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Original scientific paper
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ORDERING GOODS AND SERVICES ONLINE IN SOUTH EAST EUROPEAN COUNTRIES: COMPARISON BY CLUSTER ANALYSIS

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Abstract

Extent of online purchases of goods and services is nowadays rapidly growing part of the modern economy. It is connected to rapid changes in the commerce as well as in the way of life of entire population. In this paper the influence of important factors on online purchases in South East European countries in comparison with EU-28 countries is studied. Using selected ordinary least square model it has been shown that there is a strong dependence of the percentage of individuals who use the internet for ordering goods or services on the level of internet access for households and on the percentage of individuals aged 16–74, who have basic or above basic overall digital skills. Based on cluster analysis it is identified that countries of the region recognised candidates for future membership of the European Union (ME, MK, TR, RS) demonstrate similar development patterns as other countries from the region that are already EU member states (RO, HR, BG). It can be expected in future online purchase to contribute significantly to the acceleration of economic growth of these group of countries.

Keywords: digitalization, online purchases, e-commerce, digital skills.

Jel Classification: C38; C53; L81; L86

INTRODUCTION

The widespread digitalization nowadays leads to changes in the way of lives of people in all societies and contributes largely to the growth of all national economies. In this study particular aspects of the digitalization related to the use of internet for ordering goods or services have been studied in details. Specifically, the influence of some indicators on the Percentage of individuals who use the internet for ordering goods or

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services (main variable) has been analysed. The main variable of the study has been detected as this based on the finding that it increases rapidly in the last few years. Thus, it doubled for the EU-28 countries from 30% in 2007 to 60% in 2018 (Dumcic et al. 2019). Particularly favourable condition for increase of ordering goods and services online in EU is the open market allowing cross-border purchases (Strzelecki 2019).

In order to identify factors influencing the studied variable, several indicators that are expected to be strongly correlated with the main variable have been taken into account. Percentage of individuals who have basic or above basic overall digital skills is to be paid particular attention since in our previous studies was identified as particularly important (Dumcic, Skoko Bonic, and Zmuk 2018; Dumcic et al. 2019).

In our previous works (Dumcic, Zmuk, and Novkovska 2017) we have presented results from regression analysis of e-commerce, covering selected EU members and candidates countries. Later, this study has been extended by profile analysis of identified clusters of EU countries, based on the use of several indicators having impact on the e-commerce for individuals (Dumcic, Zmuk, and Mihajlovic 2017).

Results of the statistical analysis for the impact of nine development indicators on the Internet purchases by individuals for year 2013 (percentage of individuals who made a purchase by using the Internet in the last 12 months, out of the total population of a country) were reported in (Dumcic, Skoko Bonic, and Zmuk 2018).

Previous findings are available for the influence of different development indicators on particular forms of internet purchases. In (Dumcic, Ceh Casni, and Palic 2015) we presented study of online banking, including many results of multivariate analysis. Impact of development indicators on online booking for travel and accommodation services was reported in (Zmuk, Dumcic, and Mihajlovic 2014; Dumcic, Zmuk, and Ceh Casni 2015); distinct clusters of European countries were identified. Effects of various factors on website trust on online booking have been also studied (Kim, Kim, and Park 2017; Suk-Joo 2018; Tandon, Sharma, and Aggarwal 2019). Differences between the countries are significant and connected with various factors, such as national culture peculiarities (Hallikainen and Laukkanen 2018) and socio-cultural factors (Agnihotri and Bhattacharya 2019). Of particular interest for this study is the case of Western Balkan countries (Celic et al. 2018; Azemi et al. 2019). Previously, in (Zmuk and Mihajlovic 2018), their position within Europe concerning the influence of economic and digital development level on online booking was studied.

The issue of present barriers to e-commerce in the case of EU countries was studied empirically by Simicevic, Jakovic and Jezovita (2013). The particular case of Hungary was explored by Nagy (2016). Comparison between Hungary and Ukraine from the point of view of digital economy and society was presented in the work (Nagy 2017). The role of the social interactions (Yin et al. 2019) and social networks has attracted particular attention (Ardley et al. 2016; Awad 2019; Olotewo 2016; Singh and Singh 2018).

