

Article

Spillover Index Approach in Investigating the Linkage between International Tourism and Economic Growth in Central and Eastern European Countries

Viorica Chirilă ^{1,*} , Gina Ionela Butnaru ²  and Ciprian Chirilă ¹

¹ Department of Accounting, Economic Informatics and Statistics, Alexandru Ioan Cuza University of Iași, Bulevardul Carol I, 11, 700506 Iași, Romania; chcip@uaic.ro

² Department of Management, Marketing and Business Administration, Alexandru Ioan Cuza University of Iași, Bulevardul Carol I, 11, 700506 Iași, Romania; gina.butnaru@uaic.ro

* Correspondence: vchirila@uaic.ro

Received: 16 August 2020; Accepted: 12 September 2020; Published: 15 September 2020



Abstract: The present study analyses the relationship between economic growth and tourism growth at the level of Central and East European countries, using the spillover indices approach. Based on the monthly data obtained for the period 2000–2019, the analysis of this paper presents certain empirical results. Firstly, the relationship economic growth-international tourism grow is not stable over time, both from the point of view of its size and its direction, which suggests that the specific activities of international tourism contribute to the economic growth and hypotheses according to which international tourism growth causes economic growth are time-dependent. Secondly, the relationship economic growth-international tourism growth is dependent on certain major events, such as the economic and financial crisis that started in 2008 and the debt crises from 2010. The results obtained show that the impact of these events influences the direction of the relationship between international tourism and economic growth which becomes more accentuated during the economic growth periods.

Keywords: tourism-led economic growth; growth-led tourism; spillover index; economic growth; international tourism

1. Introduction

Tourism, as a field of economic activity, has registered one of the biggest and fastest growth rates in recent years. According to the World Tourism Organization (UNWTO), the number of arrivals of international tourism will reach 1.8 billion in 2030 if a yearly growth of 3.3% is recorded [1,2]. International tourism represents a fundamental component of international specialisation and is a significant drive of development, prosperity and welfare, as shown by the statistical data provided by the reports of the European Commission (EC), of UNWTO or those of the World Council of Tourism and Travels. At a global level, tourism has brought a significant contribution to economic growth and there is a close correlation between the economically developed countries and those with a developed touristic sector [3–10]. Tourism contributes to economic growth and poverty reduction, especially in the case of less developed countries but not automatically [11]. Therefore, in 2019, the direct, indirect, and induced impact of travels and tourism has shown that tourism has contributed with 8.9 billion USD (respectively 10.3% of the global GDP) to the global GDP (Gross Domestic Product), with 330 million jobs of those created at a global level. Worldwide destinations have registered a growth of 3.8% in 2019 in comparison with 2018, being the 10th consecutive year of sustained growth since 2009 [12]. The fact that international tourism has grown beyond any expectations confirms once more that travels are now part of the consumption models for an increasing number of persons, both in emerging economies and in the advanced ones. This also underlines the need to place tourism as one of the main

pillars of socio-economic development, being a major contributor to economic growth, exports, and job creation [1]. In a global, still unequal economic environment, positive outcomes have been registered in all regions and sub-regions while the growth of international touristic arrivals has exceeded the growth of world economy in 2019 in comparison to 2018 (+3.5% against +2.5%) [3,4].

The positive perspectives of international tourism, as shown in the World Tourism Barometer, 2020 [12] report, can be influenced by a deterioration of the economic scenario (the current trade and geopolitical tensions in Latin America, Asia and Pacific, and the Middle East), as well as by major events, such as the Brexit impact on Europe (from March 2019) which affected countries in the Euro-zone as well as the access towards destinations outside the Eurozone. Despite all these, Europe is still the biggest area in the world in terms of the expenses made by international visitors (619 billion USD), representing in 2019, 37% of the total global international expenses. The WTTC (World Travel & Tourism Council) report [3] shows that the European global economy has increased in 2019 as opposed to 2018 by 1.3%, while the tourism sector has recorded a 2.4% increase in 2019 than in 2018.

Taking into account that tourism can determine economic growth both for the developed countries and for the developing countries, for Central and East European countries (CEE), the development of tourism may have positive implications on economic growth and at the same time, it can diversify the economic activities. Tourism development can determine economic growth by means of the increase in the number of persons working in tourism, the stimulation of investments in infrastructure, technology and human capital, and the creation and development of local companies which should support the tourism activities. International tourism can also determine the reduction of the payment balance of a country because it can be considered a form of export. By promoting ecological tourism, the environment and wildlife protection can be improved. Since sustainable development means the way in which the resources are used in order to satisfy the human needs and protect the environment so that future generations are not affected, the topic is all the more important as the goals of sustainability focus on economic growth. If during the world conference from Rio de Janeiro in 1992, the participants reached the conclusion that sustainable development must represent a balance among economic growth, environmental protection and use of alternative resources, in 2015 an agreement among 196 states was concluded regarding the implementation of 17 objectives mentioned in the Agenda for Sustainable Development by 2030. The data provided by the World Tourism Organization and the Organization of American States [13] show that tourism is included in three of the sustainable development objectives as follows: objective 8 focuses on economic development and jobs, objective 12 aims for production and consumption sustainability, and objective 14 refers to the life below water. In our paper, we have tackled sustainability from the perspective of economic growth by means of tourism. As a consequence, the awareness and the opportunities by means of which tourism development may influence economic growth determined the formulation and testing of the hypothesis according to which tourism determines economic growth, which implies that a long-term factor of economic growth is tourism. The identification of the existence of this hypothesis is important for any country and especially for the decision-making factors who can create economic policies to allocate resources for the development of tourism while tourism development will in its turn determine economic growth.

The goal of the current research consists in the performance of an analysis regarding the evolution in time of the relationship between tourism growth and economic growth on a sample of ten countries from CEE: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, and Slovakia. Since previous empirical studies revealed four potential existing situations, these will represent the hypotheses of our study, as follows: international tourism growth leads to economic growth; economic growth leads to international tourism growth; the existence of a bidirectional relationship between international tourism and economic growth (bidirectional causality); the lack of a causality relationship between the two phenomena under analysis.

The performance of an empirical study comes to cover the gap of a detailed and comparative empirical research regarding the relationship between international tourism growth and economic growth. Moreover, the approach of this analysis is conducted in the context of sustainability, taking into

account that one of the sustainability goals aims to grow the economy and tourism growth also focuses on environmental protection. Therefore, this paper will fill in the missing gap in the literature. The methodology used allows the performance of subsequent comparisons between countries, which is an additional element in comparison with the previous methodologies that were non-compatible with each other. The study conclusions will allow the substantiation of the decisions made by the policy-makers concerning the phenomenon promoting development, either the international tourism or the economy overall.

There is a very scarce amount of research studies on this topic, conducted on variables recorded on a monthly basis for CEE countries, due to lack of data. The current study comes in to complete this gap, adding to the existing literature minute results about the evolution of the causality relationship between international tourism growth and economic growth. Thus, the results obtained confirm for the CEE countries included in the analysis, that the causality relationship between international tourism growth and economic growth changes over time both in terms of the relationship intensity and its direction. There are time samples where international tourism leads to economic growth and economic growth leads to international tourism, which confirms the existence of the bidimensional causality. The results also confirm the type of causality correlated with the business cycles.

In order to attain its goal, the paper is structured as follows: analysis of the literature and development of the research hypotheses, importance and economic impact of tourism in CEE countries, research methodology, data used, empirical results, discussions, conclusions, limits of research, and future research directions.

2. Literature Review and Development of Research Hypotheses

The researchers and practitioners [14–17] have not yet reached an agreement regarding some fundamental questions: Does tourism stimulate economic growth or the other way round? Is there a causality relationship between tourism and economy? Is the causality relationship unique or bidirectional, is it constant or can it change its direction on a medium and long-term?

Studies performed by Atonakakis et al. [18] and Chatziantoniou et al. [19] targeting the testing of the hypothesis tourism growth determines economic growth have highlighted four different situations: (1) the hypothesis tourism growth determines economic growth (TLEG—tourism-led economic growth) [20–28], (2) the hypothesis economic growth determines tourism growth (EDTG—growth-led tourism) [16,29], (3) the hypothesis tourism growth determines economic growth and at the same time economic growth determines tourism growth [30–34], and (4) the hypothesis regarding the lack of relationship between economic growth and tourism [35–38]. Therefore, hypotheses 1 and 2 validate a unidirectional causality, hypothesis 3 implies a bidirectional causality and hypothesis 4 shows a lack of causality.

In what follows, we will present the literature for the four research hypotheses.

2.1. The Tourism Growth Determines Economic Growth (TLEG—Tourism-Led Economic Growth)

Since 1964, McKinnon [39] laid the foundations of the TLEG hypothesis. This hypothesis was confirmed by the fact that, from an economic standpoint, the foreign currency resources brought into the country by international tourists had a positive impact because it supported the creation of goods and provision of services, as well as the investments required for production growth. Thus, the investments made both in the fixed and human capital determined subsequent economic growth. Moreover, Baker et al. 2007 [40] showed that tourism is important for the economic growth of many world regions (the Caribbean Islands, French Polynesia, Fiji, Hong Kong, etc.) since this is the main currency source obtained from the sale of goods and services to foreign visitors, improving thus the payment balance (Japan, which has a positive payment balance, encourages its citizens to travel abroad in order to ensure the balance of payments). At the same time, Pablo Romero and Molina [41] and Baker et al. [40] also mentioned other benefits from the tourism growth impacting the economic growth such as income obtained from fees, creation of jobs and many opportunities to hire the local

population, additional sources of income and performance of a high percentage of the GDP of a country, leading to the increase in the national income of the respective country and as a consequence, to the unemployment reduction and improvement of efficiency by means of the competitiveness between local and international companies. An important aspect discussed by the authors is that foreign tourists require much higher quality touristic services, which in turn, lead to a competitive advantage with beneficial consequences on all tourism-related sectors.

The tourism development is usually associated with economic growth, foreign currency inflows, employment opportunities, infrastructure improvement, sustainable development and poverty reduction [17].

The first work that tackled the relationship between tourism and economic growth was performed by Ghali in 1976 [42]. The econometric research used the least square method. The creation and confirmation for the first time of the hypothesis that tourism causes economic growth were conducted by Balaguer and Cantavella-Jordá [20] who used the Johansen cointegration method and the Granger-causality test [43] for the Spanish economy during 1975–1997. His results drew the attention of researchers who started to investigate this hypothesis in various countries [44–49]. Most of the authors of the studies confirmed the hypothesis according to which tourism development determines economic growth and the results obtained were influenced by the period considered in the analysis, by the variables used for the quantification of the two phenomena (tourism growth and economic growth), the data registration frequency, the methods used and the countries under analysis. In a paper which presents the empirical literature about tourism and economic growth, Pablo-Romero and Molina [41] underlined that the chronological presentation is the most suitable one because time determined the methodological progress which had been applied in this field of study. The analysis also presented three methodological groups that focused on (1) the time series analysis, (2) the panel data analysis, and (3) the cross-sectional analysis.

Škrinjaric [16] examined the relationship between tourism growth and economic growth and recommended that Poland should use the results of tourism growth as a premise for economic growth since this would lead to a GDP increase. For Slovakia, the results obtained showed changes in the early 2010s, when major capital investments were made in the tourism industry. The authors' general conclusion is that investments in tourism will continuously contribute to economic growths.

The research conducted by Kum et al. [50] confirmed the positive influence of tourism on economic growth and the fact that tourism is a stimulating growth factor. In a study conducted on a sample of 109 countries by Solow, it was highlighted that, without the additional progress factors, tourism loses its growth power, including in predominant touristic countries, which means that in order to have a long-term contribution to economic growth, tourism is efficient only when integrated into a larger development strategy [51]. Moreover, Lemma [52] showed the positive contribution of tourism to economic growth while Urbanc et al. [53] demonstrated that within CEE, starting with the 1990s, tourism had opened its doors, having very high growth potential. The European countries, especially those from Central and East Europe have experienced profound changes which modified the landscapes and impact on tourism, an aspect which was particularly obvious for Estonia, Poland and Slovenia, where it was noticed the estrangement of the human being from nature as a consequence of the non-adjustment to change and of the lack of understanding of the transition process of the economy. In the case of CEE countries, tourism development depends a lot on the cultural heritage and natural resources [54,55] as well as on other factors, all correlated with the tourism growth and economic growth [56].

The results of these studies proved the positive contribution of tourism on long-term economic growth. Even if some international institutions and organisations (United Nations Conference on Trade and Development, United Nations Economic Commission for Africa or United Nations World Tourism Organization) ascertain that the tourism development would be an opportunity to reduce poverty for the less developed countries, Cárdenas-García et al. [57] question these statements. Their results obtained by means of the analysis of 144 countries confirmed that tourism growth determined economic

growth in the developed countries, while in the countries with a more reduced development level, tourism growth did not cause an improvement of economic development. Surugiu and Surugiu [58] answered the question: Does the touristic sector support the economic growth in Romania? in a study where they used the Granger-causality analysis based on the vector error correction model (VECM) and impulse functions for the time frame 1988–2009. The variables used are the domestic tourism and tourism spending, the yearly growth rate of the GDP and the real exchange rate. The results showed that the positive shocks in tourism positively affect the GDP growth rate, thus confirming the hypothesis tourism-led economic growth.

Therefore, the present study aims to test the following hypothesis:

Hypothesis 1 (H1). *International tourism growth leads to economic growth (TLEG).*

2.2. The Economic Growth Determines Tourism Growth (GLT—Growth-Led Tourism)

Most of the literature which dealt with the analysis of the relationships between tourism and economic growth prevalently analyzed the (TLEG) hypothesis. Despite this, there is also a theoretical and empirical, more recent trend which described exactly the opposite relationship: economic growth influences the number of international tourist arrivals (GLT). This hypothesis is supported by the fact that the development of a country is due to good economic policies and governmental investments in both fixed and human capitals. They create a trustworthy climate and culture which encourage the foreign tourist arrivals. Moreover, Payne and Mervar [59] in Croatia, Narayan [60] in Fiji, and Tang și Yang [61] in the USA analyzed and confirmed the existence of the (GLT) hypothesis. Thus, in a study made by Sheresheva and Kopiski [62], the authors showed that as the household income in Russia increased, the basic model of the household consumption also changed, which led to the improvement of life standard. In this context, the number of tourists increased from 2.8 mil. in 2002 to 7.7 mil. in 2008, most of them spending their holidays in Turkey with approximately 10 billion dollars spent annually.

Therefore, throughout time, numerous researchers studied the relationship between economic growth and tourism growth [16,29]. For CEE countries and South and Eastern European countries, Škrinjaric [16], in his study, used the spillover index approach, obtaining results which are not common to all the countries analysed. More specifically, for most of the countries, the hypothesis economic growth determines tourism growth was confirmed for almost the entire period considered for study (the maximum period January 2000–October 2018, in relation to the data availability for the number of tourist arrivals and index of industrial production), but there were periods when the situation was inverse. Therefore, the author examined the causality relationship between tourism growth and economic growth for Bulgaria, Croatia, Czech Republic, Hungary, Poland, Slovenia, and Slovakia, using the spillover indices method and obtaining mixed results for all the countries from the sample. The only exception was represented by Poland which is the only country that confirmed the existence of the hypothesis tourism determines economic growth. It was reached the conclusion that there is a changing relationship between economic growth and tourism growth.

As a consequence, this study aims to test the following hypothesis:

Hypothesis 2 (H2). *Economic growth leads to international tourism growth (GLT).*

2.3. The Tourism Growth Determines Economic Growth and at the Same Time Economic Growth Determines Tourism Growth

The existence of the bidirectional causality between tourism growth and economic growth is theoretically supported by the fact that economic policies focus simultaneously both on the economic growth and the tourism growth [36,59].

The research conducted by Bădulescu et al. [17] investigated the GDP relationship per capita and the international tourism in Romania for the period 1995–2016. The results were obtained using the

Johansen Cointegration test and Granger-causality test and show that the causal effect of the GDP on the international tourist arrivals and on the international tourist receipts is significant in the long term. In the short run, a bidirectional causality relationship between the GDP and number of international tourist arrivals was found and a unidirectional causality relationship was found from the international tourism receipts to GDP.

The analysis of hypotheses regarding the relationship between tourism and economic growth for CEE countries is also debated by Chou [37]. Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Poland, Romania, Slovakia, and Slovenia are studied by means of the panel data that offer the possibility to take into consideration the cross-section dependence during the period 1988–2011. Economic growth is quantified by means of the real GDP per capita while tourism is measured by domestic tourism spending. In this study, the results confirmed the hypothesis tourism-led economic growth for the Czech Republic and Poland, the hypothesis growth-led tourism for Cyprus, Latvia, and Slovakia, a bidirectional relationship for Estonia and Hungary and the lack of a relationship for Bulgaria, Romania, and Slovenia. When studying the relationship between tourism and economic growth in Turkey, Demiroz and Ongan [57] reach the conclusion that there is a bidirectional causality relationship while Gunduz and Hatemi-J [58] underline the existence of a unidirectional causality relationship. A possible explanation of these different results could be the different relative weight of tourism in the country.

