Izvorni naučni članak / Original Scientific Article
dostupan online / available online: 20. 2. 2022.

DOI: 10.53028/1986-6127.2021.12.2.27

Uprava 2021; 2: str. 27-43
UDK: 35.077.3 : 351.9 : 338.465

LINKING ELECTRICITY CONSUMPTION, TOURISM, AND ECONOMIC GROWTH IN OECD COUNTRIES

POVEZANOST POTROŠNJE ELEKTRIČNE ENERGIJE, TURIZMA I EKONOMSKOG RASTA U ZEMLJAMA OECD-A

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Primljen / Recieved : 11. 9. 2021.
Prihvaćen / Accepted: 9. 1. 2022.

Abstract

This study investigates the causal link between tourism, electric power consumption and economic growth in 34 OECD countries. Unlike previous studies, this study applies the panel VAR model with the Granger causality test, impulse response, and variance decomposition. The findings show a positive trend for all variables. As economic growth increases, tourism receipts and electricity consumption are increasing as well. The results reveal bi-directional causal relationship between all of the variables, and the findings are consistent with previous studies. These findings may encourage the decision-makers to make the necessary efforts to create a friendly environment for sustainable tourism.

Keywords: economic growth, electric power consumption, impulse-response, tourism

Sažetak

Ovaj rad istražuje kauzalnu vezu između turizma, potrošnje električne energije i ekonomskog rasta u 34 zemlje OECD-a. Za razliku od prethodnih radova, ovaj primjenjuje panel VAR model, Granger test kauzalnosti, test impulsivnog odziva i dekompoziciju varijanse. Rezultati pokazuju pozitivan trend za sve varijable. Sa ekonomskim rastom, rastu i prihodi od turizma i potrošnja električne energije. Nadalje, pokazana je dvosmjerna kauzalna veza između svih varijabli, što je u skladu sa prethodnim studijama. Ovi rezultati mogu ohrabriti donosioce odluka da ulože neophodne napore kako bi kreirali prijateljsko okruženje za održivi turizam.

Ključne riječi: ekonomski rast, potrošnja električne energije, impulsivni odziv, turizam

1. INTRODUCTION

The importance of tourism industry for sustainable development has aroused the interest of the academic community. Increasing number of economists in general agree that the tourism sector as well as the consumption of energy tend to increase revenue, contribute to the economic growth and open new employment opportunities as well as to contribute to the overall development of the host countries. In addition, the tourism industry has outstripped the construction sector and became one of the most important producers of greenhouse gases (up to 8% of the total greenhouse gas emissions). Tourism sector itself shows significant growth in the last decades. The data from 2017 suggest that it was a record year in terms of the number of arrivals. This report also suggests an increase of 7% in the number of arrivals compared to the year 2016 (UNWTO, 2017). This industry is an important generator of employment opportunities around the globe (Galic, Arifhodzic, Satrovic, Dalwai, & Milicevic, 2020).

Numerous research papers have addressed the causal relationship among variables such as tourism development, energy consumption and growth. The results from the previous literature on the energy consumption-growth nexus were mixed in terms of the direction of the causality (for example, Acheampong, 2018; Gozgor et al., 2018; Satrovic, 2019a; Satrovic et al., 2020; Murshed et al., 2020; Mujtaba et al., 2020, Khan et al., 2021; Satrovic et al., 2021, etc.). These findings might be due to the fact that most studies fail to consider the potential dynamics while analyzing the relationship of interest. Another important strand of empirical literature presents evidence of the tourism-growth nexus, providing inconsistent results (Abul & Satrovic, 2021). This conflict may be due to the application of different methodologies or time-spans (Adedoyin, Satrovic, & Kehinde, 2021). Concurring with the above, there is no doubt that only a few studies analyze the trivariate relationship between tourism, economic growth and energy consumption (Satrovic, 2019b). Considering that OECD countries are developed, consume a significant amount of energy and are essential tourist destinations, it is necessary to analyze the causal linkage between tourism development, energy consumption and the growth nexus with support from the panel VAR model. This study investigates the tourism-electricity consumption-growth nexus in 34 OECD economies.