Infrastructural drivers of online purchase, such as per capita telecommunications investments and per capita gross national income, attracted significant attention (Akhter 2017).

Particularities of the countries on the road of integration in EU (recognised candidates for future membership of the European Union) are of main interest for this study, in order to assist in creation of the efficient policies for their further development. Here are

considered following countries: Montenegro (ME), Republic of North Macedonia (MK), Serbia (RS), Turkey (TR), Albania (AL) and Kosovo (KS). Similarities and differences with other countries from EU-28 will be considered in finer details using advanced analytical techniques.

1. METHODOLOGICAL BASIS

Data used in this study have been retrieved from the Eurostat database (Eurostat 2019a). First, the main indicator, Percentage of individuals who use the internet for ordering goods or services, was retrieved (Eurostat 2019b).

Multiple linear regression analysis required for the study has been performed using the software *Megastat* and *EViews*. The used general model for multiple linear regression population is described with following expression:

$$Y_i = \beta_0 + \sum_{j=1}^k \beta_j X_{j,i} + e_i \quad i = 1, 2, \dots, n \quad (1)$$

Regression parameters included in the model are estimated using the Ordinary Least Squares (OLS) method. The model with estimated parameters is described with following expression:

$$\hat{Y}_i = \hat{\beta}_0 + \sum_{j=1}^k \hat{\beta}_j X_{j,i} \quad i = 1, 2, \dots, n \quad (2)$$

Following indicators were studied in this work in order to establish the connection with the main variable (Y):

X_{1_GDPpcPPS} – GDP per capita in PPS, Index, EU-28=100 (Eurostat 2018a),

X_{2_AccHome} – Percentage of households who have internet access at home, for the population aged 16–74, also called Level of internet access for households (Eurostat 2018b) and

X_{3_DigitalSkill} – Percentage of individuals aged 16–74, who have basic or above basic overall digital skills (Eurostat 2019c).

2. ANALYSIS AND DISCUSSION

2.1. General considerations

First, the temporal variations (X=year) of the main variable for this study (Percentage of individuals who use the internet for ordering goods or services, $Y=Y_{2017IntOrderGoods}$) for EU-28 countries as a whole have been analysed. Values for the period 2006–2018 have been used (Figure 1). As is seen, fast stable increase is observed for the considered period, with an average rate of 2.73 percentage points, as is obtained from the linear fit (dotted line, $R^2=0.995$). Thus forecasted values until year 2025 go to about 80%. If using

more realistic parabolic fit (solid line, $R^2=0.997$), somehow slower growth is forecasted for future period (up to 73% in 2025), however leading to the same conclusion that on midterm (until 2025) the online purchase of goods and services will become widespread mode of purchases for citizens of EU-28. Similar behaviour is expected for Eastern European countries, since they follow in general case the trends that are dominant in EU-28.

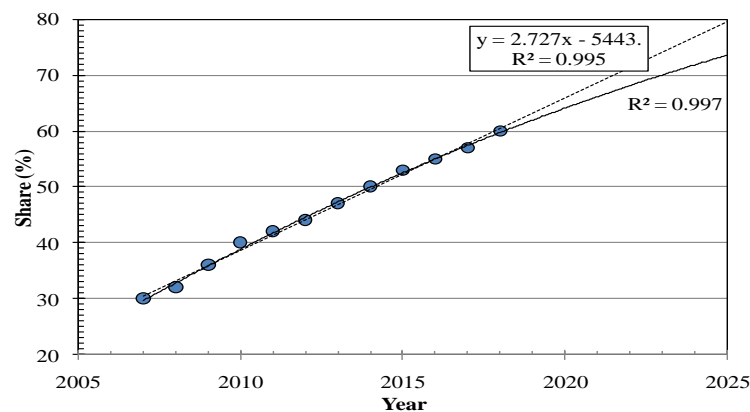


Figure 1. Evolution of the percentage of individuals who use the internet for ordering goods or services with time from year 2007 for EU-28 countries

In order to depict the situation with some Eastern European countries and Turkey, temporal variations of the percentage of individuals who use the internet for ordering goods or services for ME, MK, RS and TR are displayed in Figure 2.

