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# Tourism and Economic Growth: A Meta-regression Analysis

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## Abstract

Numerous studies have focused on delineating the relationship between tourism and economic growth. In this article, we present the results of a rigorous meta-regression analysis based on 545 estimates drawn from 113 studies that empirically tested the tourism-led growth hypothesis (TLGH). The results suggest the presence of publication bias in the literature on this topic, where the majority of studies report positive and statistically significant estimates. Findings provide support for the TLGH, but they also suggest that the estimates are sensitive to a number of factors that are related to country data, specification, and estimation characteristics, and time span. Such sensitivities suggest that greater emphasis should be placed on reporting estimates of the relationship between tourism and economic growth across a variety of methodological characteristics and specification and estimation choices. The implications of the results for theory development are also discussed.

## Keywords

economic growth, tourism-led growth hypothesis, meta-regression analysis, publication bias, methodology

## Introduction

For many countries, especially developing ones, tourism is an important source of revenue and impacts positively on the balance of payment and the living standard of the population (H. Liu and Song 2017; Paramati, Alam, and Chen 2017). The economic implications of tourism have provided researchers with several research opportunities such as one that underpins the investigation of the relationship between tourism and economic growth. The latter is commonly referred to in the literature as the tourism-led growth hypothesis (TLGH). Balaguer and Cantavella-Jordá (2002) were the first to develop and test the TLGH, providing the necessary theoretical and empirical foundation to researchers interested in this topic. Since then, a growing proportion of studies have tested the validity of the TLGH across several countries (e.g., De Vita and Kyaw 2017; Bilen, Yilanci, and Eryüzlü 2017; Inchausti-Sintes 2015; Paramati, Alam, and Chen 2017; C. F. Tang and Tan 2018; Zuo and Huang 2018).

However, findings have been mixed to date, leading researchers to question the validity of the TLGH. The various studies vary in terms of their geographical focus and in their methodological and estimation approaches (Brida, Cortes-Jimenez, and Pulinac 2016; Li, Jin, and Shi 2018; M. Liu and Jiang 2017). Researchers agree that such diversities that characterize the body of knowledge in this field may explain the mixed results obtained to date with respect to the validity of the TLGH (Castro-Nuño, Molina-Toucedo, and Pablo-Romero 2013; H. Liu and Song 2017). Methodological plurality and inconclusive findings are inherent to several fields, and they present a number of challenges for future studies. As Hunter, Schmidt, and Jackson (1982) noted, "studies will almost never be precisely comparable in design, measures, and so forth, and the findings will typically vary across studies in bizarre ways" (p. 129).

Therefore, it is difficult for researchers to make comparisons across studies and to unearth definite conclusions on the validity of the TLGH, which unfortunately limits the extent to which one can draw meaningful theoretical and methodological implications for one's own research. As a result, an integrative approach is needed to establish "generalizations

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about substantive issues from a set of studies directly bearing on those issues" (Jackson 1980, p. 438). In this context, a meta-analysis, also known as a quantitative research synthesis, becomes useful. The term *meta-analysis* is defined as "the statistical analysis of a large collection of results from individual studies for the purpose of integrating the findings. It connotes a rigorous alternative to the casual, narrative discussions of research studies which typify our attempt to make sense of the rapidly expanding research literature" (Glass 1976, p. 3). To allow researchers to systematically describe, identify, and analyze the variations in the results obtained by previous studies on the relationship between tourism and economic growth, this article uses a meta-regression analysis based on estimates extracted from existing studies on the TLGH. In so doing, the paper makes some important contributions to the literature.

Although a number of reviews on the relationship between tourism and economic growth have recently appeared in the literature (e.g., Brida, Cortes-Jimenez, and Pulinac 2016; Li, Jin, and Shi 2018; M. Liu and Jiang 2017; Pablo-Romero and Molina 2013; H. Song et al. 2012), they do not explore the outcomes of empirical studies in a systematic way. These reviews are merely narrative rather than meta-analytic (see Baumeister 2013), concluding that empirical results are sensitive to a number of factors such as the country's level of economic development, methodological approaches, and data estimation and specification characteristics. However, they do not quantify the influence of these factors on the regression coefficient of the relationship between tourism and economic growth. How the different country and methodological characteristics react and perform when included simultaneously as moderators in a multivariable regression model also remains to be investigated. In that instance, a meta-regression analysis provides answers to such questions by allowing an assessment between study-level covariates and effect size (Gursoy et al. 2018; Jackson 1980; Stanley et al. 2013).

To the authors' knowledge, the only meta-analysis article available on the TLGH to date is that of Castro-Nuño, Molina-Toucedo, and Pablo-Romero (2013). However, this study has a number of limitations. First, Castro-Nuño, Molina-Toucedo, and Pablo-Romero's (2013) meta-analysis investigates how the use of dynamic and nondynamic models influences the magnitude of the relationship between tourism and economic growth. Their study adopts a limited perspective of statistical heterogeneity arising from methodological diversity and specification characteristics that are inherent to studies included in a meta-analysis (S. G. Thompson and Higgins 2002). In contrast, a meta-regression analysis relates the effect size to one or more characteristics of the studies involved (S. G. Thompson and Higgins 2002). In the present study, we account for 41 moderators that have a bearing on the magnitude and direction of the relationship between tourism and economic growth. Second, Castro-Nuño, Molina-Toucedo, and Pablo-Romero's (2013) research is restricted to 11 studies (87 estimates) that utilized panel data only, while our study includes 545 estimates drawn from 113 articles that made use of cross-sectional, panel, or time series analysis. Therefore, our study is more inclusive and wider in scope.

