The effects of tourism and globalization over environmental degradation in developed countries

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THE N-SHAPED TOURISM-LED GROWTH HYPOTHESIS (TLGH) IN DEVELOPED COUNTRIES AND THE DYNAMIC EFFECTS OF THE GLOBALIZATION PROCESS

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Abstract

This paper validates the tourism-led growth hypothesis for a panel of selected OECD countries, including the effects of per capita CO_2, globalization and energy use during the period 1994-2014.

The long-term relationship between economic growth and the above-mentioned variables is confirmed by applying unit root tests and cointegration approaches. The Generalized Method of Moments (GMM) methodology confirms a N-shaped relationship between international tourism and per capita economic growth. Globalization does not appear to be very effective in the short run for promoting economic growth; its impact on growth is determined through a finite-lag distribution, as the optimal effect can only be achieved in the long term. A direct relationship is detected between economic growth, energy use and globalization. The recommendation is to reshape regulatory frameworks with a clearer focus on promoting international tourism and more efficient energy use as a means of enhancing sustainable economic growth in developed countries. The empirical results reveal that fossil fuels account for a large part of the energy mix, so policy makers should consider reinforcing the promotion of clean energy sources and the use of more efficient processes.

Keywords: tourism-led growth hypothesis, globalization, CO_2 emissions, energy use

1. Introduction

Tourism plays an important role in the economic development by creating new jobs, creating avenues for income, and consequently adding to tax revenue (Brida et al. 2015, Isik et al. 2018, Smeral 2015). This significant role generates employment and income directly in the sectors in which expenditure or tourism-related investment takes place. Tourism industry also induces further increases throughout the economy as the recipients of rising income spend a part of them (Stabler et al. 2010). Over the past six decades, the continued expansion and diversification of international tourism has significantly contributed to making it one of the most dynamic and fastest-growing industries. In fact, according to the World Travel and Tourism Council (2018), the total contribution of tourism to the world economy in 2017 could be quantified around 10.4 % of GDP and 9.9% of total employment. Out of 1.4 billion international tourists in 2018, OECD countries received about 60% of them. Additionally, it is expected that tourism will grow on average about 43 million a year and reach 1.8 billion international arrivals by 2030 (OECD 2018) which means multiplying by seven the international arrivals compared to 1970. This is not merely due to the emergence of numerous new destinations, but also to the diversification of tourism with more types of travel, and to the importance of an ever more personalized experience (Lee et al. 2018). The rapid growth of tourism via multiplier effects boosts the additional revenues generated by tourism spending, coupled with changes in household spending, and appears to be an induced effect of tourism on the economy (Khan et al. 1990 Brida et al. 2008), causing a positive effect on the increase of the long-run economic growth (Chou 2013). Furthermore, tourism promotes investment, incorporates environmental and sustainability criteria into public financing and investment supports (OECD 2018). Also, a more responsible practices and the integration of environmental and social standards into tourism policies, generate positive effects over innovation processes and thus toward more sustainable tourism investments.

Environmental tourism policies and economic structures are among the most relevant determinants of international tourism, where globalization process contributes positively to improve these standards in OECD countries (Govdeli and Tuba 2017).

Our study tries to confirm the existence of an N-shaped relationship between international tourism expenditures (as proxy of tourism development) and economic growth (Chang et al 2013, Zhao and Mao 2013). This non-linear connection between tourism and economic growth will depend on the level and quality of tourism industry in destination (Adamou and Clerides 2009, Castro et al.2013, Zuo and Huang 2017). In other words, the N-shaped behaviour between tourism and economic growth is related with tourism industry specialization, tourism area cycle life -TALC- and tourism led growth hypothesis- TLGH- (Po and Huang 2009, Chang et al. 2009, 2012, Zhao and Mao 2013). Therefore, the aim of this study is to explore how the level of tourism specialization varies over time, and the impact over economic growth. Hence, the N-shaped TLGH assumes a developmental trajectory, related with TALC[1] theory, which supports that grows though different stages over time (Zuo and Huang 2017). TALC theory (Butler 1980) considers that variations in tourism specialization will generate different effects over economic growth (Zou and Huang 2017). Hence, tourism development not only stimulates the growth of the sector, it also drives the overall growth of the economy (Lee and Chang 2008). Tourism contributes to reduce poverty while increasing productivity and efficiency in different sectors (Li et al. 2018), which facilitates economic growth. Hence, the economic contribution of tourism is of special interest for policy makers (Brida et al. 2015).

[1] The concept of a tourist area life cycle (TALC) was introduced by Butler (1980) to explain the evolution of a tourist area over time. This theory suggests that tourism industry will start slow with negative profits, proceed to a growth stage experiencing a rapid increase, move into a maturity stage where tourism sector begins to decrease, and finally reach a decline stage or a reemerging stage with ascending returns.

Despite tourism's capacity to create jobs and reduce poverty, the fluctuations in employment and tax revenues must be underlined as a consequence of tourism business cycles and structural change (Li et al. 2018). In view of the growth of the tourist industry and its increasing importance in OECD countries, the causality of tourism and economic growth has attracted considerable interest from academia (Chen and Chiou-Wei 2009). Since the first empirical test of the nexus between tourism and economic growth (Ghali 1976) and the first analysis of the tourism-led growth hypothesis –hereinafter TLGH– (Balaguer and Cantavella-Jordá 2002), this subject has received considerable academic attention.