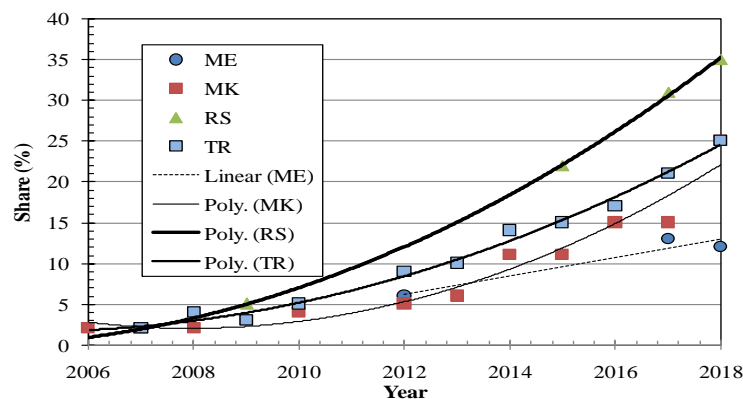


Figure 2. Evolution of the percentage of individuals who use the internet for ordering goods or services with time from year 2006 for some Eastern European countries and Turkey

As is seen from Figure 2, these countries are following EU-28 countries with significant delay. Best progress has been achieved by Serbia (RS), attaining in 2018 the value of 35%, which is the level that was attained by EU-28 in 2009. Delay of other countries considered is even more significant, particularly for the case of Montenegro (ME), where the value of the indicator remains slightly above 10% in the considered period. Limited data are available for Kosovo (15% in 2017 and 22% in 2018) and for Bosnia and Herzegovina (18% in 2018). Data for Albania are lacking. Therefore, data for these countries are not shown in Figure 2. Overall it is to be estimated that the considered countries follow the development of EU-28 in the Percentage of individuals who use the internet for ordering goods or services with a delay of 9 or more years.

2.2. Refined analysis

In order to obtain finer details relative to the characteristics of the considered group of countries (those who have signed Stabilisation and Association agreements plus Turkey) in correlation with the same characteristics EU-28 countries, group of 32 countries have been composed in this work: EU-28 plus ME, MK, RS, AL and TR. Kosovo, Albania and Bosnia and Herzegovina have been disregarded due to the scarcity of data, as it was indicated above. By further analysis it was identified that one of the EU-28 countries behaves as outlier (Luxembourg (LU) due to its GDP per capita in PPS data) and therefore was removed from the set. Finally, the number of countries used in the study has been fixed to 31.

Final data used in analysis of this work are displayed in Table 1. It is composed of data for the main variable ($Y_{2017_{\text{IntOrderGoods}}}$) and three other indicators ($X1_{2017_{\text{GDPpcPPS}}}$, $X2_{2017_{\text{AccHome}}}$ and $X3_{2017_{\text{DigitalSkill}}}$) for the year 2017 for EU-28 excluding LU and adding ME, MK, RS and TR.