Finally, our study is up-to-date as it includes articles on the topic that have been published from 1994 through to 2017, while Castro-Nuño, Molina-Toucedo, and Pablo-Romero's (2013) research is based on articles published until 2012 only. Furthermore, Castro-Nuño, Molina-Toucedo, and Pablo-Romero recommend that future meta-analysis should take into account tourist arrivals as well as tourism receipts as proxies for tourism development to have a clearer assessment of the relationship between tourism and economic growth. We incorporate this recommendation in our meta-regression analysis. Thus, our research builds upon existing reviews both in terms of scope and methodologic sophistication.

## Tourism and Economic Growth

Tourism was originally considered to be a nonproductive sector that makes a negligible economic contribution to destinations (Vanhove 2011). However, this view was quickly rejected as governments, practitioners, and researchers alike have come to realize the economic potential of tourism, spurring academic debates on the relationship between tourism and economic growth. Originally proposed by Balaguer and Cantavella-Jordá (2002), the TLGH provides the necessary theoretical underpinning that explains the contribution of tourism to the economic growth of destinations. The TLGH posits a unidirectional relationship running from tourism to economic growth. Accordingly, tourism expansion leads to an increase in foreign exchange that stimulates local production, generates employment, and provides the necessary financial resources for the development of capital goods useful for economic growth (Copeland 1991; De Vita and Kyaw 2017; Nunkoo and Ramkissoon 2011, 2012; Nunkoo and Gursoy 2012). Through the multiplier effect, development of tourism also stimulates other sectors such as agriculture, transport, food, and accommodation, generating additional production, consumption, income, and tax revenues that contribute further to the local economy. The TLGH also suggests that exogenous shocks such as an economic crisis has an adverse effect on tourism development.

The TLGH has received mixed support in the literature. While some studies confirm its validity (e.g., Arslanturk, Balcilar, and Ozdemir 2011; Brida, Lanzilotta, et al. 2010; H. Liu and Song 2017; Salifou and Haq 2017), others find an insignificant relationship (commonly referred to as the neutrality hypothesis) between tourism and economic growth (e.g., Singh et al. 2010), and even a negative relationship between the two variables under certain circumstances (e.g., Capo, Font, and, Nadal 2007). Drawing on the export-led hypothesis, another group of studies proves empirically that economic growth leads to tourism expansion, and not the opposite as postulated by the TLGH (e.g., Narayan 2004; Oh 2005). Some other researchers report a bidirectional relationship between tourism and economic growth (e.g., Dogru and Bulut 2018; Ridderstaat, Croes, and Nijkamp 2014). Other studies demonstrate that the relationship is conditional upon certain factors such as standard income determinants and institutional quality (e.g., Du, Lew, and Ng 2016; C. F. Tang and Tan 2018). The numerous empirical studies on this topic provides researchers with a rich body of knowledge that has in its own sake been the subject of systematic evaluations in the form of review articles.

For example, Brida, Cortes-Jimenez, and Pulina (2016) systematically analyzes more than 100 articles on the TLGH. The study suggests a wide geographical focus of research, with studies carried out in such countries as Brazil (Brida, Punzo, and Risso 2011), USA (H. C. H. Tang and Jang 2009), Mexico (Brida, Carrera, and Risso 2008), Nicaragua (Croes and Vanegas 2008), Australia (Corrie, Stoeckl, and Chaiechi 2013), Vietnam (Trang, Duc, and Dung 2013), and Malaysia (C. F. Tang 2013). In terms of data characteristics, studies have used cross-sectional (Po and Huang 2008), time-series (Arslanturk, Balcilar, and Ozdemir 2011; Brida, Barquet, and Risso 2010), or panel (Paramati, Alam, and Chen 2017). The empirical frameworks employed by researchers also differ considerably and include ordinary least squares (OLS) (Lee and Chang 2008), cointegration (Katircioglu 2009), generalized method of moment (GMM, Seetanah 2011), and vector error correction model (VECM, Al-mulali et al. 2014; Cortes-Jimenez and Pulina 2010).

The proxies for tourism also vary across the various studies and include tourist arrivals (Ghartey 2013; Tang and Abosedra 2014), tourism exports (Cortés-Jiménez, Nowak, and Sahli 2011), tourism receipts (Akinboade and Braimoh 2010; Belloumi 2010; Ridderstaat, Croes, and Nijkamp 2013), or tourism expenditure (Brida, Carrera, and Risso 2008; Schubert, Brida, and Risso 2011). As for the measurement of economic growth, studies have used GDP, GDP per capita, real GDP, or real GDP per capita (Brida, Cortes-Jimenez, and Pulina 2016). Similar reviews on the topic confirm the diversities in geographical and methodological characteristics and in the proxies used for tourism and economic growth (Li, Jin, and Shi 2018; Liu and Jiang 2017; Pablo-Romero and Molina 2013; H. Song et al. 2012).

The preceding discussions suggest that the literature offers little consensus concerning the most appropriate methodologies for testing the TLGH and the proxies for the tourism and economic growth variables. Researchers also use different measures and empirical frameworks to validate the TLGH. The implication of this is that like in any other empirical economic research, there are considerable variations among the reported results of the TLGH, requiring us to think about why researchers arrive at different findings when they are purportedly studying the same phenomenon. Such differences can be attributed to idiosyncratic choices of methodological approaches, statistical methods, and proxies used to operationalize different variables, and the unique characteristics of the data set (Brida, Cortes-Jimenez, and Pulina 2016; Stanley and Jarrell 1989; Zuo and Huang 2018). These variables inform the development of the meta-regression model of our study as we explain in the following section.

