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E-COMMERCE TREND FORECASTING FOR ROMANIA VS EUROPEAN UNION

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Abstract: *Considering the e-commerce as a dynamic channel sale, I conducted an analysis on the evolution of European e-commerce vs. Romania. For this purpose, I made a direct analysis, based on data available on Eurostat. Another purpose of the research was the identification of discrepancies on consumers' behavior related to online purchases between the EU and Romania.*

JEL classification: L81
Key words: e-commerce trend, e-commerce Romania, e-commerce EU

1. INTRODUCTION

Today, information and communications technology is the focus of most developed countries in the world. Applying the Internet technologies and electronic technology has become both a major opportunity and a big challenge.(Schneider & Gupta, 2016)

Now, millions of people worldwide use the Internet to do everything, from reading news to purchasing products online. (Biagi & Falk, 2017)(Dabidian, Clausen, & Denecke, 2016)

The Internet affects almost all businesses. Many companies are embracing the Internet for many of their activities (Lau, Zhao, Chen, & Guo, 2016). E-commerce intensifies the competition and produce more benefits for consumers, with lower prices and offer more choices (Oliveira, J. C., Shen, X., & Georganas, 2000). So, the Internet and e-commerce grow the efficiency and create better asset utilization. (Anvari & Norouzi, 2016)(Kock, 2008)

The Internet also expands the opportunities for business-to-business and business-to consumer ecommerce transactions across borders. (Chu, Leung, Hui, & Cheung, 2007) The internet sets up for business to consumer transactions a potential revolution in global

commerce: the individualization of trade using an expanded consumer marketplace. (Huang & Kuo, 2012)

Over the past few decades, studies have considered R&D as a proxy variable for knowledge capital in the examination of the relationship between knowledge capital and productivity. (Anvari & Norouzi, 2016)

Information and communication affect also the supply and the demand. ICT affects the economic behavior of consumers through the utility function on the demand side and the producer treatment on the supply side. (Qu, Pinsonneault, Tomiuk, Wang, & Liu, 2015)(Samiee, 2008)

In their article *The impact of e-commerce and R&D on economic development in some selected countries,* Rana Deljavan Anvari and Davoud Norouzi investigated the impact of the e-commerce and R&D, health expenditure and government size on the GDP per capita in twenty one selected countries, namely, Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, and United Kingdom. The investigation period was 2005-2013. They showed that the explanatory variables in the selected countries played a significant role in the per capita income. (Anvari & Norouzi, 2016)

The online expenditure increase over time as more consumers become more confident with online shopping and move a larger share of their shopping online. The online shopping basket differs from a traditional basket because other types of goods do not lend themselves so easily to online trade.

Estrella Gomez-Herrera, Bertin Martens and Geomina Turlea, analyzed in their article *The drivers and impediments for cross-border e-commerce in the EU* a single EU consumer survey data set that offers some unique insights into the value and direction of online cross-border trade between EU countries. They concluded that the online expenditure increase over time as more consumers become more confident with online shopping and move a larger share of their shopping online. The online shopping basket differs from a traditional basket because other types of goods do not lend themselves so easily to online trade. (Gomez-Herrera, Martens, & Turlea, 2014)

A study about *E-banking culture: A comparison of EU 27 countries and Portuguese case in the EU 27 retail banking context,* by Jaime Fonseca, shows that the customers' acceptance of online banking may be indirectly influenced by cultural differences. Jaime Fonseca concluded that citizens with higher levels of education are more likely e-banking users' that do not risk. (Fonseca, 2014)

2. DATA ANALYSIS

2.1 Last online purchase in the last 3 months

Source: Internet purchases by individuals [isoc_ec_ibuy]
Last update 02.02.17
Extracted on 06.03.17
Source of data Eurostat
INDIC_IS Last online purchase: in the last 3 months
IND_TYPE All Individuals
UNIT Percentage of individuals

Data taken from Eurostat were processed with Tableau Public v. 10.2.
For *Last online purchase in the last 3 months* was created the dimension *Country*, with the measures *Latitude* (generated) and *Longitude* (generated). The main measure is *Last online purchase in the last 3 months.* Based on these data it was created the chart Fig. 01 - Last online purchase in the last 3 months.