Bădulescu et al. [14] studied a sample of 11 countries within CEE (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia) during the period 1995–2015 using autoregressive distributed lag (ARDL) and causal analysis (Granger-causality test). The ARDL cointegrated method is adequate for small samples. The variables used in the study are GDP per capita for the quantification of economic growth and international tourist arrivals and international tourism receipts for tourism quantification. The use of the two variables for quantifying tourist activity determined different results. The results obtained confirmed in the long term the existence of causality between tourism and economic growth for the Czech Republic, Romania, and Slovakia when tourism is quantified through the two variables. When international tourist arrivals were used, for Lithuania, the causality between tourism and economic growth was confirmed and when international tourism receipts were used, the causality was confirmed as well for Bulgaria, Croatia and Romania.

As a consequence, this study aims to test the following hypothesis:

Hypothesis 3 (H3). *There is a bidirectional relationship between international tourism and economy (bidirectional causality).*

2.4. Tourism and Economic Growth: Lack of Causality Relationship

Even if the majority of studies confirmed the first three situations, there are also results that confirmed the lack of a causality hypothesis between tourism and economic growth. Katircioglu [35] studied the case of Turkey using annual data for the period 1960–2006. He also used the bound test and the Johansen approach for cointegration. His results confirmed the lack of a cointegration relationship between tourism and economic growth for Turkey, even if previous studies [63,64] confirmed the tourism contribution to Turkey's long-term economic growth.

A potential theoretical justification for this hypothesis is presented by Figini and Vici [65], who mentioned that the tourism development strategies should be focused more on the development of local tour operators than on the attraction of multinational tour operators.

Brida et al. [38] studied on a sample of 80 countries the dynamics of the evolution of economic growth and of tourism during 1995–2016. The results obtained confirmed the separation of countries studied in two large homogeneous groups: one group with a higher tourism performance and one group with a lower tourism performance, both evolutions being correlated with business cycles. The results of the countries with high performance tend to remain compact/homogeneous contiguous

but they also become distant in time, while the results for the low-performance countries are more and more heterogeneous. The authors included Bulgaria, Czech Republic, Estonia, and Slovenia as part of the group of countries with higher performance in tourism. Hungary, Lithuania, Poland, Romania, and Slovakia are part of the low-performance group while Latvia was an outlier and could not be integrated into any group.

The analysis of the dynamics of the relationship between tourism and economic growth gained a new vision with the work written by Dragouni et al. [36], who used a method proposed by Diebold and Yilmaz [66,67] of volatility transmission (used in the estimation of spillover volatility in equity markets) for the analysis of shocks transmitted between tourism and economic growth. They analysed the relationship between tourism and economic growth during 1995–2012 for the European Union countries and they reached the following conclusions: there is no relationship between the two phenomena for Sweden and UK, there is a bidirectional relationship for Austria, Portugal, and Spain, tourism determines economic growth for Italy and the Netherlands and economic growth determines tourism growth for Cyprus, Germany, and Greece. The same methodology was used by Antonakakis et al. [18], Antonakakis et al. [68], and the results obtained for the European countries confirmed that the relationship studied depends on events occurring in the economic activity of the countries.

Therefore, the current study aims to test the following hypotheses:

Hypothesis 4 (H4). *There is a lack of a causality relationship between international tourism and economic growth.*

Previous studies have highlighted the existence of contradictory results, the reason for which more complex econometric models have been used in order to study the relationship tourism-economic growth [69]. That is why in our research approach we delve into an important problem that deals with the stability over time of the relationship identified between tourism development and economic growth. This study aims to fill in this gap and analyse whether there are or not causality relationship between tourism growth and economic growth. As a distinctive feature, this study addresses the evolution in time of the relationship between tourism and economic growth by means of the methodology of spillover indices proposed by Diebold and Yilmaz [67]. For the analysis, we took into consideration all the data available in the Eurostat database for two variables: international arrivals at tourist accommodation establishments and the monthly industrial production index used to determine the economic growth rate. This study was performed on a sample of 10 CEE countries and it is one of the very few works of research that uses international tourist arrivals at tourist accommodation establishments as a variable measuring international tourism as well as the industrial production growth rate to quantify economic growth as a component of sustainable development.

3. The Importance and the Economic Impact of Tourism in the CEE Countries

As it was previously stated, tourism can determine economic growth both for developed and developing countries, while for the CEE countries, tourism growth can have positive implications on economic growth. Tourism and travels in the CEE countries were characterised in the period 2017–2019 by fluctuating values for the contribution of travel and tourism to GDP (see Figure 1).

Thus, in Figure 1, it can be noticed that for Lithuania, Poland, and Romania, increases in the contribution of travel and tourism to GDP were registered in 2019 in comparison with 2017, Hungary registers a stagnation, while for Bulgaria, Czech Republic, Estonia, Latvia, Slovenia, and Slovakia there were decreases.

According to Figure 2, the greatest contribution of travel and tourism to employment (%) is registered in Romania, being followed by Poland, Bulgaria and Slovakia while the smallest contribution travel and tourism to employment (%) is found in Hungary.

Poland and Romania also occupy top places when it comes to the weight of visitor spend within total exports according to Figure 3.

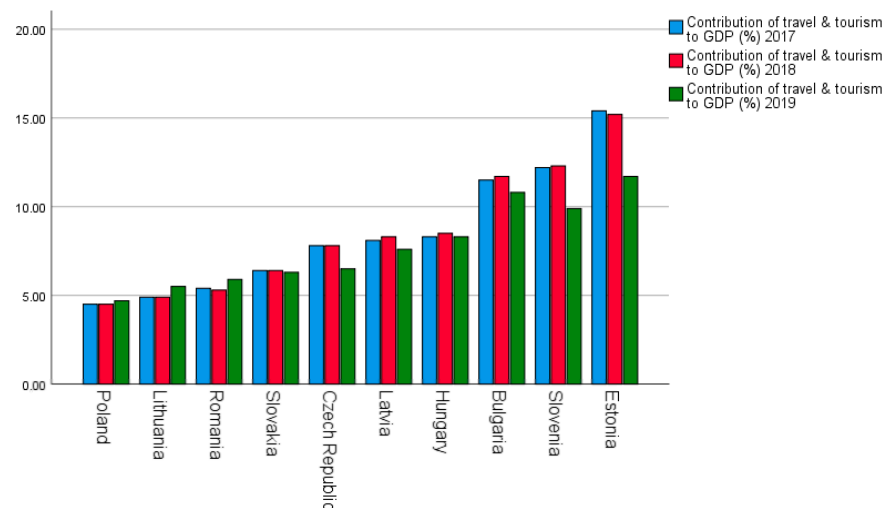


Figure 1. Contribution of travel and tourism to GDP (%) [5–10,70–72]. Source: authors realization.

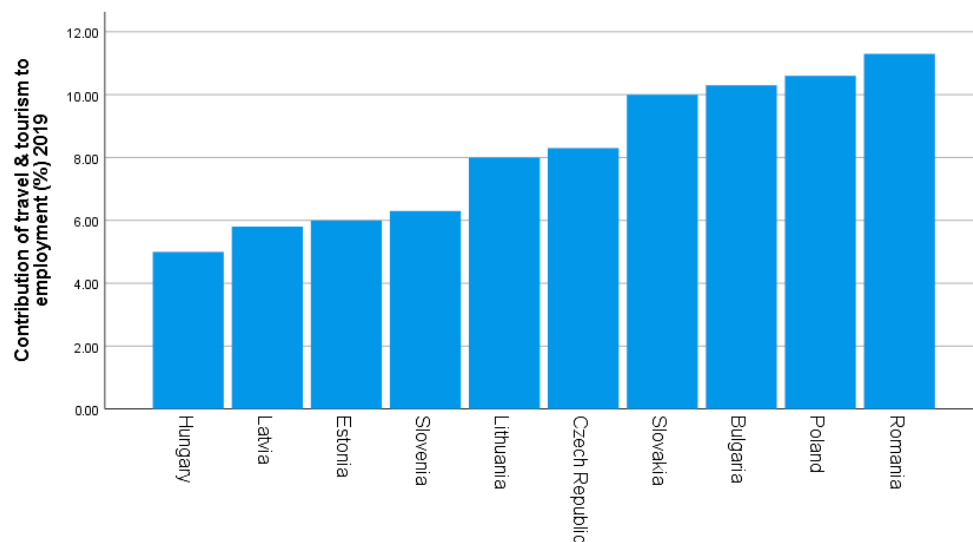


Figure 2. Contribution of travel and tourism to employment (%) [5–10,70,71]. Source: authors realization.

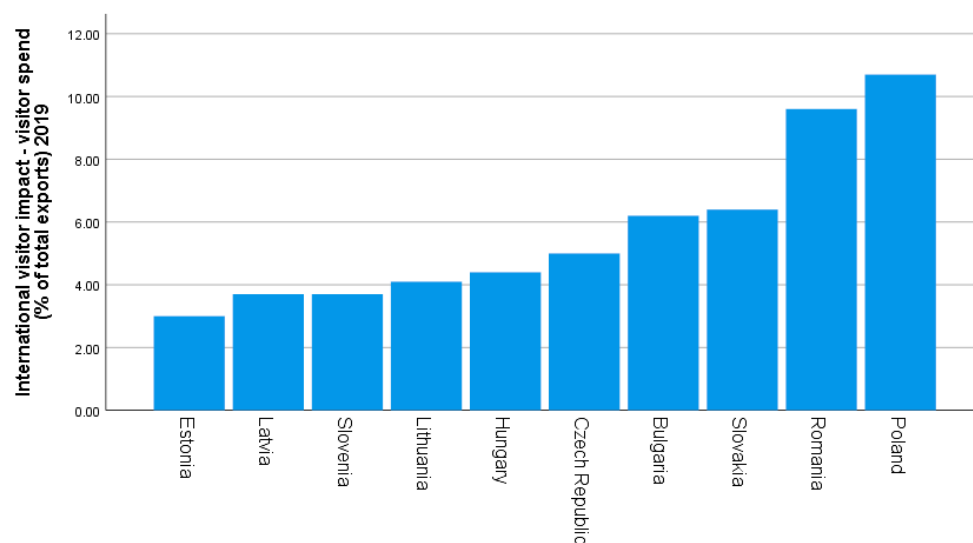


Figure 3. International visitor impact - visitor spend (% of total exports) [5–10,70,71]. Source: authors realization.

In Bulgaria, tourism is the service sector with the highest contribution to economic growth. In tourism, there are 65.90% of the employees from the service activities. Bulgaria has developed prevalently the tradition of relatively cheap international tourism, especially for the seaside destinations in summer, as well as for the mountain destinations both in summer and winter [73]. According to the data provided by Lonely Planet [74], in 2011, Bulgaria was placed among the first 10 touristic destinations preferred by tourists at a global level.

Czech Republic is a competitive and popular touristic destination within the CEE and the economy of this country receives a substantial income from tourism [75]. Prague is the 5th most visited city in Europe, after London, Paris, Istanbul, and Rome [76].

The impact of tourism industries on the economy of the Czech Republic from employment according to the data provided by the Czech Statistical Office [77] is characterised by increases, such as the number of jobs in tourism (to 237,093 jobs in tourism of the 5,320,015 number of jobs in the national economy in 2018 in comparison with 235,691 jobs in tourism of the 5,250,485 number of jobs in the national economy in 2017), the number of people employed in tourism (to 240,591 employees in tourism out of the 5,418,117 number of people employed in the national economy in 2018 in comparison with 238,843 employees in tourism out of the 5,346,092 number of people hired in the national economy in 2017). In the Annual report on tourism 2018-Czech Republic [78], the Chinese tourists represent a very important customer base for tourism in the Czech Republic. In 2018, there was a significant increase in their number—there were almost 620 thousand tourists from the Popular Republic of China who stayed in the accommodation units, representing 5.8% of the total of foreign visitors. The Chinese tourists were the 4th most frequent nationality of the total number of foreign tourists hosted in the Czech Republic in 2018. Even if the number of Chinese tourists in the Czech Republic is still increasing, in 2018, the average nights spent in the Czech Republic by the Chinese tourists have been only 2.5 nights.

Statistics Estonia [79] report the following statistical data about the touristic activity of this country as follows: 3.8 million tourists (59% foreign tourists and 41% domestic tourists) were hosted in 2019, in touristic establishments from Estonia, an increase of 1.5 million tourists compared to 2018, and the number of nights spent registering 7 million nights in 2019. The foreign tourists who travelled to Estonia in 2019 had as the main reason for the trip being holidays (71%), and business (23%), with the other 6% claiming other reasons to visit. In comparison with 2018, both the number of foreign tourists and the nights spent increased by 5%.

The statistical data provided by the Hungarian Central Statistical Office [80] show that in Hungary the touristic activity is also characterised by increases for international trips, as follows: number of inbound trips (from 31,565 thousands in 2009 to 44,460 thousands in 2019); expenditures of visitors (from 353,234 million HUF in 2009 to 601,746 million HUF in 2019); expenditures per day per person (from 11.2 thousand HUF in 2009 to 13.5 thousand HUF in 2019) [80].

The trends in the touristic activity in Hungary, synthesised by Todinca and Ardelean [81] for the period 2015–2025, show an increase in the direct contribution of tourism to the GDP of 3.9%/year, equal to the global average and over the European average (2.8%/year) and in the number of jobs in the touristic sector by 2.5%/year, over the global average (2%/year) and the European one (1.6%/year).

Latvia has become quite the touristic destination, which is testified by the constant increase in the number of its visitors [81]. Latvia was the destination with the fastest growth for the Russian tourists, with arrivals in 2017 of 13.6%, being followed by the demand for German tourists (11.7%) and by the demand for Lithuanian tourists (10.2%). The demand for Indian tourists ranks Latvia on the 3rd place while the demand for Japanese tourists puts Latvia on the last spot in the 27-country ranking analysed in Europe [82].

The State Department of Tourism within the Ministry of Economy improved the competitive advantage of Lithuania within the tourism industry by encouraging the growth of external tourism and domestic tourism [83]. The statistical data provided by Tourism Statistics in Lithuania [84] highlight that in Lithuania, the touristic activity is characterised by increases in the number of foreign tourists

arrived in Lithuania in 2019 in comparison with 2018 is of 11% (from 1,744,733 foreign tourists in 2018 to 1,936,132 foreign tourists in 2019).

In Poland, the well-developed touristic industry and tourism infrastructure ensure the easiness of communication, booking, and transportation towards this touristic destination [84].

According to the statistical data provided by the Polish Tourism Organisation [84], one can notice in Poland constant growth in the number of tourists arrived. Thus, in 2017, Poland was visited by over 18 million visitors, in 2018 the number of visitors increased to 119.6 million and in 2019 there were over 20 million arrivals. For Poland, the tourism industry represents according to the statistical data provided by Eurostat [85] an important drive for the economy and for the labour market. These increases were due to the fact that the Polish Tourism Organisation is in charge with the merchandising and promotion of Poland as a touristic destination, ensuring the development and functioning of the Polish touristic information system [84].

According to the data provided by the National Bank of Romania, the Ministry of Public Finance, and the estimates of the Master Plan for the Development of National Tourism 2007–2026, the total contribution of tourism to GDP in Romania is estimated to grow by 6.9% until 2026 [86]. Having as a feature the large consumption of live work, intelligence and creativity, tourism also drives and stimulates production from other sectors. Alongside all these, tourism is also a way (sometimes the only one) to capitalize on a superior level all categories of resources and especially the natural ones: the beauty of landscapes, the curative properties of spring and thermal waters, climate conditions. Tourism is also able to ensure the welfare of certain underprivileged areas, being a remedy for non-industrialised regions as well as a mitigation lever for inter-regional imbalances.

The data included in the Annual Report-Tourism in numbers for 2019 by Slovenian Tourist Board [87] show that in 2019 international tourist arrivals in Slovenia recorded increases of +6.3%, over the European average of +4% and the World's average of +4%. By macro-destinations of Slovenia, the indicators of touristic activity for 2019 show that: in Alpine Slovenia, international tourist arrivals is of 2,214,854 tourists; in Thermal Pannonian Slovenia, international tourist arrivals is of 1,193,346 tourists; in Mediterranean and Karst Slovenia, international tourist arrivals is of 1,396,995 tourists; in Ljubljana and Central Slovenia, international tourist arrivals is of 1,424,378 tourists.

The impact in the economy and the quantitative and qualitative dimensions of the touristic market have placed Slovakia in 2016 on the 77th position out of 185 countries according to the aggregate volume of the tourism industry and on one of the last positions (place no. 146) in relative terms as for the total contribution of tourism to GDP. The forecasts for the period 2017–2027 place Slovakia only on the 135th position in terms of the tourism industry growth at a global level [88]. According to the data provided by the Statistical Office of the Slovak Republic [89], tourism and travels in Slovakia are characterised by increases, as follows: the number of visitors increased by 20.20% in December 2019 as opposed to December 2018 (to 434,478 visitors, with 72,991 more visitors than the previous period); the increase of domestic visitors (272,475 visitors) was more dynamic, with 24.4% more in December 2019 as opposed to December 2018, an increase of 53,434 visitors. During the same period, 162,003 foreigners visited Slovakia, which represented an increase of 13.7% (with 19,557 visitors). The data provided by the European Travel Commission [82] show that Slovakia was the destination with the fastest demand growth for Indian tourists, with arrivals on the rise of 47.3% in compliance with the data from March 2019. This indicates that the Indian tourists do not only visit Slovakia in a much higher number in comparison with the month of March 2018 but also that in recent years there has been an increasing demand for Slovakia after it became very popular among all Indian tourist categories.