The objectives of this study are twofold. First objective is to provide the empirical evidence on the growth-tourism nexus as well as on the growth-energy nexus. Second objective is to estimate and discuss the trivariate model including all variables of interest. As opposed to studies to date, our study shows the renewed evidence on the energy-tourism-growth nexus in OECD member states by employing the panel VAR. The remaining sections of this paper present a literature review, the methodology and variables, the empirical results and discussion, and the conclusion.

2. LITERATURE REVIEW

Acheampong (2018) explored the CO2 emissions-energy-growth nexus, and found no causal impact of growth on energy consumption either regionally or globally. Moreover, a unidirectional causality flowing from economic growth to CO2 emissions has not been reported for the case of Latin America. Impulse-response analysis supports the propositions of the Kuznets curve for several sample countries. The empirical analysis of (Menyah & Wolde-Rufael, 2010) was conducted using South Africa's case. The Granger causality test shows a bidirectional causal relationship between energy consumption and growth in the period 1965-2006. These results are justified by (Huskic & Satrovic, 2020)

It is worth mentioning that tourism development stimulates environmental quality and has a positively significant impact on economic output in the long-run. Concurring with the above, there is no doubt that only a few studies analyze the trivariate relationship between tourism, economic growth and energy consumption. Considering that OECD countries are developed, consume a significant amount of energy, and are important tourist destinations, it is necessary to analyze the causal linkage between tourism development, energy consumption, and the growth nexus with support from the panel VAR model.

Furthermore, (Gozgor, Lau, & Lu, 2018) analyzed the linkage between energy consumption and economic growth as well as the renewable energy-growth nexus for 29 OECD countries. The authors collected the data for the period 1990-2013. The methodology includes panel ARDL as well as PQR models. This paper proposed a growth model including the proxy of ability to export sophisticated goods and services. The findings of this paper show a positive renewable energy-growth nexus. The same is found for non-renewable energy. These findings are supported by (Apergis & Payne, 2012). The energy-growth nexus has been examined by (Apergis & Payne, 2012) using the panel error correction model. The results suggest a bidirectional causal relationship in terms of the renewable-growth nexus as well as in the case of non-renewable energy-growth nexus. This is confirmed in the case of 80 countries for the period 1990-2007. In contrast to these findings, (Payne, 2009) failed to find any evidence of the causal link between renewable energy and growth using annual time-series data for the United States. This holds true for the period 1946-2006. Additionally, no causal relationship between renewable energy and economic growth was reported by (Akarca & Long, 1980).

Sustainable international tourism, intra-regional trade integration and renewable energy consumption have been acknowledged to exhibit overarching relationships (Murshed, Mahmood, Alkhateeb, & Banerjee, 2020). Furthermore, (Kirikkaleli & Adebayo, 2021) reveal that renewable energy consumption is beneficial for lowering consumption-based greenhouse gas emissions in the long-run. Similar to these findings, (Baye, Olper, Ahenkan, Surugu, Anuga, & Darkwah, 2020) imply that environmental, socio-economic and climatic factors play an important role in renewable energy consumption in Africa. Bi-directional causality between population and economic growth and between trade openness and economic growth is reported by (Mujtaba, Jena, & Mukhopadhyay, 2020). These findings are in line with those of (Abbasi, Parveen, Khan, & Kamal, 2020). Hence it is desirable to reduce the conventional sources of energy demand and include a renewable energy mix, which will ultimately strengthen the economy in a sustainable way (Anser, Yousaf, Usman, Nassani, Qazi Abro, & Zaman, 2019). There is no doubt that foreign direct investments are expected to continue to rise and increase energy consumption and economic growth. Considering this, the energy consumption-FDI-growth nexus has been evaluated using the data for the four fastest growing economies in the world. These countries also record an exponential population growth. A reverse causal relationship between energy and economic growth in the case when all four countries of interest are taken into consideration is revealed by (Lin & Benjamin, 2018). Hence, many countries have invested in renewable energy projects in recent years and continue to do so (Incekara & Ogulata, 2017; Bese, Friday, & Ozden, 2020).