## Meta-regression Analysis

A meta-regression analysis can help to explain the extent to which the particular choice of data, specification techniques, and methodological approaches influence the reported results (Stanley 2001). To conduct the meta-regression analysis, we follow the well established guidelines outlined in Stanley et al.'s (2013) and Stanley's (2001) articles, both published in the *Journal of Economic Surveys*. The first step in a meta-regression analysis is to collect the maximum possible number of empirical studies on the topic. Therefore, we conduct a systematic search of the academic literature on the topic in Scopus, Google Scholar, and the major journal databases such as ScienceDirect, Wiley Online Library, Taylor and Francis, Springer, and others using the following keywords: "tourism" "economic growth"; "effect of tourism on economic growth"; "tourism-led growth hypothesis"; and "impact of tourism on the economy." We continue with the search process until no new studies could be found. The last study was added to our database on March 15, 2017. Conceptual papers and those written in languages other than English are excluded from our analysis. We retrieve 364 studies published between 1972 and 2017. As presented in Table 1, the sample comprises journal articles, conference proceedings, working papers, theses, and books/book chapters.

We then select articles to be included in the meta-regression analysis based on the following criteria: (1) the study must include a dependent variable describing economic growth; (2) the study must include an independent variable measuring tourism; (3) the study must report an empirical estimate measuring the effect of tourism on economic growth; and (4) the study must provide information on precision of estimates ($t$-statistics or standard errors). One hundred twenty (120) studies, consisting of 601 estimates of the effect of tourism on economic growth, meet these criteria. Following Havránek and Iršová (2011), we use the multivariate method of Hadi (1994) to jointly detect outliers in both the estimates and its precision (the inverse of the standard error). Through this procedure, we identify and delete 56 observations as outliers, reducing our sample to 113 studies and 545 estimates. The oldest study in this usable sample was published in 1994 and the most recent one in 2017. The final list of studies included in the meta-analysis is presented in Figure 1.

However, since the various studies have used different units of measurement and research designs, the estimates of the effect of tourism and economic growth are not comparable. Therefore, as recommended by Stanley and Doucouliagos

**Table 1.** Literature Sources.

| Sources | Number of Articles Retrieved |
|---|---|
| Academic Journals | |
| *Tourism Economics* | 37 |
| *Tourism Management* | 25 |
| *International Journal of Tourism Research* | 16 |
| *Annals of Tourism Research* | 14 |
| *Current Issues in Tourism* | 12 |
| *Journal of Travel Research* | 9 |
| *Anatolia* | 7 |
| *Economic Modeling* | 7 |
| *Applied Economics* | 6 |
| *Tourism Analysis* | 5 |
| *Economics Bulletin* | 5 |
| *Applied Economic Letters* | 4 |
| *Tourism Management Perspectives* | 3 |
| *Journal of Policy Research in Tourism, Leisure and Events* | 3 |
| *Procedia Economics and Finance* | 3 |
| *Quality & Quantity* | 3 |
| *Sustainability* | 3 |
| *The World Economy* | 3 |
| *Tourism and Hospitality Research* | 3 |
| *Other journals* | 121 |
| Other sources | |
| Working papers | 45 |
| Conference papers | 17 |
| Theses | 9 |
| Books | 4 |

(2012), we use the partial correlation coefficient (PCC) as the standardized effect size to summarize and compare the results from various studies. The PCC is comparable across studies and enables the most comprehensive data set to be compiled on a given stream of research (Hunter and Schmidt 1990; Rosenthal 1991). The PCC is calculated from the *t*-statistic of the reported regression estimate and the degrees of freedom of the *t*-statistic as follows:

$$PCC_{ij} = \frac{t_{ij}}{\sqrt{t_{ij}^2 + df_{ij}}}, \quad (1)$$

where $PCC_{ij}$ denotes the partial correlation coefficient from the *i*th regression estimate of the *j*th study; $t_{ij}$ is the associated *t* statistic; and $df_{ij}$ is the corresponding number of degrees of freedom of the respective *t* statistic. The sign of the PCC is analogous to that of the regression coefficient that measures the effect of tourism on economic growth.

## Preliminary Analysis

Figure 1 depicts the forest plot showing the individual estimates (symbolized as black dots) collected from the various studies included in our sample, after the removal of the outliers. In order to obtain an estimate of the average effect of tourism on economic growth from the literature, we use a random effect meta-analysis method (Field 2001). A random effect model is superior to a fixed effect model as it facilitates unconditional inferences that can be generalized beyond studies included in a meta-analysis (Field 2001). The random effect estimator yields an overall weighted mean of 0.380 with a 95% confidence interval (0.328, 0.433) for the effect of tourism on economic growth, indicating some elements of variability in the results of existing studies.

## Type I and Type II Publication Bias

Controlling for publication bias is an important exercise in a meta-regression analysis (McShane, Böckenholt, and Hansen 2016). Publication bias arises from the preferential reporting of statistically significant results. This distorts meta-analytic estimates for both the population average effect size and the degree of heterogeneity (McShane, Böckenholt, and Hansen 2016; Stanley and Doucouliagos 2014). There are two potential sources of publication bias. Type I publication bias exists when researchers are tempted to report a particular direction of the estimates. The presence of type I publication bias is usually assessed graphically using a funnel plot (Stanley and Doucouliagos 2010) as presented in Figure 2. The PCC of the estimates of tourism and economic growth and the precision (the inverse of the standard errors of the respective PCC) are measured on the horizontal and vertical axes, respectively. In the case of the absence of publication bias, the funnel plot is symmetrical, with most of the precise estimates close to the true effect, while the imprecise estimates disperse widely. As shown in Figure 2, the funnel plot does not appear to be symmetrical as the right portion of the graph is heavier than the left one, indicating the presence of type I publication bias. However, the interpretation of the funnel plot is rather subjective, requiring us to use a more formal method to assess publication bias (Iršová and Havránek 2013).

Therefore, following Stanley (2005), Havránek and Iršová (2011), and Iršová and Havránek (2013), we perform a funnel asymmetry test (FAT)–multiple regression analysis (MRA) to confirm the presence of type I publication bias and its true effect. Table 2 reports the results of the FAT-MRA. They indicate that the constant term is statistically significant and positive, confirming the result of the funnel asymmetry plot. Therefore, we conclude that positive estimates are preferably reported in publications on the TLGH. Moreover, the coefficient of the precision term is also statistically significant. This indicates that the majority of the studies published on the TLGH report a positive coefficient between tourism and economic growth, irrespective of the statistical significance of the relationship.