The growth of the tourism industry, its increasing importance, the shifts in tourists' expectations and the trend towards a more customized tourist service, the need for a rapid adjustment to these expectations and fluctuating climate change requirements call for new analyses of the best practice for promoting economic growth. Sustainability and competitiveness also depend on how tourism responds to climate change (Scott 2011, Weaver 2011). In fact, tourism depends on a wide range of infrastructure services with numerous environmental and ecological impacts (Gössling 2002, Gössling et al. 2002, Gössling et al. 2015, Lee et al. 2018). Improvements in technology, spending on the environment or revenues, among others, also foster a more efficient tourism sector (Li et al. 2018).

Some studies report inconclusive results in regard to the connection between tourism and economic growth. The increasing importance of tourism in many economies, its implications for policy makers, mainly in countries where it has a crucial impact on the economy (Bianchi 2017), coupled with the continued evolution of tourism since the 1950s to the present (Brida et al. 2015, ECLAC 2009), has led to the accumulation of a vast amount of literature on TLGH. However, other studies reject this hypothesis, and point to the existence of an economy-driven tourism hypothesis (Brau et al. 2013, Lanza 2003) or reciprocal hypothesis (Shan and Wilson 2001).

Therefore, there is no clear consensus in the contribution of tourism to economic growth. Some studies have revealed a negative impact related with negative effects on local population and generate an inefficient tourist sector (Blake et al. 2003, Smorfitt et al. 2005, Zhang and Lee 2007, Dwyer et al. 2006, Li et al. 2018). Other studies report an adverse effect of tourism over environmental and economic cost of tourism development (Milne 1990, Long et al. 1990). Therefore, our study considers both perspectives applying a non-linear analysis in the connection between economic growth and international tourism. This analysis reveals a novelty in economic literature, where we also consider, within the nexus between tourism and economic growth, the impact of globalization processes joined with international tourism over economic growth, the environmental degradation and the energy use.

This study makes several contributions to the literature through: (1) a non-linear approach proposing a N-shaped relationship between tourism and economic growth; (2) including and testing the effect of globalization on economic growth by applying a V-finite lag distribution (De Leeuw 1962, Álvarez et al. 2017), as the suggestion is that the optimal effects of globalization on economic growth are not generated immediately; and (3) the application of a contemporary methodology, the pairwise Dumitrescu-Hurlin panel causality test with the addition of the cointegration and GMM methodology.

2. Literature review

Many studies support that tourism expansion has a positive direct and indirect impacts on economic growth (Mérida and Golpe 2016, Brida et al. 2016). This direct nexus between tourism and economic growth is linked to the direct revenues obtained by the different types of tourist agents, e.g., airlines, travel agencies or hotels (Liu and Song 2018). The indirect contribution is achieved through the positive impact on the balance of payments, the increase of foreign

currencies reserves, productivity, competitiveness and employment increase, etc. (Brida et al. 2015, Mérida and Golpe 2016, Paramati et al. 2017).

According to the tourist area life cycle (TALC) concept, we assume tourist destination progresses through five stages: exploration, involvement, development, consolidation, stagnation, and post-stagnation (Figure 1).

<Insert Figure 1>

Figure 1 illustrates the transition of tourism over time. When tourism industry moves into the involvement stage, there is limited interaction between tourists and local community, resulting in only basic services. Increased advertising induces a pattern of seasonal variation and a definite market area begins to emerge. During the exploration stage, there are a few adventurous tourists visiting sites with few public facilities. The development stage is the last stage where there is continued growth in local tourism industry. There is a noticeable development of additional tourist facilities and increased promotional efforts. The destination experiences a shift in control of the tourist trade to outsiders, and the number of tourists at peak periods outnumbers the local residents. Once the tourism´s growth rate begins to decrease, the destination enters a consolidation stage. Tourism has become a major component of the local economy, and a well-delineated business district has begun to take shape. Some of the facilities are outdated and the destination tries to extend the tourist season. This leads to the stagnation stage where peak numbers of tourists and capacity levels are reached. The destination has a well-established image, but it is no longer popular and the lodging facilities begin to erode and turnover. Finally, the destination reaches the post-stagnation stage facing options ranging from rejuvenation to decline, represented by various levels of change (both positive and negative) in the number of tourist arrivals. The result depends on the destination's ability to position itself and find a viable market. The following section will discuss previous research using the TALC concept and the various

stages of evolution. During the post-stagnation stage, a tourist area presents several possibilities ranging from rejuvenation to decline.

Additionally, the topic of TLGH[2] is not new in research into tourism economics, as enhancing economic growth through tourism has often been used as an important economic development strategy (Chen and Chiou-Wei 2009, Chang et al. 2012, Zhao and Mao 2013, Zuo and Huang 2017). Over 100 papers have already focused on the Granger causality test of the TLGH, highlighting different types of relationships by confirming and/or rejecting it (Brida et al. 2016)[3]. TLGH is used to test theoretically the effects of tourism on welfare and the macroeconomic effects of a temporary demand shock (Dogru and Bulut 2018, Perles et al. 2017, Schubert and Brida 2009), drawing different recommendations for policy makers for specific countries and targets (Brida et al. 2016). Even the TLGH is not new in empirical literature, our study advances in the analysis of the economic growth-tourism nexus including the role that globalization, environment and energy use.