Another important empirical examination of the energy-growth nexus was conducted by (Shahbaz, Zakaria, Shahzad, & Mahalik, 2018). Data were collected on the ten most intensive energy consumers in the world. The findings indicate a positive relationship between economic terms of interest. The results are directed to policy makers in the hope that this will encourage them to create strategies that will lead to sustainable economic development. Supportive evidence on the reverse causal relationship between the variables of interest in terms of OECD countries is provided by (Belke, Dobnik, & Dreger, 2011). The data were collected for the period 1981-2007. Moreover, the findings of this paper indicate that the consumption of energy is price-elastic. The previous paragraphs indicate that the literature to date on energy the consumption-growth nexus provides mixed results in terms of the direction of the causality. Moreover, a serious drawback is that most of the studies fail to take into account the potential dynamics while analyzing the relationship of interest. Additionally, a limited number of studies uses panel VAR to validate this relationship in terms of OECD countries.

For related studies on the tourism-economic growth nexus, it is important to mention that (Fahimi, Akadiri, Seraj, & Akadiri, 2018) report a unidirectional relationship, flowing from tourism to economic growth, for the period 1995-2015. However, the role of human capital is found to be more important, suggesting the need to make the necessary efforts in order to base economic growth on human capital rather than on tourism (Satrovic, 2018), since tourism industry is recognized as a significant producer of greenhouse gases (Sonmez, 1998). Concurrin with the above, (Dogru & Bulut, 2018) provide empirical evidence of the tourism-growth nexus. The authors collected the data for the selected European countries. The results of this paper suggest that a reverse causal relationship exists between variables of interest. Hence, there is an interplay between these two macroeconomic variables. Evidence of a reverse causal relationship is also provided by (Kim, Chen, & Jang, 2006) while analyzing the case of Taiwan, indicating that tourism is a driver of economic growth. A bidirectional causal linkage between the tourism industry and economic growth is reported by (Kim, Chen, & Jang, 2006). This implies that, in tourism-dependent countries, tourism development can be predicted by economic growth and vice versa.

Other important empirical literature provides evidence of the tourism-growth nexus which also provides inconsistent results. This conflict may be due to the application of the different methodology, the time-span or differences between the countries of interest. However, the direction of causality between tourism and economic growth continues to attract the attention of research community. A very important factor in the tourism-growth nexus is energy consumption. A strong impact of tourism and economic growth on energy consumption is reported by (Tang, Tiwari, & Shahbaz, 2016). The authors also suggest a cointegration relationship between the study variables in the case of India. The period of interest is 1971- 2012. Moreover, (Khan & Hou, 2021) investigate the impact of energy consumption and tourism growth on environmental indicators. The data were collected for 38 countries for the period 1995-2018. The authors outline the long-run equilibrium relationship between the underlying variables. Additionally, energy consumption has a positive impact on economic output and ecological footprint. In other words, energy consumption degrades environmental quality. It is worth mentioning that tourism development stimulates environmental quality and has a positively significant impact on economic output in the long-run. Concurring with the above, there is clear that only a few studies analyze the trivariate relationship between tourism, economic growth and energy consumption. Considering that OECD countries are developed, consume a significant amount of energy and are important tourist destinations, it is necessary to analyze the causal linkage between tourism development, energy consumption and the growth nexus with support from the panel VAR model.

