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PANEL ANALYSIS OF INTERNET BOOKING OF TRAVEL AND HOLIDAY ACCOMMODATION INDICATORS

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ABSTRACT

In the article four development indicators have been carefully selected and their impact on the level of acceptance of the Internet booking of travel and holiday accommodation in selected European countries has been observed. The statistical panel analysis approach was used to determine the individual and the common impact of the development indicators. The analysis has shown that an individual's wealth, the public expenditure on education, and the Internet penetration rate have a positive statistically significant impact on the level of acceptance of the Internet booking of travel and holiday accommodation whereas the share of individuals with low level Internet skills has a negative statistically significant impact. These results carry significant importance for economists, politicians and all other stakeholders responsible for tourism development in a country. The use of the unbalanced panel is the main limitation of the article.

KEY WORDS

internet booking, development indicators, European countries, fixed effect panel model, random effect panel model

CLASSIFICATION

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INTRODUCTION

Due to fast and strong development of information and communication technologies (ICT), different Internet services become available to customers. One of such Internet services is the Internet booking of travel and holiday accommodation. The Internet booking allows easy, simple and secure selection of a preferred accommodation form. Using Internet booking, a tourist can quickly collect all data about accommodation, including prices, location, language spoken in the facility, payment methods, and similar. Furthermore, a tourist can very easily compare data for two or more options of accommodation. In the process of selecting the most appropriate accommodation, tourists can bring their final decisions relying on comments and grades of other tourists who have stayed at certain accommodation.

The possibility of travel and holiday accommodation booking over the Internet has in general a positive impact on tourism in a country. Using the Internet tourists can find many different and attractive accommodation facilities, which increases their positive holiday experience significantly. On the other hand, without Internet booking their insight into accommodation options would be significantly limited. In addition, by using Internet booking tourists can avoid negative experiences regarding accommodation. If tourists are happy with their accommodation, it is more likely that they are going to spend more, to stay longer, and, what is most important, to come back to spend their holiday in the same country (not necessarily in the same accommodation).

In order to have a developed service of the Internet booking of travel and holiday accommodation, some prerequisites must be fulfilled. These prerequisites can be observed through the development indicators. Firstly, it is very important that tourists have enough resources to travel and to go on holiday. Next, the Internet infrastructure has to be well developed enabling tourists to have access to the Internet. Furthermore, in order to be able to use Internet booking services, it is necessary that tourists have certain knowledge and well developed Internet use skills.

The article aims to investigate the impact of development indicators on the spread and the level of acceptance of the Internet booking use in European countries. Accordingly, the research hypothesis of the paper is that an individual's wealth, the public expenditure on education, and the Internet penetration rate have a positive statistically significant impact on the percentage of individuals who booked travel and holiday accommodation over the Internet, whereas the percentage of the total number of individuals with low level Internet skills in a country has a negative statistically significant impact. In the analysis, an individual's wealth is estimated by gross domestic product per capita, the Internet penetration rate is estimated by the percentage of individuals using the Internet and low level Internet skills are estimated by the percentage of the total number of individuals who have carried out only 1 or 2 of the 6 Internet-related activities.

The artcle is organized as follow. After a brief introduction to the problems and aims of the article in the chapter 1, the chapter 2 provides a literature review. In the chapter 3, data and variables which are used in the panel analysis are presented. The chapter 4 covers the conducted panel analysis with included comments. The final chapter, chapter 5, brings conclusions and some suggestions for further research.

LITERATURE REVIEW

In order to achieve the maximum tourism potential, innovation is the key basis of the transformation of the tourism system [1]. The popularity of the Internet has greatly changed people's way of life [2, 3; pp.1-7]. According to [4; pp.3-8], the main benefits of the online

marketing for consumers are a wide range of choices, the quality of service, and personalised products and services. Heung [5; pp.370-378] approximated that 30 percent of travellers use the Internet for reservation or purchase of travel products or services. Use of new technologies and Internet booking of travel products depends on the characteristics of market segments identified by age, income, gender, education and personal demands of tourists that encourage motivation to certain forms of booking [6; pp.288-297]. According to research, factors such as age, education, income, previous purchase experience or years/hours of the Internet use have a positive association with tourists' intention to purchase vacations online [7]. The Internet is used by younger and more educated tourists and this trend is expected to continue [8; pp.833-843], while the focus will be on the growth of online booking [9].