While many studies support TLGH, shocks have reduced economic growth (Dunn and Dunn 2002, Blacke et al. 2003, Smorfitt et al. 2005, Zhang and Lee 2007, Groizard and Santana-Gallego 2018,). Other factors such as insufficient tourist regulations (Dwyer et al. 2013), environmental factors (Pham et al. 2010), devaluation policies (Pratt 2014) or type of tourism services (e.g. rural, business or leisure tourism) have had negative effects on economic growth (Agarwal 2012, Akama and Kieti 2007, Gal et al. 2010). This negative effect may be caused by inefficient and incorrect administration and policy decisions in the tourism sector. As a driving

[2] TLGH is considered to be a reflection of the export-led growth hypothesis (ELGH), which states that economic growth can be boosted by intensifying the amount of labour and capital, but also through the expansion of exports (Brida et al. 2016).

[3] Despite the increasing interest of many researchers in testing the TLGH, there is a notable lack of consensus regarding the relationship between tourism and economic growth (Aslan 2013, Cortés-Jiménez and Pulina 2010, Tugcu 2014). These discrepancies may be due to the different time frame, country or set of countries analysed or even to the different methodologies used for the empirical test (Brida et al. 2016).

force for economic growth, tourism should be a strategic sector that is able to foster economic and social development (Gossling and Hall 2006, Scott 2006, Peeters 2007, WTTC 2011, OECD 2018).

Our study points out, that even tourism sector contains beneficial effects over economic growth, there are also many tourism-related economic, social and environmental costs (Palmer and Rier 2003). The N-shaped reflects a non-linear connection between tourism and economic growth, which denotes a long-run relationship related with the stage of development of tourism industry and its effects over income in receipt countries (Figure 2).

<Insert Figure 2>

Figure-2 reflects the non-linear effects of tourism specialization on economic growth, which project that in early stages of tourism development, this industry exerts a positive effect over local economies confirming the TLGH and showing ascending returns, even this process present high requirements of energy sources, mainly fossil, with low environmental controls.

The N-shaped connection between tourism and economic growth, assumes that in early stages of tourism development, there are ascending returns that brings job opportunities, ascending tax revenues or improvements in balance of payment, which stimulate the local production and income in destination (Sinclair 1998). Consequently, in early stages, tourism industry would promote economic growth, though the overexploitation of energy sources and low environmental restrictions (Zou and Huang 2017). By contrast, the negative connection between tourism expansion and economic growth, with negative returns (Capo et al. 2017), would be, for example, as consequence of the Dutch disease (e.g. the boom gaming industry), which reduces the area´s long-term sustainability (Sheng and Tsui 2007, Sequeira and Campos 2007, Capo et al. 2007, Miero and Ramos 2010). Tourism´s industry specialization does not always contribute to economic growth, because of the *law of returns* and limitations of environmental carrying

capacity. When tourism industry starts to experiment diminishing returns, the link with economic growth becomes negative, appearing excessive competition or institutional inertia (path-dependence) (Essletzbichler and Rigby 2007). During this second stage appears negative externalities, via crowding out effect, economic lackage and pernicious environmental repercussions (Po and Huang 2008, Zuo and Huang 2017), being tourism industry mainly controlled by external corporations with weak linkage with local economy. Some studies also intend this negative connection because the tourism´s substitution of the welfare generated in the trade regime dominated by export taxes or import subsidies (Chen and Devereux 1999). To avoid this situation, there are necessary institutional modifications, which adopt sustainable considerations and innovation strategies, where globalization would contribute positively to reach this situation. In addition, local tourism firms should control the expansion of this industry providing and advanced tourism sector.

Finally, the third stage suggests an optimal situation where a high developed tourism industry is immersed in a second life cycle, with diverse set of tourism activities with high return and low environmental impact. During this third stage, will appear cleaner technologies and environmental regulations directly connected with tourism industry (Zuo and Huang 2017). This third stage proposes an optimal scenario, where tourism industry obtains positive returning companionable with positive economic growth. For example, Wu and Xie (2010) concluded that economies with high tourism specialization presented a positive nexus between tourism and economic growth, while the relationship was not obvious when the tourism specialization was low. found an N-shape relationship between tourism and economic growth.

