most countries perform their mobile retail purchases via smartphone, which represent the predominant driver of growth for e-commerce transactions (Hubert et. al, 2017).

As they have multiple functions in a mobile terminal, applications (shortly apps) have been widely used in the field of e-commerce retailing in order to support consumer in online shopping. As mobile devices become widespread, the interest among businesses has increased, leading to desktop- and mobile-optimized websites constituting separate channels, as does each app released for different operating systems for mobile devices (Fenu, and Pau, 2015).

We notice that smartphones have been transformed into individual assistants, entertainment gadgets and information portals (Abdillah, 2020). A report shows that the share of mobile commerce in e-commerce has increased from 52.4% in 2016 to 70.4% in 2020 and is estimated to reach 72.9% globally for 2021. According to figures, its absolute value has more than doubled in 2020 ($ 2.91 trillion) compared to 2017 ($ 1.36 trillion) (Meghisan-Toma et. al, 2021).

The forecast illustrated below in Figure 2 shows the monthly traffic per smartphone worldwide between 2014 and 2026. In 2026, global monthly smartphone data traffic is projected to reach 33.7 gigabytes per active smartphone worldwide.

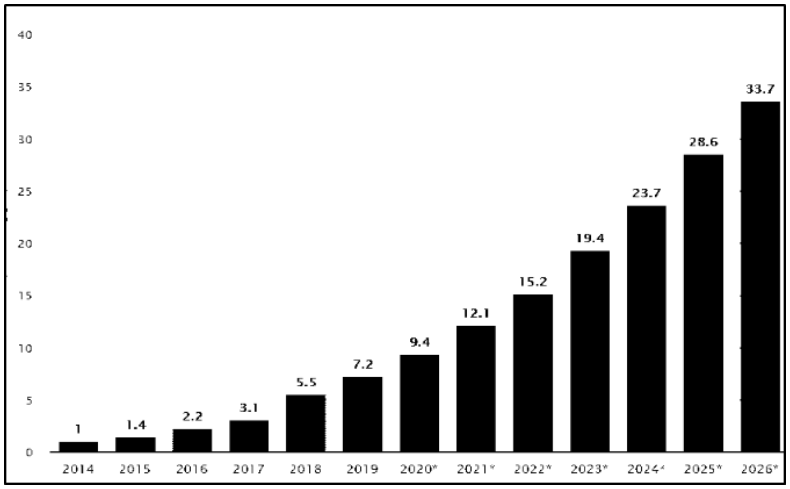


Figure 2. Monthly mobile data traffic per smartphone worldwide from 2014 to 2026 (GB/month)

Source: statista.com.

A particularity of m-commerce is that it allows potential customers to search for products at any time, to compare prices and to make payments effortlessly regardless of where they are at the moment. It is expected that m-commerce will become the main channel for online shopping, given that 87% of customers engage in online product search before purchasing (Statista, 2021).

Major strengths of online shopping

Recent studies on online shopping suggest that the intention of adoption is strongly affected by the perceptions of usefulness (utility) and ease of use (effort). Utilitarian values include time savings, judgments of convenience, and economic aspects in the context of online shopping. Further antecedents also include instant connectivity, hedonic motivation, habit, risk, and contextual value as essential predictors (Dima & Vasilache, 2016; Hubert et. al, 2017).

The most important feature to support perceived ease of use and usefulness of websites is the m-payment with an e-wallet, which provides all functions of today's wallet on one convenient smart card eliminating the need for several cards. Another valuable feature of the websites is product related information, which includes: product availability, specifications, price list, product comparison and reviews, testimonials from other buyers, promotional items and policy of return & exchange product (Basbeth and Sumapraja, 2021).

Research on consumer behaviour and e-commerce has found that hedonic motivation is positively related to online purchase and repurchase intentions. Furthermore, young adults were found to link fashion shopping with a leisure activity - this underlines the importance of entertainment and enjoyment as significant determinants of purchase intention. Therefore, hedonic motivation was an important determinant of e-commerce purchases during the COVID-19 pandemic, as the closure of restaurants, bars, and cinemas during the shutdown had limited opportunities to engage in leisure activities (Koch. et. al, 2020).

