Heterogeneous Panel Granger causality between GDP and Tourism in 11 EU members in Central and Southeastern Europe

Blanka Škrabić Perić
University of Split, Faculty of Economics, Department of Quantitative Methods
Cvite Fiskovića 5, 21000 Split Croatia
+385914430778
bskrabic@efst.hr

Žana Vidović
SAT Yachts
Rendićeva 24, 21000 Split Croatia
+385981695971
zanavidovic4@gmail.com

Abstract
This paper investigates the relationship between tourism development and economic growth for 11 Central and South-Eastern European EU members during the period from 1995 to 2013. Recent empirical studies are mostly focused on proving the tourism–led growth hypothesis, while the other direction of causation or a bidirectional relationship, is rarely investigated. Considering the possibility of the growth- led tourism hypothesis or a bidirectional relationship, as well as heterogeneity among selected countries, the authors use the heterogeneous panel Granger causality test to explore the real relationship between tourism and economic growth. The results significantly confirm heterogeneity in the relationship between GDP and tourism in the countries examined here. The results indicate bidirectional Granger causality between international tourism receipts and GDP for five countries: The Czech Republic, Hungary, Poland, Romania and Slovakia. GDP growth Granger causes growth of international tourism receipts in Bulgaria and Croatia. For Estonia, Lithuania, Latvia and Slovenia, a causal relationship is not confirmed in any direction.

Keywords: Tourism development, GDP, heterogeneous panel Granger causality, LSDV corrected estimator

JEL classification: C23, P2, 01, L83

Introduction

The World Travel & Tourism Council (2016) announced that their 10 year forecasts provide a unique perspective on the sector's growth for long-term growth, and that tourism will continue to be an economic strength and social development for the world. Also, they indicate that

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Travel and Tourism generated 9.0% of global GDP, supporting one of 11 jobs in the global economy in 2015. At same time, international tourism is becoming very popular in the academic literature as a potential source of economic growth.

Most existing empirical studies try to explain the impact of tourism on economic growth. This hypothesis is called tourism-led growth. On the other hand, the relation between tourism and economic growth can be the reverse. It is possible that economic growth contributes to tourism growth and it is called growth-led tourism. Finally, the third possibility and ideal situation is bidirectional causality between tourism and growth. In recent times, in theory and practice, international tourism is often considered as an important contributor to economic growth (Proença and Soukiazis, 2008; Payne and Mervar, 2010; Aslan 2014; Du *et al.* 2016.). On the other hand, empirical studies about the relationship between tourism and economic growth are conducted for developed and developing counties and results vary by the data set (one country, more countries), time period, and the methodology that is used.

Additionally, it is widely accepted that tourism should be especially interesting to developing countries, because it could be one of the main factors in achieving economic growth as in developed countries (Aslan, 2014). The Central and South-Eastern European (CSEE) countries are typical example of developing countries. All these countries have passed the process of transition from centrally planned economies to open economies. The transition process covered all sectors: financial sectors, institutions, trade, tourism and so on and all these countries have become EU members. Hegerty (2016) indicated that these countries improved living standard in the last decades, while their economies did not reach EU averages.

Nonetheless, there are only a few empirical studies which investigate the relationship between international tourism and economic growth for CSEE countries (Payne and Mervar, 2010; Surugiu and Surugiu, 2013; Gricar *et al*., 2016). As for other groups of countries, results vary by the country, time period, indicators of tourism and the econometrics method used. For most CSEE countries, we could not find empirical evidence about the relationship between international tourism and economic growth. To the best of our knowledge, only Chou (2013) considered a group of countries like ours, but without Croatia and Lithuania. He investigated the relationship between domestic tourism spending and growth. Our research differs from Chou (2013) because we consider international tourism receipts because this type of tourism is considered as a potential factor of economic growth.

On the one hand, the ambiguous results of only a few empirical studies about the relationship between tourism and growth in CESEE countries and, on the other hand, the generally accepted view that international tourism contributes to economic growth, impose the need for further investigation into the relationship between international tourism and GDP growth. Therefore, this research tries to empirically investigate the real relationship between international tourism and GDP growth for 11 EU members from CESEE countries in the period of 1994-2013 by using panel data.

Considering the fact that data for most CESEE countries have been available since the mid-1990s, the time period is short for any time series analysis for yearly data. To avoid this problem, this paper uses panel data analysis because it has better properties for data with a moderate number of time periods. However, it is impossible to ignore the fact that these countries are heterogeneous by the type of tourism, geographic position and different level of development of tourism infrastructure and tradition. This research uses Heterogeneous Panel Granger causality methods to investigate the relationship between growth and tourism. Also, taking into account the fact of a relatively small number of countries and a moderate time period, it was necessary to choose an appropriate dynamic panel data estimator. Therefore, the Least Squared Dummy Variable corrected (LSDVc) estimator for panel data is employed as a base to perform the Granger causality test. This estimator shows the best properties in simulation studies among panel data estimators for the samples with small numbers of cross sections and moderate time periods (Judson and Owen, 1999; Bun and Kiviet, 2001; Bruno 2005a).