4. Methodology

Before the in-depth study of the relationship between international tourism and economic growth by means of the spillover index created by Diebold and Yilmaz in 2012 [67], the existence of the Granger-causality [90] was tested for each country in the sample. The variables which were used in

testing the causality are growth rates of international tourist arrivals at tourist accommodation and growth rates for industrial production. Thus, the following equations were estimated:

$$y_{1,t} = \alpha_1 + \sum_{i=1}^n \beta_i y_{1,t-i} + \sum_{j=1}^m \gamma_j y_{2,t-j} + \varepsilon_{1t}, \quad (1)$$

$$y_{2,t} = \alpha_2 + \sum_{i=1}^n \theta_i y_{2,t-i} + \sum_{j=1}^m \delta_j y_{1,t-j} + \varepsilon_{2t}, \quad (2)$$

where: $y_{1,t}$ and $y_{2,t}$ time series corresponding to the growth rates of international tourist arrivals at tourist accommodation and growth rates for industrial production; β_i and γ_j parameters corresponding to the lags of the variables $y_{1,t}$ and $y_{2,t}$ that influence the variable $y_{1,t}$; θ_i and δ_j the parameters corresponding to the lags of the variables $y_{2,t}$ and $y_{1,t}$ that influence the variable $y_{2,t}$.

The choice of the lags' size i and j was performed by selecting the equations for which minimal values of the Akaike and Schwarz information criteria were obtained. At the same time, the residual variables from the Equations (1) and (2) must meet the hypothesis of the lack of autocorrelation and homoscedasticity.

The results obtained should be interpreted as follows:

- if in the Equation (1) there are only the statistically significant parameters γ_j , then the variable $y_{2,t}$ Granger causes the variable $y_{1,t}$;
- when in the Equation (2) there are the statistically significant parameters δ_j the variable $y_{1,t}$ Granger causes the variable $y_{2,t}$;
- when in the two equations there are both the parameters γ_j and the parameters δ_j which are statistically significant, there is a bidirectional Granger-causality relationship between the two variables $y_{1,t}$ and $y_{2,t}$;
- when none of the parameters γ_j and δ_j are statistically significant, then the variables are independent one from the other.

Testing the significance of the parameters is conducted by calculating the F statistic of the Wald test. If the results obtained confirm the Granger-causality, it can be continued with the VAR estimation model.

In order to identify the inter-linkages between international tourism and economic growth, we used in this study the spillover index which was created by Diebold and Yilmaz [66] and then developed by Diebold and Yilmaz [67].

The advantages of the spillover index created are represented on one hand by the decomposition of the total spillover into the spillover from one variable and on the other hand by the spillover to a variable (which allows the determination of the recipient variable or of a variable which induces shocks), as well as the decomposition of the forecast error variance which is not influenced by the variable order (as it was estimated in the VAR model by means of the Cholesky-factor identification). This last advantage is very important, especially when studying the relationship between tourism and economic growth since at the beginning of the study it was not known which variable influences another variable, taking into account that there can be four distinct situations [18].

The VAR model was estimated using the methodology proposed by Diebold and Yilmaz [60] which can be represented by means of the model proposed by Equation (1), as follows:

$$y_t = \sum_{i=1}^q C_i y_{t-i} + \varepsilon_t, \quad (3)$$

In our case y_t is a vector with two endogenous variables (N endogenous variables, in general), C_i is a 2×2 matrix of autoregressive coefficients ($N \times N$ matrix of autoregressive coefficients, in general),

ε_t is a vector 2×1 of error terms ($N \times 1$ vector of error terms, in general) which are assumed as not being serially correlated.

The total, direct and net spillover indices are determined based on the VAR model from Equation (3) through the general decomposition of the forecast error variance.

Diebold and Yilmaz [67] calculated the total volatility spillover index using Equation (4), as follows:

$$S^g(H) = \frac{\sum_{i,j=1}^N \sum_{i \neq j} \widetilde{\theta}_{ij}^g(H)}{\sum_{i,j=1}^N \widetilde{\theta}_{ij}^g(H)} \cdot 100 = \frac{\sum_{i,j=1}^N \sum_{i \neq j} \widetilde{\theta}_{ij}^g(H)}{N} \cdot 100, \quad (4)$$

where:

$\theta_{ij}^g(H)$ —is the H -step-ahead forecast error variance decomposition [90,91] and it is rendered by Equation (5), where the conditions mentioned in Equation (6) are met:

$$\widetilde{\theta}_{ij}^g(H) = \frac{\theta_{ij}^g(H)}{\sum_{j=1}^N \theta_{ij}^g(H)}, \quad (5)$$

$$\sum_{j=1}^N \widetilde{\theta}_{ij}^g(H) = 1 \text{ and } \sum_{i,j=1}^N \widetilde{\theta}_{ij}^g(H) = N \quad (6)$$

Diebold and Yilmaz [67] also determined the directional spillover indices which allow the quantification of as much volatility of a variable as possible when this is transmitted towards another variable/other variables and they decomposed the total spillover in spillover from one variable/some variables or to a variable/to some variables.

The directional volatility spillover received by the variable i from other variables j is quantified through the index from Equation (7), as follows:

$$S_{\cdot i}^g(H) = \frac{\sum_{j=1}^N \sum_{j \neq i} \widetilde{\theta}_{ij}^g(H)}{\sum_{i,j=1}^N \widetilde{\theta}_{ij}^g(H)} \cdot 100\% = \frac{\sum_{j=1}^N \sum_{j \neq i} \widetilde{\theta}_{ij}^g(H)}{N} \cdot 100\%, \quad (7)$$

while the measuring of directional volatility spillovers transmitted by the variable i to other variables j is calculated by using the index rendered in Equation (8), as follows:

$$S_{i \cdot}^g(H) = \frac{\sum_{j=1}^N \sum_{j \neq i} \widetilde{\theta}_{ji}^g(H)}{\sum_{i,j=1}^N \widetilde{\theta}_{ji}^g(H)} \cdot 100\% = \frac{\sum_{j=1}^N \sum_{j \neq i} \widetilde{\theta}_{ji}^g(H)}{N} \cdot 100\%, \quad (8)$$

When calculating the difference between the directional spillover indices presented in Equations (7) and (8) the net spillover is obtained as seen in the relationship proposed by Equation (9), as follows:

$$S_i^g(H) = S_{\cdot i}^g(H) - S_{i \cdot}^g(H), \quad (9)$$

In what follows, we will use this methodological framework of the volatility spillover index proposed by Diebold and Yilmaz [67], as well as by Koop et al. [90] and Pesaran and Shin [91], between economic growth and international tourism and vice versa in order to identify the interdependence type between the two phenomena. The study was conducted for each of the 10 CEE countries included in the sample.

5. Data

As it was previously stated, this study took into consideration 10 CEE countries, as follows: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. For the quantification of the tourism performance, the number of international tourists is a variable which had already been used in other previous studies focused on the relationship between tourism and economic growth [92–97]. For the quantification of economic growth, we used industrial production because, unlike the GDP which is recorded on a term basis at the most, this variable has a higher frequency with monthly recordings [97,98].

From the Eurostat database [99], a European Statistical Office, international tourist arrivals at tourist accommodation establishments was extracted for the countries under study, with a monthly frequency between January 2000–October 2019. Not all countries analysed had available data for the period mentioned. Thus, according to Appendix A, Table A1, for international tourist arrivals at tourist accommodation in Slovenia and Hungary, there were data available starting with January 2001, Bulgaria, Czech Republic, and Romania have available data since January 2002, Estonia, Latvia, Poland, and Slovakia, have available data starting with January 2003, while the smallest sample was available for Slovakia, starting with the year 2004. In the database provided by Eurostat, the time series international tourist arrivals are not seasonally adjusted.

Since in the Eurostat database, Bulgaria does not have monthly data for 2004 regarding international tourist arrivals at tourist accommodation, even if it has values registered before this year, the series was completed for the missing year with data provided by the WTO—World Tourism Barometer reports [100–103]. The Eurostat database also offered seasonally adjusted time series for the industrial production index where there were available values for all countries and for all periods common with the time series for international tourist arrivals at tourist accommodation. The graphical representation of the variable international tourist arrivals at tourist accommodation for CEE countries is presented in Appendix A, Figure A1.

Since the time series international tourist arrivals for the countries considered in the analysis present trend, seasonal evolutions as well as increased variability in time, they were logarithmated for the reduction of variability [104] and then seasonally adjusted by means of the method TRAMO/SEATS, as it is also recommended in the works of the authors Andrei T. et al. [105] and Akar [106]. The TRAMO/SEATS method (Time Series Regression with ARIMA noise, Missing Values and Outliers/Signal Extraction in ARIMA Time Series) was developed by Maravall [107], Gomez [108], and Gomez and Maravall [109] for the seasonal adjustment.

The graphical representation of the seasonally adjusted time series for the industrial production index and for international tourist arrivals at tourist accommodation is presented in Figures 4 and 5, respectively.

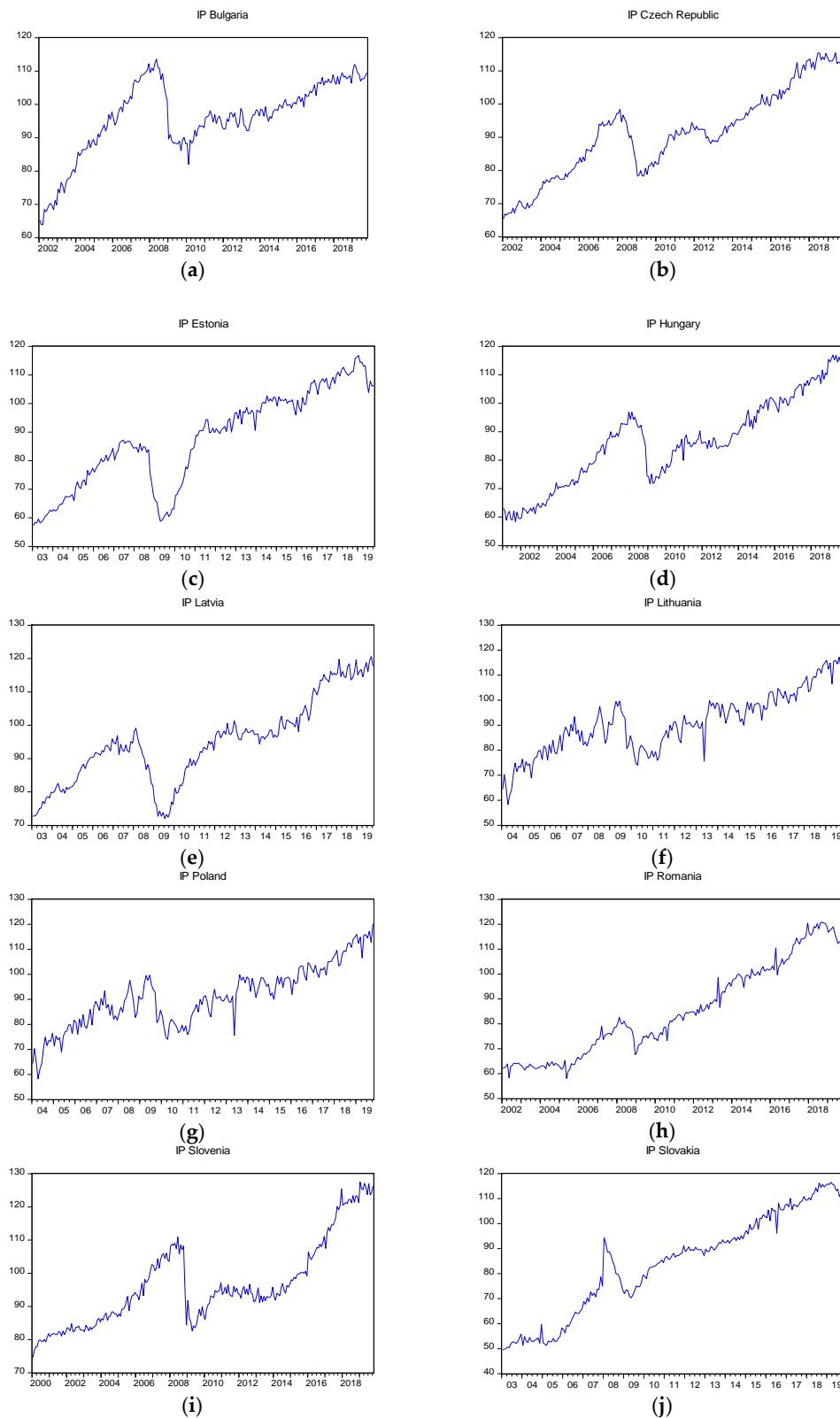


Figure 4. Seasonally adjusted time series for industrial production index (IP) in CEE countries: (a) Bulgaria; (b) Czech Republic; (c) Estonia; (d) Hungary; (e) Latvia; (f) Lithuania; (g) Poland; (h) Romania; (i) Slovenia; (j) Slovakia. Source: Results obtained by the authors.

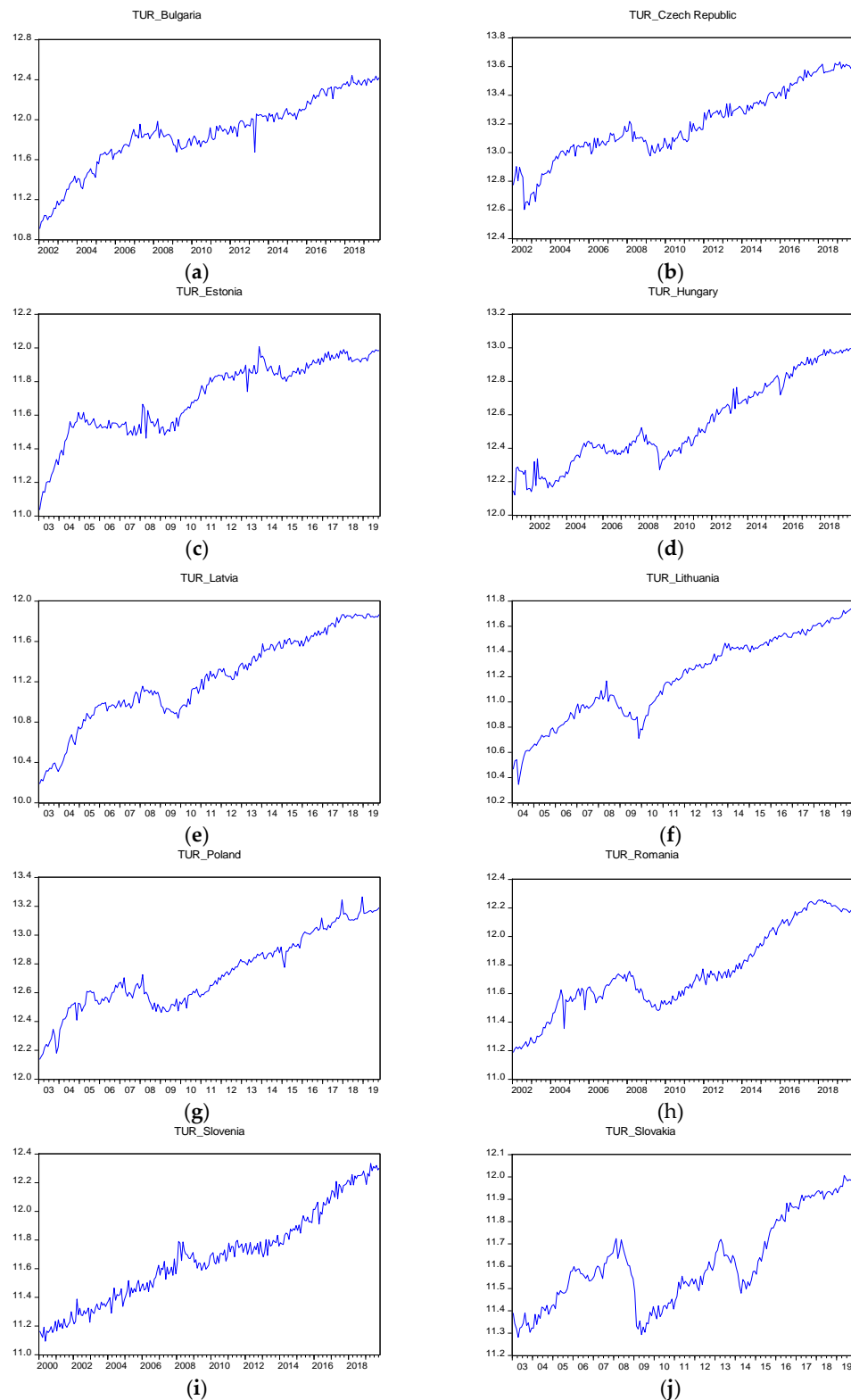


Figure 5. Figure 5. Logarithmated and seasonally adjusted time series for international tourist arrivals at tourist accommodation (TUR) in CEE countries: (a) Bulgaria (b) Czech Republic (c) Estonia (d) Hungary (e) Latvia (f) Lithuania (g) Poland (h) Romania (i) Slovenia (j) Slovakia. Source: Results obtained by the authors.