In addition our study also explore how the processes of globalization, economic growth and environmental degradation are increasingly connected (Boukas and Ziakas 2013, De Vita 2014, Tang 2013, Fereidouni and Al-mulali 2014, Meng 2014). Globalization is considered a main

driving force for economic growth that increases the access to international markets and services in critical sectors such as tourism, thereby enabling environmental correction (Aitken et al. 1997, Hsiao and Shen 2003, Tamazian, et al. 2009, List and Co 2000, Turner and Witt 2001, Shahbaz et al. 2016). In fact, Globalization also fosters economic efficiency by refining new technologies (technical effect), thus facilitating the control of CO_2 emissions (Tisdell 2001) as a consequence of the indirect effects on environmental quality (Cavlovic et al. 2000). In line with the literature, globalization promotes energy efficiency, which considerably contributes to controlling environmental degradation (List and Co 2000). Globalization increases access to international markets and services in critical sectors such as tourism, enabling more efficient sectorial processes and environmental correction (Turner and Witt 2001, Govdeli andTuba 2017). Globalization processes also enhance technological innovation and increase energy efficiency, enabling low-carbon economic growth (Tamazian et al. 2009). Other effects of globalization include accelerating the development of the tourism industry, producing greater trade openness, and improving access to international markets, services and trade corporations (Keintz 1968, Turner and Witt 2001). Tourism appears to be positively affected by trade openness as a proxy of globalization (Summers and Heston 1991, Dwyer et al. 2000).

Otherwise, we also include in our main model the impact of carbon emissions over economic growth, trained by fossil fuels and inefficient energy processes (Lee and Brahmasrene 2013, Turner and Witt 2001). Various studies support that environmental damage increases due to industrialization, modernization, and urbanization (Azam et al. 2016). Chen et al. (2016) found that a 1% increase in per capita energy consumption reduces real per capita GDP by 3% worldwide, and 4.2% in developing countries, while a 1% increase in per capita CO2 emissions increases world GDP by about 6.7%, and the GDP of a set of 188 countries by 11.9% and 6.1% for the period 1993–2010. In addition to reducing carbon emissions, more efficient energy

conversion technologies and clean energy technologies such as renewables are traditional ways of mitigating climate change in developed economies (Álvarez et al. 2017). In other words, without proper regulation, carbon emissions will continue damaging economic growth (Uddin et al. 2016). The extra cost of inefficient energy use and pollution is greater than the resulting benefits from the energy conservation required to enhance efficient energy usage with energy-related equipment and the processes.

Furthermore, a large part of the economic literature has exposed how energy use and climate change contribute to enhancing economic growth, while the globalization process (e.g. trade openness and foreign direct investment) is considered one of the main drivers of economic and social development (Aitken et al. 1997, Hsiao and Shen 2003, Tamazian, et al. 2009, List and Co 2000, Turner and Witt 2001, Shahbaz et al. 2016). For instance, Katircioglu (2014) recognizes that there are important interactions between tourism and energy sector, environment or economic growth. In this sense, tourism development leads to a growth in energy capability and increases in pollution levels as consequence of expansion of tourism-related activities. Energy use and its impact on economic growth are also widely considered where tourism not only contributes to economic growth but also to an increase in energy consumption (Liu et al. 2011) and carbon emissions (Gössling and Peeters 2015, Lee et al. 2018). Previous research underlines the fact that tourism drives economic growth in different ways: (1) the *foreign exchange* brought by tourists and the improvement in the current account balance; (2) *job creation*, which helps reduce poverty, and the subsequent tax revenues; (3) *investment* in infrastructure, human capital and technology; (4) increased *competition and productivity* and hence the promotion of *efficiency*; and (5) the use and exploitation of *economies of scale and scope* boosted by tourism (Brida and Pereyra 2009, Dogru and Sirakaya-Turk 2017, Imran et al. 2014, Lanza et al. 2003, Lee and Brahmasrene 2013, Li et al. 2018, Schubert et al. 2011, Shahzad et al. 2017).

Based on the above arguments, our hypotheses are the following:

H1: An N-shaped relationship is expected between economic growth and international tourism.

H2: A long-term relationship is expected between the globalization process and economic growth.

3. Data and methodology

The aim of this study is to analyse the factors affecting CO_2 emissions in selected OECD countries, with a special focus on the role of international tourism and globalization and their relationship with the process of environmental degradation. This section describes the data and outlines the methodology used. The sample is restricted to the period for which annual data are available, from 1994 to 2014 (21 observations for each country) in the World Bank database (WDI 2018).

<Insert Table 1>

The GMM regression approach may therefore yield biased results. This supports the GMM regression approach, which describes the complete picture of the heterogeneous impact of the factors driving CO_2 emissions in this study. A model based on the carbon emissions function for selected OECD countries is used to estimate the impact of different variables on environmental degradation. The baseline equation (Equation 1) for this study contributes to previous empirical literature and considers the effect of rising international tourism on per capita economic growth; the effects of globalization, CO2 emissions and energy use on economic growth are also analysed.

$$GDP_{it}=\alpha_1 T_{it}+\alpha_2 T_{it}^2+\alpha_3 T_{it}^3 + \alpha_4 ZG_{it}+\alpha_5 CO2_{it}+\alpha_6 EU_{it}+\varepsilon_{it} \quad (1)$$

Equation 1 proposed a cubic relationship between international tourism and economic growth (see Figure 2). To explore the role of carbon emissions and energy use, as driving forces of the connection between economic growth and tourism, we also propose an additional model (Eq.2), where we isolate the effect of these two variables:

$$GDP_{it}=\alpha_1 T_{it}+\alpha_2 T_{it}^2+\alpha_3 T_{it}^3 + \alpha_4 ZG_{it}+\varepsilon_{it} \quad (2)$$

The non-linearity of the tourism-economic growth connection was suggested previously (Brida et al. 2015, 2016, Po and Huang 2008). In order to test this non-linearity, this research proposes the hypothesis of a N-shaped nexus between economic growth and tourism to verify the effect of rising international tourism on economic growth in selected OECD countries[4] between 1994 and 2014.