According to research conducted by [10], when planning trips, 45 % of respondents used the Internet for booking transport and accommodation within the overall structure of tourism services used via the Internet. Because of particular relevance of rapid response, more emphasis should be on development of online host-to-host connectivity and real-time sourcing. The process has to become faster and reservations need to be confirmed immediately. Therefore, an emphasis should be given to "controlled" technology fitted to tourists' needs. So, multichannel distribution must be improved: sales over the Internet, sales through call-centres, sales via new digital channels (TV, etc.) and still through own and third-party travel agencies [9].

A regional difference can be noticed: Internet users in Northern and Western European countries tend to book holidays online more than users in Southern and Eastern European countries [5; pp. 370-378]. Travellers, predominantly from Western countries with higher education levels and higher annual household income, are more likely to use the Internet for online purchase of travel products [11]. According to [12] population with higher income has developed competencies and skills in using the Internet. On the other hand, older population does not show the interest for this form of services booking. The perceived lack of secure payment methods, and a lack of confidence in the technology are the main arguments for slow penetration of new technologies in the travel marketplace [13; pp.368-385].

According to the survey on the attitudes of Europeans towards tourism, 56 % of the EU citizens organise their holidays themselves, rather than purchase a pre-defined package. At the same time other participants in the travel industry such as airlines have entered the package holidays market either as organisers, retailers or by providing links to other tourist services making it easier for consumers to put together the package themselves. Further, this method of sale has also resulted in a change in the types of holiday arrangements available to consumers, and this has made it easier for consumers to make their own arrangements through websites of airlines, hotels, the railway, travel agents and tour operators [14].

According to [15] the Scandinavian and the UK travel markets have the highest online penetration rates (near 50 %) while online travel comprises a much smaller share in Southern and Eastern Europe (Spain, Italy, Poland). Despite that, the Internet provides an essential infrastructure and the principal penetration source during travel planning, research and shopping and booking for travellers across Europe.

Household Internet access rate varies significantly by region, and country within the EU, ranging from 30 % in Bulgaria to 90 % in the Netherlands in 2009. There are clear regional trends in the Internet access – countries in Northern and Western Europe have much higher Internet penetration while countries in Eastern and Southern Europe have a far lower Internet penetration rate [11].

According to [16] the results show that the percentage of individuals who booked travel and holiday accommodation over the Internet in the last 12 months in selected South Eastern

European countries (Bulgaria, Romania, Turkey, the Former Yugoslav Republic (FYR) of Macedonia, Serbia, Croatia) is positively correlated with each of the four regressors: the Gross Domestic Product (GDP) per capita; the public expenditure on education as percentage of GDP; the Internet penetration rate; and the individuals' level of Internet skills.

DATA EXPLORATION

In the analysis the main variable under the study is the Percentage of individuals who booked travel and holiday accommodation over the Internet in the last 12 months (Y_{IntBook}). The explanatory variables which are used in the study are: the Gross Domestic Product per capita in Purchasing Power Standards (GDP per capita in PPS), Index, EU 28 = 100 (X_{GDPpc}); Public Expenditure on Education, given as the percentage of GDP (X_{ExpEduc}); the Internet Penetration Rate given as the Percentage of Individuals using the Internet (X_{IntUse}); and the Individuals' Level of Internet Skills as the percentage of the total number of individuals aged 16 to 74 who have carried out 1 or 2 of the 6 Internet-related activities (X_{IntSkill}).

Data sources included Eurostat's and the World Bank's databases [17-21]. The data are collected for all the European Union state members (EU 28) and for the three official EU candidate countries Turkey, the Former Yugoslav Republic of Macedonia (FYROM) and Serbia. The values of variables for all 31 observed countries are observed in the period of 12 years, from 2003 to 2014. Unfortunately, not all the data were available for each country and for each year. The number of collected individual data for the observed countries is shown in Table 1 and for the observed years in Table 2.