Table A2 in the Appendix B presents the descriptive statistical indicators for the industrial production indices for the countries analysed, which are seasonally adjusted time series as well

as for the international tourist arrivals at tourist accommodation, which are logarithmated and seasonally adjusted.

Table 1. Granger-causality tests.

Country	LRIPI Does Not Cause LRTUR F-Statistic	LRTUR Does Not Cause LRIPI F-Statistic	Result
Bulgaria	1.49318	1.89116 ***	LRTUR \geq LRIPI
Czech Republic	4.32661 **	0.12844	LRIPI \geq LRTUR
Estonia	0.49426	2.27114 ***	LRTUR \geq LRIPI
Hungary	4.49845 **	1.14635	LRIPI \geq LRTUR
Latvia	2.35272	1.16512	-
Lithuania	3.16028 **	1.97892	LRIPI \geq LRTUR
Poland	0.103334	0.516589	-
Romania	2.43322 **	0.37679	LRIPI \geq LRTUR
Slovakia	1.76611	2.95523 ***	LRTUR \geq LRIPI
Slovenia	3.43545 ***	1.52261	LRIPI \geq LRTUR

** Significant at 5%, *** Significant at 10%. Source: Results obtained by the authors.

For the analysis of the short-term dynamics of the relationship between international tourism and economic growth in CEE countries, the VAR model was used since its condition was that the variables must be stationary. In order to test the stationarity, certain unit root tests were used for the robustness of results. First, the ADF test (Augmented Dickey-Fuller) proposed by Dickey and Fuller [110] was used since it is a traditional test used in most research papers. Another test, the PP test (Phillips-Perron) [111] was used, which, unlike ADF, takes into consideration an autocorrelation order higher than the one considered in the test equation. If there is a structural break, the unit root tests ADF and PP can determine results that may appear meaningless. That is the reason why the other two unit root tests were used, the modified ADF breakpoint unit root test [112] and Lee-Strazicich root test [113]. The modified ADF breakpoint unit root test [114] enables a single structural break, while by means of the Lee-Strazicich root test, we can consider two structural breaks. Since the time series in the analysis include a long period of time, it is recommended to use the Lee-Strazicich root test. In this study, we will consider two moments of structural breaks.

In the Appendix B Table A2, for the seasonally adjusted industrial production time series, as well as for the logarithmated and seasonally adjusted time series for international tourist arrivals at tourist accommodation, one can observe that all unit root tests depict the same situation, namely, they have at least one unit root. As a consequence, the first difference of these time series was used and it was determined the growth rates by calculating the logarithm of the first difference. Both the industrial production growth rate and the growth rate for international tourist arrivals are stationary according to the results of the unit root tests presented in Appendix B Table A3.

The determination of the variance coefficients for the growth rates for industrial production and international tourist arrivals based on the means and standard deviations corresponding to each time series, presented in the Appendix B Table A3, highlights the presence of higher volatility for the industrial production growth rate for the countries considered in comparison with the international tourist arrivals at tourist accommodation time series. Even if during the period under study, the CEE countries suffered both from the global financial and economic crisis which started at the end of 2007 and from the crisis of sovereign debts of EU countries, the industrial production average rates are very low (even reaching the value 0.02%) but still positive.

According to the Jarque-Berra test [114] presented in Appendix B Table A3, most of the statistical time series do not follow normal distribution laws. There are some exceptions though, such as the growth rates of industrial production in the Czech Republic and Latvia and the growth rates of international tourist arrivals at tourist accommodation in Latvia, which follow normal distribution laws. The evolution of industrial production and international tourist arrivals at tourist accommodation

growth rates are stationary according to the unit root tests and graphical representations from Appendix C, Figures A2 and A3.

6. Empirical Results

The empirical analysis of the relationship between international tourism development and economic growth for CEE countries starts with the testing of the existence and direction of the causality relationship. Since both the economic growth rate and the growth rate of international tourist arrivals at tourist accommodation are stationary the Granger-causality between the two variables was determined. The choice of lags i and j from the Equations (1) and (2) was made by selecting the estimated equations for which the minimal values of the Akaike, Schwarz, Hannan-Quinn, and Forecast Prediction Error information criteria were obtained. The estimated residual variables are also white noise.

The results obtained for the Granger-causality are presented in Table 1.

The data included in Table 1 confirm the hypothesis H1, which says that international tourism determines economic growth for Bulgaria, Estonia, and Slovakia, and the hypothesis H2, according to which economic growth causes international tourism growth for the Czech Republic, Hungary, Lithuania, Romania, and Slovenia. For Latvia and Poland, there was no Granger-causality identified between the variables considered, that is why we will exclude these countries from the subsequent analyses. We also notice that no country comprised in the sample is characterised by hypothesis H3 of the bidirectional influence of these two phenomena.

For the estimation of VAR models corresponding to each country, we determined the optimal lag length by taking into consideration both information criteria and meeting the white noise requirement of residuals. Testing the lack of multivariate autocorrelation was conducted using the Lagrange multiplier test [115] and testing the homoscedasticity by means of the White [116]. The optimal lag lengths obtained based on the information criteria are presented in Table 2 while the lag used in the subsequent estimations for each country of the VAR model is highlighted in bold.

Table 2. Optimal lag length obținute pentru modelele VAR(p) utilizând criterii informaționale ¹.

Country	FPE	AIC	SC	HQ
Bulgaria	3	3	1	3
Czech Republic	2	2	1	2
Estonia	6	6	3	3
Hungary	2	2	1	1
Latvia	1	2	1	1
Lithuania	3	3	1	1
Poland	1	1	1	1
Romania	2	2	1	2
Slovakia	1	1	1	1
Slovenia	5	5	2	2

¹ FPE—Forecast Prediction Error, AIC—Akaike information criteria, SC—Schwarz information criteria, HQ—Hannan-Quinn information criteria. Since the information criteria indicate different values for the optimal lag length, this was chosen by taking into account the maximum possible number of freedom levels (respectively the minimum number of parameters) and at the same time, ensuring that for each VAR model (corresponding to each country) the hypothesis of the lack of multivariate autocorrelation and homoscedasticity is met. The optimal lag length is highlighted in bold. Source: Results obtained by the authors.

In Table 3, there is an overview of the results of the spillover growth analysis between the international tourist arrivals at tourist accommodation and economic development for each country left in the study. These results are obtained based on the total spillover index according to the methodology proposed by Diebold and Yilmaz [67].

Table 3. Spillover table ¹.

Bulgaria				Czech Republic			
	RIP	RTUR			RIP	RTUR	
RIP	98.623	1.377	Total spillover index: 1.052	RIP	99.729	0.271	Total spillover index: 1.445
RTUR	0.727	99.273		RTUR	2.620	97.380	
Contr. TO others	0.727	1.377		Contr. TO others	2.620	0.271	
Contr. incl. own.	99.349	100.651		Contr. incl. own.	102.349	97.651	
Net spillovers	−0.651	0.651		Net spillovers	2.349	−2.349	
Estonia				Hungary			
	RIP	RTUR			RIP	RTUR	
RIP	98.967	1.033	Total spillover index: 0.868	RIP	98.767	1.233	Total spillover index: 1.433
RTUR	0.702	99.298		RTUR	1.632	98.368	
Contr. TO others	0.702	1.033		Contr. TO others	1.632	1.233	
Contr. incl. own.	99.669	100.331		Contr. incl. own.	100.399	99.601	
Net spillovers	−0.331	0.331		Net spillovers	0.399	−0.399	
Lithuania				Romania			
	RIP	RTUR			RIP	RTUR	
RIP	96.762	3.238	Total spillover index: 5.615	RIP	97.373	2.627	Total spillover index: 2.877
RTUR	7.992	92.008		RTUR	3.128	96.872	
Contr. TO others	7.992	3.238		Contr. TO others	3.128	2.627	
Contr. incl. own.	104.755	95.245		Contr. incl. own.	100.501	99.499	
Net spillovers	4.755	−4.755		Net spillovers	0.501	−0.501	
Slovakia				Slovenia			
	RIP	RTUR			RIP	RTUR	
RIP	98.266	1.734	Total spillover index: 1.821	RIP	97.243	2.757	Total spillover index: 3.484
RTUR	1.908	98.092		RTUR	4.211	95.789	
Contr. TO others	1.908	1.734		Contr. TO others	4.211	2.757	
Contr. incl. own.	100.174	99.826		Contr. incl. own.	101.454	98.546	
Net spillovers	0.174	−0.174		Net spillovers	1.454	−1.454	

¹ Note: RIP, RTUR—growth rates for industrial production and international tourist arrivals. Source: Results obtained by the authors.

For each country, by columns, there are the contributions for the forecast error time series, the growth rate of international tourist arrivals at tourist accommodation (j) and the industrial production growth rate (i), which result from the innovations at the time series i and j (contribution TO others).

The contributions to the forecast error variance of time series, the industrial production growth rate (i) and the growth rate of international tourist arrivals at tourist accommodation (j), which result from the innovations at the time series j and i are presented in the rows of Table 3 (contribution FROM others).

The net spillover growth is calculated as a difference between the two contributions: the contribution TO others and the contribution FROM others. The average effect on the growth rate of international tourism and the industrial production growth rate represents the total spillover index.

Since, as is the case of Bulgaria, net spillovers for the growth rate of international tourist arrivals at tourist accommodation are positive, this suggests that international tourism is a net transmitter. Indeed, for Bulgaria, hypothesis H1 was confirmed which says that the international tourism growth determines economic growth. If the net spillover growth rate is negative, as is for Bulgaria for the industrial production growth rate, this indicates that this series is a net recipient.

The results from Table 3, in the case of Lithuania, show that the value obtained for the total spillover index is 5.615. For this country, Table 3 also shows that a shock on international tourism explains 96.76% of the forecast error variance of international tourism and 3.24% of the industrial production index. The values for spillovers between international tourism and economic growth determine the decreasing order of countries as follows: Lithuania, Slovenia, Romania, Slovakia, Bulgaria, Hungary, Estonia, Czech Republic. According to the same results, Bulgaria and Estonia are countries where even if the spillover is weak, it transmits from international tourism to economic growth. For the

other countries, Czech Republic, Hungary, Lithuania, Romania, Slovakia, and Slovenia, the spillover is performed from economic growth to international tourism, results which are in compliance with those obtained by Škrinjarić [16].

For all countries, the total spillover index has low and very low values, which indicates that there is a weak interdependence between economic growth and international tourism. The highest values are recorded for Lithuania and Slovenia (5.615 and 3.484, respectively). The lowest value of the total spillover index is recorded for Estonia (0.868) but low values exist also for Bulgaria (1.052), Czech Republic (1.445), Hungary (1.433), Slovakia (1.821), and Romania (2.877). In regard to the net spillover (for the countries which have a higher spillover index), both Lithuania and Slovenia prove that economic growth is the shock transmitter for tourism. This confirmation completes the results obtained through the VAR methodology.

To determine the total spillover index for the countries left in the sample, a 60-month rolling-window was considered. For this reason, indices have a number of values smaller with the size of the rolling-window. The sample of 60 months was also used in the research conducted by Antonakakis et al. [68] and Dragouni et al. [36]. The descriptive statistical indicators for the total spillover indices are presented in Table 4. As the results included in Table 4 and Figure 6 show, the total spillover indices fluctuate over time, very much for all countries in the analysis. The highest fluctuation is observed for Slovenia (between 0.238% and 19.606%). There are also high fluctuations for Slovakia (between 0.427% and 17.854%), Estonia (0.285% and 16.22%), Lithuania (1.395% and 16.058%), Czech Republic (0.537% and 14.624%), and Romania (0.803% and 14.756%). The lowest fluctuations of the total spillover index are registered in Hungary (from 0.041% to 8.212%) and Bulgaria (from 0.281% to 9.295%).

Table 4. Descriptive statistics of the total spillovers indices (TOT).

	Mean	Maximum	Minimum	Std. Dev.	Observations
TOT_BG	2.137163	9.576	0.281	1.864597	153
TOT_CZ	4.326379	14.624	0.537	3.25609	153
TOT_EST	5.26927	16.22	0.285	3.975054	141
TOT_HU	4.025291	8.212	0.041	1.952532	165
TOT_LIT	7.817008	16.058	1.395	2.756687	129
TOT_RO	7.999359	14.756	0.803	3.946686	153
TOT_SLO	7.161441	19.605	0.238	5.553055	177
TOT_SVA	7.718156	18.281	0.427	3.560974	141

Note: TOT_BG, TOT_CZ, TOT_EST, TOT_HU, TOT_LIT, TOT_RO, TOT_SLO, TOT_SVA represent the total spillover index for Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Romania, Slovenia and respectively Slovakia. Source: Results obtained by the authors.

The total spillover index for all the countries left in the study shows that the interdependences between economic growth and international tourism development vary over time. Important decreases in total spillover index are registered during the economic and financial crisis between 2007–2008 and after 2010 (2010–2013), also known as the year of the start of the debt crises.

In this study, the authors identified that the fluctuation of the total spillover index between economic growth and international tourism growth for CEE countries is in compliance with both the results of the study conducted by Antonakakis et al. [18] where they included countries such as Austria, Cyprus, Germany, Greece, Italy, the Netherlands, Portugal, and Spain, and with the results of the study performed by Tang and Tan [97] for Malaysia and Turkey.

In what follows, we verify whether the previously determined relationship between the spillover direction between economic growth and international tourism, respectively between international tourism and economic growth are maintained and are stable over time. This investigation will be responded based on the analysis of the directional and net spillover between tourism growth and economic growth, whose situations are described in Figures 7 and 8.

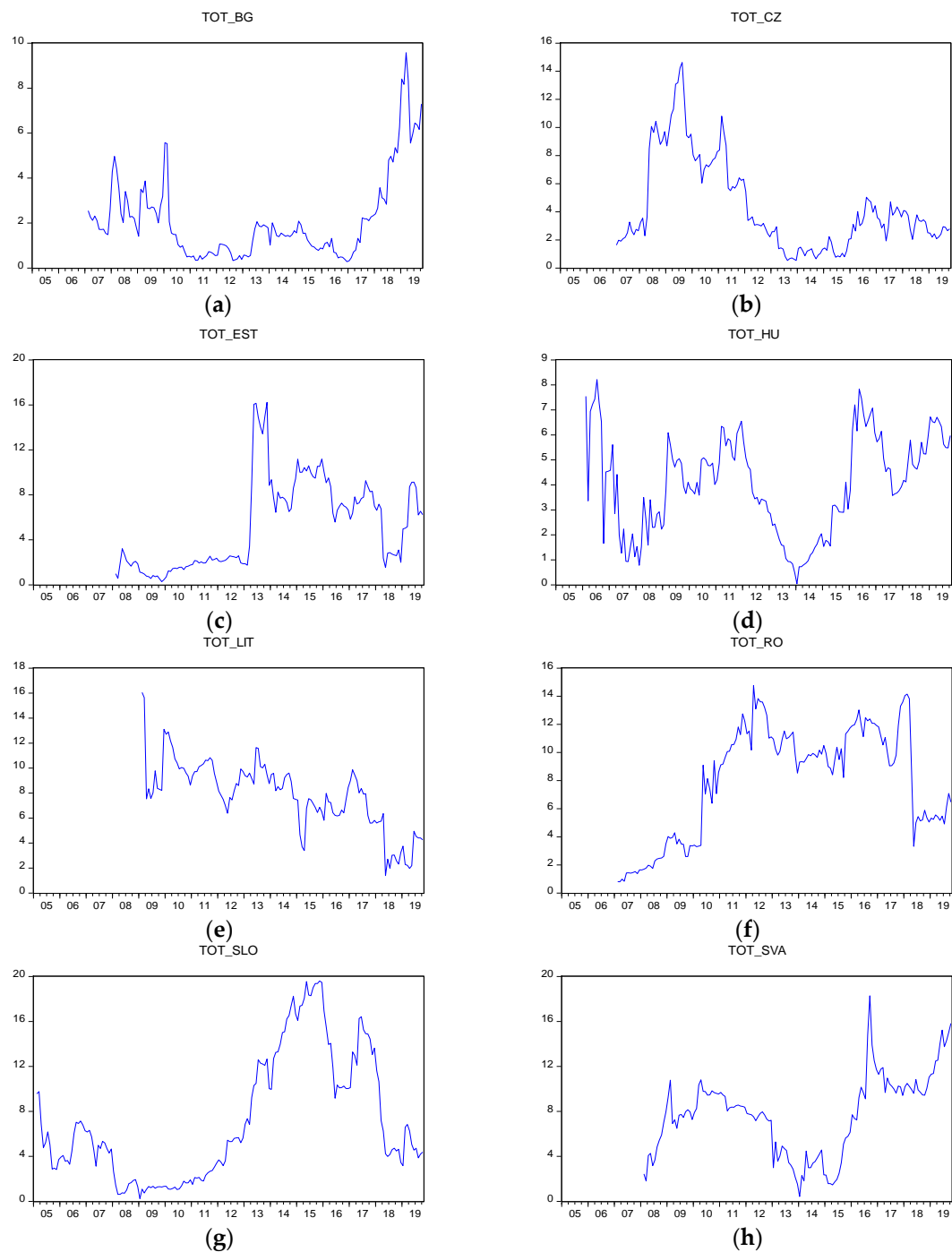


Figure 6. Total spillover index of economic growth and international tourist arrivals at tourist accommodation (TOT) in CEE countries: (a) Bulgaria (b) Czech Republic (c) Estonia (d) Hungary (e) Lithuania (f) Romania (g) Slovenia (h) Slovakia. Source: Results obtained by the authors.