As shown in Figure 1, in its early stages, tourism development is positively related with economic growth, confirming the TLGH.

GDP_{it} is the real GDP per capita (logarithms current US$ PPP); T_{it} is international tourism expenditure (logarithms current US$). T^2_{it} and T^3_{it} are also included to confirm a non-linear cubic relationship between international tourism expenditure and income for selected OECD countries (see footnote 1) during 1990-2014. We apply a V-finite lag distribution (De Leeuw 1962, Álvarez et al. 2017) to confirm the positive effect of the globalization process in selected developed countries, confirming that the optimal effects of globalization on economic growth are not generated immediately (Figure 3).

This finding is one of the novelties in the field of study –mainly in the empirical literature– due to the assumption of a long-term optimal effect in the connection between globalization processes

[4] Australia, Austria, Canada, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.

and economic growth (Figure 3). ZG_{it} represents the globalization processes. As described above, we have transformed globalization into a V-finite lag distribution variable (Figure 3), based on De Leeuw's (1962) scheme, whose optimal impact appears at t-2:

$$ZGit = \left[\sum_{j=0}^{s/2} (j+1) + \sum_{j=(s/2)+1}^{s=4} (s \quad j+1) \right] * \text{Git} - j \tag{3}$$

Equation 3 (ZG_{it-j}) is a dynamic variable of an order 4 finite V-lag distribution structure, which considers that globalization processes accumulate over time. Equation 1 also considers the effects of per capita carbon emissions $CO2_{it}$ (logarithms $MTCO_2$) E_{it}, energy use per capita (logarithms kg of oil equivalent per capita) on GDP_{it}.

<Insert Figure 3>

Figure 3 shows a De Leeuw's finite-lags distribution scheme (Álvarez et al. 2017) in order to analyse the relationship between globalization and economic growth. The main contribution of our study is to confirm that globalization measures require time lags to accomplish their maximum impact on economic growth. These results indicate that globalization as an instrument of technical progress (List and Co 2000, Tamazian et al. 2009, Tisdell 2001) can contribute positively to both economic growth and decontamination processes via the energy efficiency process.

The descriptive statistics (Table 2) show that the distribution of variables is skewed and more concentrated than the normal distribution, with longer tails.

<Insert Table 2>

To validate our proposed hypotheses, we apply some preliminary tests: the non-stationarity of the series through several panel unit tests; the potential cointegration among variables through different cointegration tests; and the causality relationship among variables.

4. Empirical results

<Insert Table 3 here>

To identify a possible long-run relationship between the variables, they must be integrated in order one, I(1) level. This is determined through the second-generation panel unit root tests. In order to verify the applicability of the unit root tests, we have applied Chudik and Pesaran (2015) weak cross-sectional dependence test, and the results stated in Table 3 demonstrate the presence of cross-sectional dependence, thereby validating the application of the second-generation panel unit root tests. The results of unit root tests documented in Table 4 puts forth the evidence of the variables to be first order integrated.

<Insert Table 3>

<Insert Table 4>

The results suggest that the variables are I(1). According to the *p*-values reported in the above table, all the series are non-stationary at levels (rejecting the null hypothesis) at their first difference which stands for the integration at I(1). As the null hypothesis is the stationarity of the series (rather than the non-stationarity), the significant results suggest their non-stationarity; these aspects must be properly addressed. Following the confirmation that all the variables were integrated in order one, I(1), the Westerlund and Edgerton (2008) cointegration test was done to determine the existence of long-run relationships among the variables. The results reported in Table 5 show the presence of cointegrating association among the variables and Table 6 shows the structural breaks in the cointegrating series.

<Insert Table 5>

<Insert Table 6>

The results of the GMM based on Equation 1, are shown in Table 5. To explore the isolate effect of energy use and carbpn emissions we also include modifications in our main model (Equation1), excluding the variables EU_{it} and CO2it.