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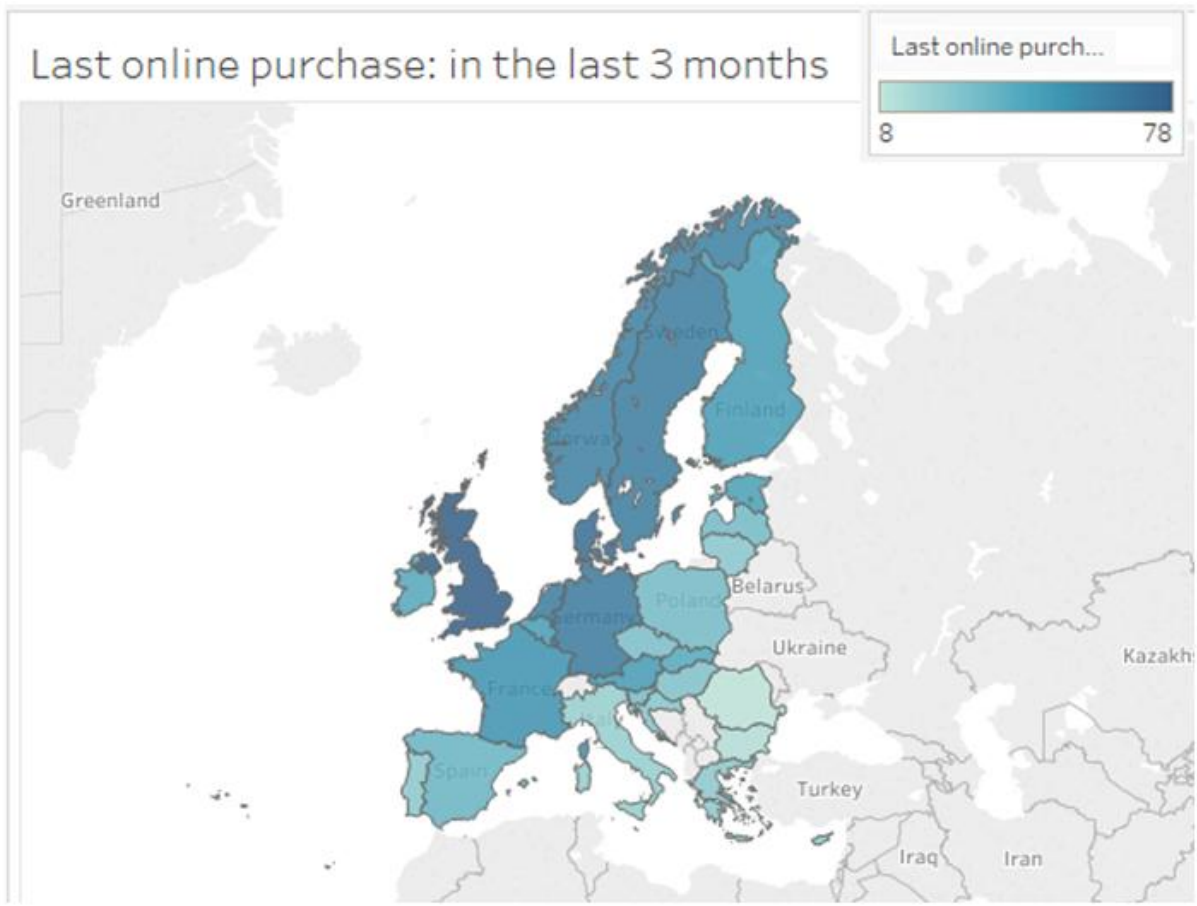

Fig. 1 - Last online purchase in the last 3 months (updated February 2017)

Forecast for *Last online purchase in the last 3 months*

Options Used to Create Forecasts

Time series: Year of Time

Measures: Value of European Union (28 countries), Value of Romania

Forecast forward: 5 years (2017 – 2021)

Forecast based on: 2007 – 2016

Ignore last: No periods ignored

Seasonal pattern: None (Search for a seasonal pattern in yearly data is not supported)

Value of European Union (28 countries)

Initial	Change From Initial	Seasonal Effect		Contribution		
2017	2017 – 2021	High	Low	Trend	Season	Quality
47 ± 4	9	None		100.0%	0.0%	Ok

Value of Romania

Initial	Change From Initial	Seasonal Effect		Contribution		
2017	2017 – 2021	High	Low	Trend	Season	Quality
9 ± 2	3	None		100.0%	0.0%	Poor

All forecasts were computed using exponential smoothing.