Type II publication bias occurs when there is a disproportionate likelihood for researchers to report significant results (Stanley 2005). Type II selection bias causes excessive

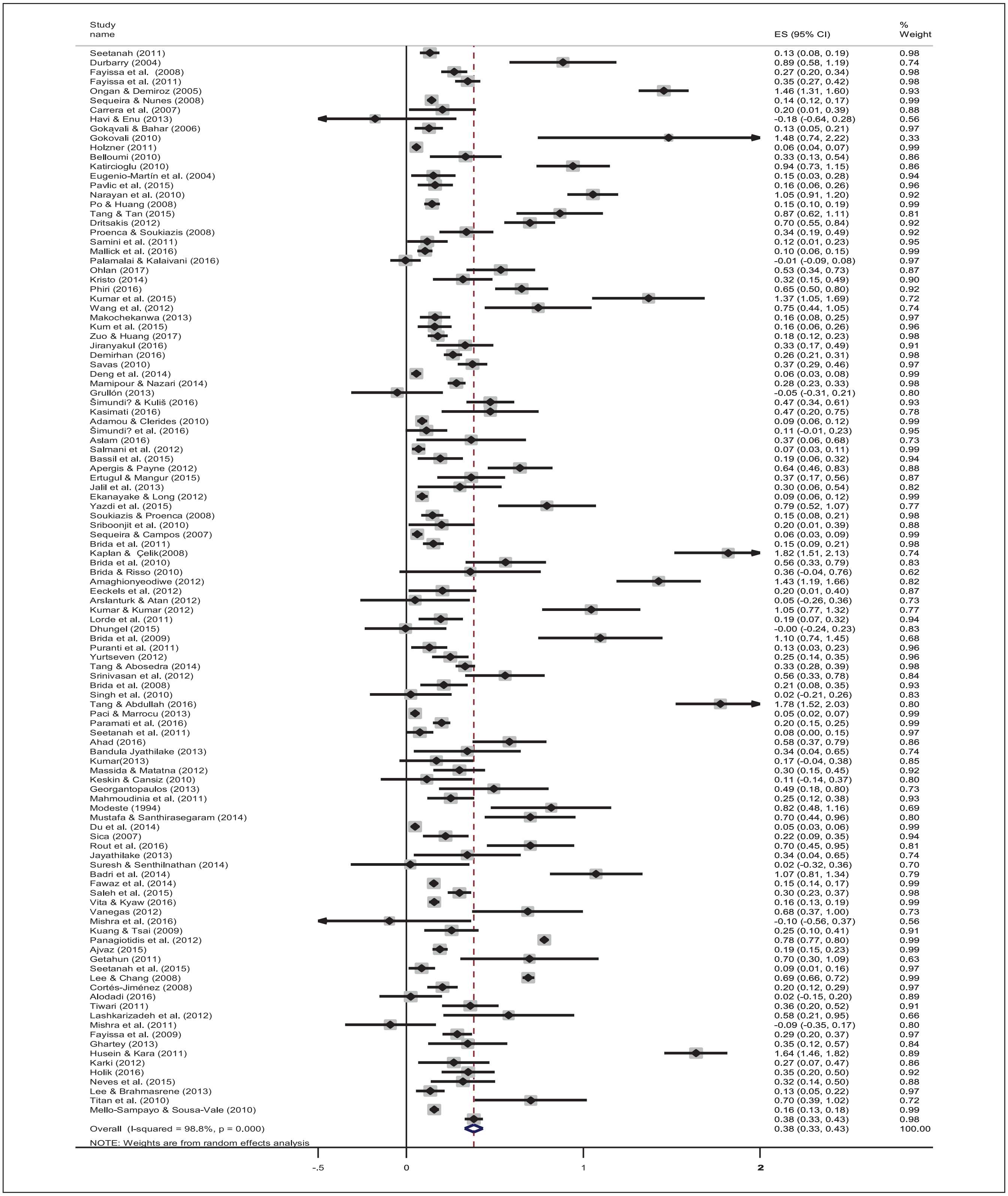


**Figure 1.** Forest plot of individual estimates.

variations, where large $t$ values (in magnitude) are reported and can be assessed using the Galbraith plot (Stanley 2005). A Galbraith plot is a scatter plot with the precision (inverse of the standard errors of the PCC) on the horizontal axis and

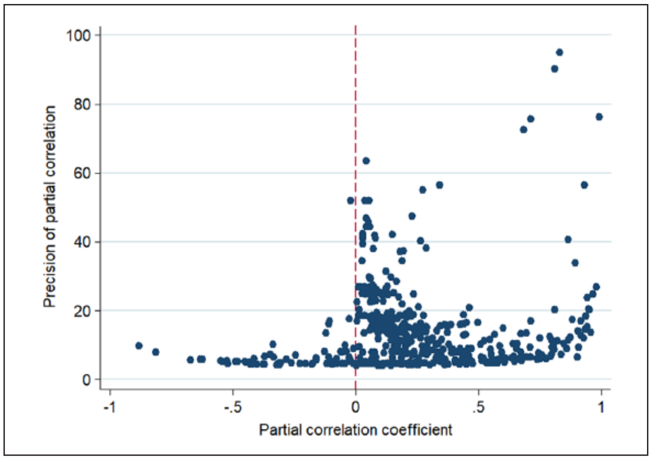


**Figure 2.** Funnel plot for tourism estimates.
Note: Dashed vertical line indicates a zero partial correlation coefficient.

the statistical significance (*t* statistics of the respective PCC) of the estimates on the vertical axis. In the case of an absence of type II publication bias, only 10% of the studies' *t* values should exceed 1.65 in absolute value. However, an inspection of the Galbraith plot in Figure 3 reveals that more than 10% of our sample (508 out of 545 observations) exceeds 1.65 in absolute value. In particular, more than 10% of the *t* statistics are not within the two-sided critical value of the 10% significance level. To confirm the presence of type II publication bias empirically, following Stanley (2005), we bring a minor modification to the FAT-MRA model by considering the magnitude of the reported effect. Results are presented in Table 2 and indicate that the constant is statistically significant and different from zero. Therefore, we conclude that empirical studies on the TLGH are more likely to report statistically significant results, irrespective of the direction of the effect, confirming the findings of the Galbraith plot.