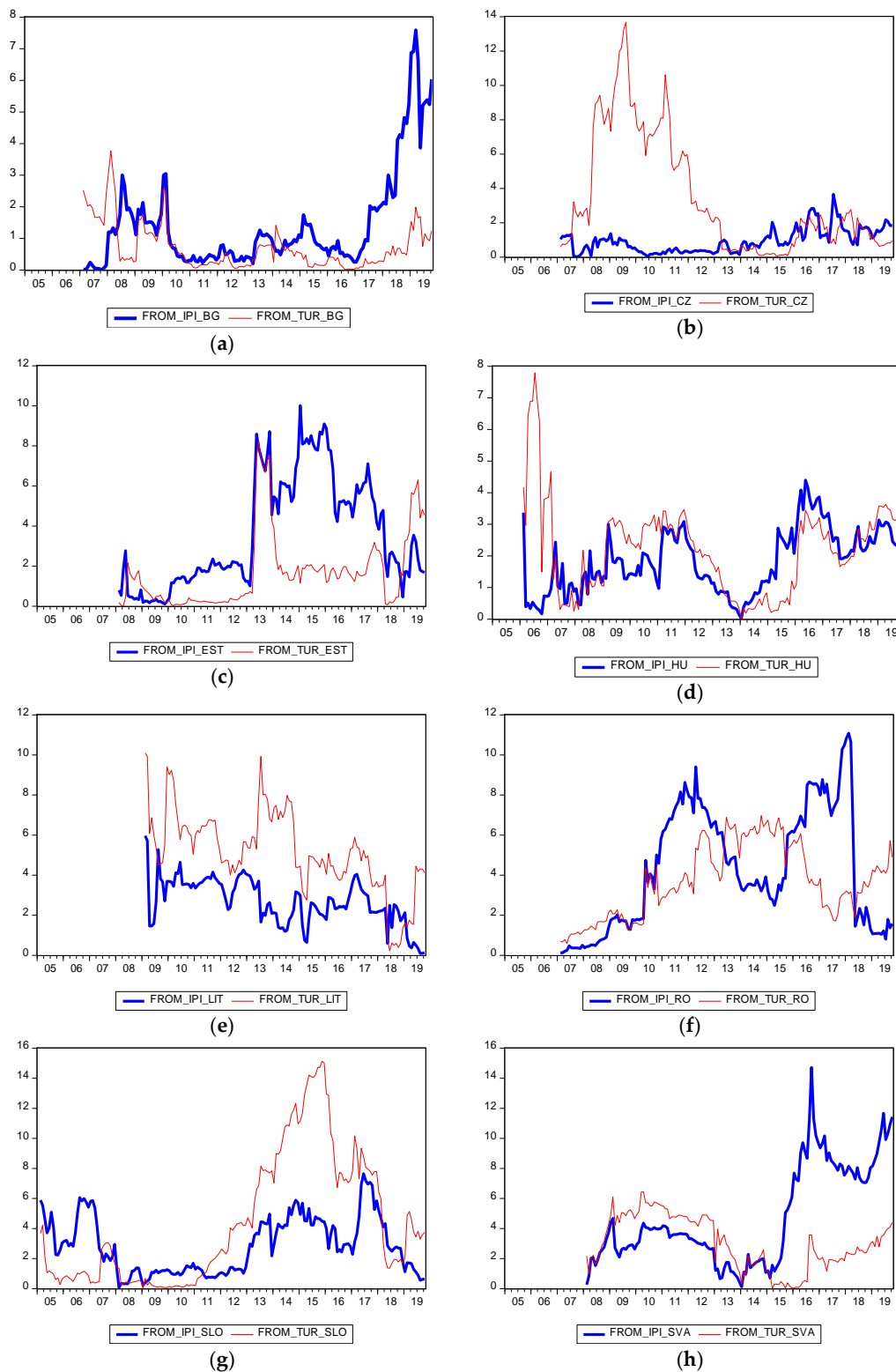


Figure 7. Directional spillovers FROM economic growth rate (FROM_IPI) and growth rate international tourist arrivals at tourist accommodation (FROM_TUR) in CEE countries: (a) Bulgaria (b) Czech Republic (c) Estonia (d) Hungary (e) Lithuania (f) Romania (g) Slovenia (h) Slovakia. Source: Results obtained by the authors.

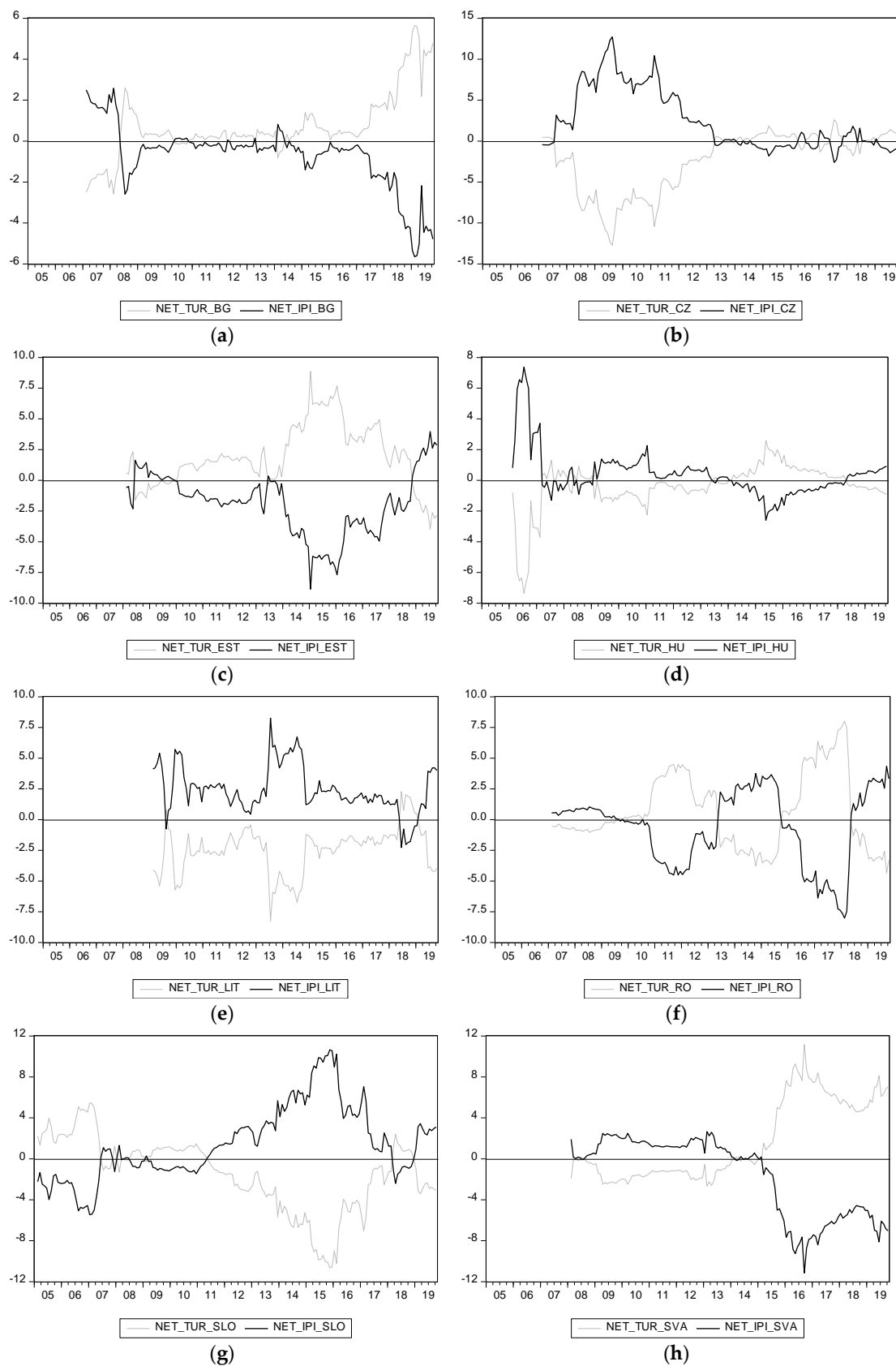


Figure 8. Net spillover index of economic growth and international tourist arrivals at tourist accommodation (TOT) in CEE countries: (a) Bulgaria (b) Czech Republic (c) Estonia (d) Hungary (e) Lithuania (f) Romania (g) Slovenia (h) Slovakia. Source: Results obtained by the authors.

Regarding the evolution of the spillover indices from the industrial production growth rate and from the tourism growth rate, it was noticed that for the entire period considered in the study this situation is not stable, it is not maintained. There are periods when the spillover of the industrial production growth rate is more emphasized but also periods when the tourism growth rate gains the upper hand. Therefore, the graphical representations from Figures 7 and 8 show for all countries left in the analysis a change in time of the shock transmission from one phenomenon to another one.

The graphical representation of net spillover both from the industrial production growth rate to the growth rate of international tourist arrivals, as well as from the growth rate of international tourist arrivals to the industrial production rate, is graphically represented in Figure 8. When the values of the net spillover index from the industrial production growth to international tourism growth are positive, economic growth has a spillover effect of shocks on the international tourism growth rate and when the values are negative, economic growth is the recipient of shocks from the international tourism growth. When the values of the net spillover index from the international tourism growth rate to the industrial production growth rate are positive, international tourism has a spillover effect of shocks and when they are negative, the tourism is the recipient of shocks.

In the case of Bulgaria and Estonia, the greatest values of the net spillover index from the international tourism growth rate to the industrial production growth rate are positive which implies a shock spillover from international tourism towards economic growth. In the case of Czech Republic, Hungary, Lithuania and Slovenia, the greatest values of the net spillover indices from the industrial production growth rate to the international tourism growth rate are positive, showing a shock transmission from economic growth to international tourism. Following the results obtained for the spillover indices, it can be noticed that the testing of working hypotheses H1 and H2 (TLG, GLT) are not confirmed overall. There are periods when hypothesis H1 which tests whether international tourism growth leads to economic growth is confirmed, and periods when hypothesis H2 which tests whether economic growth leads to international tourism growth is confirmed. Six countries out of the eight studied (Czech Republic, Estonia, Hungary, Lithuania, Romania, and Slovenia) experienced in the last period of time studied, starting with 2018 or 2019, a change in the shock transmission between the two phenomena, leading to the confirmation of hypothesis H2, referring to economic growth led tourism (with the exception of Czech Republic).

In what follows, the authors will describe the idiosyncrasies of each country included in the analysis.

In the case of Bulgaria, one can notice from Figure 8 that the net spillover index of the industrial production growth rate has negative values which highlights that the international tourism growth causes a spillover towards the industrial production growth. For almost the entire period studied, hypothesis H1 is confirmed which states that international tourism growth determines economic growth. There are also some exceptional periods during the years 2006–2007, before the economic and financial crisis and also in 2013. Therefore, according to Figure 4, when the industrial production growth rate is negative (the industrial production registers drops) hypothesis H1 according to which international tourism growth determines economic growth is invalidated, but hypothesis H2 is supported, stating that economic growth determines international tourism growth. From Figure 8, one can also notice that for a long period of time the values of the net spillover indices are very low, almost close to zero, which confirms a very low total spillover index (result depicted in Table 3), as well as the confirmation of hypothesis H4 which states there is a causality relationship missing between international tourism and economic growth. There are exceptions for the interval 2006–2007 and 2017–2018 when the highest values and the lowest values, respectively, of the net spillover index of industrial production growth rate are recorded. It can be stated that when industrial production has the highest values recorded, economic growth determines international tourism growth. Since the last years included in the analysis present high values of the net spillover index from international tourism growth to economic growth, it is recommended that the policy-makers of this country make decisions to continue the already launched tourism development because this sector of the economic activity is a drive for economic growth.

Estonia, another country for which hypothesis H1 was confirmed, which says that international tourism growth determines industrial production growth (by the estimation of VAR model), presents a variation of the spillover index between the two phenomena, as Figure 8 shows. Even if almost during the entire period the net spillover shock index from the industrial production index to international tourism registers negative values, confirming the previously mentioned hypothesis H1, there are two time spans, 2008–2009 and 2018–2019 respectively, when the net spillover index registers positive values, suggesting transmission from economic growth to international tourism growth, and respectively, the confirmation of hypothesis H2.

In comparison with Bulgaria and in accordance with Figures 4 and 8, when economic growth registers negative values, this causes shock spillover from economic growth towards international tourism growth. During the periods when positive values are registered for economic growth, tourism determines the shock spillover on economic development. The confirmation of causality between tourism and economic growth by business cycles stages is in compliance with the results obtained by Brida et al. [38].

For the Czech Republic, hypothesis H2, whereby economic growth determines international tourism growth, was confirmed. When analysing the net spillover shock index from economic growth towards international tourism growth, presented in Figure 8, it was noticed that this varies very much over time. At the beginning of the period, its values are positive, confirming the shock transmission from economic growth to tourism growth (confirming hypothesis H2), however, after 2013, the index has negative fluctuations and rarely positive, confirming the hypothesis H1 whereby tourism growth determines economic growth. If the data from Figures 4 and 5 are analysed, it can be noticed that the industrial production index and international tourist arrivals at tourist accommodation establishments for the Czech Republic, in 2013, reached the value they had before the economic and financial crisis. Therefore, economic growth, as well as international tourism growth, determine in this case how the shocks are transmitted from the international tourism growth to economic growth.

In the case of Hungary, the net spillover shock index presented in Figure 8, from economic growth to international tourism growth, shows for a long period of time, 2006–2014, values which are close to zero, which confirms that the aggregate total spillover index has a low value and that hypothesis H4 is confirmed according to which there is a lack of causality between international tourism and economic growth. Still, at the beginning of the analysis which was conducted for the sample made up of 10 CEE countries, the highest positive values were observed confirming hypothesis H2 where economic growth leads to international tourism growth. At the end of the period, after 2014, when predominant negative values were registered, it was suggested the confirmation of hypothesis H1, where international tourism growth determines economic growth. There is almost the same situation as in the case of Czech Republic: reaching in 2014 the same value of the industrial production index as the one before the economic and financial crisis determines a change in the shock spillover, from international tourism growth towards economic growth. In the case of international tourism, the return to the value before the economic and financial crisis happened sometime before, in 2012.

For Lithuania, it was observed that during the period under consideration, there was the highest value of the aggregate total spillover index. The graphical representation of the net spillover shock index from economic growth to international tourism growth, presented in Figure 8, show that in almost the entire sample studied, there are mostly high positive values, indicating a transmission from economic growth to international tourism, a situation previously identified through the VAR methodology. Nevertheless, apart from the fact that this spillover fluctuates in time (it is not constant), we notice that in 2018 the net spillover index is negative suggesting transmission from international tourism development to economic growth. Thus, we can include Lithuania within the countries whose spillover phenomenon is not unidirectional throughout the period considered. In this case, hypothesis H3 is confirmed.

In the case of Romania, the evolution of net spillover index from Figure 8 suggestively evolved under the form of cycles. Since the start of the time sample until the year 2010, low positive values for

the net spillover index are noticed, which indicates a transmission from economic growth to tourism growth, then between 2010 and mid-2013 negative values, with spillover from international tourism growth to economic growth. The net spillover index continues from mid-2013 until 2015 and then after 2017 with positive values showing a spillover from economic growth to international tourism growth (hypothesis H2 is confirmed). During the interval 2015–2017, there are negative values suggesting a spillover from international tourism growth to economic growth for which hypothesis H1 is confirmed.

Slovenia stands out through two distinct periods concerning the spillover between these two phenomena. During the first part of the period, until 2010, the spillover is performed prevalently from international tourism to economic growth (hypothesis H1 is confirmed) while in its second part, after 2010, the spillover is done especially from economic growth to international tourism growth (hypothesis H2 is confirmed), with one brief exception in 2018. The same situation occurs in Slovakia but the other way round. There are two distinct periods: in the first period up to 2014, the spillover is performed from economic growth to international tourism growth (hypothesis H2 is confirmed) while after 2014 the spillover happens from international tourism growth to economic growth.

As a consequence of the current analysis, one can notice that there are countries included in the study for which there is no constant and consistent spillover between the two phenomena considered: international tourism and economic growth. For the same country, within the time sample under consideration, there are both the shock spillover from economic growth to international tourism and from international tourism to economic growth.