Table 1. Variables used in the study for the year 2017 for 31 countries

| Country Codes | $Y_{2017_{\text{IntOrderGoods}}} (\%)$ | $X1_{2017_{\text{GDPpcPPS}}} (\text{index, EU-28} = 100)$ | $X2_{2017_{\text{AccHome}}} (\%)$ | $X3_{2017_{\text{DigitalSkill}}} (\%)$ |
|---------------|----------------------------------------|-----------------------------------------------------------|-----------------------------------|----------------------------------------|
| BE | 60 | 118 | 86 | 61 |
| BG | 18 | 47 | 67 | 29 |
| CZ | 56 | 87 | 83 | 60 |
| DK | 80 | 127 | 97 | 71 |
| DE | 75 | 124 | 93 | 68 |
| EE | 58 | 75 | 88 | 60 |
| IE | 53 | 181 | 88 | 48 |
| EL | 32 | 69 | 71 | 46 |
| ES | 50 | 91 | 83 | 55 |
| FR | 67 | 105 | 86 | 57 |
| HR | 29 | 59 | 76 | 41 |
| IT | 32 | 95 | 81 | 44 |
| CY | 32 | 82 | 79 | 50 |
| LV | 46 | 64 | 79 | 48 |
| LT | 38 | 75 | 75 | 55 |
| | | | | |

Table 1. (continued)

| Country Codes | Y_2017 _{IntOrderGoods} (%) | X1_2017 _{GDPpPPS} (index, EU-28 = 100) | X2_2017 _{AccHome} (%) | X3_2017 _{DigitalSkill} (%) |
|---------------|-------------------------------------|-------------------------------------------------|--------------------------------|-------------------------------------|
| HU | 39 | 68 | 82 | 50 |
| MT | 52 | 93 | 85 | 56 |
| NL | 79 | 129 | 98 | 79 |
| AT | 62 | 130 | 89 | 67 |
| PL | 45 | 68 | 82 | 46 |
| PT | 34 | 77 | 77 | 50 |
| RO | 16 | 56 | 76 | 29 |
| SI | 46 | 82 | 82 | 54 |
| SK | 59 | 77 | 81 | 59 |
| FI | 71 | 109 | 94 | 76 |
| SE | 81 | 125 | 95 | 77 |
| UK | 82 | 108 | 94 | 71 |
| ME | 13 | 42 | 71 | 50 |
| MK | 15 | 36 | 74 | 32 |
| RS | 31 | 36 | 68 | 39 |
| TR | 21 | 65 | 81 | 34 |

Source: Eurostat database, selection based on authors' previous analyses.

Descriptive statistics for these series of data are given in Table 2.

Table 2. Descriptive statistics for variables used in the study for the year 2017 for 31 countries

| Statistics | Y_2017 _{IntOrderGoods} (%) | X1_2017 _{GDPpPPS} (Index, EU-28 = 100) | X2_2017 _{AccHome} (%) | X3_2017 _{DigitalSkill} (%) |
|----------------------|-------------------------------------|-------------------------------------------------|--------------------------------|-------------------------------------|
| Count | 31 | 31 | 31 | 31 |
| Mean | 47.48 | 87.10 | 82.61 | 53.61 |
| Standard Error | 3.78 | 5.90 | 1.50 | 2.46 |
| Standard Deviation | 21.05 | 32.84 | 8.38 | 13.70 |
| Coeff. of variation= | 44.33% | 37.71% | 10.14% | 25.55% |
| Range | 69 | 145 | 31 | 50 |
| Minimum | 13 | 36 | 67 | 29 |
| Maximum | 82 | 181 | 98 | 79 |
| 1st quartile | 32 | 66,5 | 76,50 | 46,00 |
| Median | 46 | 82 | 82,00 | 54,00 |
| 3rd quartile | 61 | 108 | 88,00 | 60,50 |
| interquartile range | 29 | 42 | 11,50 | 14,50 |
| Mode | 32 | 75 | 81 | 50 |
| Kurtosis | -1.03 | 0.70 | -0.62 | -0.53 |
| Skewness | 0.068 | 0.684 | 0.076 | 0.035 |
| zmin= | UK= -1.64 | IE= -1.56 | NL= -1.86 | NL= -1.80 |
| zmax= | ME= 1.64 | MK and RS= 2.86 | BG= 1.84 | RO= 1.85 |

Source: Eurostat, Authors' results (Dumcic et al. 2019).

In Table 3 correlation matrix for considered variables is shown. It is seen that correlation coefficients between the main variable and variables X2_2017_{AccHome} and X3_2017_{DigitalSkill} are markedly high (> 0.9). All other coefficients are markedly lower.