The maximum possible number of individual data points per country is 60. According to Table 1 there is no country for which the individual data points for the each observed variable in the each observed year are known. Nevertheless, the highest number of individual data points is collected for the Netherlands (50), Austria, Denmark, Finland, Ireland, Slovakia, and Spain (all 49). As expected, the fewest number of individual data points is collected for Serbia (21), FYROM (28), and Turkey (35). It has to be emphasized that no data at the variable X_{ExpEduc} for FYROM and Luxembourg were found in the observed period. Similar, only one data point was provided at the variable X_{IntSkill} for Serbia. These limitations should be taken into account in the further analysis.

Because there are five variables observed in 31 countries, the maximum possible number of individual data points per year is 155. Again, according to Table 2, that was not possible to achieve in any of the years in the period from 2003 to 2014. Still, the highest number of collected individual data points was in 2010 (148), 2007 (147) and in 2011 (142). On the other side, the fewest number of individual data points was collected in 2003 (68), 2004 (77) and in 2014 (91). There were no available data for the variable X_{ExpEduc} in 2013 and 2014, for the variable X_{IntUse} in 2003 and 2004, and for the variable X_{IntSkill} in 2003, 2004, 2008, 2009, 2012 and 2014.

Considering the number of individual data points per variable, it might be concluded that at the variable X_{GDPpc} 370 out of possible 372 (99 %) data points are successfully collected. For the main variable under the study, Y_{IntBook}, 320 or 86 % of possible individual data points are provided. The fewest number of individual data points is available for the variable X_{IntSkill} (44 %).

According to Figure 1 the average percentage of individuals who booked travel and holiday accommodation over the Internet in the last 12 months in the observed countries has a positive linear trend. Considering 12 countries there were on average 5,9 % individuals who booked travel and holiday accommodation over the Internet in the last 12 months per country in 2003. According to the most recent data, there were on average 22,7 % individuals who booked travel and holiday accommodation over the Internet in the last 12 months per country in 2014. However, Table 3 reveals that the coefficient of variation, in the range from 78 to 143,

Table 1. The number of collected individual data values for 31 selected European countries, from 2003 to 2014.

Country	Variable					Total
	$Y_{IntBook}$	X_{GDPpc}	$X_{ExpEduc}$	X_{IntUse}	$X_{IntSkill}$	
Austria	12	12	9	10	6	49
Belgium	9	12	9	10	5	45
Bulgaria	10	12	9	9	5	45
Croatia	8	12	7	8	4	39
Cyprus	11	12	9	10	6	48
Czech Republic	12	12	9	10	5	48
Denmark	12	12	9	10	6	49
Estonia	10	12	8	10	6	46
Finland	12	12	10	9	6	49
France	9	12	10	9	4	44
FYROM	6	12	0	7	3	28
Germany	12	12	6	10	6	46
Greece	12	12	3	10	6	43
Hungary	10	12	9	10	6	47
Ireland	12	12	9	10	6	49
Italy	10	12	9	9	6	46
Latvia	11	12	9	10	6	48
Lithuania	11	12	9	10	6	48
Luxembourg	12	12	0	10	6	40
Malta	10	12	7	10	6	45
Netherlands	12	12	10	10	6	50
Poland	10	12	9	10	6	47
Portugal	11	12	9	10	6	48
Romania	9	12	8	9	5	43
Serbia	2	10	6	2	1	21
Slovakia	11	12	10	10	6	49
Slovenia	10	12	9	9	6	46
Spain	12	12	10	10	5	49
Sweden	11	12	9	10	6	48
Turkey	9	12	3	8	3	35
United Kingdom	12	12	9	10	5	48
Total	320	370	242	289	165	1386

Table 2. The number of collected individual data values in the observed years, 31 European countries, from 2003 to 2014.