Given these results, it is important to check whether publication bias in the data sample poses a threat to the meta-analysis results. Accordingly, we use two techniques, the Orwin Fail-Safe N (Orwin 1983) and the Fisher Fail-Safe N (Fisher 1992; see Rothstein, Sutton, and Borenstein 2006 for further details on their applications). The Orwin's Fail-Safe N value is 402, suggesting that there is a need for more than 400 studies averaging to zero to reduce the mean correlation to 0.04 (one-tenth of the standard deviations in the sample). On the other hand, the Fisher test value is 1861.39 (df = 226, $p < .0001$). It is clear that the probability we have missed such a significant number of studies is low. Therefore, we conclude that the estimates of the impact of tourism on economic growth are not susceptible to publication bias.

## Heterogeneity

A meta-analysis brings together inherently diverse studies giving rise to heterogeneity. The latter exists when the true effects that are evaluated differ between those studies. In the context of studies on TLGH, potential sources of heterogeneity relate to geographical characteristic and methodological approach (data characteristics, estimation methods, and model specification). To check for heterogeneity, we follow the steps adopted by Iršová and Havránek (2013). In our case, to verify whether the estimates of the relationship between tourism and economic growth differ, we use a sample of European countries. As shown in Figure 4, these estimates differ across those countries, with the values ranging from $<-0.01$ to $>0.08$. These results point toward the presence of heterogeneity, suggesting that the estimates are sensitive to a range of factors that need to be investigated.

Tourism researchers investigating the TLGH have to make many method choices concerning data, specification, and estimation that may have influenced the coefficient reported in studies (Brida, Cortes-Jimenez, and Pulina 2016; Zuo and Huang 2018). Therefore, to provide further confirmation of heterogeneity in our study sample, following Iršová and Havránek (2013), we test whether the methodology used by previous studies to estimate the relationship between tourism and economic growth influences the estimates reported in those studies. To this end, we use a single country, Turkey, as the sample. In our data set, there are seven studies on Turkey that utilize different methodological approaches to test the TLGH. Results are presented in Figure 5 and they indicate that the size of the estimate is a function of the methodological approaches used in the study. The results suggest that even the results of studies based on a single country differ: from positive to negative; from negligible to economically significant. Therefore, it is important that we control for the methodological approaches used by previous studies in the meta-regression analysis.

## Moderator Variables

Identifying moderators is an important step in a meta-regression analysis. As Hall and Rosenthal (1991) argue, "meta-analysts have always looked for moderator variables—that is, characteristics of studies or their samples that are correlated with the studies' results" (p. 438). An effect size (coefficient) indicates the magnitude and direction of the relationship between two variables. In a meta-regression analysis, any variable that influences that effect size is a moderator. These moderators can be, among others, the independent and/or the dependent variables because the way researchers operationalize them may influence the size of the reported coefficient for that relationship in a study (Stanley 2001; Valickova, Havránek, and Horvath 2015). Therefore, investigating moderator effects in a meta-regression analysis means checking whether the estimates are different across the various subgroups, and in so doing, it implies a comparison of the average effect across subgroups of studies (Hall and Rosenthal 1991). Drawing on our previous discussions on the theoretical and empirical foundations of the relationship between tourism and economic growth (e.g., Brida,

**Table 2.** Funnel Asymmetry Test.

| | Coefficient | Robust Standard Error | *p* Value |
|---|---|---|---|
| Test for type I publication bias (equation: $t_k = \beta_0 + \beta_1 \left(1/SE_{pcc_k}\right) + \varepsilon_k$) | | | |
| Precision (true effect beyond bias) | 0.0473 | 0.0103 | 0.000*** |
| Constant (publication selection bias) | 1.6426 | 0.1665 | 0.000*** |
| Observations | 545 | | |
| Studies | 113 | | |
| Test for type II publication bias (equation: $\lvert t_k \rvert = \beta_0 + \beta_1 \left(1/SE_{pcc_k}\right) + \varepsilon_k$) | | | |
| Precision (true effect beyond bias) | 0.0244 | 0.0084 | 0.004** |
| Constant (publication selection bias) | 2.3190 | 0.1272 | 0.000*** |
| Observations | 545 | | |
| Studies | 113 | | |

Note: The response variable is the *t* statistic of the estimated coefficient on tourism, which are estimated using the mixed effects model with robust standard error.
**$p < 0.01$; ***$p < 0.001$.

Cortes-Jimenez, and Pulina 2016; Li, Jin, and Shi 2018; H. Liu and Jiang 2017; Paramati, Alam, and Chen 2017; Zuo and Huang 2018), we identify 41 variables that may influence the regression coefficient reported in the various studies on the TLGH. We group them under the following five categories: country characteristics; data characteristics; specification characteristics; estimation characteristics; and publication characteristics. These are described in Table 3.