7. Conclusions, Limits of the Research, and Future Directions

The research in the CEE countries regarding the causality relationship between tourism and economic growth is influenced by the data availability, both from the point of view of the period required and from the perspective of available variables. The uses of variables that quantify international tourism and economic growth with monthly frequency in the research performed on the causality between international tourism and economic growth are very scarce (most of them being conducted on annual data) and this study comes to cover this gap.

As it can be noticed from the analysis, the starting data of the study, especially for international tourist arrivals at tourist accommodation establishments with monthly frequency (for the industrial production there is a longer time period) are different according to their availability. Since there has not been any analysis of the causality relationship between international tourism and economic growth for CEE countries and using the spillover index under study, the authors chose to look into this one.

In the study of the research hypotheses according to which international tourism leads to economic growth and economic growth leads to international tourism, by using the static approach, the results obtained were contradictory. The methodological framework of the volatility spillover indices proposed by Diebold and Yilmaz [67], Koop et al. [90], as well as Pesaran and Shin [91], was used on a sample of 10 CEE countries. This enabled the ability to study the relationship between international tourism growth and economic growth and vice versa in order to identify the interdependence type between phenomena and their follow-up over time. As a consequence of the analyses conducted in the current study, the results obtained enabled the validation or invalidation of the hypotheses advanced in the literature review chapter.

Firstly, the relationship between economic growth and international tourism growth is time-variant. Thus, there is the possibility that for the same country, for a certain period of time, international tourism growth determines economic growth, confirming thus hypothesis H1 whereby tourism growth leads to economic growth. Meanwhile, under other time intervals, economic growth determines international tourism growth, confirming thus hypothesis H2 according to which economic growth leads to tourism growth. According to the results obtained, for Bulgaria and Estonia, hypothesis H1 is confirmed (international tourism led economic growth), while hypothesis H2 (economic growth led international tourism) is confirmed for the other countries: Czech Republic, Hungary, Lithuania, Romania, Slovenia, and Slovakia. Moreover, all the countries have time samples unequally distributed, which caused that

hypotheses H1 and H2 be validated in turns. We estimate that for the 10 CEE countries, the hypothesis H3 regarding the existence of a bidirectional relationship between tourism and economy (bidirectional causality) should include both hypothesis H1 where international tourism leads economic growth and hypothesis H2 where economic growth leads international tourism. Under the conditions of the present study, hypothesis H3 is also validated, respectively the existence of the bidirectional causality. Especially for Bulgaria and for Hungary, one can notice time intervals with very low or close to zero values for spillover index which confirms the lack of causality between the two phenomena, meaning the confirmation of hypothesis H4.

Secondly, the causality relationship between international tourism and economic growth fluctuates over time, taking values that change from one interval to another time interval analysed. The fluctuation of the causality intensity is strongly correlated with the business cycles and therefore this result is in agreement with the conclusions drawn by Brida et al. [38] and Antonakakis et al. [68]. The analysis distinguishes Romania, whose results show the change between the shock spillover from international tourism or the industrial production index, these being conducted by business cycle stages. Taking into account the results obtained, it is recommended that the policymakers take measures in accordance with the business cycle stages corresponding to each country.

For Bulgaria, Estonia, and Slovakia where the hypothesis H1 (TLEG) is confirmed, policymakers should support the investments in the touristic sector and the creation of adequate jobs for the development of activities performed by the economic agents from this sector such as tax rebates, the flexibility of labour market in the touristic field, facilitating the supply chains of food products towards hotels, etc. These policies can determine a stronger initial development of international tourism and then a sustained economic growth.

In the Czech Republic, Hungary, Lithuania, Romania, and Slovenia where the hypothesis EGLT (H2) is validated, the proposed decisions should lead to the increase in the trust level of international tourists by means of investments in the improvement of the image of touristic destinations abroad, high-quality standards in the field of tourism, improvement of connections and means of transportation outside the country and, last but not least, increase in the level of safety and security perceived by international tourists.

For Latvia and Poland, the fourth hypothesis was confirmed, namely the lack of causality. Under this circumstance, it is recommended that the facilities and the attention of policymakers should move from the international economic actors in the touristic field functioning in these two countries towards the local agents which have a greater contribution to the economic growth in the areas where they deploy their activity.

As it has already been mentioned, the previous studies obtained contradictory results determined by the use of different time samples, different variables that quantify the two phenomena studied, tourism growth and economic growth, and respectively, the country sample included in the analysis. In the present study, the results obtained are different for Bulgaria and Estonia, which does not confirm the results obtained in the study conducted by Škrinjarić [16]. This result can be explained by the inclusion in the analysis of a different variable: the total tourist arrivals. All these considered, we propose that future research should focus on the study of the causality relationship between tourism and economic growth by taking into account several variables that quantify component elements of tourism, such as the domestic tourist arrivals. The goal will be to minutely analyse the touristic phenomenon for the same CEE countries. Even if the variable international tourist arrivals has been mentioned in the literature as an indicator of tourism quantification overall, the variable which was used, namely international tourist arrivals at tourist accommodation establishments offered the possibility of conclusions only in regard to the relationship between international tourism and economic growth and vice versa. Consequently, this study touches on an important topic and helps in understanding the phenomenon which exists between the existence or lack thereof of a unidirectional causality, of a bidirectional causality or the lack of causality between the variables analysed. Moreover, as a distinctive feature, this study quantified economic growth as a component of sustainable development.

Since we now have the spillover indices, future research could focus on the performance of comparative econometric models between the evolution of macroeconomic indicators and the spillover index between tourism growth and economic growth. This will allow the in-depth knowledge of the spillover phenomenon by means of the identification of the economic factors influencing the causality between tourism growth and economic growth.

This study has its limits. In order to perform an analysis comprising a sample of 10 CEE countries, data provided by Eurostat were used. For future research, the authors recommend the elaboration of a methodological approach including compatible samples which could allow the use of other variables in the analysis.

Author Contributions: All authors contributed equally to the research presented in this paper and to the preparation of the final manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This project is funded by the Ministry of Research and Innovation within Program 1—Development of the national RD system, Subprogram 1.2—Institutional Performance—RDI excellence funding projects, Contract no.34PFE/19.10.2018.

Acknowledgments: The authors would like to thank the anonymous reviewers for their valuable comments and suggestions to improve the quality of the paper.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Data availability for the number of international tourist arrivals ¹.

Country	Start	End	Months Analysed
Bulgaria	January 2002	October 2019	214
Czech Republic	January 2002	October 2019	214
Estonia	January 2003	October 2019	202
Hungary	January 2001	October 2019	226
Latvia	January 2003	October 2019	202
Lithuania	January 2004	October 2019	190
Poland	January 2003	October 2019	202
Romania	January 2002	October 2019	214
Slovakia	January 2003	October 2019	202
Slovenia	January 2000	October 2019	237

¹ Source: own presentation after data provided by Eurostat Database [103].

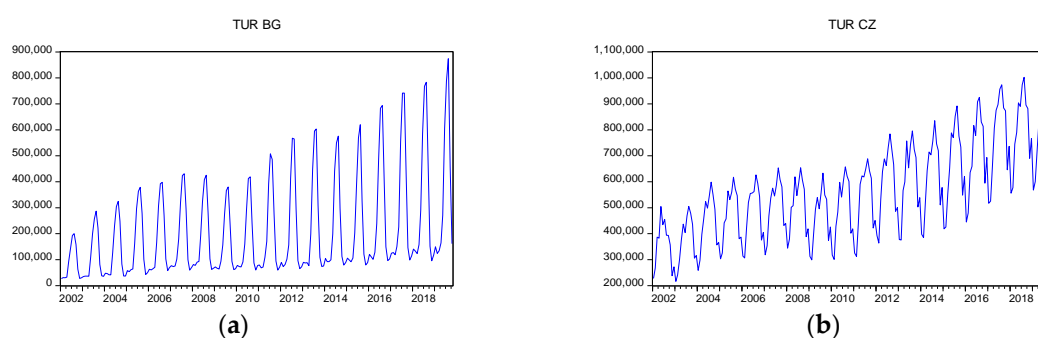


Figure A1. Cont.

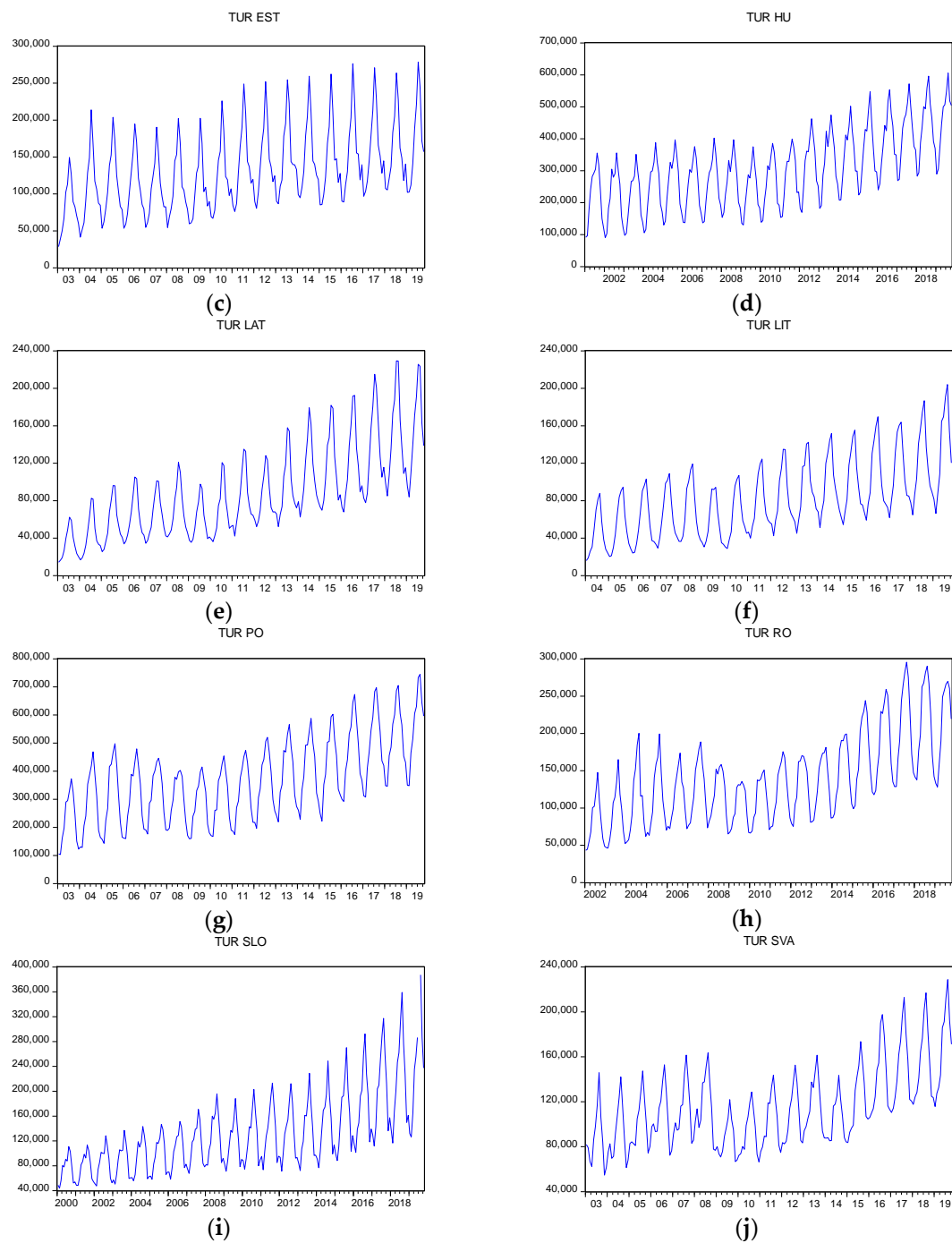


Figure A1. International tourist arrivals at tourist accommodation (TUR) in CEE countries: in CEE countries: (a) Bulgaria; (b) Czech Republic; (c) Estonia; (d) Hungary; (e) Latvia; (f) Lithuania; (g) Poland; (h) Romania; (i) Slovenia; (j) Slovakia. Source: Results obtained by the authors.

Appendix B

Table A2. Descriptive statistics for the seasonally adjusted time series: industrial production index and international tourist arrivals at tourist accommodation.

	BG	CZ	ES	HU	LA	LI	PO	RO	SLO	SVA
Industrial production index – seasonally adjusted time series										
Mean	95.93	91.18	87.65	86.22	94.83	90.89	86.26	85.29	96.58	84.07
Std.dev	11.06	13.12	16.58	15.25	12.58	12.28	19.23	18.62	12.76	20.10
Skewness	−0.87	0.04	−0.21	0.064	0.19	0.04	0.02	0.38	0.78	−0.21
Kurtosis	3.45	2.27	1.89	2.23	2.37	2.67	2.14	1.89	2.82	1.91
JB ¹	29.24 *	4.75 ***	11.91 *	5.68 ***	4.66 ***	0.88	6.13 **	16.27 *	24.72 *	11.44 *
ADF ²	−2.45	−1.76	−2.33	−1.69	−1.65	−3.39	−2.42	−2.72	−1.38	−2.47
PP ³	−2.41	−2.39	−2.43	−2.36	−1.85	−1.45	−2.86	−0.40	−1.78	−1.07
ADF break ⁴	−3.24	−2.43	−3.65	−1.72	−2.32	−3.20	−1.80	−2.05	−2.66	−2.10
LS ⁵	−6.38	−5.23	−6.23 **	−4.51	−5.37	−6.50 *	−4.62	−3.76	−5.22	−5.29
Obs.	214	214	202	226	202	190	202	214	238	202
International tourist arrivals at tourist accommodation – logarithmated and seasonally adjusted time series										
Mean	11.86	13.19	11.70	12.54	11.22	11.18	12.73	11.74	11.68	11.60
Std.dev	0.35	0.24	0.21	0.25	0.43	0.34	0.26	0.29	0.32	0.19
Skewness	−0.56	−0.01	−0.65	0.33	−0.33	−0.24	0.10	0.23	0.23	0.41
Kurtosis	2.96	2.37	2.77	1.87	2.40	1.98	2.23	2.17	2.22	2.14
JB ¹	11.28 *	3.52	14.66 *	16.26 *	6.81 **	10.19 *	5.33 ***	7.96 **	8.13 **	12.03 *
ADF ²	−3.03	−2.91	−2.71 ***	−2.37	−2.85	−2.54	−2.83	−1.50	−2.42	−0.51
PP ³	−3.92 **	−0.82	−2.92 **	−3.20 ***	−3.22 **	−3.06	−3.16 ***	−2.11	−0.53	−1.95
ADF break ⁴	−3.55	−2.07	−5.79 *	−2.58	−3.63	−4.09	−3.06	−3.15	−1.90	−2.86
LS ⁵	−6.80 **	−5.23	−4.01	−4.86	−4.54	−4.67	−5.38	−4.08	6.35 **	−4.78
Obs.	214	214	202	226	202	190	202	214	238	202

* Significant at 1%, ** Significant at 5%, *** Significant at 10%, ¹ JB—Jarque-Bera test [115], ² ADF—Augmented Dickey-Fuller unit root test [111], ³ PP—Phillips Perron unit root test [112], ⁴ ADF break—Augmented Dickey-Fuller unit root test with break [113], ⁵ LS—Lee and Strazicich unit root test [114]; Source: Results obtained by the authors.

Table A3. Descriptive statistics for the growth rates of industrial production index and international tourist arrivals at tourist accommodation.