The results of empirical research confirm heterogeneity in the relationship between tourism and growth among the countries considered here. Precisely, the results only partially confirm the theoretical statement that international tourism is a significant factor in achieving economic growth for CESEE countries. For only five countries from the data set, a bidirectional relationship is confirmed. For two countries, it is confirmed that GDP contributes to tourism development, while for four countries, there is no causality between tourism and growth. Therefore, it is evident that more than half of the CSEE countries cannot consider international tourism as a leading indicator of economic growth. Finally, the results indicate several recommendations for future empirical studies for CSEE countries which deal with economic growth and tourism. They have to consider the heterogeneity of countries and the possibility of bidirectional causality which has been proved for some countries.

The rest of paper is organised as follows. The next section, the Literature Review, presents the results of similar studies. The Data and Methodology section describes the data and the methodology in detail. The Empirical Results and Discussion of Results provide the results of empirical analysis and give an economic interpretation of results. The last section, the Conclusion, summarizes the results of studies and provides policy implication and recommendations for further research.

Literature Review

The literature about the relationship between GDP and tourism is widely represented in the economic literature. The detailed literature review about the relationship between GDP growth and tourism development for different countries, the results and methodology is presented in detail in Pablo-Romero and Molina (2013). They concluded that existing empirical studies are primarily interested in proving the growth-led tourism hypothesis, but reverse causality and bidirectional hypothesis are somewhat rarely investigated. Also, earlier research analyses the relationship for one country and used time series analysis, while more recent studies consider groups of countries and use panel data analysis. The main concern of panel data analysis is heterogeneity among obtained countries. Their final conclusion is that results vary by group of countries used, methodology and time period.

Considering the detailed literature review provided by Pablo-Romero and Molina (2013), this paper discusses only recent research which the deals with similar groups of countries to ours or uses panel methodology. The previous empirical studies mostly tried to investigate the influence of tourism on economic growth. Therefore, empirical studies usually extend some version of growth model by a tourism variable (Du *et al.,* 2016; Proença and Soukiazis, 2008)

Thus, Du *et al.* (2016) developed an extension of the Solow model and estimate the model with 109 countries over the period from 1995 to 2011. They used OLS methodology with robust standard errors to take into account possible heteroscedasticity. Results indicated that tourism did not affect growth directly, but influence it through standard income determinants. Precisely, in regressions which included only tourism and growth, tourism had a significant influence, but if other variables were included, tourism lost significance. On the other hand, Proença and Soukiazis (2008) upgraded the growth model with the tourism variable for four Southern European countries (Greece, Italy, Portugal and Spain) in the period from 1990 to 2004. They found evidence that supported tourism-led growth hypothesis, but with small value of tourism coefficients. They concluded that tourism can be considered as an alternative source of the growth for these countries.

The main disadvantage of these studies is assumptions of homogeneity of influence of tourism on economic growth as well as the assumption of exogeneity of the tourism variable (neglecting the possibility of reverse causality). From these two studies, which assume homogeneity of slopes, it is not possible to reach a final conclusion about hypothesis tourism-led growth.

However, studies which assume heterogeneity between countries also do not produce unique results. On one hand, Dritsakis (2012) investigated the long run relationship between economic growth and tourism in seven Mediterranean countries over the period from 1980 to 2007. He used the Fully Modified Ordinary Least Squares heterogeneous panel cointegration test and confirmed panel the cointegration relationship between tourism and growth. He also found that tourism receipts have a high impact on GDP in all seven Mediterranean countries. On the other hand, Aslan (2014) examined the relationship between tourism and economic growth in twelve Mediterranean countries over the period between 1995 and 2010 and obtained significantly different results. He employed somewhat different methodology, the heterogeneous panel Granger causality test, and he found evidence of bidirectional relationship only for Portugal. Unidirectional causal relationship from tourism to GDP growth was confirmed only for Turkey and Israel. The other direction, in which, GDP growth causes tourism growth was confirmed for Spain, Italy, Tunisia, Cyprus, Croatia, Bulgaria and Greece. Finally, for Malta and Egypt, results did not indicate the existence of causality between tourism and GDP in any direction.