### *Meta-regression Model Building*

To investigate the influence of the moderator variables on the reported estimate of the effect of tourism on economic growth, we use a meta-regression based on the approach of Valickova, Havranek, and Horvath (2015), H. Doucouliagos and Paldam (2008), and H. Doucouliagos and Stanley (2009). The meta-regression model is represented as follows:

$$PCC_{ij} = \alpha + \sum_{k=1}^{N} \beta_k X_{ijk} + \varepsilon_{ij}, \tag{2}$$

where $PCC_{ij}$ denotes the PCC from the *i*th regression estimate of the *j*th study; $X$ is a set of explanatory variables that are assumed to influence the reported estimates; $N$ denotes the total number of moderator variables and $\varepsilon_{ij}$ is the error term. However, due to the presence of publication selection bias in our sample, equation (2) cannot be employed. Thus, in order to model and correct publication selection bias, we utilize the following meta-regression model, as recommended by Stanley, Doucouliagos, and Jarrell (2008):

$$PCC_{ij} = \beta_0 + \beta_1 SE_{pcc_{ij}} + \sum_{k=1}^{N} \beta_k X_{ijk} + \varepsilon_{ij}, \tag{3}$$

where $PCC_{ij}$ denotes the PCC from the *i*th regression estimate of the *j*th study; $SE_{pcc_{ij}}$ is the standard error of the respective PCC; $X$ is a set of explanatory variables that are proposed to influence the reported estimates; $N$ denotes the total number of moderator variables; and $\varepsilon_{ij}$ is the error term. However, equation (3) is heteroscedastic (see Valickova, Havránek, and Horvath 2015). Following Havránek and Iršová (2011) and Valickova, Havránek, and Horvath (2015), to correct for heteroscedasticity, we divide equation (3) by the standard error of the respective PCC. This method is known as the weighted least square (WLS) method.

$$t_{ij} = \beta_1 + \frac{\beta_0}{SE_{pcc_{ij}}} + \sum_{k=1}^{N} \frac{\gamma_k X_{ijk}}{SE_{pcc_{ij}}} + \epsilon_{ij}, \tag{4}$$

where $t_{ij}$ represents the *t* statistic of the PCC from the *i*th regression estimate of the *j*th study, $SE_{pcc_{ij}}$ is the standard error of the respective PCC, $X$ is a set of explanatory variables that are assumed to influence the reported estimates, $N$ denotes the total number of moderator variables, and $\epsilon_{ij}$ are the estimate-level disturbances.

Since our data set is likely to be characterized by heteroscedasticity, employing the OLS method to estimate equation (4) will lead to biased results. Instead, we employ the mixed effects model to estimate equation (4). Since we extract more than one observation of tourism estimates from the same study, it is important to take into consideration that the estimates of one study are likely to be dependent on a range of factors (Disdier and Head 2008; Havránek and Iršová 2011). Thus, we employ the mixed effects model to cater for within-study dependence (H. Doucouliagos and Stanley 2009). A mixed effects model consists of a mixture of both fixed effects and random effects. As such, it allows us to cater for both within-study dependence and unobserved between-study variations. In contrast to an OLS, the mixed effects model allows for unobserved between-study heterogeneity by giving each study approximately the same weight (H. Doucouliagos and Stanley 2009; Rabe-Hesketh and Skrondal 2008). The mixed effect model can be expressed as follows:

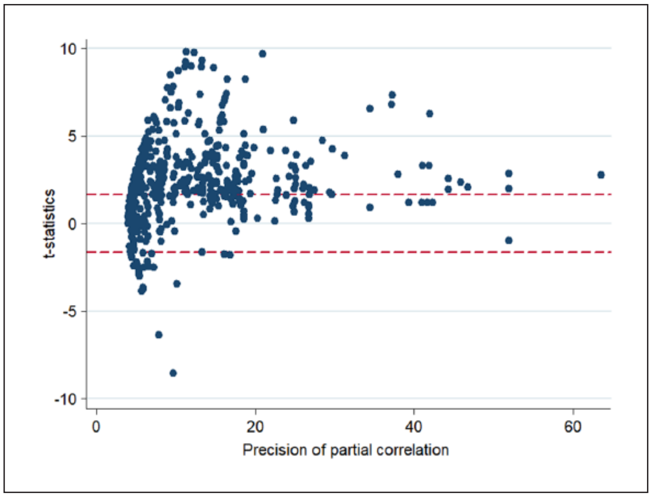


**Figure 3.** Galbraith plot for tourism estimates.
Note: Dashed horizontal lines indicate the thresholds of two-sided critical values at the 10% significance level ±1.65.

$$t_{ij} = \beta_1 + \frac{\beta_0}{SE_{pcc_{ij}}} + \sum_{k=1}^{N} \frac{\gamma_k X_{ijk}}{SE_{pcc_{ij}}} + \zeta_j + \upsilon_{ij}, \quad (5)$$

where $t_{ij}$ represents the $t$ statistic of the PCC from the $i$th regression estimate of the $j$th study, $SE_{pcc_{ij}}$ is the standard error of the respective PCC, $X$ is a set of explanatory variables that are assumed to influence the reported estimates, $N$ denotes the total number of moderator variables, $\zeta_j$ and $\nu_{ij}$ are the study-level random effects and estimate-level disturbances, respectively.

Another important consideration that arises after the specification of the meta-regression model is to determine which moderator variables should be included in the regression models. The inclusion of all the 41 moderators in the models would lead to spurious regressions. Moreover, the 41 moderator variables imply $2^{41}$ possible combinations, which is statistically impossible to enumerate. This is conceptually known as model uncertainty (Fernandez, Ley, and Steel 2001). As a result, we use the Bayesian model averaging (BMA) method. This method estimates many models consisting of possible subsets of the explanatory variables (moderator variables) and it constructs a weighted average over the best models. These weights are known as the posterior model probabilities. The higher the posterior model probability, the better the model fits the data. Moreover, the BMA also provides information about how likely an explanatory variable (a moderator variable) can be included in the "true" regression. This is represented by the posterior inclusion probability (PIP), which can be interpreted as the probability that a particular variable (moderator) is included in the regression (Havránek and Iršová 2011). PIP is calculated by the sum of probabilities of models including the particular moderator variable (Cuaresma, Fidrmuc, and Hake 2014). Eicher, Papageorgiou, and Raftery (2011) consider PIP values between 15% and 75%, 75% and 95%, and 95% and 99% and those greater than 99% as weak, substantial, strong, and decisive, respectively.