Year	Variable					Total
	Y_{IntBook}	X_{GDPpc}	X_{ExpEduc}	X_{IntUse}	X_{IntSkill}	
2003	12	30	26	0	0	68
2004	20	30	27	0	0	77
2005	23	31	23	23	20	120
2006	28	31	23	28	27	137
2007	29	31	27	30	30	147
2008	29	31	26	30	0	116
2009	31	31	27	30	0	119
2010	30	31	27	30	30	148
2011	28	31	27	28	28	142
2012	30	31	9	30	0	100
2013	30	31	0	30	30	121
2014	30	31	0	30	0	91
Total	320	370	242	289	165	1386

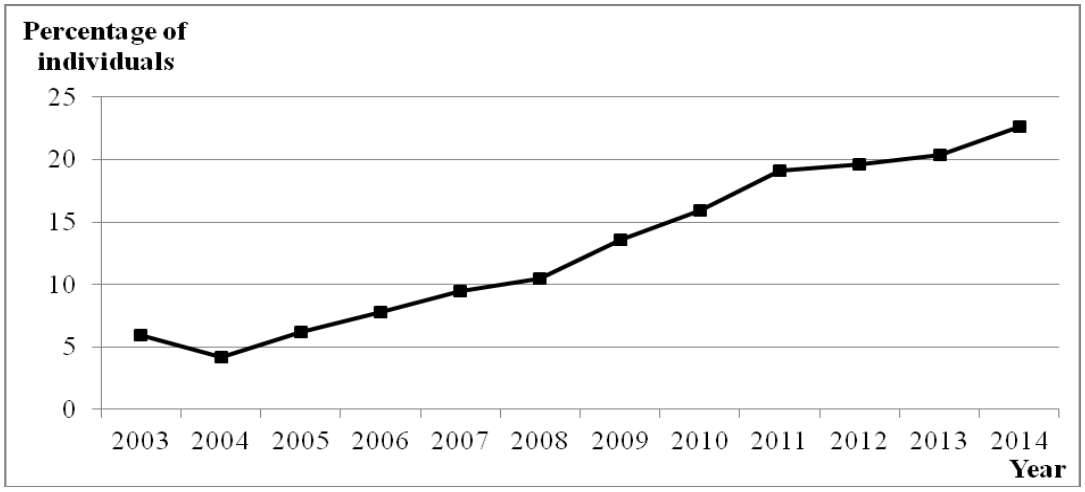

Figure 1. Average Percentage of individuals who booked travel and holiday accommodation over the Internet in the last 12 months, in 31 European countries from 2003 to 2014.

is the highest right at this variable. So, the variability level in variable values among countries is the highest at the variable Y_{IntBook}. Huge variability levels are a product of large differences among countries. So, in 2014, only 1 % of individuals booked travel and holiday accommodation over the Internet in the last 12 months in FYROM and 2 % in Romania. On the other hand, in 2014, there were 57 % individuals who booked travel and holiday accommodation over the Internet in the last 12 months in Sweden, 55 % in Denmark, and 53 % in Luxembourg. As it was expected, the lowest variability level is present at the variable X_{IntUse}.

The conducted outlier analysis has shown that Luxembourg's GDP per capita values can be considered as outliers in all the observed years. Namely, it has been shown that Luxembourg's GDP per capita values deviate more than 3 standard deviations from the average GDP per

Table 3. Basic descriptive statistics results of selected variables, in 31 European countries from 2003 to 2014.

Year	Variables														
	$Y_{IntBook}$			X_{GDPpc}			$X_{ExpEduc}$			X_{IntUse}			$X_{IntSkill}$		
	n	**Mean**	**CV**	***n***	**Mean**	**CV**	***n***	**Mean**	**CV**	***N***	**Mean**	**CV**	**n**	**Mean**	**CV**
2003	12	5.9	86	30	89.7	51	26	5.10	24	–	–	–	–	–	–
2004	20	4.2	143	30	90.9	50	27	4.95	25	–	–	–	–	–	–
2005	23	6.2	116	31	89.4	50	23	5.13	21	23	54.4	36	20	30.6	38
2006	28	7.8	109	31	90.5	50	23	5.10	21	28	56.0	33	27	28.6	36
2007	29	9.5	106	31	91.4	49	27	5.00	19	30	58.9	30	30	27.3	36
2008	29	10.5	102	31	92.2	47	26	5.22	18	30	63.7	27	–	–	–
2009	31	13.5	101	31	91.2	46	27	5.51	19	30	65.5	24	–	–	–
2010	30	15.9	95	31	91.5	47	27	5.44	21	30	70.1	22	30	29.1	28
2011	28	19.1	82	31	92.0	48	27	5.34	24	28	74.4	18	28	25.8	29
2012	30	19.6	87	31	92.1	47	9	5.04	27	30	75.1	18	–	–	–
2013	30	20.4	83	31	92.1	46	–	–	–	30	77.5	16	30	26.9	24
2014	30	22.7	78	31	92.0	46	–	–	–	30	79.7	14	–	–	–

capita in the each observed year. Consequently, in order to get valid results, in the further analysis the option of omitting Luxembourg's GDP per capita data should be taken into account.