Table 3. Correlation matrix for variables used in the study for the year 2017 for 31 countries

| R | Y 2017 _{IntOrderGoods} | X1 2017 _{GDPpcPPS} | X2 2017 _{AccHome} | X3 2017 _{DigitalSkill} |
|---------------------------------|---------------------------------|-----------------------------|----------------------------|---------------------------------|
| Y 2017 _{IntOrderGoods} | 1.0000 | | | |
| X1 2017 _{GDPpcPPS} | 0.7654 | 1.0000 | | |
| X2 2017 _{AccHome} | 0.9027 | 0.8129 | 1.0000 | |
| X3 2017 _{DigitalSkill} | 0.9166 | 0.6852 | 0.8471 | 1.0000 |

Source: Eurostat, Authors' results (Dumcic et al. 2019)

Further, we tested the possible OLS models using the considered variables. Results for two of these models are presented in (Dumcic et al. 2019): model with $X1_{2017_{GDPpcPPS}}$ and $X2_{2017_{AccHome}}$ as independent variables and model with $X2_{2017_{AccHome}}$ and $X3_{2017_{DigitalSkill}}$ as independent variables. In both cases $Y_{2017_{IntOrderGoods}}$ is considered as dependent variable. It has been found that most appropriate model is the one with $X2_{2017_{AccHome}}$ and $X3_{2017_{DigitalSkill}}$ as independent variables. It is described by following expression:

$$Y_{2017_{IntOrderGoods}} = \hat{\beta}_0 + \hat{\beta}_2 X2_{2017_{AccHome}} + \hat{\beta}_3 X3_{2017_{DigitalSkill}} \quad (3)$$

where $\hat{\beta}_2 > 0$ and $\hat{\beta}_3 > 0$.

Estimated values of the parameters are found to be:

$$\hat{\beta}_0 = -89.61 \pm 16.59 \quad (4)$$

$$\hat{\beta}_2 = 1.12 \pm 0.29 \quad (5)$$

$$\hat{\beta}_3 = 0.83 \pm 0.18 \quad (6)$$

All the parameters are expressed with their standard errors.

Based on regression diagnostics tests for residuals it was found that there is neither problem of non-normality (Jarque-Berra test), nor problem of heteroskedasticity and (Bruch-Pagan Test). Value of the Variance Inflation Factor, $VIF=3.541$, shows that there is no multicollinearity problem. Model is statistically significant at 1% significance level. Therefore, there is a strong influence of the considered indicators on the online purchase in the considered group of counties.

This result shows that the main factor determining the percentage of individuals who use the internet for ordering goods or services strongly depends on the level of internet access for households (parameter value 1.12) and on the Percentage of individuals aged 16–74, who have basic or above basic overall digital skills (parameter value 0.83). The first of these factors appears to be dominant, with the estimated parameter value of 1.12. Therefore, the physical access to appropriate facilities at home is the most important factor for development of online purchases. Somehow lower value of the second parameter indicate that digital skills are almost equally important for the development of online purchases, since the facilities by themselves without appropriate skills of their users do not create condition for the growth of online purchases. Very high confidence level indicates that the factors involved here are of fundamental origin. Indeed, access to appropriate facilities at home is substantial condition for the activity considered, while

the digital skills are essential ability needed to perform the activity — inline purchase of goods and services.

Contrary to this, the effect of economic development level (GDP) appears to do not be as much important. Above finding can be explained by the fact that all this countries already have attained some economic development level where the household's disposable income is not a strong limiting factor for proceeding to internet purchases.

In order to provide more specific information on the particularities of different groups of countries involved in the study, cluster analysis was done (Dougherty 2006; Hair et al. 2008; Field 2011). Four clusters are found (Figure 3) based on four variables, using Ward linkage and Squared Euclidean distances, in 2017.