We use the *bms* package in the R software to understand which moderator variables are likely to have a statistically significant influence on the estimates. Results of the BMA estimation are presented in Table 4, and a graphical representation of the BMA estimation is shown in Figure 6. The PIP expresses how likely a variable should be included in the "true" regression. It can be observed that some of the variables have a PIP value of lower than 0.1, suggesting that they may be unimportant (Iršová and Havránek 2013). Seventeen moderators have a PIP value of between 0.1 and 1, suggesting that they may have influenced the reported coefficients of the effect of tourism on economic growth. These moderators include two country characteristics (geographical distance and exchange rate), two variables from the data characteristics (time series and observation), eight variables from the specification characteristics (real GDP, GDP, international tourism receipts, per capita international tourism receipts, tourism revenues, tourism receipts as % of exports, tourism receipts as % of GDP, and long run), four variables from the estimation characteristic category (generalized least squares [GLS], autoregressive distributed-lagged model [ARDL], error correction model [ECM], and fully modified ordinary least square [FMOLS]), and one variables from the publication characteristics category (crisis). The posterior mean of the regression coefficients shows the direction of the effect of the variables. For instance, a negative posterior mean suggests that the variable has a negative effect on the estimate. To control for publication bias, we utilize a WLS model estimated using the mixed effect model with robust standard error (Stanley and Doucouliagos 2015, 2017). Here, we include only those variables with a PIP value of greater than 0.1. Results are provided in Table 4.

## Results and Discussion

Following Riley, Higgins, and Deeks (2011) and Borenstein et al. (2010), we employ a random effects model to provide an overall estimate of the average effect of tourism on economic growth. A random effects model takes into account that the true effect sizes vary from study to study (Borenstein et al. 2010). Findings from the random effects analysis of the tourism estimates extracted from the 113 studies yield a PCC of 0.380 ($p < 0.001$), with a confidence interval of 0.328 to 0.433. According to H. Doucouliagos (2011), PPC values of greater than ±0.33 in a meta-analysis in empirical economics is considered to be "large" (p. 10). Therefore, this meta-regression analysis finds empirical evidence supporting the relationship between tourism and economic growth. The finding corroborates the results of studies that validate the TLGH (e.g., Antonakakis et al. 2016; Bilen, Yilanci, and Eryüzlü 2017; Brida and Risso 2009; Salifou and ul Haq 2017; Tang