	BG	CZ	ES	HU	LA	LI	PO	RO	SLO	SVA
Industrial production growth rate										
Mean	0.002	0.0025	0.003	0.0027	0.002	0.003	0.004	0.002	0.002	0.004
Std.dev	0.021	0.015	0.025	0.025	0.020	0.046	0.016	0.027	0.022	0.031
Skewness	−0.47	−0.28	−0.38	−0.63	−0.22	−0.11	−0.39	−1.02	−1.31	1.77
Kurtosis	8.37	3.31	4.78	6.47	3.48	5.38	3.57	9.28	11.08	17.81
JB ¹	264.14 *	3.84	31.65 *	128.62 *	3.62	45.08 *	7.90 **	387.32 *	714.44 *	1942.5 *
ADF ²	−18.88 *	−18.00 *	−6.17 *	−20.82 *	−17.49 *	−18.48 *	−18.09 *	−14.55 *	−20.18 *	−21.96 *
PP ³	−18.62 *	−17.61 *	−15.90 *	−20.42 *	−17.15 *	−22.77 *	−17.89 *	−22.82 *	−19.91 *	−21.12 *
ADF break ⁴	−21.44 *	−19.07 *	−15.68 *	−23.05 *	−18.04 *	−19.15 *	−18.92 *	−23.27 *	−21.78 *	−24.48 *
LS ⁵	−10.94 *	−10.10 *	−14.21 *	−14.96 *	−12.86 *	−12.19 *	−13.01 *	−15.33 *	−16.63 *	−13.48 *
Obs.	213	213	201	225	201	189	201	213	237	201
Growth rate for international tourist arrivals at tourist accommodation										
Mean	0.0006	0.0003	0.0004	0.0003	0.0007	0.0006	0.0004	0.0003	0.0004	0.0002
Std.dev	0.005	0.003	0.003	0.002	0.004	0.003	0.003	0.003	0.004	0.002
Skewness	0.306	−0.618	0.145	0.158	0.169	−1.595	−0.424	−0.456	−0.154	−0.500
Kurtosis	14.056	7.074	7.908	8.886	2.855	11.196	5.2316	13.371	3.047	5.119
JB ¹	1088.33 *	160.93 *	202.48 *	325.77 *	1.13	609.35 *	47.73 *	962.04 *	0.965	46.02 *
ADF ²	−15.52 *	−22.91 *	−8.391 *	−24.18 *	−19.75 *	−18.63 *	−18.92 *	−14.96 *	−19.53 *	−16.86 *
PP ³	−26.61 *	−24.78 *	−24.89 *	−25.84 *	−19.86 *	−18.63 *	−20.13 *	−21.82 *	−50.11 *	−16.60 *
ADF break ⁴	−22.68 *	−25.67 *	−23.89 *	−25.97 *	−20.38 *	−19.81 *	−19.99 *	−20.53 *	−28.02 *	−18.89 *
LS ⁵	−15.74 *	−10.97 *	−11.23 *	−10.39 *	−13.88 *	−14.14 *	−13.50 *	−16.21 *	−19.73 *	−9.84 *
Obs.	213	213	201	225	201	189	201	213	237	201

* Significant at 1%, ** Significant at 5%, ¹ JB—Jarque-Bera test [115], ² ADF—Augmented Dickey-Fuller unit root test [111], ³ PP—Phillips Perron unit root test [112], ⁴ ADF break—Augmented Dickey-Fuller unit root test with break [113], ⁵ LS—Lee and Strazicich unit root test [114]; Source: Results obtained by the authors.

Appendix C

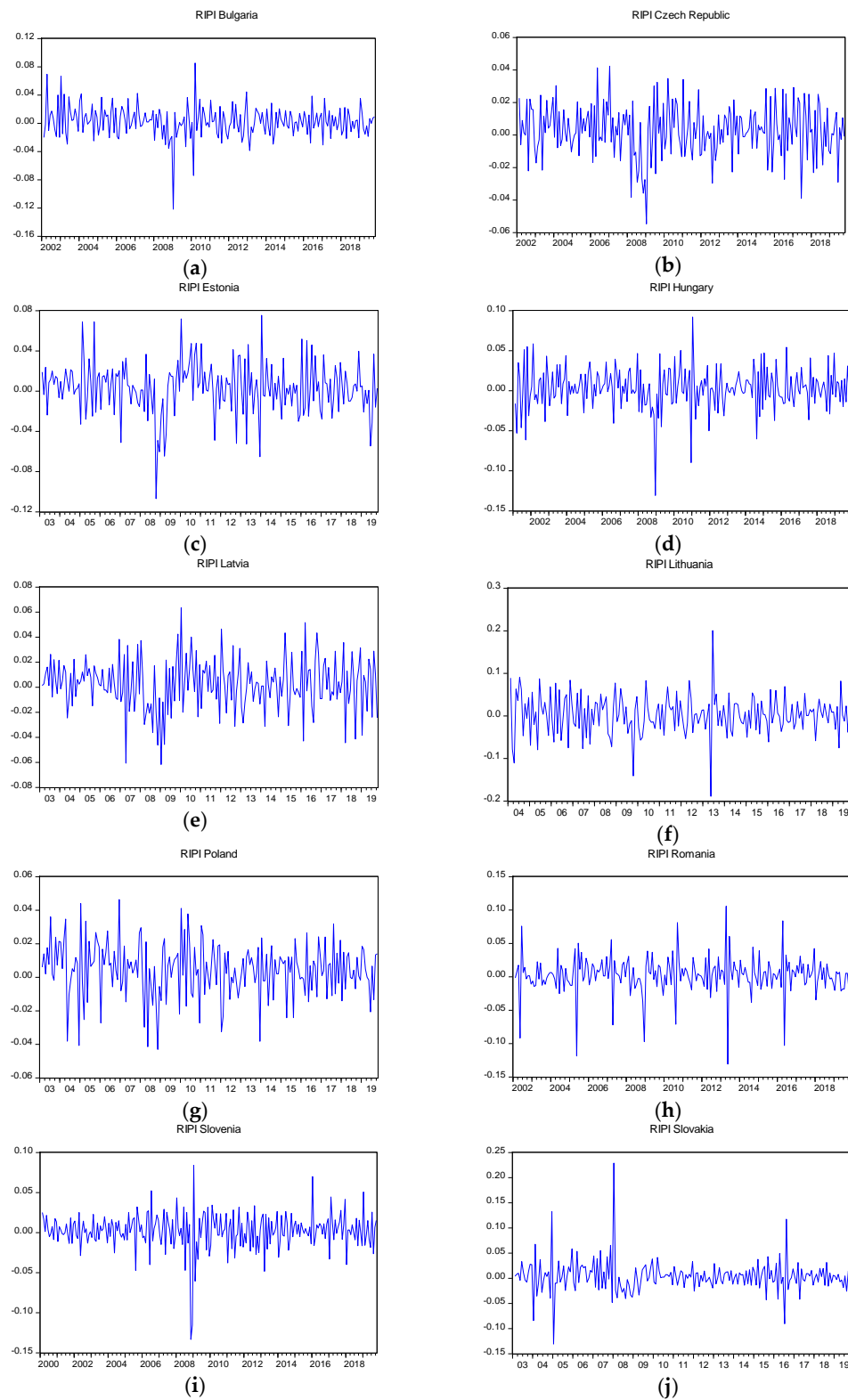


Figure A2. The evolution of growth rates for industrial production index (RIPI) in CEE countries: (a) Bulgaria (b) Czech Republic (c) Estonia (d) Hungary (e) Latvia (f) Lithuania (g) Poland (h) Romania (i) Slovenia (j) Slovakia. Source: Results obtained by the authors.

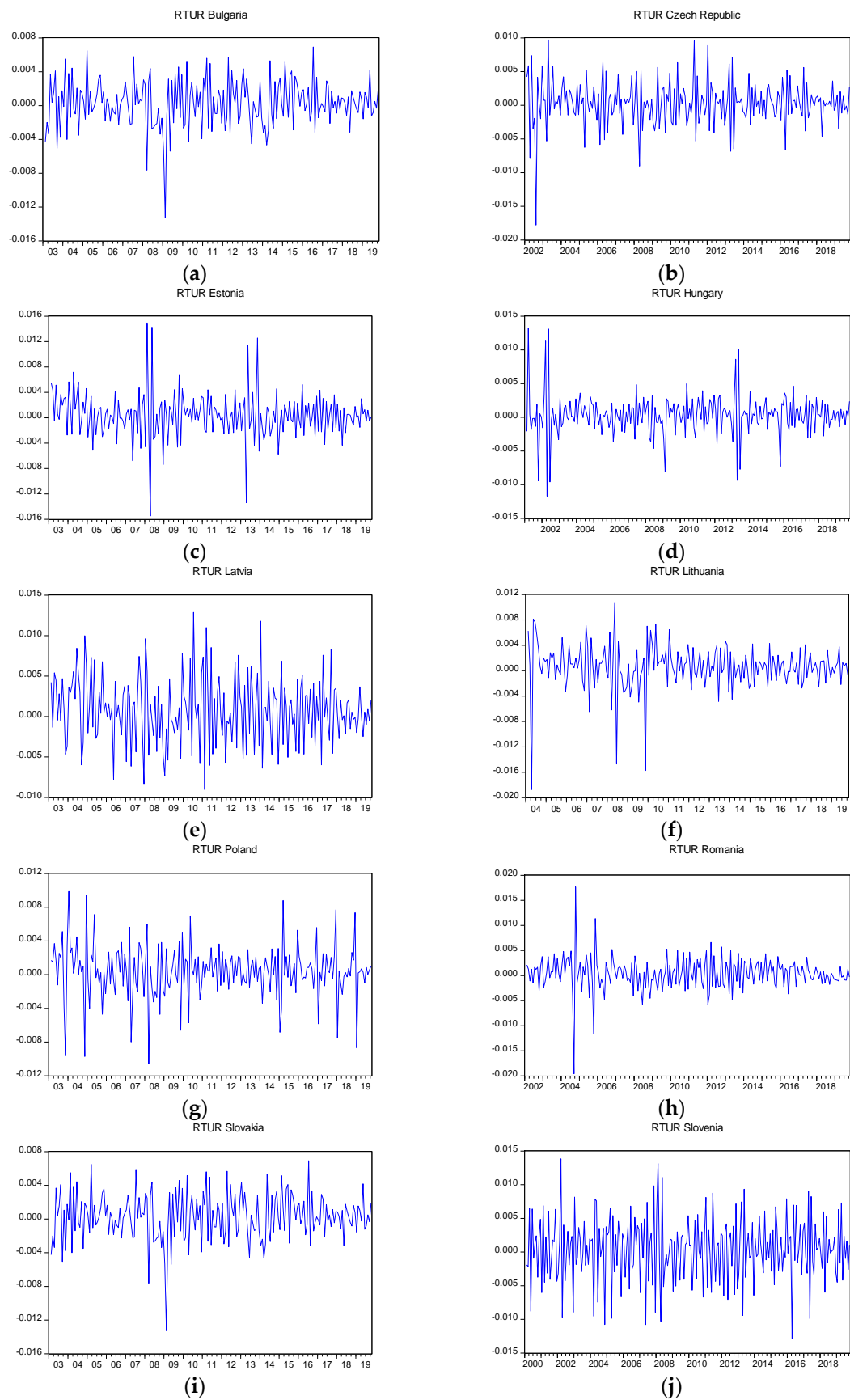


Figure A3. The evolution of growth rates for international tourist arrivals at tourist accommodation (RTUR) in CEE countries: (a) Bulgaria (b) Czech Republic (c) Estonia (d) Hungary (e) Latvia (f) Lithuania (g) Poland (h) Romania (i) Slovenia (j) Slovakia. Source: Results obtained by the authors.

References

1. Global Wellness Summit Home Page. Tourism Towards 2030. Global Overview. Advanced Edition Presented at UNWTO19th General Assembly. Available online: https://www.globalwellnesssummit.com/wp-content/uploads/Industry-Research/Global/2011_UNWTO_Tourism_Towards_2030.pdf (accessed on 5 May 2020).
2. The Organisation for Economic Co-operation and Development. OECD Tourism Trends and Policies 2020. Available online: <https://www.oecd.org/cfe/tourism/OECD-Tourism-Trends-Policies%202020-Highlights-ENG.pdf> (accessed on 10 April 2020).
3. World Travel & Tourism Council. Global Economic Impact & Trends 2020. Available online: <https://wtcc.org/Research/Economic-Impact> (accessed on 19 July 2020).
4. World Travel & Tourism Council. Economic Impact Reports. Available online: <https://wtcc.org/Research/Economic-Impact> (accessed on 19 July 2020).
5. World Travel & Tourism Council. Estonia, 2020 Annual Research: Key Highlights. Available online: <https://wtcc.org/Research/Economic-Impact> (accessed on 19 July 2020).
6. World Travel & Tourism Council. Hungary, 2020 Annual Research: Key Highlights. Available online: <https://wtcc.org/Research/Economic-Impact> (accessed on 19 July 2020).
7. World Travel & Tourism Council. Lithuania, 2020 Annual Research: Key Highlights. Available online: <https://wtcc.org/Research/Economic-Impact> (accessed on 19 July 2020).
8. World Travel & Tourism Council. Poland, 2020 Annual Research: Key Highlights. Available online: <https://wtcc.org/Research/Economic-Impact> (accessed on 19 July 2020).
9. World Travel & Tourism Council. Romania, 2020 Annual Research: Key Highlights. Available online: <https://wtcc.org/Research/Economic-Impact> (accessed on 19 July 2020).
10. World Travel & Tourism Council. Slovenia, 2020 Annual Research: Key Highlights. Available online: <https://wtcc.org/Research/Economic-Impact> (accessed on 19 July 2020).
11. United Nations Conference on Trade and Development. Selected Sustainable Development Trends in the Least Developed Countries. Available online: https://unctad.org/en/PublicationsLibrary/alddc2019d1_en.pdf (accessed on 5 August 2020).
12. The World Tourism Organization. World Tourism Barometer. 2020. Available online: <https://www.unwto.org/world-tourism-barometer-n18-january-2020> (accessed on 20 July 2020).
13. The World Tourism Organization. World Tourism Organization and Organization of American States. Tourism and the Sustainable Development Goals—Good Practices in the Americas. 2018. Available online: <https://www.e-unwto.org/doi/epdf/10.18111/9789284419685> (accessed on 5 August 2020).
14. Bădulescu, A.; Bădulescu, D.; Simut, R. The complex relationship between international tourism demand and economic growth: An analysis on Central and Eastern European economies. *Amfiteatru Econ.* **2018**, *20*, 935–950. [CrossRef]
15. Nunkoo, R.; Seetanah, B.; Jaffur, Z.R.K.; Moraghen, P.G.W.; Sannassee, R.V. Tourism and economic growth: A meta-regression analysis. *J. Travel Res.* **2019**, *59*, 404–423. [CrossRef]
16. Škrinjarić, T. Examining the Causal Relationship between Tourism and Economic Growth: Spillover Index Approach for Selected CEE and SEE Countries. *Economies* **2019**, *7*, 19. [CrossRef]
17. Bădulescu, A.; Bădulescu, D.; Simut, R.; Dzitac, S. Tourism–economic growth nexus. The case of Romania. *Technol. Econ. Dev. Econ.* **2020**, *26*, 867–884. [CrossRef]
18. Antonakakis, N.; Dragouni, M.; Filis, G. How strong is the linkage between tourism and economic growth in Europe? *Econ. Model.* **2015**, *44*, 142–155. [CrossRef]
19. Chatziantoniou, I.; Filis, G.; Eeckels, B.; Apostolakis, A. Oil prices, tourism income and economic growth: A structural VAR approach for European Mediterranean countries. *Tour. Manag.* **2013**, *36*, 331–341. [CrossRef]
20. Balaguer, J.; Cantavella-Jordá, M. Tourism as a long-run economic growth factor: The Spanish case. *Appl. Econ.* **2002**, *34*, 877–884. [CrossRef]
21. Kaplan, M.; Çelik, T. The impact of tourism on economic performance: The case of Turkey. *Int. J. Appl. Econ. Financ.* **2008**, *2*, 13–18. [CrossRef]
22. Brida, J.G.; Carrera, E.S.; Risso, W.A. Tourism's impact on long-run Mexican economic growth. *Econ. Bull.* **2008**, *3*, 1–8.
23. Brida, J.G.; Risso, W.A. Tourism as a Factor of Long-Run Economic Growth: An Empirical Analysis for Chile. *Eur. J. Tour. Res.* **2009**, *2*, 178–185.