Research on uncertainty factors in the consumer behavior of customers at the e-commerce level has found the main factors of uncertainty perceived by customers and also verifies the correlation between these factors and the intention of the Millennials to buy (Horvath et. al, 2021).

According to the existing literature, the greatest advantage differentiating m-commerce from e-commerce is that, mobile apps are faster (instant connectivity) and the checkout process when ordering online is significantly easier (Pamula, 2019). Moreover, application programs are downloadable, free of charge and usually marked by the name and logo of a company. As this facilitates brand recognition, mobile apps have become important marketing stimuli in shaping customers' brand experience in e-commerce (Li et. al, 2020).

Results of a recent regression analysis, indicate that when people engage in online shopping, their perceived wellbeing improves. Only one unit increase in the frequency of online shopping has 16% of the impact on satisfaction with life, 38% on happiness and 24% on subjective vitality. This positive association of e-shopping with wellbeing could be explained by the fact that e-shopping expands choices, focuses on experiences and saves time (Guillen-Royo, 2019).

Important limitations of online shopping

M-commerce is associated with several barriers and risks such as payment security concerns, privacy risks, low quality of telecom services, data leakage, server side problems, software application risks and many others (Pamula, 2019). The literature indicates that online customer information is collected and tracked for data-driven marketing efforts but is inadequately safeguarded. For example, security risk (e.g., personal information leakage) has been found to have strong negative effects on online transactions (Tran, 2021).

Conversely from the previous studies according to which e-shopping is connected to enjoyment, other studies show that it may detract from wellbeing if people shop more than before and become indebted or increase the extent to which their lives revolve around materialistic pursuits like shopping (Guillen-Royo, 2019).

A major drawback of online commerce is that consumers cannot physically examine products, which leads to product uncertainty or unsatisfied customers (Bartók et al., 2021). Regarding mobile devices, some of them may have small screens and graphics issues, therefore user experience and user interfaces need to be constantly improved, which translates into higher research and implementation costs (Pantelimon et. al, 2020).

Another important limitation could be that digitalization has not reached all households throughout the EU states (Stankovic et. al, 2021). We can distinguish discrepancies between regions within countries, especially when it comes to peripheral or rural areas, which are less digitally developed (Małkowska et al. 2021). This is partially due to a lack of digital infrastructure and of digital competency. Due to pandemic effects over the entire socio-economic life, it is stringent to accept that digitalization makes the difference and replaces the downsizing of mobility. Moreover, accelerating the digitalization process as a consequence of health crisis, seems to be a game changer in the entire economy and social life.

Moreover, there are also concerns among citizens about digital surveillance and monopolization that play an important role in digital skepticism (Fuchs, 2020).

Research methodology

Further in this paper, we will delve deeper into the subject of e-commerce, focusing on an analysis that highlights the change in online activity determined by the pandemic context. Therefore, we will compare the situation between 2019 (before Covid-19) and 2020 (after the Covid-19 pandemic onset) regarding the selected indicators, performing a Hierarchical Cluster Analysis and using Ward's method for the dendrogram.

In order to acquire a better perspective over the changes in e-commerce in the context of the crisis generated by the Covid-19 pandemic, we chose to focus our attention on European Union states. Firstly, we calculated the change in electronic commerce by comparing the values of chosen indicators in 2019, before the pandemic took place, and 2020, which is the year when the pandemic was already the "new normal". Secondly, we performed a Cluster Analysis in order to see how the EU states were grouped before the pandemic (2019) and if they have changed and how they have changed after the pandemic (2020) with regards to online commerce. Data processing was carried out using IBM SPSS Statistics software, having as source the values of 6 indicators that will be described below.

The six indicators gathered for this paper are available on the Eurostat platform and they are directly related to digital economy and electronic commerce.