Value of European Union (28 countries)

Model			Quality Metrics					Smoothing Coefficients		
Level	Trend	Season	RMSE	MAE	MASE	MAPE	AIC	Alpha	Beta	Gamma
Additive	Additive	None	2	1	0.55	5.3%	27	0.500	0.033	0.000

Sum of Romania

Model			Quality Metrics					Smoothing Coefficients		
Level	Trend	Season	RMSE	MAE	MASE	MAPE	AIC	Alpha	Beta	Gamma
Additive	Additive	None	1	1	0.84	32.0%	12	0.500	0.000	0.000

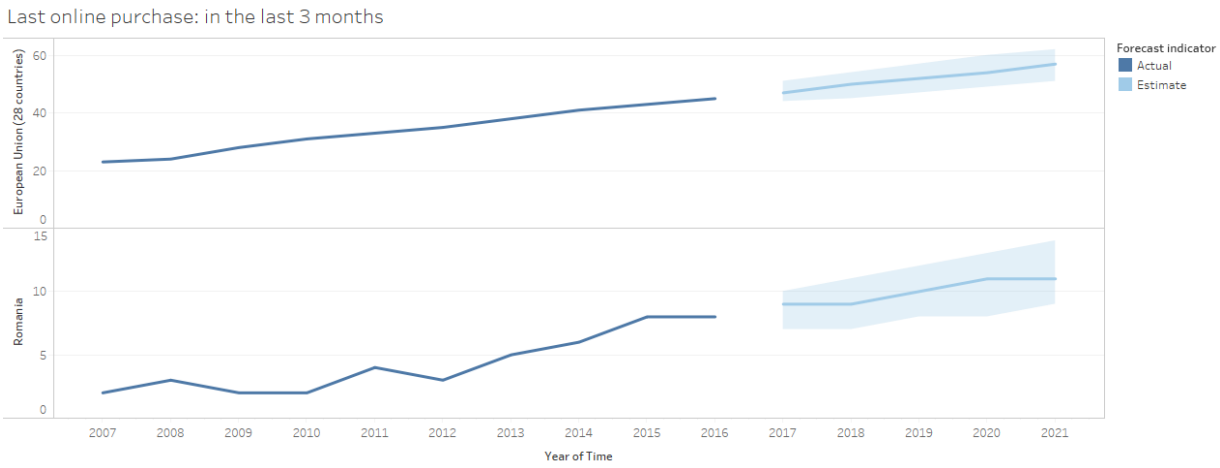

Fig. 2 - Forecast: Last online purchase in the last 3 months

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Trend Lines Model for for *Last online purchase in the last 3 months*

A linear trend model is computed for value of European Union (28 countries) (actual & forecast) given Time Year. The model may be significant at p <= 0.05.

Model formula:	Forecast indicator*(Year of Time + intercept)
Number of modeled observations:	15
Number of filtered observations:	0
Model degrees of freedom:	4
Residual degrees of freedom (DF):	11
SSE (sum squared error):	3.28032
MSE (mean squared error):	0.298211
R-Squared:	0.998025
Standard error:	0.546087
p-value (significance):	< 0.0001

Analysis of Variance:

Field	DF	SSE	MSE	F	p-value
Forecast indicator	2	1.3502099	0.675105	2.26385	0.150166

A linear trend model is computed for value of Romania (actual & forecast) given Time Year. The model may be significant at p <= 0.05.