PANEL DATA ANALYSIS

As it was previously described, there were 31 countries and five different variables in the period of 12 years analyses at the beginning of the analysis. Obviously, in this case, it is appropriate to conduct a panel data analysis. Owing to the fact that there are no available data for each country for each variable for each observed year, an unbalanced panel analysis approach must be used. Using an unbalanced panel, instead of the balanced one, does not cause any major conceptual problem [22]. Furthermore, there are more individual units (countries, here 31) than the number of periods (years, here 12). Consequently, the provided data can also be called short panel data [23].

In the research of travel and holiday Internet booking, a classical cross-sectional approach was used in the previous research [16, 24; pp.155-168]. In order to understand the position of travel and holiday Internet booking in selected European countries better, in this paper the panel data analysis is going to be conducted because of its advantages over the pure cross-sectional data or the pure time series data analysis [25]. Unlike the pure cross-sectional data or the pure time series data analysis, the panel data estimation techniques can take into account heterogeneity of individuals over time. Furthermore, the panel data analysis results in more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency [25, 26; pp.159-172]. The panel data analysis is more appropriate to be used in the analysis of repeated cross-sectional data. Also, the panel data analysis can better detect and measure effects that are invisible to the cross-sectional and the time series data analysis [27; pp.206-224].

In the panel data analysis, three different static approaches can be used: independently pooled panels, random effects models, and fixed effects models. The selection among these methods depends upon the key assumption of the analysis. So, at independently pooled panels the main assumption is that there are no unique characteristics of individuals within the observed variables and no universal effects across time [28; pp.243-260]. On the other hand, fixed effect models assume that there are unique characteristics of individuals which are fixed in time and which are not the results of random variation. If the research aim is to make a conclusion only about observed individuals, the use of fixed effect models, or least squares dummy variable models is recommended. Unlike fixed effect models, random effect models assume that unique characteristics of individuals are the results of random variation. Also, this model is appropriate to make conclusions about all individuals, not only the observed.

The fixed effect model is given by the following equation

$$Y_{it} = (u_i + \beta_0) + \beta_1 X_{1it} + \beta_2 X_{2it} + ... + \beta_k X_{kit} + v_{it}, \quad (1)$$

where the variable Y and the variable X have both i and t subscripts for I = 1, 2, …, N units (here countries) and t = 1, 2, …, T time periods (here years). The coefficient u, the fixed effect [29, 30], has subscript i meaning that it is different for each country in the sample, whereas coefficients β do not have any subscripts suggesting that they are the same for all countries and for years. In case the coefficient u does not have any subscript, the common constant methods or the pooled OLS method is going to be used in the analysis. The random effect model is equal to

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + ... + \beta_k X_{kit} + (u_i + v_{it}), \quad (2)$$

where u_i now represents the random effect [31].

For the purpose of the analysis, overall six panel models are built. In each of the models the independent variable is set to be Y_{IntBook}. First, the individual impact of variables X_{GDPpc}, X_{ExpEduc}, X_{IntUse}, and X_{IntSkill} on the dependent variable is observed resulting in four panel models. After that, two panel models including all these variables are observed. The selection of an appropriate panel model (pooled OLS, fixed effect, random effect) is made using the *F*-test for the fixed effect model, the Breusch-Pagan Lagrange Multiplier (LM) test [32; pp. 239-253] and the Hausman test [33; pp. 1251-1271, 34]. The panel results for individual models are given in Table 4.

Table 4. Panel analysis of Percentage of individuals booking travel and holiday accommodation over the Internet in the last 12 months in the selected European countries, individual models. Standard errors are in parentheses.