<Insert Table 7>

The coefficients $\alpha_1>0$ and $\alpha_2<0$ and $\alpha_3>0$ validate the tourism-led growth hypothesis in a first stage and the third stage, while during the second stage the relationship between tourism and economic growth is negative. This evidence confirms that in a first stage of tourism development, tourism boosts economic growth, validating the tourism-led growth hypothesis (Balaguer and Cantavella-Jorda 2002, Lean and Chang 2008, Katircioglu 2011, Lee and Hung 2010, Ghosh 2011, Lee and Brahmasrene 2013, Tugcu 2014, Drissakis 2012). Dritsakis (2012) investigates the long-run relationship between economic growth and tourism in seven Mediterranean regions through cointegration and FMOLS, confirming the TLGH for the regions. Although much of the previous literature has explored the TLGH and revealed the existence of the negative effects of tourism on income levels, our empirical results confirm a non-linear relationship between economic growth and international tourism. The empirical results confirm that increases in international tourism would be detrimental to economic growth (Blake et al. 2003, Smorfitt et al. 2005, Zhang and Lee 2007, Dwyer et al. 2006, Sheng and Tsui 2010, Pratt 2014, Li et al. 2018). The coefficient $\alpha_4 >0$ confirms a positive relationship between economic growth and globalization processes. We apply a novel transformation of globalization processes through a V-finite lag distribution (De Leeuw 1962, Álvarez et al. 2017), confirming that the optimal effects of globalization on economic growth are not generated immediately (Figure-3); according to De Leeuw (1962) the optimal impact occurs in t-2[5]. According to the econometric results, we find a negative connection between economic growth and carbon emissions ($\alpha_5 <0$) and economic growth. These results confirm that economic growth in OECD countries is supported by carbon

[5] When we use globalization G (without any transformation) the adjustment of the model presents R-squared=0.702916 and adjusted R-squared= 0.700281. In contrast, when we use the variable ZG, R-squared = 0.734557 and adjusted R-squared = 0.731566, as the model proposed in Equation 1 has a better fit with globalization transformed into a finite lag distribution variable.

emissions. In other words, this result establishes that the reduction in carbon emissions would have a positive impact on economic growth. In other words, the presence of inefficient environmental measures would reduce economic growth (Chen et al 2016).

Finally, the empirical results also validate a positive relationship between energy use and economic growth ($\alpha_6 > 0$). Societies with rising growth levels generate increased energy use (Apergis and Payne 2009, Sinha et al. 2017, Zafar et al. 2018), which has a positive impact on economic structures.

We usually consider correlation when we explore the relationship between variables, although this does not imply causation in econometrics. Many correlations can be empty or spurious. Granger (1969) included an approach to find the chronological ordering of movements of variables. Our study also applies the pairwise Dumitrescu-Hurlin panel causality test to explore the movements among variables. We apply a 2-lag order selection as the appropriate lag length. These lags imply the relevance of past information and must refer to a reasonable time span in which one variable can be used to predict another. By applying lag 2, according to Schwarz information criteria (SIC), we obtain the Wbar and Zbar statistics, allowing common factors in the cross-equation covariance to be detached:

<Insert Table 8>

<Insert Figure 4>

Figure-4 (based on the results shown in Table 8) reflects Our empirical results also reveal a bilateral causality between tourism and economic growth (Samimi et al 2011, Lorde et al 2011, Lean and Tang 2010, Durbarry 2004, Chen and Chiou 2009, Nowak and sahli 2007, Ridderstaat 2014).

Economy-driven tourism growth suggests that economic development positively affects economic growth by improving tourism infrastructures, education or safety processes (Cárdenas et al. 2013). We obtain unidirectional causality from international tourism to carbon emissions and energy use. Ghosh (2010) showed a two-way short-term causality between carbon emissions and economic growth in India during 1971–2006, concluding that in the short run, any effort to diminish carbon emissions could ultimately slow economic growth in India. Our results, in line with Uddin et al (2016), establish a unidirectional causality running from economic growth to the carbon emission and energy consumption. These results suggest that carbon emission reduction strategies will reduce economic growth if no supplementary policies are taken to alter this causal relationship. Our study also confirms unidirectional causality running from economic growth to energy use (Ghosh 2002, Marathe and Mozumder 2007, Narayan and Smyth 2005, Chen et al. 2007, Yoo 2006, Huang et al. 2008, Ozturk et al. 2010, Altunbas and Kapusuzoglu 2011, Çetintaş 2016), confirming the conservation hypothesis (Ozturk et al. 2010, Çetintaş 2016) regarding the impact of economic growth on energy use. This hypothesis suggests that a modification in the energy mix would not negatively affect economic growth. Finally, we also find a bidirectional causality running from globalization to carbon emissions, energy use, economic growth and international tourism. A bidirectional time-varying causality between energy consumption and CO2 emissions was shown in Ajmi et al. (2015) and Pao et al. (2011). Some interdisciplinary studies have been conducted to evaluate the dynamic behaviours of energy consumption and CO2 emissions (Krey et al. 2012, Fang 2015).

5. Discussion of the empirical results

The GMM econometric results reveal the existence of a N-shaped relationship between economic growth and international tourism. These results evidence the first and the third stage confirm the tourism led-growth hypothesis (TLGH). Between first and third stage, tourism reflects a negative

impact on economic growth. The econometric results also provide certain turning points, useful to analyze the tourism-economic growth nexus, when we isolate the effects of environmental damage and energy use. When we consider the energy use and environmental damage in our main model (Equation 1), we are assuming that these variables infer over the relationship between economic growth and tourism. To understand the behavior of these variables we also propose as additional model the isolation of these driving forces in the connection between economic growth and tourism (see equation 2). changes in the turning points, demonstrating consequences over tourism-economic growth nexus.