3. METHODOLOGY AND VARIABLES

This paper uses the panel vector autoregressive (PVAR) econometric technique. As an alternative to the multivariate SEM models, vector autoregression (VAR) models were suggested in the early 1980s (Sims, 1980). The characteristic of the VAR model is that it operates only with endogenous variables. Apart from this, it is important to emphasize that some shocks that are considered endogenous can be removed by applying certain statistical procedures. Panel VAR is a relatively new methodology. It combines the VAR applied using time-series data with the characteristics of panel data. The PVAR model introduces fixed impacts and enables us to show unobserved singular heterogeneity, thereby improving the reliability of the analysis. There are several vital benefits that increase the usage of the PVAR approach. It is also recognized as an increasingly reasonable technique for exploring the dynamics in the observed variables. In addition, the PVAR model is based on the development of a series and is indifferent with respect to a particular economic theory. Concurring with the above, it only operates with endogenous variables, meaning that no distinction is made among the endogenous and exogenous variables. Each PVAR displays an authentic integration between the determinants and their analysis, since each variable depends not only on its historical values but also on various determinants. Special attention is paid to shocks, which are critical sources of dynamics for OECD countries that are important tourist destinations worldwide. This is especially meaningful for the interconnections between tourism development, energy consumption and economic growth. Our PVAR model is formalized as follows (Equation 1):

$$Y_{it} = \sigma_i + A(M)Y_{it} + \beta_i + \varphi_t + u_{it} \quad (1)$$

where the country of interest is represented by i and the time period by t; the vector of energy consumption, tourism development and economic growth is denoted by Y_{it}; σ_i represents the matrix of fixed effects that is country-specific; $A(M)$ represents a lag operator (matrix); individual and time effects are denoted by β_i and φ_t, respectively; and the vector of residuals is represented by u_{it}. To promote more reliable behavior, the log form of the variables has been used. Equations (2), (3) and (4) express the PVAR model by capturing the observed variables:

$$\Delta L(GDP_{it}) = \sigma_{1i} + \sum_{j=1}^{k} d_{1j} \Delta L\left(GDP_{it-j}\right) + \sum_{j=1}^{k} \theta_{1j}\, \Delta L\left(TR_{it-j}\right) + \sum_{j=1}^{k} \varphi_{1j}\, \Delta L\left(EC_{it-j}\right) + \beta_{1i} + \varphi_{1t} + u_{1it} \quad (2)$$

$$\Delta L(TR_{it}) = \sigma_{2i} + \sum_{j=1}^{k} d_{2j} \Delta L\left(GDP_{it-j}\right) + \sum_{j=1}^{k} \theta_{2j}\, \Delta L\left(TR_{it-j}\right) + \sum_{j=1}^{k} \varphi_{2j}\, \Delta L\left(EC_{it-j}\right) + \beta_{2i} + \varphi_{2t} + u_{2it} \quad (3)$$

$$\Delta L(EC_{it}) = \sigma_{3i} + \sum_{j=1}^{k} d_{3j} \Delta L\left(GDP_{it-j}\right) + \sum_{j=1}^{k} \theta_{3j}\, \Delta L\left(TR_{it-j}\right) + \sum_{j=1}^{k} \varphi_{3j}\, \Delta L\left(EC_{it-j}\right) + \beta_{3i} + \varphi_{3t} + u_{3it} \quad (4).$$

In the estimation, the moment and model selection criteria (MMSC) proposed by (Andrews & Lu, 2001) are adopted to decide the optimal number of lags. Equations (1)-(4) integrate the fixed effects to examine singular heterogeneity, so unobserved time effects are integrated at the individual level and are applicable in capturing any global shocks that may influence the OECD countries considered in this analysis. Time effects are managed by taking the first differences of all of the variables. As part of the empirical methodology, it is important to mention that, to calculate the impulse-response functions (IRFs), orthogonal residuals are required, due to the fact that their variance-covariance matrix is unlikely to be diagonal. Due to the properties of IRF, the effect of tourism and energy consumption can be observed while keeping other innovations constant. To calculate the confidence bounds, we used 200 Monte Carlo simulations. Another chief benefit of the PVAR model is the introduction of impulse-response analysis, which captures the response of one variable in light of the changes in another observed variable. We also show the rate change in a variable, as revealed by the innovation to another variable, that is aggregated after some time, as well as the size of all-out effects, by introducing a variance decomposition analysis. Before utilizing the PVAR model, we examined the stationarity properties of the data by using the Levin–Lin–Chu (LLC) t*, Im–Pesaran–Shin and ADF – Fisher inverse chisquare test.