Statistics	Model 1	Model 2	Model 3	Model 4
	Fixed effect	Random effect	Fixed effect	Fixed effect
Intercept	23,5614	−23,6729***	−17,5907***	33,3669***
	(16,9598)	(5,6862)	(4,8121)	(6,3485)
X_{GDPpc}	–0,1137	–	–	–
	(0,1898)			
X_{ExpEduc}	–	6,6812***	–	–
		(1,0252)		
X_{IntUse}	–	–	0,4754***	–
			(0,0705)	
X_{IntSkill}	–	–	–	−0,7029***
				(0,2271)
F-test (model)	22,61***	–	51,12***	15,45***
Degrees of freedom	265	156	253	131
Sum of squared residuals	16751,84	20646,03	8714,46	7019,20
Standard error of regression	7,95	10,65	5,89	7,32
"Within" variance	–	37,61	–	–
"Between" variance	–	82,99	–	–
F-test (fixed effect)	7,43***	15,38***	13,31***	10,42***
Breusch-Pagan test	163,56***	258,07***	320,45***	25,86***
Hausman test	16,54***	1,07	10,24***	86,34***
No. of countries	29	26	30	30
No. of years	11	8	10	6
No. of data	614	389	573	331

*significant at probability level 0,1
**significant at probability level 0,05
***significant at probability level 0,01

Considering the key variable Y_{IntBook}, data for only 12 countries are available, which is equal to 39 % of the observed countries, in 2003. Because of that it has been decided to omit all data from 2003. Similar, it has been decided to exclude Serbia from the further analysis because of the lack of data at the key variable. Furthermore, the outlier analysis has shown that Luxembourg is an outlier according to the variable X_{GDPpc}. So, in Model 1 Luxembourg was also omitted. Consequently, Model 1 was built using data for 29 countries in the period from 2004 to 2014.

According to the *F*-test for the fixed effect model (p-value < 0,0001), the Breusch-Pagan Lagrange Multiplier test (p-value < 0,0001) and the Hausman test (p-value < 0,0001) results, which are provided in Table 4, the most adequate panel model in case of Model 1 is the fixed effect model. In order to estimate Model 1, the one-way fixed effect model based on the within estimator was used [35, 36]. That way no dummy variables were used in the model. As a consequence, there are larger degrees of freedom, resulting in smaller model errors (mean squared error, standard error of the estimates, square root of mean squared errors, standard errors of parameter estimates). In order to compensate for these problems and the problem of heteroscedasticity, robust standard errors were used [37]. Still, the coefficient of determination (R^2) is not correct because the intercept term is suppressed and therefore, it has not been shown in Table 4. Model 1 shows that the variable X_{GDPpc} does not have a statistically significant impact on the variable Y_{IntBook} at any usually used significance level α (p-value = 0,5496).

For the variable X_{ExpEduc}, in 2012 only data for 9 countries are available, whereas no data for the observed countries were published for 2013 and 2014. Consequently, in Model 2 these three years are omitted from the further analysis. Because of no or very few data points for the variable X_{ExpEduc}, the following countries are excluded from Model 2: FYROM, Greece, Luxembourg, and Turkey. Therefore Model 2 was built using data for 26 countries in the period from 2004 to 2011.

The *F*-test for the fixed effect model (p-value < 0,0001) and the Breusch-Pagan Lagrange Multiplier test (p-value < 0,0001) showed that, at any usually used significance level α, the null hypothesis at both tests can be rejected. In that way, the pooled OLS was evaluated as an inappropriate panel model for Model 2. According to the results of the Hasuman test (p-value = 0,3012), which are shown in Table 4, at any usually used significance level α, the null hypothesis can be rejected. Consequently, the random effect model is selected as an appropriate panel model. The variable X_{ExpEduc} is statistically significant at any usually used significance level α (p-value < 0,0001) pointing out that one percentage point increase of public expenditure on education, in relation to GDP, would lead to 6,68 percentage points increase of individuals who booked travel and holiday accommodation over the Internet in the last 12 months.

Unavailability of data for the variable X_{IntUse} resulted in the exclusion of the year 2004 from Model 3. Because all countries have a satisfactory number of data points for both variables that are included in Model 3, all countries are kept in the model. Model 3 was formed using data for 30 countries in the period from 2005 to 2014.