Despite the growing literature that investigates the relationship between tourism and economic growth, only a few studies considered this relation for one of CSEE countries. Payne and Mervar (2010) examined the tourism-led hypothesis for Croatia using quarterly data over the period 2001-2008 by performing the Toda-Yamaoto long-run Granger causality test. In their model, except for international tourism and growth, they also included exchange rate. Their results confirmed growth-led tourism, while the tourism-led growth hypothesis was not confirmed. Gricar *et al.* (2016) applied Granger causality approach to investigate the relationship between tourism (measured by tourism arrivals) and economic growth in Slovenia and Montenegro. They found unidirectional relationship from GDP growth to tourism for Slovenia, while for Montenegro the bidirectional relationship was confirmed. On the other hand, Surugiu and Surugiu (2013) studied the long-run relationships between domestic tourism expansion and economic growth in Romania during the period from 1988– to 009. Using the Granger causality analysis based on the vector error correction model (VECM), the empirical results suggested that the tourism-led growth hypothesis was confirmed for domestic tourism. On other hand, the results did not confirm growth-led tourism hypothesis. However, international tourism is not considered in this study.

Considering the presented results of studies for one of CSEE countries, it is not possible to derive a unique conclusion about the relationship between international tourism and economic growth. The most similar research to our by sample of countries and used methodology is provided by Chou (2013). Nevertheless, he investigated the relationship between domestic tourism spending and economic growth, while we investigate relationship between international tourism and economic growth. He investigated the causal relationship between domestic tourism spending and economic growth in 10 transition countries: Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Poland, Romania, Slovakia and Slovenia, over the period from 1988 to 2011. He used bootstrap panel causality tests, which accounted for country-specific heterogeneity. He confirmed bidirectional relationship for Estonia and Hungary. The unidirectional relationship that growth causes tourism spending was confirmed in the Czech Republic and Poland, while reverse direction was confirmed in the Cyprus, Latvia and Slovakia. For Bulgaria, Romania and Slovenia, results indicated that neither tourism development nor economic growth is sensitive to each other. We extend his research by considering international tourism receipts which is widely accepted as an important driver of economic growth

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Data and Methodology

Data

The data set consists of 11 CESEE countries (Bulgaria, The Czech Republic, Croatia, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia and Slovenia) which are currently EU members, over the period from 1994 to 2013. Variables in the study include international tourism receipts (TOUR) in US dollars. This indicator is very often used as tourism indicator in the similar studies (Proença and Soukiazis, 2008; Payne and Mervar, 2010; Aslan, 2014).

The World Bank defines international receipts as expenditures by international inbound visitors, including payments to national carriers for international transport. These receipts include any other prepayment made for goods or services received in the destination country. They also may include receipts from same-day visitors, except when these are important enough to justify a separate classification. For some countries they do not include receipts for passenger transport items.

For an indicator of economic development, GDP in US dollars is used. For both indicators, data are obtained from the World Bank Data Bank. Descriptive statistics of both variables is presented in Table 1.

Table 1· Descriptive Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
TOUR	209	3170.18	3053.41	37	13000
GDP	217	82746.1	102835	4400	550000

Figure 1 presents the average value of GDP in of millions US dollars while Figure 2 presents the average value of tourism receipts in \ millions of dollars.

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Fig. 1.
Average value of GDP.