Our study uses panel data for 34 OECD countries covering the period 1995-2014. The data used to test the causal link between tourism development, energy consumption and economic growth are collected annually from The World Bank. TR denotes international tourism receipts (current US$), which is used as a proxy for tourism. EC is the notation for the energy consumption approximated using electric power consumption (kWh per capita). Economic growth is approximated using real GDP per capita (GDP). Since two variables of interest are denoted per capita, we divided international tourism receipts by the population in a given year in order to make the variables comparable. Our study differs from (Adedoyin & Bekun, 2020) who explored the causal relationship between not only tourism and energy consumption but also urbanization and pollutant emissions. Moreover, our study utilizes electric power consumption as a proxy for energy consumption and tourism receipts per capita as a proxy for tourism development.

4. EMPIRICAL RESULTS AND DISCUSSION

Table 1 presents a summary statistics on energy consumption, tourism development and economic growth. This includes the mean, standard deviations, and maximum and minimum values as well as skewness and kurtosis, which test for the normality in the series of interest. The average real GDP per capita is found to be 35879.07

constant 2010 USD for the selected 34 OECD countries. Among the 37 OECD countries, data were unavailable for Chile, Colombia and Mexico; hence 34 OECD countries are used in the study.

Table 1. Summary statistics

Stat.	GDP	TR	EC
Mean	35879.07	969.80	8713.17
Sd	20852.59	1302.34	6993.24
Max	111968.00	10785.18	54799.20
Min	6539.91	37.69	1227.33
skewness	0.97	4.91	3.21
kurtosis	4.25	31.81	17.94

Source: Authors

The highest reported value of GDP equals 111968 constant 2010 USD while the lowest value equals 6539.91 indicating huge differences among the OECD countries for the period 1995- 2014. The mean reported value of tourism receipts per capita is equal to 969.80 current USD. Tourism receipts display a maximum value of 10785.18 and a minimum value of 37.69, implying that huge differences exist among the OECD member states. A similar conclusion can be drawn in terms of EC, suggesting a mean value of 8713.17 kWh per capita. As for the maximum value, it is reported to be 54799.20, whereas the lowest value is 1227.33.

The trend reveals minimum values in the early observed years while the later dates have maximum values. As such, the trend for all variables is positive since, as economic growth increases, tourism receipts and energy consumption increase as well. A sustained pick-up in economic growth is apparent in most of the OECD countries in the period of interest. Consequently, energy consumption shows a growth trends. The trend in increased energy consumption can be justified, as the fourth industrial revolution that has been occurring since the middle of the last century. As for tourism receipts, this industry has been promoted for decades, since technological advances enable the global population to obtain more information about different tourist destinations.

We further executed the unit root tests on the observed variables and summarize the findings in Table 2. The Levin–Lin–Chu (LLC) t* test suggests that the L(GDP) and L(TR) panels are stationary in terms of their levels. However, the Im–Pesaran–Shin test and ADF – Fisher inverse chisquare show that both of these panels contain a unit root. Hence, it can be concluded that the null assuming non-stationary cannot be rejected. All three of the tests agree that the level values of L(EC) contain unit root. Taking into account the fact that PVAR requires the series to be I(1), we test for the stationariy properties for the first difference of the variables of interest. Using the first difference of the L(GDP), L(TR) and L(EC), we now have the stationary panels. This is confirmed for a 1% level of significance for every variable when the models include the trend.