<Insert Figure 5>

Figure 5 illustrates the turning point (X(1)), calculated from econometric results (Table 7). When we omit the effects of energy use and carbon emission in Equation 1, we find a new turning point (X(1)*), which reflects how the variables $CO2_{it}$ and E_{it} delays the transition to the second stage where there is a negative relationship between economic growth and international tourism. In line with other studies, we find that the negative effects of tourism over economic growth relate to inefficient policies that impact negatively over tourism industry (Pham et al. 2010, Dwyer et al. 2013, Li et al. 2018). Other studies reveal that policies related with currency devaluation (Pratt 2014) or foreign investment in tourism (Sheng and Tsui 2010) generate a negative effect on economic growth. The type of tourism –resorts or rural tourism, for example– also conditions its economic impact, (Agarwal 2012, Akama and Kieti 2007, Gal et al. 2010, Sheng and Tsui 2010). Li et al. (2018) consider that diminishing marginal income effects might also explain the negative economic impacts affecting the tourism industry.

The isolation of energy use and environmental damage (see equation 2), modifies the turning points. When we consider the role of the energy use and the environmental damage in our main model (Equation 1), we find that this variables help to maintain a positive connection between

tourism and economic growth in early stages of tourism development (X(3) > X(1)). Otherwise, to reach the optima third stage (positive connection between developed tourism industry and sustainable economic growth). The empirical results also support that dirty activities and the traditional energy use of fossil sources delay the reach of the third stage (X(2) > X(4)). Therefore, there are necessary energy and environmental regulations linked with tourism industry for diminishing the pernicious influence of both energy use (mainly dominated by fossil sources) and carbon emissions. So, the empirical results confirm that societies need to assume strict energy and environmental measures in order to enhance the effects of international tourism over economic growth.

The empirical results also reveal that globalization has a positive effect on economic growth, and the results validate the impact of the finite-lags of this variable. This model thus allows a dynamic analysis of the effect of globalization on economic growth through the De Leeuw approach. Finally, we also find a direct connection between energy use, carbon emissions and economic growth. The transformation into a V-finite distribution variable explains how measures associated with the globalization process (e.g. foreign direct investment, trade openness, etc) include a lag to obtain maximum impact on economic growth. In other words, these results reveal the positive impact of globalization on economic growth. Empirical evidence has quantified the fact that globalization serves as an instrument of technical progress (List and Co 2000, Tamazian et al. 2009, Tisdell 2001). These results indicate that globalization measures require time lags to accomplish their maximum impact on economic growth, and the maximum effects cannot be seen in the short term. According to the results of the OLS, FMOLS and DOLS regressions –and in line with previous evidence–, globalization accelerates the technical effect in both the traditional economic sectors and in tourism. The coefficient $\alpha_3 > 0$ confirms that globalization processes help

the international tourism industry to correct emissions (Summers and Heston 1991, Dwyer et al. 2000, Rasekhi and Mohammadi 2015).

The negative connection between economic growth and carbon emissions implies the use of dirty sources reduce economic growth in selected OECD countries. The results suggest the need for a change in environmental regulations through innovation and stricter measures (Balsalobre and Álvarez 2016, Álvarez el al. 2017; Sinha et al., 2018).

Finally, we have found evidence of the positive effect of energy use (E_{it}) on per capita gross domestic product, confirming the growth hypothesis. Societies' increased growth levels have been proven to be caused mainly by energy use, which has a positive effect on economic structures. Otherwise the positive relationship between economic growth and carbon emissions suggests that developed countries use dirty sources to achieve economic growth. OECD countries could reinforce their promotion of high-quality tourism in order to increase its long-run (positive) impact on economic growth. As a result of this economic pattern, it can be stated that when the economy requires (additional) energy sources, fossil fuels have a higher impact on the economic cycle and environmental degradation.

The correct application of tourism and global measures (e.g. foreign direct investment or trade openness) would enhance social welfare, reduce poverty and accumulate capital (Li et al. 2018). Blake et al. (2008) consider three channels for influencing tourism poverty: government revenues, earnings and prices. When prices rise as a consequence of higher output prices and wages in tourism industries, it reduces real income levels for the local population. In addition, the population not employed in tourism does not benefit from the earnings from tourism channels. Unless the government reallocates revenues in tourism-related taxes, this can directly impact the local population and increase poverty levels. In line with Blake et al. (2008) and Lin et al. (2018), the role of tourism in reducing poverty is still under question, and governments need to attract

foreign investment and tourism-related infrastructures to improve the quality of the tourism sector and local incomes. According to the empirical results, unless governments consider the most efficient and cleaner policies for planning and managing tourism, economic systems will be considerably reduced by pernicious effects of international tourism (see Figure 5).

The results underline the need to design a legal framework for a cleaner tourism sector linked to better infrastructures and the promotion of renewable sources and energy efficiency. The integration of technologies would create competitive value through the use of information and communication technologies (Dwyer et al. 2009, WEF 2017).

6. Conclusions and main policy implications.

This paper aims to underline the relevance of tourism and its impact on economic growth in developed countries by confirming a N-shaped connection between tourism and economic growth, under the TLGH scheme. The impact of globalization, carbon emissions and energy use on economic growth is also analysed. The results obtained from the GMM estimation validates a N-shaped relationship between international tourism and economic growth, where globalization process, energy use make a positive contribution, while carbon emissions present a negative connection with economic growth. The proposed N-shaped nexus between tourism and economic growth (under the TLGH scheme) analyzes the structural effect of tourism industry and how specialization process is closely related with the environment and the use of energy. Accordingly, we can establish policy recommendation in line with the promotion of structural changes and innovations in tourism industry (e.g. implementation of technology connected with the reduction of operational cost) to transform this industry under a more sustainable patter with industry.