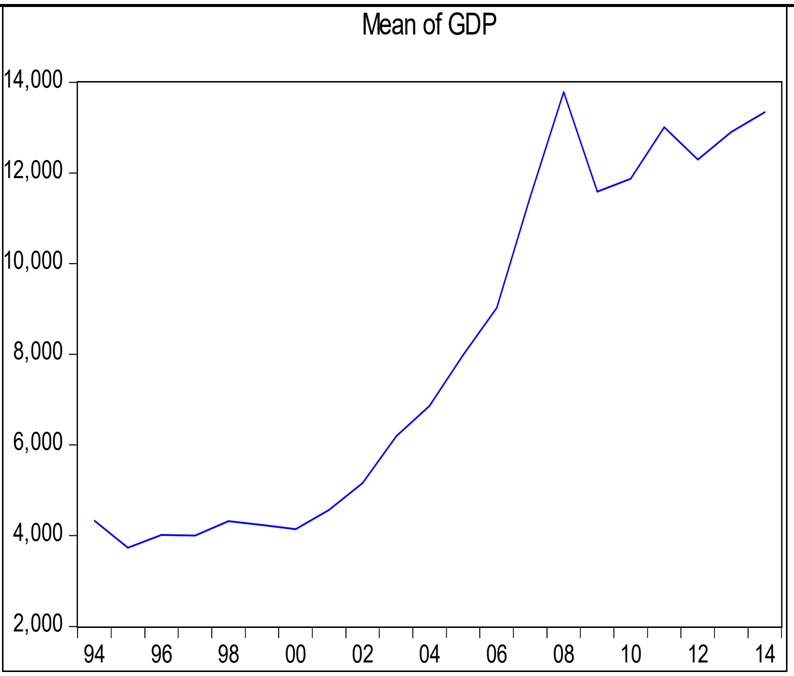
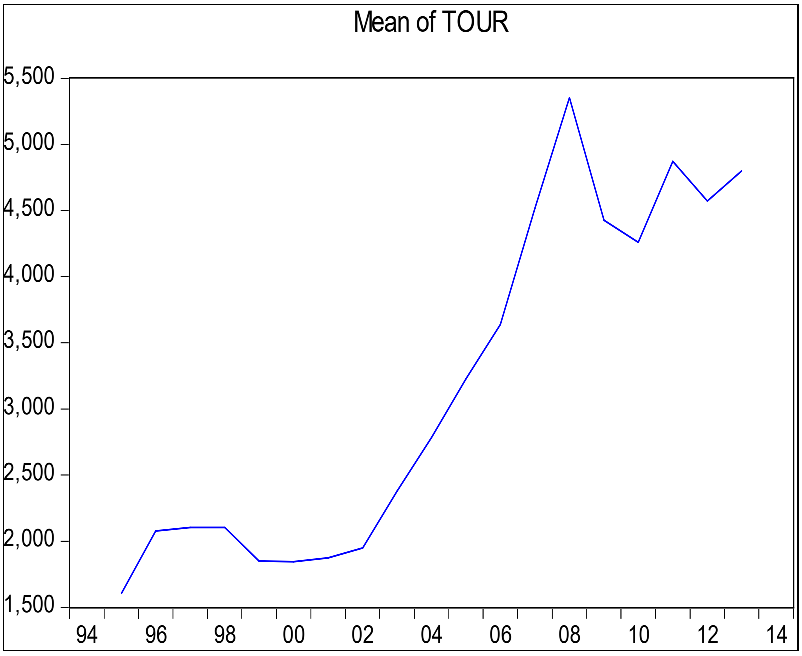


Fig. 2.
Average value of international tourism receipts.



From Figure 1 and Figure 2 the growth of tourism and growth of GDP is visible with a peak in 2007. From 2008-2010, GDP and tourism receipts declined simultaneously. In 2010, GDP started to increase while tourism started to increase in 2011.

Methodology

Causality between two economic behaviours is very often bidirectional. Therefore, Vector Autoregression (VAR) and Granger causality are very important methods for time series analysis. However, bidirectional causality is also possible for panel data. Consequently, Holtz-Eakin *et al.* (1988) developed the Vector Autoregression method or panel data (PVAR). Their method is suitable for data sets with a large number of individuals (N) and small number of time periods (T). They assumed homogeneity of coefficients by individuals, but they allowed variation of coefficients according to time. Considering the fact that our data set consists of a small number of individuals (11) and moderate time span (20), their method is not appropriate for our data set. Additionally, Pesaran and Smith (1995) and Pesaran *et al.* (1999) indicated that with the growth of time dimension, assumptions of slope homogeneity is often inappropriate. They proposed several estimators, including mean group (MG) and Pooled mean group estimator (PMG), which assume slopes heterogeneity between individuals, but this estimator must contain a long time span. Blackburne and Frank (2007) indicated that T must be large so that the model can be estimated for each individual. However, our T is not large enough to estimate separate regression for each of the countries. This problem exists in most macroeconomic studies for ESEE countries. Therefore, some other methodology has to be performed in the empirical analysis of this paper. Hurlin and Venet (2001) proposed the Heterogeneous Granger causality test for panel data, which can be performed regardless of the number of individuals and time periods. This methodology is appropriate for our data set and will be described in detail and performed in our paper. However, Dumitrescu and Hurlin (2012) proposed a new version of non-causality test in heterogeneous panel data. Results of Monte Carlo simulations show that the power of the test is somewhat reduced for a data set with ten individuals and 10 and 25 time periods. Mentioned values describe the size of our data set. Therefore, we decided to follow the earlier version of Hurlin and Venet (2001) procedure. Additionally, Hurlin and Venet (2001) procedure allows testing instantaneous causality (influence of current value of independent variable), while the other versions of the test consider only previous values, but in our case, it is possible that growth of tourism affects economic growth and vice versa in the same period.