Table 2. The stationary properties of the variables

Trend included	*L(GDP)*		*Δ(LGDP)*		*ΔL(TR)*		*ΔL(TR)*		*ΔL(EC)*		*ΔL(EC)*	
Test	Stat.	p-value	Stat.	p-value	Stat.	p-value	Stat.	p-value	Stat.	p-value	Stat.	p-value
Levin–Lin–Chu (LLC) t* test	-5.16	0.000	-10.90	0.000	-4.34	0.000	-14.40	0.000	-1.22	0.111	-17.36	0.000
Im–Pesaran–Shin test	1.85	0.968	-8.94	0.000	-0.46	0.324	-11.17	0.000	5.34	1.000	-16.37	0.000
ADF – Fisher inverse chisquare	56.86	0.830	201.40	0.000	66.85	0.517	232.70	0.000	34.92	0.999	335.71	0.000

Source: Authors

A further step was required to determine the optimal number of lags. For this purpose, we reported the coefficient of determination, the p-value of the J statistics as well as (Hansen, 1982) the J statistics. Moreover, there was a need to select the moment conditions. This procedure is in accordance with (Andrews & Lu, 2001). The prerequisite states that the number of endogenous variables should be lower than the number of these moment conditions. The measures that aid the model selection for first- to third-order PVAR using the first four lags of the variables are presented in Table 3.

Table 3. Ideal autoregressive lag length

Order	CD	J	J p-value	MBIC	MAIC	MQIC
1	0.324309	43.90883	0.021131	-122.558	-10.0912	-54.3148
2	0.382434	31.85779	0.022855	-79.1197	-4.14221	-33.6246
3	0.442767	21.67775	0.009958	-33.811	3.677752	-11.0635

Source: Authors

Table 4. Panel VAR-Granger causality Wald test

Dependent variable	Excluded		
	ΔL(TR)	*ΔL(EC)*	All
ΔL(GDP)	8.637*** (0.003)	7.404*** (0.000)	15.416*** (0.000)
	ΔL(TR)	*ΔL(EC)*	All
Δ(TR)	3.673** (0.041)	7.218*** (0.007)	9.822*** (0.000)
	ΔL(TR)	*ΔL(EC)*	All
ΔL(EC)	23.722*** (0.000)	6.193** (0.013)	28.416*** (0.000)

Note: p-value in parentheses, ***,** and * represents 1%, 5% and 10% levels of significance
Source: Authors

We carry out the traditional VAR Granger causality test (Table 4). Additionally, we used the Dumitrescu & Hurlin causality test to check for the behavior and sensitivity of the variables (Table 5). As shown in Table 4, bi-directional causality between tourism development and economic growth is found. Consequently, tourism development is convenient for predicting the behavior of economic growth and vice versa. Tourism development will influence economic growth to a high magnitude. Electric power consumption and tourism development are also found to influence each other in the sample countries, reporting bi-directional causality between these two sampling variables in both tests. Bi-directional relationship also flows between economic growth and electric power consumption. An increasing trend in economic growth is apparent in most OECD countries and is accompained by a rise in electricity use.