The *F*-test for the fixed effect model (p-value < 0,0001), the Breusch-Pagan Lagrange Multiplier test (p-value < 0,0001) and the Hausman test (p-value < 0,0001) results showed that at any usually used significance level α, their null hypotheses can be rejected. Therefore, the fixed effect model was selected as the most appropriate for Model 3. The variable X_{IntUse} is statistically significant at any usually used significance level α (p-value < 0,0001). So, for one percentage point increase of the percentage of individuals who use the Internet, the percentage of individuals who booked travel and holiday accommodation over the Internet in the last 12 months is expected to increase by 0,48 percentage points.

Because of periodical research and data collection, the data for the variable X_{IntSkill} in 2004, 2008, 2009, 2012, and 2014 are not available. So, Model 4 was formed based on data for 30 countries and 6 years.

Because of the *F*-test for the fixed effect model (p-value < 0,0001), the Breusch-Pagan Lagrange Multiplier test (p-value < 0,0001) and the Hausman test (p-value < 0,0001) results, the fixed effect model was selected as the most appropriate for Model 4. The variable X_{IntSkill} is statistically significant at the significance level α of 1 % (p-value = 0,0024). For one percentage point increase of the percentage of the total number of individuals aged 16 to 74 who have carried out 1 or 2 of the 6 Internet-related activities, the percentage of individuals who booked travel and holiday accommodation over the Internet in the last 12 months is expected to decrease by 0,70 percentage points.

Despite the assumption that the variables Y_{IntBook} and X_{GDPpc} have a positive statistically significant relation, Model 1 results have shown the opposite. The other three models, Models 2, 3, and 4, have shown the expected relations. So, Models 2 and 3 have shown positive statistically significant relations between the variable Y_{IntBook} and the independent variables in each model separately (X_{ExpEduc}, X_{IntUse}). On the other side, Model 4 has shown a negative statistically significant relation between the variables Y_{IntBook} and X_{IntSkill}.

In order to analyse the impact of all the four independent variables (X_{GDPpc}, X_{ExpEduc}, X_{IntUse}, X_{IntSkill}), when they are all included in the model together, on the variable Y_{IntBook}, two additional panel models are formed. Both models, Model 5 and Model 6, have the same variables included, but the difference is in the number of data points which have been used. In Model 5 all available data for the 5 observed variables in 30 countries in the period from 2004 to 2014 is included. On the other hand, in Model 6 some reductions have been done to lower the attrition impact of the unbalanced panel [38]. In that way the following four countries have been omitted from Model 6: FYROM, Greece, Luxembourg, and Turkey (Serbia was omitted at the very beginning of the analysis). Furthermore, the following years have also been omitted from Model 6: 2004, 2008, 2009, 2012, 2013, and 2014. The results for Model 5 and Model 6 are given in Table 5.

The *F*-test for the fixed effect model (p-value < 0,0001) and the Breusch-Pagan Lagrange Multiplier test (p-value = 0,0001) showed that, at any usually used significance level α, the null hypothesis at both tests can be rejected. According to the Hausman test result (p-value = 0,0244) at the 0,01 significance level, the null hypothesis cannot be rejected. Consequently, the random effect model is selected as an appropriate panel model for Model 5. At the 0,05 significance level the independent variables X_{GDPpc} (p-value = 0,0265), X_{ExpEduc} (p-value < 0,0001), X_{IntUse} (p-value < 0,0001), and X_{IntSkill} (p-value < 0,0001) can be individually considered as statistically significant. According to the results in Table 5, if gross domestic product per capita in purchasing power standards, EU 28 = 100, would increase by one index point, holding all other variables constant, the percentage of individuals who booked travel and holiday accommodation over the Internet in the last 12 months would on average increase by 0,15 percentage points. Furthermore, one percentage point increase of public expenditure on education, in relation to GDP, holding all other variables constant, would lead to 5,01 percentage points increase of individuals who booked travel and holiday accommodation over the Internet in the last 12 months. In case of one percentage point increase of the percentage of individuals who use the Internet, while holding all other variables constant, the percentage of individuals who booked travel and holiday accommodation over the Internet in the last 12 months is expected to increase by 0,38 percentage points. Finally, in case of one percentage point increase of the percentage of the total number of individuals aged 16 to 74 who have carried out 1 or 2 of the 6 Internet-related

Table 5. Panel analysis of Percentage of individuals booking travel and holiday accommodation over the Internet in the last 12 months in the selected European countries, models with included all the independent variables. Standard errors are in parentheses.