Table 1. List of indicators used in the analysis

No.	List of indicators	Unit of measure	Explanation
1.	Frequently using the internet	percentage of individuals	Frequency of internet access: daily
2.	Selling goods or services	percentage of individuals	Internet use: selling goods or services
3.	Ordering goods or services over the internet for private use	percentage of individuals	Last online purchase: in the last 12 months

No.	List of indicators	Unit of measure	Explanation
4.	Finding information about goods and services	percentage of individuals	Internet use: finding information about goods and services
5.	Internet banking	percentage of individuals	Internet use: Internet banking
6.	Share of enterprises' turnover on e-commerce (%)	percentage of turnover	All enterprises without financial sector (10 persons employed or more)

Source: Data from Eurostat database.

Results and discussion

For each of the abovementioned indicators, we calculated the shift as the difference between the value of 2020 and the value of 2019, where shift no. 1 is related to indicator no. 1, respectively shift no. 6 being related to indicator no. 6. All six shift averages corresponding to the six indicators were positive, which means that overall, at EU level, there has been an increase for these indicators in 2020 compared to 2019.

Using "descriptive statistics" in Excel, we were able to quick scan the shift results. The highest shift average is 6.2 for the indicator no. 3 (Goods or services ordered from the internet) meaning that this indicator has undergone the biggest increase at EU level. The lowest shift averages are 1.4 corresponding to indicator no. 6 (Share of enterprises' turnover on e-commerce - %) and 1.3 corresponding to indicator no. 2 (Selling goods or services). A higher average reflects that the change in that indicator was more pronounced in the context of the pandemic, while a lower average shows that, although the values of the indicators increased during the crisis, the change at EU level was not so intense.

In Figure 3, we can see these six shifts at each EU state level. Giving a glance to the countries that indicate the biggest changes, we notice Hungary, with a positive average shift of 8.2 on all six indicators, followed by Romania, with a mean of 7.6, and Cyprus with an average increase of 6.6. A reason that can explain these results is that in these countries e-commerce was not as developed as in other EU countries or online shopping was not as usual before the pandemic as it was in the most developed EU states. During the crisis, these countries have moved to a large extent in the world of e-commerce.

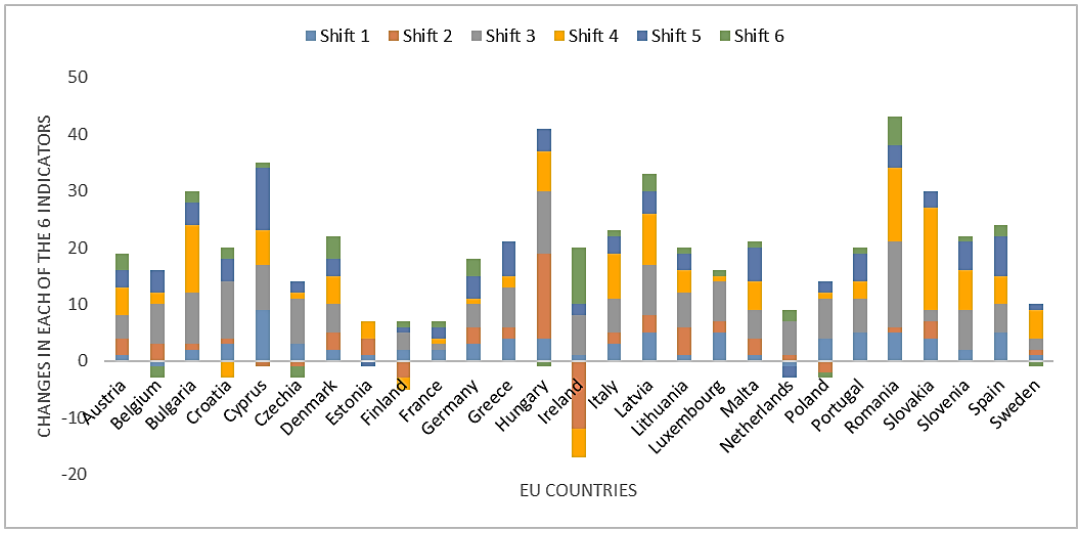


Figure 3. The shift in e-commerce during COVID-19 (2019 vs 2020)

Source: Authors' own processing based on data from Eurostat database.