Table 5. Dumitrescu & Hurlin causality test

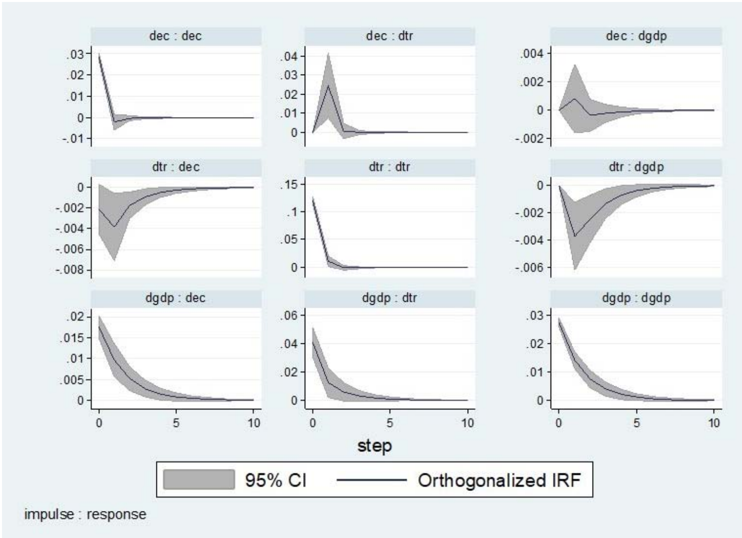
Null	W-bar	p-value
ΔL(TR)≠ >ΔL(EC)	4.846***	0.000
ΔL(EC)≠ >ΔL(TR)	3.054***	0.002
ΔL(GDP)≠ >ΔL(TR)	3.159***	0.001
ΔL(TR)≠ >ΔL(GDP)	2.046**	0.041
ΔL(GDP)≠ >ΔL(EC)	2.681***	0.007
ΔL(EC)≠ >ΔL(GDP)	1.899*	0.058

Note: ***,** and * represents 1%, 5% and 10% levels of significance

Source: Authors

Concurring with the above, economic growth is not found to be solely dependent on tourism development as it also depends on electric power consumption. Similarly, tourism development is intensified by electric power consumption and vice versa. Ensuring policies to support the development of sustainable tourism is a feasible procedure to beat the negative externalities of the tourism industry and take advantage of the positive externalities of the tourism sector in OECD countries. Panel VAR is rarely interpreted by itself. Rather, researchers are keen to explore the impact of changes that are exogenous in every endogenous variable to the other variables of interest (Abrigo & Love, 2016). Graph 1 presents the impulse-response of the given variable to shocks in another variable.

Graph 1. Impulse-response



Source: Authors

Graph 1 shows that a positive one standard deviation (SD) shock in TR leads to an increase in EC in the period from 0 to 2. It reverts to equilibrium after the second period. However, EC is found to have only a short-run positive response to GDP. TR is found to have a negative response to the shock in EC. This response decreases in the period between 1 and 5 and after that reverts to equilibrium. TR is found to have only a short-run negative response to GDP. The positive response of GDP to EC and GDP to TR decreases in the short-run. These responses reach equilibrium after the fifth period.

Table 6. Forecast-error variance decomposition

Response variable	Impulse variable			Response variable	Impulse variable			Response variable	Impulse variable		
ΔL(GDP)	*ΔL(GDP)*	*ΔL(TR)*	*ΔL(EC)*	*ΔL(TR)*	*ΔL(GDP)*	*ΔL(TR)*	*ΔL(EC)*	*ΔL(EC)*	*ΔL(GDP)*	*ΔL(TR)*	*ΔL(EC)*
0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	1	0.102808	0.897192	0	1	0.273054	0.003909	0.723038
2	0.985169	0.014129	0.000703	2	0.106654	0.858063	0.035283	2	0.322898	0.015358	0.661743
3	0.980174	0.019043	0.000783	3	0.108534	0.856241	0.035225	3	0.336378	0.017351	0.646271
4	0.978779	0.020406	0.000815	4	0.109056	0.855742	0.035203	4	0.340146	0.017898	0.641956
5	0.978384	0.020792	0.000824	5	0.109205	0.855599	0.035197	5	0.341221	0.018053	0.640726
6	0.978271	0.020902	0.000827	6	0.109248	0.855558	0.035195	6	0.34153	0.018098	0.640373
7	0.978239	0.020934	0.000828	7	0.10926	0.855546	0.035194	7	0.341618	0.01811	0.640271

8	0.978229	0.020943	0.000828	8	0.109264	0.855542	0.035194	8	0.341644	0.018114	0.640242
9	0.978227	0.020946	0.000828	9	0.109265	0.855541	0.035194	9	0.341651	0.018115	0.640234
10	0.978226	0.020946	0.000828	10	0.109265	0.855541	0.035194	10	0.341653	0.018115	0.640231