Hurlin and Venet (2001) consider a stationary VAR representation for panel data. For each individual $i = 1,\dots,$ N, and each time period $t = 1,\dots,$ T, they consider the first equation from a VAR representation:

$$y_{it} = \sum_{k=1}^{p} \gamma^{(k)} y_{i,t-k} + \sum_{k=0}^{p} \beta_i^{(k)} x_{i,t-k} + \alpha_i + \varepsilon_{it}, \qquad (1)$$

with $p \in \mathbb{N} \cup \{0\}$, α_i is individual-specific which can be expressed through fixed or random effect for each individual, while ε_{it} are i.i.d. $\left(0, \sigma_\varepsilon^2\right)$. $\gamma^{(k)}$ is fixed for all individuals, while coefficients $\beta_i^{(k)}$ are different for each individual. Different $\beta_i^{(k)}$ coefficients enable heterogeneity of individuals. It is also possible that $\gamma^{(k)}$ vary by the individuals, but these differences are not essential for the research question. Additionally, by allowing different $\gamma_i^{(k)}$ in the equation, additional parameters are included.

By assuming the slope homogeneity, results can be misleading for two reasons. First, there is possibility that for some individuals *x* non causes y while for some others *x* causes *y*. Second, it is a possibility that for each individual *x* causes *y,* but with different intensity. By using this method, both problems are removed.

The testing procedure can be explained through three steps. The first step consists in testing the *homogenous non causality hypothesis* (*HNC*) and it is defined by:

$$\begin{aligned} &H_0 : \beta_i^{(k)} = 0, \forall i \in \{1,\dots,N\}, \forall k \in \{0,\dots,p\} \\ &H_1 : \exists (i,k), \beta_i^{(k)} \neq 0 \end{aligned} \qquad (2)$$

If H_0 is not rejected, HNC is confirmed, meaning that variable *x* does not *y* in the Granger sense for all *N* individuals in the sample. The result confirms homogenous non causality, and the testing procedure is finished.

A rejection of H_0 can occur for two different reasons. The first one is the *homogenous causality hypothesis* (*HC*). It implies that all coefficients of $x_{i,t-k}$ are identical and they are not null for each individual. Therefore, the second step in testing procedure is *HC* hypothesis. It is tested as follows:

$$\begin{aligned} &H_0 : \forall k \in \{1,...,p\}\ \beta_i^{(k)} = \beta_j^{(k)}, \forall i,j \in \{1,...,N\}, \\ &H_1 : \exists k \in \{1,...,p\}, \exists i,j \in \{1,...,N\}, \beta_i^{(k)} \neq \beta_j^{(k)} \end{aligned} \tag{3}$$

If *HC* is rejected, it implies that the process is non-homogenous. In this case, Granger causality is non homogenous. The first reason is that some coefficients $\beta_i^{(k)}$ are different for each individual. This relationship is called Heterogeneous Causality *(HEC)*.

The second reason of rejection of HC is Heterogenous Non Causality *(HENC)*. This means that *x* causes *y* only for a subgroup of the individuals from sample.

Therefore, the third step of the procedure is testing the *HENC* hypothesis. The test procedure is defined as follows:

$$\begin{aligned} &H_0 : \exists i \in \{1,...,N\}, \forall k \in \{1,...,p\}, \beta_i^{(k)} = 0 \\ &H_1 : \forall i \in \{1,...,N\}, \exists k \in \{1,...,p\}, \beta_i^{(k)} \neq 0 \end{aligned} \tag{4}$$

HENC is verified through two nested tests. The first test is realized for each individual, $i = 1,...,N$:

$$\begin{aligned} &H_0 : \forall k \in \{1,...,p\}, \beta_i^{(k)} = 0 \\ &H_1 : \exists k \in \{1,...,p\}, \beta_i^{(k)} \neq 0 \end{aligned}. \tag{5}$$

These *N* individual tests enable the identification of individuals for which there is no Granger causal relationship. Based on the results of *N* individual tests, two groups of individuals are formed. The first group (I_c) contains individuals for which a relationship exists, while I_{nc} contains individuals for which a relationship of that kind does not exist. In the next step, $\beta_i^{(k)} = 0, \forall i \in I_{nc}, \forall k \in \{1,...,p\}$ is tested.

If *HENC* is not rejected, it implies that a subgroup of individuals exist for which the variable *x* does not Granger cause variable *y*. On the contrary, if *HENC* is rejected, it implies that a Granger causal relationship exists between *x* and y for all individuals in the panel, but the data generating process is still heterogeneous (*HEC*).

Before the testing procedure, it is necessary to choose an adequate panel data estimator. Despite the huge popularity of two dynamic panel data estimators Arellano and Bond (1991) and Blundell and Bond (1998), they are not employed for our research. They are proposed for large *N* and small *T*. Our sample does not satisfy basic conditions to apply these estimators. On the other hand, Least Square Dummy Variables (LSDV) is biased when a lagged dependent variable is included in the model. However, Kiviet (1995) developed a new estimator, called Least Square Dummy Variables corrected (LSDVc), by calculating bias of LSDV estimator. This estimator shows better properties of all mentioned estimators in case of small *N* and small and moderate *T* (dimensions of our data sets) in several simulation studies about bias and efficiency of dynamic panel data estimators in small samples (Judson and Owen, 1999; Bun and Kiviet, 2001; Bun and Kiviet, 2003; Bruno, 2005a). Despite, its good properties, it is not often used in the empirical studies. The main reason is, before 2005 it can be used only for balanced panel data, but Bruno (2005b) enabled the use of LSDVc for unbalanced data. Still, it is not often used in empirical studies because it is not incorporated in any statistical software. Considering its good properties for data set as in ours, it is applied for estimation our equations.