The countries for which the change in the use of e-commerce was extremely low in the context of the pandemic were Finland with an average change of only 0.2 and the Netherlands with 0.8. An explanation for this could be that these countries already had a strong digital and online activity even before the pandemic, therefore the increase could not be as dramatic as in other states. Atypically, Ireland was the only EU state with a negative average shift (-1.4), marking significant decreases on indicators 2 (Selling goods or services) and 4 (Finding information about goods and services).

However, the values obtained by calculating the shift (which is the difference between the values of 2020 and those of 2019) reflect only to a small extent the situation on the 27 states in the pandemic context. The coefficients of variation calculated for each shift reflect a low homogeneity, which means that the averages are not relevant, as there are significant fluctuations from indicator to indicator and from state to state. Thus, we chose to conduct a Hierarchical Cluster Analysis in order to get a better perspective over the change in online commerce in EU.

Before and after the pandemic - a comparative Cluster Analysis

The Cluster analysis is a multidimensional analysis of data, being a grouping method of the elements corresponding to a set, starting from one or more characteristics of these elements. In our case, this grouping of elements refers to the set of the 27 EU states, based on the six chosen indicators (that were mentioned before in table 1). We chose to compare between 2019 grouping, which represents the situation before pandemic and that of 2020 corresponding to the situation after the crisis. By this comparison we aim to see how the pandemic changed the situation among EU states if we are to look at the e-commerce attribute. Conducting the analysis on the values of the indicators from 2019, the following grouping resulted:

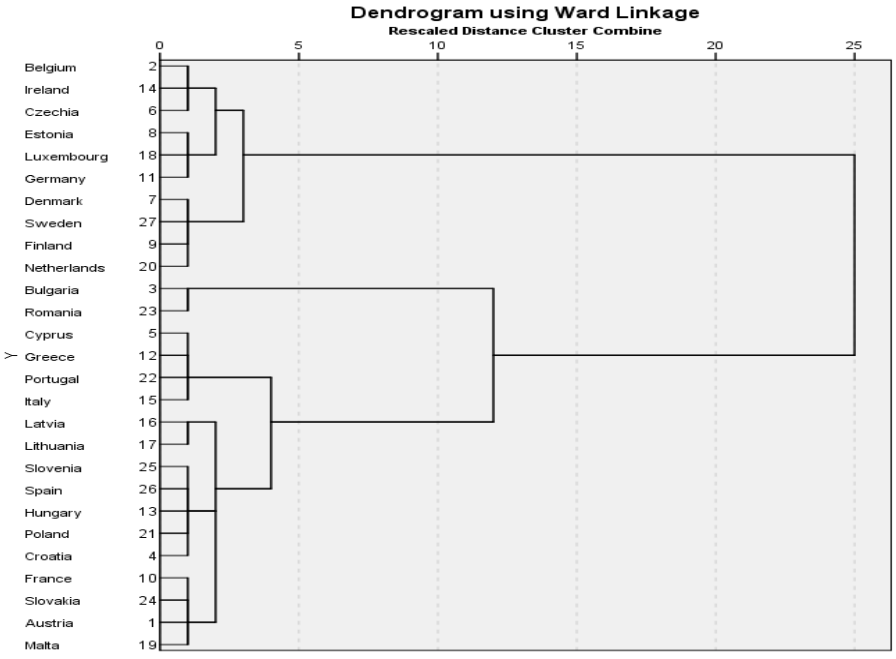


Figure 4. Dendrogram 1 (2019) – the situation before the pandemic

Source: Authors' own processing in SPSS, based on data from Eurostat database.