Source: Authors

The variance decomposition is displayed in Table 6. We find that own shock accounts for 100% of the variation in economic growth in the first year. The effect of own shock decreases in the ten year period. TR accounts for more than a 1% variation in economic growth through the ten years, while electric power consumption accounts for less than 1%. This implies that tourism development plays a more significant role in economic development in comparison with electric power consumption. Economic growth accounts for more variation in TR in comparison with electric power consumption. Own shock accounts for almost 90% of the variation in tourism development in the first year. This effect decreases in the period of interest. Electric power consumption has no influence on TR in the first year; however, it accounts for almost 4% of the variation in the tenth period. Economic growth is a major determinant of tourism development for the OECD countries, according to these models. Electric power consumption's own shock explains 72% of its variation. Tourism development accounts marginally for changes in electric power consumption while economic growth accounts for more than 30% of the variation in electric power consumption in the ten year period.

5. CONCLUSION

Utilizing information on 34 OECD economies for the period 1995-2014, the present research has explored the tourism-electricity consumption-growth nexus. This investigation uses the panel VAR econometrics techniques with Granger causality tests; impulse-response and variance decomposition, to explore the causality connections between tourism development, electricity consumption and economic growth. The summary of the statistics shows a positive trend for all variables; as economic growth increases, tourism receipts and electricity consumption increase as well. To proceed to the empirical analysis, there was a need to determine the optimal number of lags and test for stationarity. The optimal number of lags is found to be one. In addition, the unit-root tests suggest the stationary properties in the first difference, while the level variables are found to contain the unit-root. The causality tests indicate a bi-directional causal relationship between all of the variables for the sample of OECD economies. Impulse-response functions show that a positive one standard deviation (SD) shock in TR leads to an increase in EC in the period from 0 to 2. It reverts to equilibrium after the second period. However, EC is found to have only a short-run positive response to GDP. TR is found to have a negative response to the shock in EC. This response decreases in the period between 1 and 5 and after that reverts to equilibrium. TR is found to have only a short-run negative response to GDP. The positive response of GDP to EC and GDP to TR decreases in the short-run. These responses reach equilibrium after the fifth period. The findings of this study are consistent with other studies published to date. Beginning with the bi-directional causality between tourism development and economic growth, this finding is similar to that of (Dritsakis, 2004; Oh, 2005; Kim, Chen, & Jang, 2006; Lee & Chien, 2008; Chou, 2013; Surugiu & Surugiu, 2013; Zhang & Zhang, 2020).

The bi-directional causality between tourism development and energy consumption corroborate the findings of (Al-Mulali, Fereidouni, & Lee, 2014; Sekrafi & Sghaier, 2018). Strong evidence on the bi-directional causality between energy consumption and economic growth is provided by (Yang, 2000; Belloumi, 2009; Carfora, Pansini, & Scandurra, 2019). Similar results for the case of the OECD economies are affirmed by (Satrovic & Dag, 2019). The findings of this paper aim to encourage the decision makers to make the necessary efforts in order to create a friendly environment for sustainable tourism. In addition, there is a need to promote sustainable development by finding an alternative for energy based fossil fuels, i.e. to promote the development of renewable energy. Herein, the empirical results of this paper are expected to fill in some of the gaps in the literature on the tourism-electricity consumption-growth nexus by providing policy implications and proposing that renewable energy and sustainable tourism are the key drivers of sustainable growth. Hence, the recommendations for future research include the control of the consumption of renewable energy. In addition, there is a need to increase the time span by introducing the period 2015-2021. As suggested by (Mehmood & Tariq, 2020), special attention should be paid to the role of globalization. Lastly, there is a need to take into account the structural breaks due to the financial crisis that occurred in the period 2007-2008, since these years are under consideration in the present study.

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