Empirical Results and Discussion of Results

For performing the presented Heterogeneous Panel Granger causality, it is necessary to test the stationarity of data. From Figures 1 and 2, it is obvious that both variables indicate a trend. Therefore to investigate the stationarity of prominent variables, unit root tests with trend and constant are performed. Considering the fact that panel unit root tests show weakness in different situations, several unit root tests are performed (the Levin, Lin & Chu Test, Breitung's Test, the Im, Pesaran and Shin Test, and two versions of Fisher test: ADF - Fisher Chi-square and PP - Fisher Chi-square). Kónya (2006) also indicated that different unit root tests give contradictory results.

Table 2.
Results of panel unit root tests.

GDP				
Method	Statistic	Prob.**	Cross-sections	Obs
Null hypothesis: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.05265	0.1463	11	180
Breitung t-stat	-0.90241	0.1834	11	169
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.20143	0.1148	11	180
ADF - Fisher Chi-square	24.1200	0.3410	11	180
PP - Fisher Chi-square	10.8832	0.9764	11	206
dGDP				
Null hypothesis: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.30323	0.0000	11	190
Breitung t-stat	-8.63827	0.0000	11	179
Null hypothesis: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.28529	0.0005	11	190
ADF - Fisher Chi-square	54.0635	0.0002	11	190
PP - Fisher Chi-square	58.3259	0.0000	11	195
TOUR				
Null hypothesis: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.87629	0.0020	11	172
Breitung t-stat	-2.76350	0.0029	11	161
Null hypothesis: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.24521	0.0006	11	172
ADF - Fisher Chi-square	43.7387	0.0038	11	172
PP - Fisher Chi-square	12.4607	0.9471	11	198

Note: Statistic-denotes test statistics, Prob.-notes p-value of unit root test
** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.
Cross-sections- denotes number of individuals
Obs-number of used observations. Number of used observations vary with characteristics of unit root test
Source: author's calculations

The results from Table 2 indicate that variable *GDP* is not stationary. The results (column Prob. of Table 2) of all unit root tests do not reject null hypothesis about the presence of unit root (common or individual unit root), all p-values are greater than 0.05. Results (column Prob. of Table 2) of unit root tests for differenced value of *GDP (dGDP)* reject the null hypothesis about the presence of unit root; all p-values are less

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than 0.05. The results (column Prob. of Table 2) of unit root testing reject the presence of unit root for *TOUR* variable. Precisely, all unit root tests (p-values less than 0.05) except Fisher Chi-square (p-value is 0.9471) reject null hypothesis about the presence of unit root. Therefore, for further investigation of Granger causality between *TOUR* and *GDP*, the variable *GDP* in the first differences and *TOUR* variable in the level will be used. Before performing Granger causality test, it is necessary to choose the optimal lag length.

Table 3.
Optimal Lag order by country.

Country	Number of lags
Bulgaria	1
Czech Republic	1
Croatia	3
Estonia	3
Hungary	1
Lithuania	1
Latvia	3
Poland	3
Romania	3
Slovakia	1
Slovenia	1

From Table 3, it is visible that more than half of the countries indicate 1 lag as an optimal number of lag. Results were obtained by Schwarz' Bayesian Information Criterion (SBIC). Therefore, VAR(1) will be performed to investigate the relationship between *GDP* and *TOUR*. Additional reasons for choosing one lag are: too many lags waste observations and the standard errors of estimated coefficients become larger, making the results less precise (Chou 2013), also more lags acquire additional coefficients to estimate and additional degrees of freedom are lost. By including tree lags in VAR additional two observations are lost for each country and model has an additional two coefficients to estimate for each country