Model formula:	Forecast indicator*(Year of Time + intercept)
Number of modeled observations:	15
Number of filtered observations:	0
Model degrees of freedom:	4
Residual degrees of freedom (DF):	11
SSE (sum squared error):	9.02188
MSE (mean squared error):	0.820171
R-Squared:	0.944447
Standard error:	0.905633
p-value (significance):	< 0.0001

Analysis of Variance:

Field	DF	SSE	MSE	F	p-value
Forecast indicator	2	0.3493377	0.174669	0.212966	0.811438

Individual trend lines:

Panes		Color	Line		Coefficients				
Row	Column	Forecast indicator	p-value	DF	Term	Value	StdErr	t-value	p-value
European Union (28 countries)	Year of Time	Estimate	0.0002412	3	Year of Time	0.0065719	0.0003151	20.8533	0.0002412
					intercept	-233.655	13.6993	-17.056	0.000439
European Union (28 countries)	Year of Time	Actual	< 0.0001	8	Year of Time	0.0069527	0.000181	38.4229	< 0.0001
					intercept	-249.061	7.37203	-33.7846	< 0.0001

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Romania	Year of Time	Estimate	0.0138818	3	Year of Time	0.0016428	0.0003164	5.19141	0.0138818
					intercept	-61.4056	13.7555	-4.46406	0.0209364
Romania	Year of Time	Actual	0.0002583	8	Year of Time	0.0019414	0.0003129	6.20403	0.0002583
					intercept	-74.765	12.7484	-5.86467	0.0003765

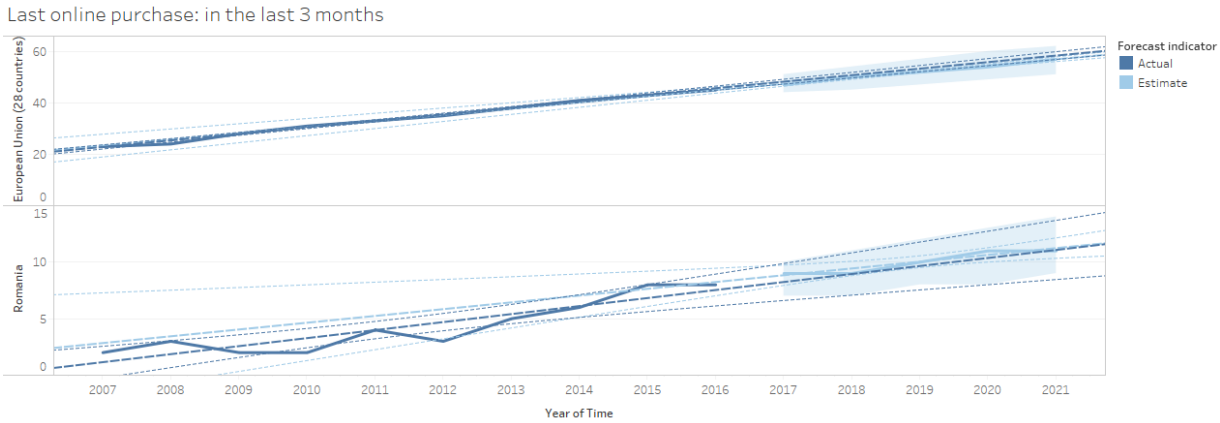

Fig. 3 - Trend lines: Last online purchase in the last 3 months

2.2 Internet use: Internet banking

Source: E-banking and e-commerce [isoc_bde15cbc]

Last update 02.02.17

Extracted on 06.03.17

Source of data Eurostat

INDIC_IS Internet use: Internet banking

IND_TYPE All Individuals

UNIT Percentage of individuals

Forecast for *Internet use: Internet banking*

Options Used to Create Forecasts

Time series: Year of Time

Measures: Value of European Union (28 countries), Value of Romania

Forecast forward: 3 years (2017 – 2019)

Forecast based on: 2007 – 2016

Ignore last: No periods ignored

Seasonal pattern: None (Search for a seasonal pattern in yearly data is not supported)

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Value of European Union (28 countries)

Initial	Change From Initial	Seasonal Effect		Contribution		
2017	2017 – 2019	High	Low	Trend	Season	Quality
51 ± 6	5	None		100.0%	0.0%	Ok

Value of Romania

Initial	Change From Initial	Seasonal Effect		Contribution		
2017	2017 – 2019	High	Low	Trend	Season	Quality
5 ± 1	1	None		100.0%	0.0%	Poor

All forecasts were computed using exponential smoothing.