24. Brida, J.G.; Barquet, A.; Risso, W.A. Causality between Economic Growth and Tourism Expansion: Empirical Evidence from Trentino-Alto Adige. *Tour. Int. Multidiscip. J. Tour.* **2010**, *5*, 87–98.
25. Zortuk, M. Economic impact of tourism on Turkey's economy: Evidence from cointegration Tests. *Int. Res. J. Financ. Econ.* **2009**, *25*, 231–239.
26. Kreishan, F.M.M. Tourism and economic growth: The case of Jordan. *Int. Manag. Rev.* **2011**, *7*, 89–93.
27. Arslanturk, Y.; Balcilar, M.; Ozdemir, Z.A. Time-varying linkages between tourism receipts and economic growth in a small open economy. *Econ. Model.* **2011**, *28*, 664–671. [\[CrossRef\]](#)
28. Schubert, S.F.; Brida, J.G.; Risso, W.A. The impacts of international tourism demand on economic growth of small economies dependent on tourism. *Tour. Manag.* **2011**, *32*, 377–385. [\[CrossRef\]](#)
29. Firoiu, D.; Ionescu, G.H.; Băndoi, A.; Florea, N.M.; Jianu, E. Achieving Sustainable Development Goals (SDG): Implementation of the 2030 Agenda in Romania. *Sustainability* **2019**, *11*, 2156. [\[CrossRef\]](#)
30. Dritsakis, N. Tourism as a long-run economic growth factor: An empirical investigation for Greece using causality analysis. *Tour. Econ.* **2004**, *10*, 305–316. [\[CrossRef\]](#)
31. Kim, H.J.; Chen, M.H.; Jang, S.C.S. Tourism expansion and economic development: The case of Taiwan. *Tour. Manag.* **2006**, *27*, 925–933. [\[CrossRef\]](#)
32. Khalil, S.; Mehmood, K.K.; Waliullah, K. Role of tourism in economic growth: Empirical evidence from Pakistan economy. *Pak. Dev. Rev.* **2007**, *46*, 985–995. [\[CrossRef\]](#)
33. Lee, C.C.; Chang, C.P. Tourism development and economic growth: A closer look at panels. *Tour. Manag.* **2008**, *29*, 180–192. [\[CrossRef\]](#)
34. Cortés-Jiménez, I.; Pulina, M. Inbound tourism and long run economic growth. *Curr. Issues Tour.* **2010**, *13*, 61–74. [\[CrossRef\]](#)
35. Katircioglu, S.T. Revisiting the tourism-led-growth hypothesis for Turkey using the bounds test and Johansen approach for cointegration. *Tour. Manag.* **2009**, *30*, 17–20. [\[CrossRef\]](#)
36. Dragouni, M.; Filis, G.; Antonakakis, N. *Time-Varying Interdependencies of Tourism and Economic Growth: Evidence from European Countries*; FIW Working Paper No. 128; Research Centre International Economics: Vienna, Austria, 2013. Available online: <https://www.econstor.eu/handle/10419/121121> (accessed on 10 April 2020).
37. Chou, C.M. Does tourism development promote economic growth in transition countries? A panel data analysis. *Econ. Model.* **2013**, *33*, 226–232. [\[CrossRef\]](#)
38. Brida, J.G.; Gómez, D.M.; Segarra, V. On the empirical relationship between tourism and economic growth. *Tour. Manag.* **2020**, *81*, 104–131. [\[CrossRef\]](#)
39. McKinnon, R.I. Foreign exchange constraints in economic development and efficient aid allocation. *Econ. J.* **1964**, *74*, 388–409. [\[CrossRef\]](#)
40. Baker, S.; Bradley, P.; Huyton, J. *Principles of Hotel Front Office Operations*, 2nd ed.; Cengage Learning: London, UK, 2000.
41. Pablo-Romero, M.; Gomez-Calero, P.; Sanchez-Rivaz, J. Tourism, Competitiveness and Economic Growth: A New Analytical Model. In *Tourism-From Empirical Research Towards Practical Application*; Intech: Rijeka, Croatia, 2016; pp. 111–113. [\[CrossRef\]](#)
42. Ghali, M.A. Tourism and Economic Growth: An Empirical Study. *Econ. Dev. Cult. Chang.* **1976**, *24*, 527–538. [\[CrossRef\]](#)
43. Granger, C.W.J. Investigating causal relations by econometric models and cross spectral methods. *Econometrica* **1969**, *37*, 424–438. [\[CrossRef\]](#)
44. Akinboade, O.; Braimoh, L.A. International Tourism and Economic Development in South Africa: A Granger Causality Test. *Int. J. Tour. Res.* **2010**, *12*, 149–163. [\[CrossRef\]](#)
45. Brida, J.G.; Lanzilotta, B.; Lionetti, S.; Risso, W.A. The Tourism-Led Growth Hypothesis for Uruguay. *Tour. Econ.* **2010**, *16*, 765–771. [\[CrossRef\]](#)
46. Brida, J.G.; Punzo, L.F.; Risso, W.A. Tourism as a Factor of Growth: The Case of Brazil. *Tour. Econ.* **2011**, *17*, 1375–1386. [\[CrossRef\]](#)
47. Al-mulali, U.; Fereidouni, H.G.; Lee, J.Y.; Mohammed, A.H. Estimating the Tourism-Led Growth Hypothesis: A Case Study of the Middle East Countries. *Anatolia* **2014**, *25*, 290–298. [\[CrossRef\]](#)
48. Bilen, M.; Yilanci, V.; Eryüzlü, H. Tourism Development and Economic Growth: A Panel Granger Causality Analysis in the Frequency Domain. *Curr. Issues Tour.* **2017**, *20*, 27–32. [\[CrossRef\]](#)
49. Pablo-Romero, M.P.; Molina, J.A. Tourism and economic growth: A review of empirical literature. *Tour. Manag. Perspect.* **2013**, *8*, 28–41. [\[CrossRef\]](#)

50. Kum, H.; Alper, A.; Merve, G. Tourism and Economic Growth: The Case of Next-11 Countries. *Int. J. Econ. Financ. Issues* **2015**, *5*, 1075–1081.
51. Du, D.; Lew, A.A.; Ng, P.T. Tourism and Economic Growth. *J. Travel Res.* **2014**, *55*, 454–464. [[CrossRef](#)]
52. Lemma, F.A. Tourism Impacts. Evidence of Impacts on Employment, Gender, Income. 2014. Available online: https://assets.publishing.service.gov.uk/media/57a089f2ed915d622c000495/Tourism_Impacts_employment_gender_income_A_Lemma.pdf (accessed on 20 July 2020).
53. Urbanc, M.; Printsman, A.; Palang, H.; Skowronek, E.; Woloszyn, W.; Éva, K.G. Comprehension of rapidly transforming landscapes of Central and Eastern Europe in the 20th century. *Acta Geogr. Slov.* **2004**, *44*, 101–131. [[CrossRef](#)]
54. Dudulan, D.; Balaure, V.; Popescu, I.C.; Vegheş, C. Cultural Heritage, Natural Resources and Competitiveness of the Travel and Tourism Industry in Central and Eastern European Countries. *Ann. Univ. Apulensis Ser. Oeconomica* **2010**, *12*, 742–748. [[CrossRef](#)]
55. Butnaru, G.I.; Niță, V. European Union and Romanian Tourism— β and σ Convergence in the Economic Development Regions of Romania. *Amfiteatru Econ.* **2016**, *18*, 369–384.
56. Haller, A. *Exporturile—Factor de Dezvoltare și Creștere Economică*; Performantica: Iași, Romania, 2008.
57. Cárdenas-García, P.J.; Sánchez-Rivero, M.; Pulido-Fernández, I. Does Tourism Growth Influence Economic Development? *J. Travel Res.* **2015**, *54*, 206–221. [[CrossRef](#)]
58. Surugiu, C.; Surugiu, M.R. Is the tourism sector supportive of economic growth? Empirical evidence on Romanian tourism. *Tour. Econ.* **2013**, *19*, 115–132. [[CrossRef](#)]
59. Payne, J.E.; Mervar, A. Research Note: The Tourism–Growth Nexus in Croatia. *Tour. Econ.* **2010**, *16*, 1089–1094. [[CrossRef](#)]
60. Narayan, P.K. Fiji's tourism demand: The ARDL approach to cointegration. *Tour. Econ.* **2004**, *10*, 193–206. [[CrossRef](#)]
61. Tang, C.H.H.; Jang, S.S. The tourism–economy causality in the United States: A sub-industry level examination. *Tour. Manag.* **2009**, *30*, 553–558. [[CrossRef](#)]
62. Sheresheva, M.; Kopiski, J. The main trends, challenges and success factors in the Russian hospitality and tourism market. *Worldw. Hosp. Tour. Themes* **2016**, *8*, 260–272. [[CrossRef](#)]
63. Demiroz, D.M.; Ogan, S. The contribution of tourism to the long-run Turkish economic growth. *J. Econ.* **2005**, *53*, 880–894.
64. Gunduz, L.; Hatemi-J, A. Is the tourism-led growth hypothesis valid for Turkey? *Appl. Econ. Lett.* **2005**, *12*, 499–504. [[CrossRef](#)]
65. Figini, P.; Vici, L. Tourism and growth in a cross-section of countries. *Tour. Econ.* **2010**, *16*, 789–805. [[CrossRef](#)]
66. Diebold, F.; Yilmaz, K. Measuring financial asset return and volatility spillovers, with application to global equity markets. *Econ. J.* **2009**, *119*, 158–171. [[CrossRef](#)]
67. Diebold, F.X.; Yilmaz, K. Better to give than to receive: Predictive directional measurement of volatility spillovers. *Int. J. Forecast.* **2012**, *28*, 57–66. [[CrossRef](#)]
68. Antonakakis, N.; Dragouni, M.; Filis, G. Tourism and growth: The times they are a-changing. *Ann. Tour. Res.* **2015**, *50*, 165–169. [[CrossRef](#)]
69. Lyócsa, Š.; Vašaničová, P.; Litavcová, E. Interconnectedness of international tourism demand in Europe: A cross-quantilogram network approach. *Phys. A Stat. Mech. Its Appl.* **2019**, *526*, 1–13. [[CrossRef](#)]
70. World Travel & Tourism Council. Czech Republic, 2020 Annual Research: Key Highlights. Available online: <https://wttc.org/Research/Economic-Impact> (accessed on 19 July 2020).
71. World Travel & Tourism Council. Slovakia, 2020 Annual Research: Key Highlights. Available online: <https://wttc.org/Research/Economic-Impact> (accessed on 19 July 2020).
72. World Data Atlas, World and Regional Statistics, National Data, Maps, Rankings. Available online: <https://knoema.com/atlas> (accessed on 3 September 2020).
73. Manea, C. Bulgaria. In *Turism Rural European*; Dobrescu, E.M., Nistoreanu, P., Eds.; Sitech: Craiova, Romania, 2018.
74. Lonely Planet Home Page. Lonely Planet's Top Countries for 2011. Available online: <https://www.lonelyplanet.com/articles/lonely-planets-top-10-countries-for-2011> (accessed on 7 July 2020).
75. Market Research Czech Republic Tourism Q3 2020. Available online: <https://www.marketresearch.com/Business-Monitor-International-v304/Czech-Republic-Tourism-Q3-13316080/> (accessed on 21 July 2020).
76. Nica, A.M. Czech Republic. In *Turism Rural European*; Dobrescu, E.M., Nistoreanu, P., Eds.; Sitech: Craiova, Romania, 2018.

77. Czech Statistical Office. Tourism Employment Module. 2020. Available online: https://www.czso.cz/csu/czso/tourism_employment_module (accessed on 19 July 2020).
78. European Commission. Internal Market, Industry, Entrepreneurship and SMEs, Annual Report on Tourism 2018—Czech Republic. Available online: <https://ec.europa.eu/growth/tools-databases/vto/content/annual-report-tourism-2018-czech-republic> (accessed on 19 July 2020).
79. Statistics Estonia. More Tourists Staying in Accommodation Establishments—2020. Available online: <https://www.stat.ee/news-release-2020-016> (accessed on 20 July 2020).
80. Hungarian Central Statistical Office. The Number of Inbound Trips to Hungary and the Related Expenditures (2009–2019). Available online: https://www.ksh.hu/stadat_annual_4_5 (accessed on 10 May 2020).
81. Todinca, V.; Ardelean, L. Hungary. In *Turism Rural European*; Dobrescu, E.M., Nistoreanu, P., Eds.; Sitech: Craiova, Romania, 2018.
82. Spânu, M.; Nicula, V. Latvia. In *Turism Rural European*; Dobrescu, E.M., Nistoreanu, P., Eds.; Sitech: Craiova, Romania, 2018.
83. European Travel Commission. European Tourism: Trends & Prospects (Q2/2019). Available online: https://etc-corporate.org/uploads/2019/07/ETC_Quarterly_Report_Q2_2019.pdf (accessed on 2 April 2020).
84. Polish Tourism Organisation. Poland, a Place to be in 2020. Available online: <https://www.poland.travel/en/travel-inspirations/poland-a-place-to-be-in-2020> (accessed on 26 July 2020).
85. Eurostat. Tourism Vital to Employment in Several Member States. Available online: <https://ec.europa.eu/eurostat/en/web/products-eurostat-news/-/DDN-20200415-1> (accessed on 9 June 2020).
86. WTO. Romania National Tourism Development Master Plan 2007–2026. 2017. Available online: http://turism.gov.ro/web/wp-content/uploads/2017/05/masterplan_partea1.pdf (accessed on 3 April 2020).
87. Špik, A.; Počuča, J. Annual Publication—Tourism in Numbers 2019. Available online: https://www.slovenia.info/uploads/dokumenti/tvs/2019/tourism_in_numbers_2019.pdf (accessed on 28 April 2020).
88. Bulin, D.; Georgică, G. Slovakia. In *Turism Rural European*; Dobrescu, E.M., Nistoreanu, P., Eds.; Sitech: Craiova, Romania, 2018.
89. Statistical Office of the Slovak Republic. *Tourism Development in Accommodation Establishments in the SR 12/2019*; Headquarters Bratislava: Bratislava, Slovak Republic, 2019.
90. Koop, G.; Pesaran, M.H.; Potter, S.M. Impulse response analysis in nonlinear multivariate models. *J. Econ.* **1996**, *74*, 119–147. [CrossRef]
91. Pesaran, H.H.; Shin, Y. Generalized impulse response analysis in linear multivariate models. *Econ. Lett.* **1998**, *58*, 17–29. [CrossRef]
92. Bjørnland, H.C.; Leitemo, K. Identifying the interdependence between US monetary policy and the stock market. *J. Monet. Econ.* **2009**, *56*, 275–282. [CrossRef]
93. Laopodis, N.T. Are fundamentals still relevant for European economies in the post-Euro period? *Econ. Model.* **2009**, *26*, 835–850. [CrossRef]
94. Espinoza, R.; Fornari, F.; Lombardi, M.J. The role of financial variables in predicting economic activity. *J. Forecast.* **2012**, *31*, 15–46. [CrossRef]
95. Dritsakis, N. Tourism development and economic growth in seven Mediterranean countries: A panel data approach. *Tour. Econ.* **2012**, *18*, 801–816. [CrossRef]
96. Peersman, G.; Van Robays, I. Cross-country differences in the effects of oil shocks. *Energy Econ.* **2012**, *34*, 1532–1547. [CrossRef]
97. Tang, C.F.; Tan, E.C. How stable is the tourism-led growth hypothesis in Malaysia? Evidence from disaggregated tourism markets. *Tour. Manag.* **2013**, *37*, 52–57. [CrossRef]
98. Tang, C.F. Is the tourism-led growth hypothesis valid for Malaysia? A view from disaggregated tourism markets. *Int. J. Tour. Res.* **2011**, *13*, 97–101. [CrossRef]
99. European Commission. Eurostat Database. 2020. Available online: <https://ec.europa.eu/eurostat/data/database> (accessed on 10 April 2020).
100. World Tourism Organization—UNWTO World Tourism Barometer. Volume 2, No. 1, January 2004. Available online: <https://www.e-unwto.org/toc/wtobarometereng/2/1> (accessed on 10 April 2020).
101. World Tourism Organization—UNWTO World Tourism Barometer. Volume 2, No. 2, June 2004. Available online: <https://www.e-unwto.org/toc/wtobarometereng/2/2> (accessed on 10 April 2020).
102. World Tourism Organization—UNWTO World Tourism Barometer. Volume 2, No. 3, October 2004. Available online: <https://www.e-unwto.org/toc/wtobarometereng/2/3> (accessed on 10 April 2020).

103. World Tourism Organization—UNWTO World Tourism Barometer. Volume 3, No. 1, January 2005. Available online: <https://www.e-unwto.org/toc/wtobarometereng/3/1> (accessed on 10 April 2020).
104. Shumway, R.H.; Stoffer, D.S. *Time Series Analysis and Its Applications With R Examples*, 4th ed.; Springer International Publishing: Cham, Switzerland, 2017.
105. Andrei, T.; Mirica, A.; Glăvan, I.R.; Ferariu, G.A.; Radulescu-George, I.M. Seasonal adjustment of tourism data for Romania using JDemetra+. In Proceedings of the 13th International Conference on Applied Statistics, Bucharest, Romania, 7–8 June 2019; Volume 1, pp. 8–16. [[CrossRef](#)]
106. Akar, C. Modeling Turkish Tourism Demand and the Exchange Rate: The Bivariate GARCH Approach. *Eur. J. Econ. Financ. Adm. Sci.* **2012**, *50*, 133–141.
107. Maravall, A.; Gomez, V. *Signal Extraction in ARIMA Time Series Program SEATS*; EUI Working Paper Eco No. 92/65; Department of Economics, European University Institute: Florence, Italy, 1992.
108. Gomez, V.; Maravall, A. *Time Series Regression with ARIMA Noise and Missing Observations Program TRAM*; EUI Working Paper Eco No. 92/81; Department of Economics, European University Institute: Florence, Italy, 1992.
109. Gomez, V.; Maravall, A. *Programs SEATS and TRAMO: Instructions for the User*; Working Paper No. 9628; Bank of Spain: Madrid, Spain, 1996.
110. Dickey, D.A.; Fuller, W.A. Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *J. Am. Stat. Assoc.* **1979**, *74*, 427–431. [[CrossRef](#)]
111. Phillips, P.C.B.; Perron, P. Testing for a Unit Root in Time Series Regression. *Biometrika* **1988**, *75*, 335–346. [[CrossRef](#)]
112. Perron, P. The great crash, the oil price shock and the unit root hypothesis. *Econometrica* **1989**, *57*, 1361–1401. [[CrossRef](#)]
113. Lee, J.; Strazicich, M.C. Minimum Lagrange multiplier unit root test with two structural breaks. *Rev. Econ. Stat.* **2003**, *85*, 1082–1089. [[CrossRef](#)]
114. Jarque, C.J.M.; Bera, A.K. Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Econ. Lett.* **1980**, *6*, 255–259. [[CrossRef](#)]
115. Lütkepohl, H. *New Introduction to Multiple Time Series Analysis*; Springer: Berlin, Germany, 2005.
116. Doornik, J.A. Testing General Restrictions on the Cointegration Space. 1995. Available online: <https://www.doornik.com/research/coigen.pdf> (accessed on 10 April 2020).



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).