The VAR model can be written by the equations:

$$\begin{aligned} dGDP_{it} &= \gamma_1 dGDP_{i,t-1} + \sum_{k=0}^{1} \beta_{1i}^{(k)} TOUR_{i,t-k} + \alpha_{1i} + \varepsilon_{1it} \\ TOUR_{it} &= \gamma_2 TOUR_{i,t-1} + \sum_{k=0}^{1} \beta_{2i}^{(k)} dGDP_{i,t-k} + \alpha_{2i} + \varepsilon_{2it} \end{aligned}, \qquad (6)$$

where i denotes country $(i = 1,...,11)$, t denotes the time period, k denote lags $k = 1,...,l$. α_{1i} and α_{2i} are country specific while ε_{1it} and ε_{2it} are i.i.d. $\left(0, \sigma_\varepsilon^2\right)$, $dGDP_{it}$ is differenced value of *GDP* for country i in the period t while $TOUR_{it}$ is international tourism receipts for country i in the period t. Results are obtained by using LSDVc estimator, while the Blundell and Bond estimator is used as an initial estimator to calculate the bias of the LSDV estimator. LSDVc estimator in the first step estimates LSDV estimator. In the second step, a Blundell and Bond (1998) consistent estimator is estimated. Its results serve to calculate bias of LSDV estimator. In the last step, coefficients obtained by LSDV are corrected for the calculate bias.

The results from the Heterogeneous Panel Granger causality test are presented in Table 4. Results obtained with Anderson and Hsiao (1981) as an initial estimator will serve as robustness check. Results are presented in Appendix Table A1.

The second column of Table 4 shows the results of Granger causality in direction *dGDP→TOUR*. The result of HNC hypothesis indicates rejection of the null hypothesis. This means that for least one country *dGDP* causes *TOUR*. Therefore, it is necessary to test the HC hypothesis. The result of HC indicates rejection of a homogenous influence of *dGDP* on *TOUR* among countries and the HENC hypothesis is tested. Results indicate that *dGDP* causes *TOUR* in Bulgaria, Czech Republic, Croatia, Hungary, Poland and Romania at a 5% significance level and Slovakia at 10% significance, while for the other countries (Estonia, Lithuania, Latvia and Slovenia) causality does not exist. The second step of HENC additionally confirms that causality does not exist.

The third column of Table 4 presents results for the direction *TOUR→ dGDP*. Given the p-value of HNC hypothesis, indicates rejection of homogenous non causality and the testing procedure continues. The result of the HC hypothesis indicates rejection of homogenous causality. Therefore, the HENC hypothesis is tested. Results indicate that *TOUR*

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causes *GDP* for the following countries: The Czech Republic, Hungary, Poland and Romania at 5% and Slovakia at 10%. For all other countries *TOUR* non Granger causes *GDP*.

Table 4.
Results of Granger causality testing.

	dGDP→TOUR	***TOUR→ dGDP***
HNC hypothesis		
p-value	**0.0000**	**0.0000**
HC hypothesis		
p-value	**0.0000**	**0.0000**
First step of HENC testing		
Bulgaria	**0.0009**	0.3645
Czech Republic	**0.0000**	**0.0000**
Croatia	**0.0000**	0.2628
Estonia	0.7238	0.8542
Hungary	**0.0018**	**0.0077**
Lithuania	0.7665	0.4817
Latvia	0.7294	0.4918
Poland	**0.0000**	**0.000**
Romania	**0.0275**	**0.0000**
Slovakia	***0.0775***	***0.0831***
Slovenia	0.2017	0.3650
Second step of HENC testing		
p-value	0.7925	0.7428
Diagnostics of LSDV model		
Number of obs.	184	184
Number of individuals	11	11
R square	0.5411	0.93

Note: [a]p-value in hipothesys testing, p-value<0.1 are bold and italic, p-value<0.05 are bold
Source: author's calculations

Table 5 summaries results from Table 4 and shows the nature of the relationship between tourism and growth for each country.

Table 5. Results of Granger causality testing.

	Direction
Bulgaria	***dGDP to TOUR***
Czech Republic	**Bidirectional**
Croatia	***dGDP to TOUR***
Estonia	**No causality**
Hungary	**Bidirectional**
Lithuania	**No causality**
Latvia	**No causality**
Poland	**Bidirectional**
Romania	**Bidirectional**
Slovakia	**Bidirectional**
Slovenia	**No causality**

Finally, from Table 5 it can be concluded that a bidirectional causal relationship exists for the Czech Republic, Hungary, Poland, Romania and Slovakia. These results indicate that these countries succeeded in achieving a situation where economic growth promotes tourism and vice versa. For Bulgaria and Croatia *GDP* growth causes growth of international tourism receipts. For these two countries, economic growth leads to tourism promotion while the other direction is not achieved. For Croatia similar results are obtained from Aslan (2014) and Payne and Mervar (2010) and for Bulgaria (Aslan 2014). For Estonia, Latvia, Lithuania and Slovenia there is no relationship between *TOUR* and *GDP* in any direction. Results for the three Baltic countries are not totally unexpected because their tourism development started in 1991. Cottrell and Cottrell (2015) indicated that academic literature about tourism of Baltic countries is rare despite lots of potential of tourism growth in Lithuania, Latvia and Estonia. Results for Slovenia are in line with Chou (2013). He also found that there is no causality between domestic tourism spending and growth in any direction. Our results confirm his results for international receipts. Results are additionally confirmed by results from Appendix Table A1 except for Slovakia, where causality does not exist in any direction.