Value of European Union (28 countries)

Model			Quality Metrics					Smoothing Coefficients		
Level	Trend	Season	RMSE	MAE	MASE	MAPE	AIC	Alpha	Beta	Gamma
Additive	Additive	None	3	2	0.62	5.6%	31	0.500	0.084	0.000

Value of Romania

Model			Quality Metrics					Smoothing Coefficients		
Level	Trend	Season	RMSE	MAE	MASE	MAPE	AIC	Alpha	Beta	Gamma
Additive	Additive	None	1	0	0.85	17.6%	-2	0.350	0.000	0.000

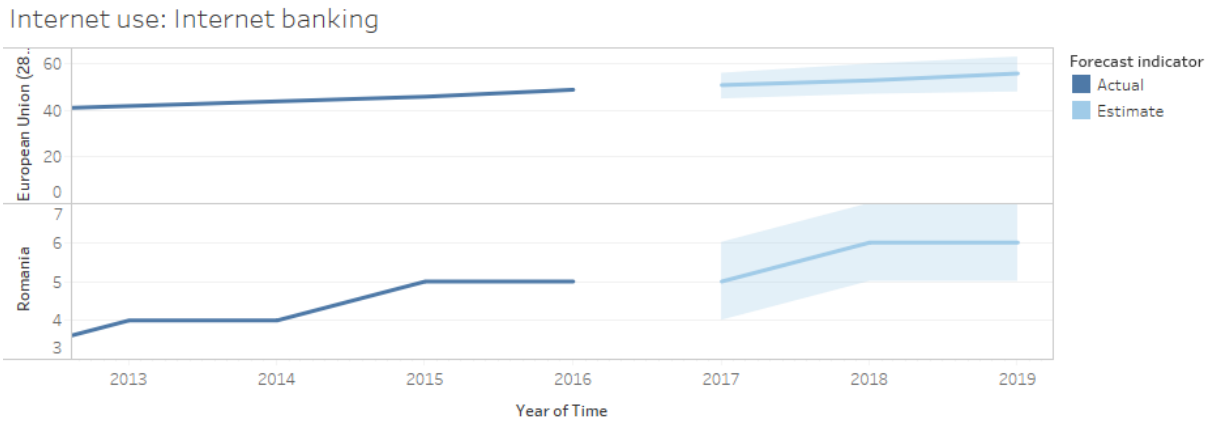

Fig. 4 - Forecast: Internet use: Internet banking

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Trend Lines Model for *Internet use: Internet banking*

A linear trend model is computed for value of European Union (28 countries) (actual & forecast) given Time Year. The model may be significant at p <= 0.05.

Model formula:	Forecast indicator*(Year of Time + intercept)
Number of modeled observations:	13
Number of filtered observations:	0
Model degrees of freedom:	4
Residual degrees of freedom (DF):	9
SSE (sum squared error):	8.12128
MSE (mean squared error):	0.902365
R-Squared:	0.992598
Standard error:	0.949929
p-value (significance):	< 0.0001

Analysis of Variance:

Field	DF	SSE	MSE	F	p-value
Forecast indicator	2	1.0548572	0.527429	0.584496	0.577219

A linear trend model is computed for value of Romania (actual & forecast) given Time Year. The model may be significant at p <= 0.05.

Model formula:	Forecast indicator*(Year of Time + intercept)
Number of modeled observations:	13
Number of filtered observations:	0
Model degrees of freedom:	4
Residual degrees of freedom (DF):	9
SSE (sum squared error):	1.65772
MSE (mean squared error):	0.184191
R-Squared:	0.933486
Standard error:	0.429175
p-value (significance):	< 0.0001

Analysis of Variance:

Field	DF	SSE	MSE	F	p-value
Forecast indicator	2	0.051403879	0.0257019	0.139539	0.871604

Individual trend lines:

Panes		Color	Line		Coefficients				
Row	**Column**	**Forecast indicator**	**p-value**	**DF**	**Term**	**Value**	**StdErr**	**t-value**	**p-value**
European Union (28 countries)	Year of Time	Estimate	0.0731864	1	Year of Time	0.0068493	0.0007909	8.66025	0.0731864
					intercept	-241.879	34.089	-7.09551	0.0891344
European Union (28 countries)	Year of Time	Actual	< 0.0001	8	Year of Time	0.0069195	0.0003006	23.0207	< 0.0001
					intercept	-243.908	12.2456	-19.9181	< 0.0001