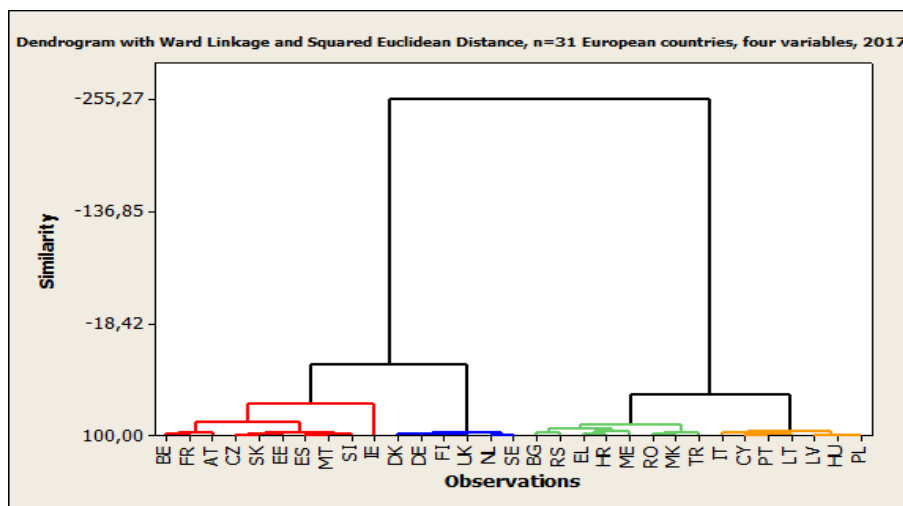


Figure 3. Dendrogram for 31 countries grouped into four clusters based on four variables, for the year 2017

As is seen from Figure 3, considered 31 countries are clearly separated in four clusters. For our study the most important one is the third from left cluster including: BG, RS, EL, HR, ME, MK, TR. All countries in the focus of our study (ME, MK, RS and TR) fall into the same group.

Other countries belonging to this cluster (BG, EL, HR), although already part of EU-28, belong to the same geographical region and have many similarities with the countries from the focus group. Therefore, it is expected all considered countries to follow the same patterns of development in future of the online purchases. Although the countries from the focus group have attained significantly lower economic development levels, the progress of the online purchases is expected to grow with similar rates and to attain the high levels of 80 % for the percentage of individuals who use the internet for ordering goods with a delay of about a decade, i.e. around year 2035. Thus, the importance of the online purchases will attain high level much before the focus group countries attain an economic development level comparable to EU-28.

CONCLUSIONS

Online purchase of goods and services is rapidly growing during the last decade. Thus, in EU-28 in the period from 2006 to 2018, percentage of individuals who use the internet for ordering goods or services doubled from 30% up to 60%. Eastern European countries, which are focus of this study, follow the same trend with a delay of about one decade.

Analysis in this paper was based on the use of econometric models for online purchase of goods and services for the set of countries composed of EU-28 and focus group, in total 31 countries. Results of the analysis show that online purchase strongly depends on the level of internet access for households and on the percentage of individuals aged 16–74, who have basic or above basic overall digital skills. Statistical analysis using the OLS models confirms that the general behaviour of the development of online purchases in these countries is similar.

Specific differences between the countries are identified using clustering method. All the countries from the focus group (ME, MR, RS and TR) fall in the same cluster, out of the four clusters in which is divided the entire group of 31 countries. In the same cluster fall other countries from the region, that are already EU member countries: BG, EL and HR. Therefore, it is expected all the countries from the region to follow similar patterns in development of the online purchases in future.

Since the development of online purchases of goods and services appears to do not be substantially limited by the economic development level of the South East European countries and Turkey (as measured by the GDP per capita PPP), it is concluded that further advancement can be achieved based on the improvement of the digital skills of the population, a process that is already on-going in these countries. In addition, progress in this field can be an asset for faster development of entire economy in the region. Therefore, policies aiming at improvement of the digital skills of the population, on medium and long term, can effectively contribute to the acceleration of their economic growth. It can also be expected this development to contribute to the development of other sectors of considered national economies.

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