Conclusion

This research investigated the relationship between economic growth and tourism development in the 11 CSEE countries that are now EU members. Considering the heterogeneity among countries in the level of tourism development, tourism tradition and the type of tourism as differences in the level of economic development, the Heterogeneous Panel Granger causality test was employed to investigate the relationship between tourism and economic growth. Moreover, this paper tries to empirically confirm the generally accepted view that tourism is an important contributor to economic growth. Results of this analysis confirmed heterogeneity among countries in the relation between tourism and economic growth. Results indicated bidirectional causality between growth and tourism for the Czech Republic, Hungary, Poland, Romania and Slovakia. Unidirectional causality, precisely the growth-led tourism hypothesis, was confirmed for Bulgaria and Croatia. For Slovenia, Estonia, Lithuania and Latvia there was no causality between growth and tourism in any direction. From an analysis of detailed results by countries, it is evident that tourism cannot be uniformly considered as important driver of economic growth in all CSEE countries. Therefore, considering the results of this research gives different policy implications in regard to these results. For countries where bidirectional relationship is achieved, policy makers can support policies that improve tourism infrastructure and transportation facilities to reach higher economic growth. At same time, they can focus attention to ensure all conditions for economic growth: political stability, strong institutions, and stable investment in physical and human capital. As a consequence, they will reap the benefits of tourism.

Countries where economic growth has statistically significant influence on tourism have to promote a strategy of economic growth though human and capital investment and political stability. Consequently, tourism will allow countries to obtain additional resources such as better infrastructure, and a higher quality labour force. Additionally, political stability and crime will create the impression of a safe country and attract international tourists. At same time, tourism cannot be considered as leading indicator for economic growth. However, they have to promote tourism as potential source of economic growth. Finally, for countries where there is no relationship between tourism and economic growth, policymakers cannot expect feedback effect between tourism and economic growth. Governments of these countries should focus on economic policies to promote tourism as a potential source of economic growth and vice versa.

Results of this study provide several implications for further research. First, the results of this research impose the need for using heterogeneous dynamic panel data estimator to investigate the relationship between tourism and growth for group of CESEE countries. Second, for countries with bidirectional relationship, it is necessary to include a tourism variable in growth models and economic growth in tourism modelling. At same time, they have to control for endogeneity of tourism or GDP growth in the model. Third, researchers who upgrade the model of growth with the variable of tourism development by using panel data methodology have to achieve homogeneity of countries in the sample. Therefore, the results of this study and/or similar studies can be the first step to choose a homogenous sample of countries. However, this study has several limitations. These empirical studies in consider only two variables. It is well known that some other variables can have important influence on GDP and/or tourism. Therefore, further research has to include other determinants such as the exchange rate, human capital, freedom index, political stability and so on. Finally, considering the data set, characteristics such as small numbers of cross sections, moderate time spans and missing data, this paper has methodological limitations. Namely, some advanced methodologies that consider cross sectional dependence or require balanced panel data set could not be applied.

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Appendix

Table A1.
Results of Granger causality testing with Anderson Hsiao estimator as initial estimator.

	dGDP→TOUR	***TOUR→ dGDP***
HNC hypothesis		
p-value	**0.0000**[a]	**0.0000**
HC hypothesis		
p-value	**0.0000**	**0.0084**
First step of HENC testing		
Bulgaria	**0.0000**	0.5698
Czech Republic	**0.0026**	**0.0001**
Croatia	**0.0000**	0.4726
Estonia	0.7587	0.9154
Hungary	**0.0050**	**0.0779**
Lithuania	0.7965	0.6701
Latvia	0.7607	0.6691
Poland	**0.0000**	**0.0000**
Romania	**0.0437**	**0.0000**
Slovakia	0.1140	0.2511
Slovenia	0.2601	0.5674
Second step of HENC testing		
p-value	0.6601	0.8667

Note: [a]p-value in hipothesys testing, p-value<0.1 are bold and italic, p-value<0.05 are bold.
Source: author's calculations

Table A2.
Results of Granger causality testing.

	Direction
Bulgaria	***dGDP to TOUR***
Czech Republic	**Bidirectional**
Croatia	***dGDP toTOUR***
Estonia	**No causality**
Hungary	**Bidirectional**
Lithuania	**No causality**
Latvia	**No causality**
Poland	**Bidirectional**
Romania	**Bidirectional**
Slovakia	**No causality**
Slovenia	**No causality**