Romania	Year of Time	Estimate	0.333333	1	Year of Time	0.0013699	0.0007909	1.73205	0.333333
					intercept	-53.3758	34.089	-1.56578	0.361831
Romania	Year of Time	Actual	< 0.0001	8	Year of Time	0.0009956	0.0001301	7.6505	< 0.0001
					intercept	-37.1473	5.30172	-7.00666	0.0001119

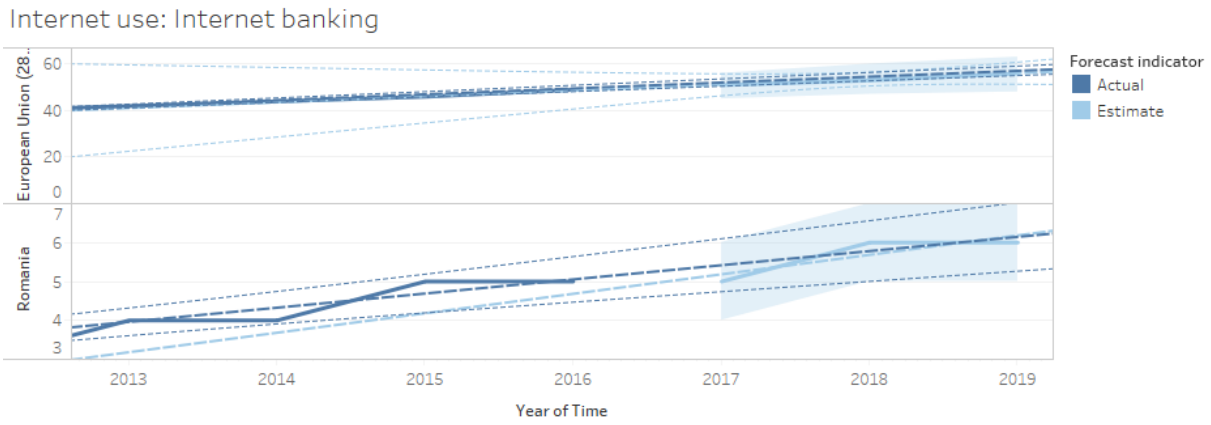

Fig. 5 - Trend lines: Internet use: Internet banking

2.3 Consumers' behaviour related to online purchases

Factors influencing consumers' behaviour related to online purchases identified by Eurostat are:

B1- Individuals used information from several retailer, producer or service provider websites every time or almost every time before buying/ordering online

B2 - Individuals used price or product comparison websites or apps every time or almost every time before buying/ordering online

B3 - Individuals used customer reviews on websites or blogs every time or almost every time before buying/ordering online

B4 - Individuals used information from several retailer, producer or service provider websites some times before buying/ordering online

B5 - Individuals used price or product comparison websites or apps some times before buying/ordering online

B6 - Individuals used customer reviews on websites or blogs some times before buying/ordering online

B7 - Individuals used information from several retailer, producer or service provider websites rarely or never before buying/ordering online

B8 - Individuals used price or product comparison websites or apps rarely or never before buying/ordering online

B9 - Individuals used customer reviews on websites or blogs rarely or never before buying/ordering online

B10 - Individuals bought/ordered online by clicking/buying straightaway through an advertisement on a social media website or app

B11 - Individuals did not buy/order online by clicking/buying straightaway through an advertisement on a social media website or app

Source: Consumers' behaviour related to online purchases [isoc_ec_ibhv]

