RELATIONSHIP BETWEEN ECONOMIC GROWTH, TOURISM AND ENERGY CONSUMPTION: A REVIEW

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Extended Abstract

At the end of 2018, the Bulletin of the World Meteorological Organization on Greenhouse Gases (WMO, 2018) warned about a new growth of carbon dioxide (CO2) levels. In 2017, it had reached the value of 405.5 parts per million (pmm). One year later, it grew again, reaching the value of 407.4 ppm. These levels had not been known on the planet since 3-5 millions of years. Since 1990, the harmful particles increase has been 41% of the total radioactive forcing, causing the global warming effect.

Data continues showing a harmful particles growth, indicating that efforts to reduce greenhouse gases till now have not been enough. In fact, the recent IEA report (2019) indicates that global CO2 emissions related to energy increased by 1.7% in 2018, reaching a record high of 33.1 Gt of CO2. In this line, if the goal that temperatures do not rise more than 1.5ºC wants to be fulfilled, then, it is necessary to be carbon neutral in 2050 (report of the IPCC on Global Warming, 2018). This would require rapid and deep reductions in CO2 emissions and other greenhouse gases, which ultimately require major changes in the production and consuming patters in all economy.

The continuous CO2 emissions growth, mainly derived from the energy consumption increase associated with the world economic growth, seems to have no solution. This question has been awakening the interest of the scientific community for years, which tries to explain and analyze the link between CO2 emissions, energy consumption and economic growth in almost all economic sectors. The tourism sector is one of the

economic sectors that have received attention from the scientific community. In recent years, there has been an incipient interest growth in knowing the link between tourism activity economic growth, energy consumption and C02 emissions.

The importance of the tourism sector is notorious, as its economic activity, not only represents around 10% of world GDP and 7% of employment (UNWTO, 2018), but also the worldwide activity growth also increases. In 2017, according to the aforementioned report, international tourists increased by 7%, (reaching a total of 1326 million tourists), while total revenues from international tourism increased by 5% (reaching the value of 1.34 billions of US $).

Nevertheless, tourism economic growth also appears to be significantly responsible for the CO2 emissions growth (Sharpley and Telfer 2015). Thus, several studies have assessed the impact of tourism on the CO2 emissions and on the energy consumption. The UNEP and UNWTO (2007) report already offered some figures of the sector's contribution to climate change. The report showed that tourism was responsible for around 5% of worldwide CO2 emissions, contributing to 4.6% of global warming. Other valuations of tourism impacts on emissions have been also undertaken. For example the studies by Peeters & Dubois (2010) finds that tourist caused 4.4% of global CO_2 emissions in 2005, while the study by Scott et al. (2010) indicates that the contribution of tourism to climate change in terms of radioactive forcing was between 5.2 and 12.5% in the same year. Other studies show greater impacts. Thus, the recent study by Lenzen et al (2018) find that tourism account for about 8% of global greenhouse gas emissions. However, it is worth noting that these studies are difficult to compare because, as stated previously in Gossling (2013), they use different system boundaries and allocation principles. In any case, what is revealed is the important contribution of tourism to CO2 emissions. And even more, its tendency to a growing contribution. In that sense, the study by Lezen et al (2018) shows that tourism's global carbon footprint has increased from 3.9 to 4.5 GtCOe between 2009 and 2013, four times more than previously estimated.

Moreover, these studies that try to measure the proportion of CO2 emissions related to the tourism sector, other researchers have focused in the analysis of the relationships between emissions or /and energy consumption and tourism. Basically, the authors try

to find the causal relationships between these variables (and other in some cases as for example economic growth) and/or the long run functional relationships between them.

The aim of this study is to review the related existing literature, in order to highlight what is the state of art currently. The interest is clear, since the sector is a clear source of economic growth worldwide, but at the same time a great source of co2 emissions growth. To this end, studies that analyze the causality between emissions of CO2 (or energy consumption) and tourism and/or estimate in the long term the functional relationship between CO2 emissions (or energy consumption) and tourism are collected. This collection has been made thorough a related studies search. In a first phase, the search has been executed introducing in the Google Academic website words such as energy, tourism and emissions of CO2. Secondly, this search has been completed by reviewing the citations of the selected studied. From this search, the studies have been classified, according to several characteristics, extracting the main conclusions from them.

The number of studies found has been 56, mainly published since 2014. They can be classified into three types of studies; those that only investigates the causal relationships between variables (10 studies), those that only empirically determinate the long run estimates (20 studies), and those which combine both types of procedure (26). It is worth noting, that there are 18 studies which long run estimates can be considered special, as they define the emissions function in order to contrast the tourism EKC.

Regarding the results of the studies, those are presented depending on the basis method used. For the causalities studies, the unilateral relationships running from tourism to CO2 emissions is observed I 3 studies and the inverse in one. In addition, 2 studies confirms the causal relationships from tourism to energy consumption, 1 the inverse relationships and 3 the reciprocal relation.

Regarding the long run estimates that do not consider the EKC hypothesis, 6 studies indicate that tourism affects positively CO2 emissions growth, 3 studies indicate that tourism affects positively EC, 2 studies confirm that tourism reduces CO2 emissions and one that reduce energy consumption. The results for the estimates that consider the tourism EKC show that EKC hypothesis is confirmed in 3 studies, and some countries in other 3 studies. Regarding the behavior of the tourism variable in these studies, the

results are the following: Tourism affects positively CO2 emissions growth in 3 studies, tourism affects positively EC in 3 studies, and tourism reduces CO2 in 3 studies.

Regarding the 17 studies that combine causality test and long run estimates (but not KC), Tourism affects positively CO2 emissions growth in 10 studies; tourism affects positively energy consumption in 2 studies, and reduces CO2 in 4 studies. Likewise, the following causalities relationships are found: T→CO2 in 7 studies, CO2 → T in 3 studies, T↔CO2 in 3 studies, T→EC in 3 studies, T↔EC in 4 studies and EC → T in 3 studies. Finally, when considering these studies but including tourism EKC, the results of our study show that the hypothesis is confirmed in 5 studies, and in some countries in other 2 studies. In addition, the results also indicate that tourism affects positively CO2 emissions growth in 5 studies and reduces CO2 in 4 studies. Likewise, the casual relationships are the following, T→CO2 in 4 studies, CO2 → T in 1 study, T↔CO2 in 3 studies, T→EC in 3 studies and finally, EC → T in 1 study.

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