Out of the 3 main clusters that we can see in the dendogram, the cluster with the highest percentages in the use of e-commerce consists of 11 states. For indicator no.2, individuals who sell goods or services online, the best performing countries are the Netherlands and Finland with 36% and 32% of the population. Regarding people who ordered goods or services over the internet, the highest percentages are obtained by Denmark and Sweden, with 84% and 82%. Belgium and Ireland have the largest share of enterprises' turnover on e-commerce, with 33 and 34 percent, respectively.

The middle cluster in terms of e-commerce performance includes 13 states: Austria, Croatia, Cyprus, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Slovakia, Slovenia and Spain. The most representative countries corresponding to this group are Slovenia, Poland and Hungary, with average values of the indicators compared to the other countries in the group. The weakest states of this cluster are Greece and Cyprus.

The group with the lowest performances in terms of online shopping consists of Bulgaria, Romania and Italy. Regarding people who frequently use the internet, Romania has the lowest percentage (57%), followed by Bulgaria (60%). In this respect, Italy has a significantly higher percentage (73%). In fact, although it has been assimilated to this cluster, Italy is at a considerable distance from the other two states. If we look at the internet banking part, in Romania and Bulgaria, only 8, respectively 9% of the population use the internet in this purpose, while in Italy 36% of the population is carrying internet banking operations.

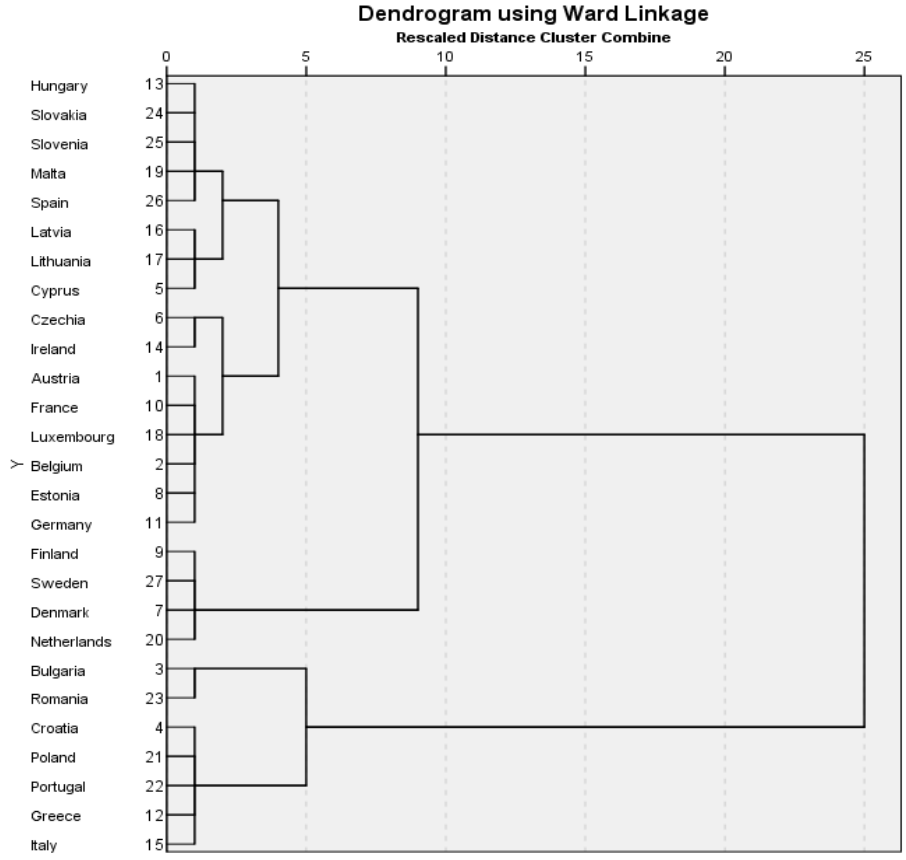


Figure 5. Dendrogram 2 (2020) – the situation during the pandemic

Source: Authors' own processing in SPSS based on data from Eurostat database.