Last update 02.02.17

Extracted on 06.03.17

Source of data Eurostat

IND_TYPE All Individuals

TIME 2016

UNIT Percentage of individuals

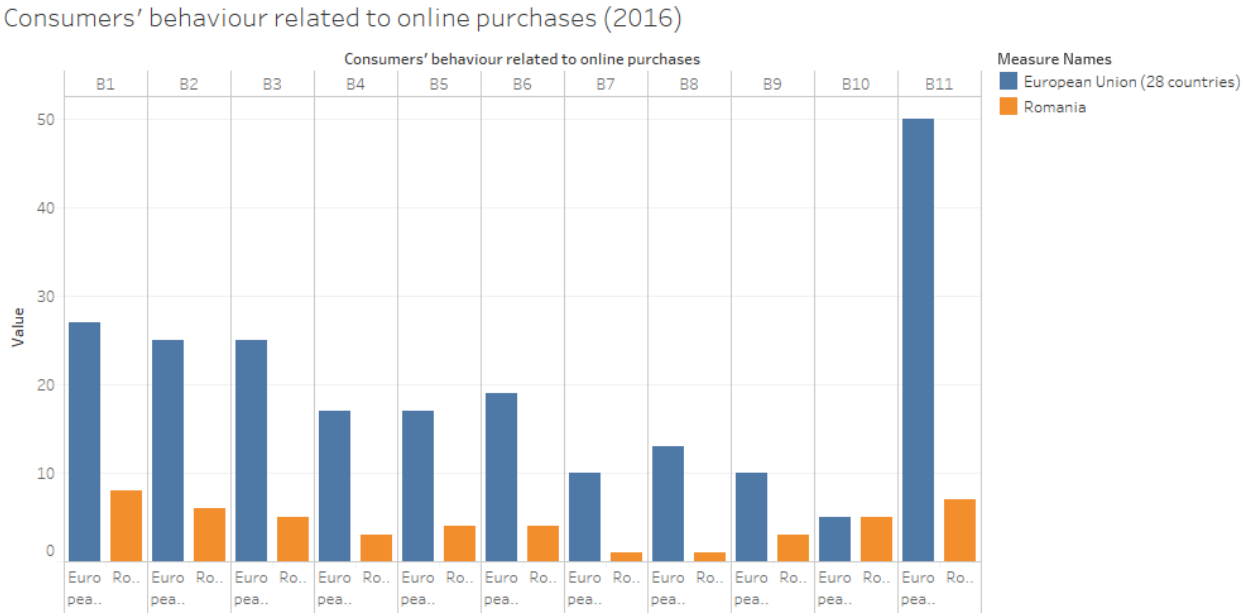

Fig. 06 - Consumers' behavior related to online purchases

CONCLUSION

In this paper, is described the result of a forecasting for online purchase (using *Last online purchase in the last 3 months* indicator). The results show a growth for *percentage of individuals - Last online purchase in the last 3 months* from 45 (2016) to 57 (2021) for EU28. Also, a growth is for Romania from 8 (2016) to 11 (2021).

A forecasting for *Internet use: Internet banking* shows a growth for *percentage of individuals* from 49 (2016) to 56 (2021) for EU28 and for Romania from 5 (2016) to 6 (2019).

The comparison between EU28 and Romania for *Consumers' behavior related to online purchases* shows big differences for Romanian's behavior related to online purchases.

The results (for 2016) indicate that Romanians *buy/order online by clicking/buying straightaway through an advertisement on a social media website or app* more than EU28 citizens (Romania -7%; EU28 - 50%); EU28 citizens *used information from several retailer, producer or service provider websites every time or almost every time before buying/ordering online* more than Romanians (Romania -8%; EU28 - 27%); EU28 citizens *used price or product comparison websites or apps every time or almost every time before buying/ordering online* more than Romanians (Romania - 6%; EU28 - 25%); EU28 citizens *used customer reviews on websites or blogs every time or almost every time before buying/ordering online* more than Romanians (Romania - 5%; EU28 - 25%); EU28 citizens *used information from several retailer, producer or service provider websites rarely or never before buying/ordering online* more than Romanians (Romania - 1%; EU28 - 10%); individuals both from EU28 and Romania *bought/ordered online by clicking/buying straightaway through an advertisement on a social media website or app* (Romania - 5%; EU28 - 5%).

So, e-commerce is likely to continue to contribute to economic growth in the EU and in Romania, perhaps providing a greater boost to the EU's economy than to Romania's economy. Also, Romanian's on-line purchasing habits would have to change for them to make a stronger contribution to the Romanian economy

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