Statistics	Model 5	Model 6
	Random effect	Random effect
Intercept	−39,2047*** (7,8733)	−39,7637*** (8,0287)
X_{GDPpc}	0,1463** (0,0650)	0,1436** (0,0657)
$X_{ExpEduc}$	5,0066*** (1,2129)	5,0746*** (1,2239)
X_{IntUse}	0,3824*** (0,0533)	0,3853*** (0,0540)
$X_{IntSkill}$	−0,4559*** (0,1056)	−0,4523*** (0,1064)
Degrees of freedom	81	81
Sum of squared residuals	6859,58	6861,67
Standard error of regression	7,97	8,01
"Within" variance	16,68	16,83
"Between" variance	22,74	23,62
F-test (fixed effect)	4,61***	4,76***
Breusch-Pagan test	14,64***	14,42***
Hausman test	11,20**	10,78**
No. of countries	30	26
No. of years	11	5
No. of data	1297	617

*significant at probability level 0,1
**significant at probability level 0,05
***significant at probability level 0,01

activities, while holding all other variables constant, the percentage of individuals who booked travel and holiday accommodation over the Internet in the last 12 months is expected to decrease by 0,46 percentage points.

In the process of selecting the most appropriate panel model for Model 6, first the *F*-test for the fixed effect model (p-value < 0,0001) and the Breusch-Pagan Lagrange Multiplier test (p-value = 0,0001) have been taken. Both tests showed that the fixed effect model or the random effect model could be appropriate models. The conducted Hausman test (p-value = 0,0291) has shown that, at the level of significance $\alpha = 5$ %, the null hypothesis cannot be rejected. Therefore, the random effect model was selected to estimate Model 6. According to the conducted individual significance tests, at the 5 % level the independent variables X_{GDPpc} (p-value = 0,0310), $X_{ExpEduc}$ (p-value < 0,0001), X_{IntUse} (p-value < 0,0001) and $X_{IntSkill}$ (p-value < 0,0001) are considered to be statistically significant in the model. The estimated coefficients in Model 6 are very similar to those in Model 5, and because of that they are not going to be interpreted again.

Similarity of Model 5 and Model 6 results from the fact that the used statistical programme has automatically omitted some data. Nevertheless, Model 5 and Model 6 have confirmed what was stated in the research hypothesis of the paper. Therefore, the hypothesis that the variables Gross Domestic Product per capita, Public Expenditure on Education, and Internet Penetration Rate have a positive statistically significant impact on the variable Percentage of individuals who booked travel and holiday accommodation over the Internet, whereas the variable Percentage of the total number of individuals with low level Internet skills has a negative statistically significant impact, can be accepted.

CONCLUSIONS

The Internet booking of travel and holiday accommodation improves accessibility to different tourism contents in a country. In that way, it has positive impacts on further development of tourism and the improvement of residents' living standards. Therefore, the research of determinants which have a significant impact on development of the Internet booking, and the analysis of their impact in European countries is justified.

In the conducted panel analysis, the impact of four development indicators on the level of acceptance of the Internet booking of travel and holiday accommodation has been inspected. It has been concluded that an individual's wealth, measured as gross domestic product per capita, individually does not have a statistically significant impact on the Internet booking development in the selected European countries. On the other hand, the other three development indicators have highly statistically significant individual impacts on the level of the Internet booking use in the European countries. So, the public expenditure on education, measured as the percentage of GDP, and the Internet penetration rate have a positive individual impact on the Internet booking use whereas the percentage of individuals with low Internet skills has a negative individual impact.

When all four development indicators together were included in the panel analysis it has been revealed that the development indicators have a statistically significant impact on the level of use of the Internet booking of travel and holiday accommodation. The coefficient signs in Model 5 and Model 6 showed to be as they had been expected. Consequently, the stated research hypothesis of the paper has been accepted.

The main problem of the paper is that an unbalanced approach was used. In order to get more reliable results, more efforts should be invested into getting data for all the included variables for all the observed countries in the entire observed period. Also, the data for all European countries should be included in the analysis. Unfortunately, unlike the European Union member states, other European countries do not have very well developed systems of collecting data.

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