In the dendrogram for 2020, we can see a grouping of states into 4 clusters. This time, Romania and Bulgaria form a stand-alone cluster, with the weakest performance in terms of e-commerce, although Romania went through a significant shift during the pandemic. However, Romania and Bulgaria managed to reach only 62% of individuals who frequently use the internet (indicator no. 1), in contrast to Denmark (94%) and Finland (92%), countries belonging to the best performing cluster, along with the Netherlands and Sweden.

Although they had significant increases in the percentage of individuals who order online (indicator no. 3), Romania and Bulgaria still have the lowest percentages, of 38% and 31%, respectively, meaning they still have a long way to go. In 2020, Italy was assimilated to the cluster formed by Croatia, Cyprus, Greece Hungary, Poland, Portugal, Slovenia, having considerably better performances than Romania and Bulgaria, but weaker than the states from the first two clusters. However, Italy had only 44% of the population ordering online, while Slovenia was the state with the highest percentage (63%) of its cluster.

Regarding the Share of enterprises' turnover on e-commerce (indicator no. 6), Bulgaria achieved 6% (from 4% in 2019), while Romania had an increase up to 12% (from 7% in 2019). Despite these shifts, they are still far behind Belgium and Ireland who got the highest percentages, 31% and 44%. We have to mention that Belgium and Ireland are from the second performant cluster, which is including as well other 11 states.

Concerning the individuals who use internet for selling online (indicator no. 2) Bulgaria is situated slightly higher than Romania, with 7% comparing to 4%. Yet, the most performant country is Netherlands with 37%, followed by Germany and Malta with 33%, both being included in the second performant cluster.

Romania and Bulgaria also rank lasts when it comes to percentage of individuals who use internet banking (indicator no. 4) with only 12% and 13% of population. On the opposite side, the quartet of states which make up the best performing cluster, consisting of Sweden, Netherlands, Finland and Denmark, have percentages between 94 and 85%.

Conclusions

Even if this analysis does not provide a detailed picture of the performance of each state in terms of progress in e-commerce in the pandemic context, it manages to provide an overview of the positions corresponding to the best as well as the most poorly performing EU states, in terms of e-commerce and their ability to overcome their current position.

It can be observed that many countries at the bottom of the rankings (Romania and Bulgaria) have made considerable progress in terms of online activity, especially online shopping. Moreover, we can clearly see that for countries that are already at a high level of development (Netherlands, Denmark, Finland etc.) before the pandemic, a shift too significant is practically no longer possible.

Although many states are still emerging in the use of e-commerce, especially in those where there are dramatic discrepancies between rural and urban areas, the crisis caused by Covid-19 has represented a change in the paradigm for them. It is expected that in the upcoming years, e-commerce and especially m-commerce, will have a strong upward trend for these states.

The Coronavirus pandemic taught us that we are never prepared for what may come, so we have to be flexible in order to adapt to any change in the environmental context and to learn as we go. SMEs were the most affected by pandemic shock, first because of lockdown,

then the lack of resources related to disruption on demand side, and lately because of allocating resources in the effort to survive instead to invest.

Electronic commerce offered the possibility to reach new markets at a relatively low cost, in a convenient way for both buyers and sellers, in this way generating increased revenues since its inception. The benefits of e-Commerce such as efficiency, 24/7 services, competitive pricing, variety in item selection have outnumbered the resources required in the initial setup of the e-Commerce websites. The advances in modern e-commerce, including advertising, shopping, investing, banking, and other online services have facilitated people to interact with the internet in their daily lives (Taneja, 2021).

Along with the increase in innovative opportunities from the beginning of the lockdown, commercial businesses problems posed a great threat to both customers' buying behavior, as well as to the company's sales. Delays in the manufacturing and transportation of the products contributed to poor customer satisfaction. In order to address these issues, further efforts and actions need to be made, such as maintaining ethical business practices, investing in employees, working to maintain or reorient supply chains (Bhavya, 2020).

Future work need to be conducted in order to explore new ways to address the identified challenges in the development of e-commerce and m-commerce by protecting vulnerable consumers as well as creating innovative business e-commerce models (Dumanska et. al, 2021).

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