The GMM methodology was applied to assess this new tourism-led growth hypothesis between international tourism (T_{it}) and per capita economic growth (GDP_{it}) for a panel of 24 OECD

countries during 1990-2014. We have also included the following additional explanatory variables of economic growth: globalization (ZG_{it}), carbon emissions ($CO2_{it}$) and energy use (EU_{it}). As a novel approach in the empirical literature we have transformed globalization into a Z-Deleeuw finite distributed lag variable in order to explore the long-term connection between economic growth and globalization. From the econometric results of GMM, we provide evidence of an N-shaped relationship between international tourism and economic growth, validating the tourism-led growth hypothesis in the first and the third stage of the connection between tourism and economic growth. By contrast, during the second stage of tourism development we find that tourism impacts negatively over economic growth via the diminishing marginal income effect and inefficiencies in the tourist sector (Li et al. 2018).

The results confirm that a high specialized tourism industry will demand improvements in energy use and environment to obtain sustainable positive connections with economic growth. In consequence, our study confirms that increasing output of tourism will be joined with economic structural transformations, connected with the capability to attract visitors, reflecting both social and environmental effects (McElroy 2003). By contrast, the empirical results also states how tourism industry´s limitations can not be changed in short term. In other words, our empirical results reveal that the use of fossil sources and pollutive activities delays the optimal connection between tourism industry and economic growth.

Therefore, our study validates of a non-linear relationship between economic growth and international tourism in OECD countries, suggesting that the negative effects of tourism over economic growth, would be solve with the adoption of environmental and energy regulations to reduce the pernicious effects that tourism industry exerts over economic growth; once tourism sector has reached a certain turning point.

To counteract this trend, governments can play a key role by implementing suitable measures while promoting efficient foreign infrastructures and smoothing the impact of tourism on the local population. The correct policies can reduce poverty and lead to a more efficient tourist sector in developed countries. This consideration is supported by the positive effects of globalization measures on economic growth and the fact that these effects must be planned in the long term, as they have been shown to require a certain time before they achieve optimum levels. The econometric results confirm a positive connection between CO2 and economic growth for the selected panel and demonstrate that economic growth is maintained by rising carbon emissions, confirming that unclean industry contributes positively in the selected countries. This relationship is coupled with an increasing process of degradation, where this economic growth is accomplished through carbon emissions. Lastly, we also obtained evidence of the positive connection between energy use and economic growth, and found unidirectional causality running from economic growth to energy use, confirming the conservation hypothesis.

The results validate the economic conservation hypothesis, where energy consumption impacts directly on economic growth. This impact is associated to a greater degradation process, in which economic growth is accomplished by increasing carbon emissions. Societies experiencing economic growth have greater energy requirements, which increase the use of fossil fuels and, by extension, CO2 emissions. In consequence, governments need to assume changes in the energy mix, reducing fossil sources and promoting renewable energy and more efficient and innovative uses. Foreign investment can certainly contribute to this goal. Globalization can be said to be implicated in the promotion of clean technologies (technical effect), and also contributes to the adoption of the regulatory measures necessary to improve competitiveness and efficiency in the international tourism industry.

However, this study still has some limitations in terms of the type of globalization or some of its more specific effects. Despite these limitations, one of the contributions of this paper is the clear need to curb the potential negative effects of international tourism on economic growth, highlighting the close connection between developed societies and fossil fuels as a mean of increasing their income levels.

The countries analysed here could therefore be expected to enhance their tourism industry and environmental quality by establishing adequate policies for globalization and trade openness (Summers and Heston 1991, Dwyer et al. 2000).

We also propose policy recommendations to reduce the negative effect of international tourism before these economies reach a certain point in their tourism industry.

The recommendation is therefore to redouble the efforts to achieve a more efficient tourism sector with greater promotion of renewable sources in order to reduce environmental degradation, energy dependency and poverty levels.

This research proposes a series of policy recommendations to obtain sustainable economic growth and a developed and efficient tourism sector for the selected countries. Governments must first undertake changes in the energy mix by promoting renewable energy and more efficient and innovative energy uses, to reduce the share of fossil sources.

Globalization processes can be expected to contribute to the arrival of cleaner technologies, where it is necessary to adopt regulatory measures to attract clean and efficient foreign investment, and particularly investment associated to the tourism sector. These measures would allow a more efficient host tourism sector, reverting the economic impacts of tourism to tourists and not to the local population. A suitable management policy can reduce poverty by obtaining improvements in the tourism sector. This consideration is supported by the positive effect of

globalization measures on economic growth and how these effects must be programmed in the long term.

Despite these limitations, this study is meaningful in offering a guide to reducing the potential adverse effects of international tourism on economic growth, highlighting the close connection between developed societies and fossil fuels and their negative consequences on the environment.

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