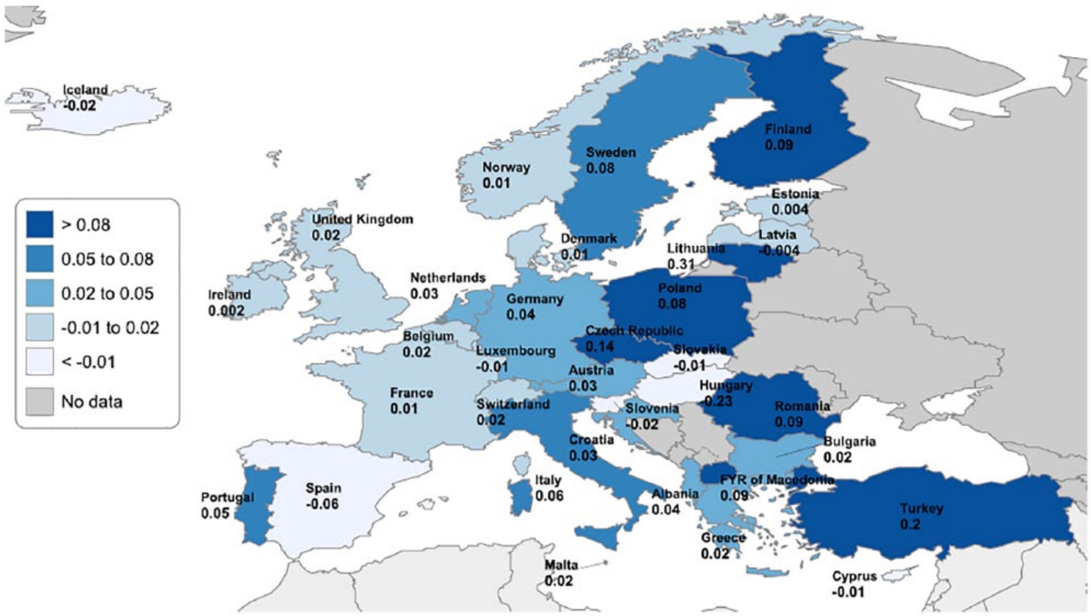


**Figure 4.** Country heterogeneity in the estimates of the impact of tourism on economic growth.

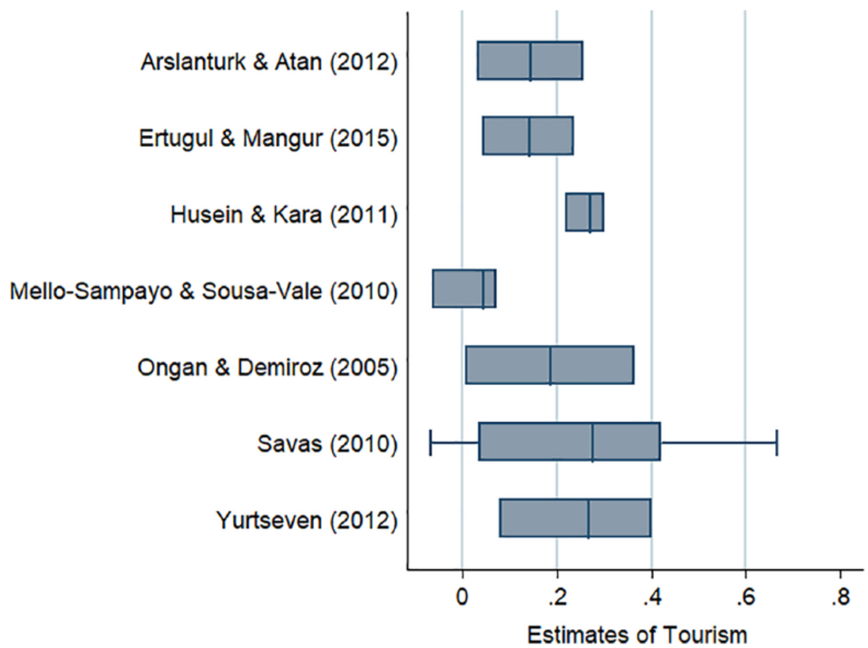


**Figure 5.** Method heterogeneity in the estimates of the impact of tourism on economic growth.

and Tan 2013). There are several important inferences that we draw from results, requiring researchers to interpret the findings of existing studies on TLGH with care.

One of them relates to publication bias that has been found to be problematic in several fields of research such as education (Cook and Therrien 2017), management (Harrison et al. 2017), biomedical (Easterbrook et al. 1991), and economics (H. Doucouliagos and Stanley 2009). However, there has been little discussions of publication bias in tourism research. Our empirical results confirm the presence of publication bias, suggesting that studies predominantly report a positive and significant relationship between tourism and economics

**Table 3.** Descriptions of Variables.

| Moderator Variables | Description |
|---|---|
| PCC | The partial correlation coefficient derived from the estimate of the tourism economic growth relationship |
| $1/Se_{PCC}$ | The precision of the partial correlation coefficient |
| *t* statistics | The *t* statistic of the estimated coefficient of tourism on exchange rate |
| Country characteristics | |
| Geographical distance | The logarithm of the country's tourist arrivals weighted by the distance of the destination country from the countries of origin of the tourists (kilometres). |
| Relative tourism prices | The logarithm of the consumer price index of the destination country adjusted by US$ exchange rate. |
| Foreign spending | The logarithm of the visitor exports in the destination (US$ billion). |
| Tourism consumption | The logarithm of the destination country's internal travel and tourism consumption (US$ billion). |
| Exchange rate | The logarithm of the real effective exchange rate of the destination country |
| GDP per capita_Des | The logarithm of the GDP per capita (constant US$) of the destination country |
| Developing | =1 if the study was conducted in a developing country (developed countries as the benchmarks) |
| Tourism income | The logarithm of the GDP per capita of the country of origin of the tourists |
| Data characteristics | |
| Panel data | =1 if panel data are used |
| Time series | =1 if time series data are used |
| Cross section | The number of cross sections included in the study |
| Observation | The number of years used in the study's analysis |
| Specification characteristics | |
| GDP | =1 if the GDP is used as a proxy |
| Real GDP | =1 if the real GDP is used as a proxy |
| GDP per capita | =1 if the GDP per capita is used as a proxy |
| Real GDP per capita | =1 if the real GDP per capita is used as a proxy |
| International tourism receipts | =1 if international tourism receipts is used as a proxy |
| Real international tourism receipts | =1 if real international tourism receipts is used as a proxy |
| Per capita international tourism receipts | =1 if per capita international tourism receipts is used as a proxy |
| Tourism revenues | =1 if tourism revenues is used as a proxy |
| Tourism expenditures | =1 if tourism expenditure is used as a proxy |
| No. of international tourist arrivals | =1 if number of international tourist arrivals is used as a proxy |
| Total tourist arrivals | =1 if total tourist arrivals is used as a proxy |
| Per capita tourist arrivals | =1 if per capita tourist arrivals is used as a proxy |
| Tourism receipts as % of exports | =1 if tourism receipts as a percentage of exports is used as a proxy |
| Tourism receipts as % of GDP | =1 if tourism receipts as a percentage of GDP is used as a proxy |
| Long-run | =1 for long-run estimates (short-run estimates are the benchmarks) |
| Estimation characteristics | |
| Log | =1 if the regression was estimated within a log-log specification |
| OLS | =1 if ordinary least squares (OLS) are used for the estimation of the regression coefficients |
| Fixed effect | =1 if the fixed effect estimator is used for the estimation of the regression coefficients |
| Random effect | =1 if the random effect estimator is used for the estimation of the regression coefficients |
| Pooled OLS | =1 if the pooled OLS is used for the estimation of the regression coefficients |
| GLS | =1 if the generalized least square (GLS) is used for the estimation of the regression coefficients |
| DOLS | =1 if dynamic ordinary least squares are used for the estimation of the regression coefficients |
| ARDL | =1 if the autoregressive distributed lag model is used for the estimation of the regression coefficients |
| GMM | =1 if the generalized method of moments (GMM) is used for the estimation of the regression coefficients |

*(continued)*

**Table 3. (continued)**

| Moderator Variables | Description |
|---|---|
| VECM | =1 if the vector error correction model is used for the estimation of the regression coefficients |
| ECM | =1 if the error correction model is used for the estimation of the regression coefficients |
| FMOLS | =1 if the fully modified ordinary least squares method is used for the estimation of the regression coefficients |
| Publication characteristics | |
| Year | The year of publication of the study |
| Crisis | =1 if the study included in its sample the years of the recent economic crisis (2008-2011) |

Note: Data Sources: World Tourism Organization; World Development Indicators; international financial statistics www.cepii.fr and www.bruegel.org. For country-level variables, we used values for 2011, the median year of the data used in the primary studies; multicollinearity: to cater for multicollinearity, the variables under each category (e.g., country characteristics, data characteristics, and specification characteristics) include only those that were retained after removal of those variables that had the least number of observations. PCC = partial correlation coefficient.

**Table 4.** Bayesian Model Averaging.

| | Bayesian Model Averaging (BMA) | | |
|---|---|---|---|
| Response Variable: PCC | PIP | Post. Mean | Post. Std. |
| Country characteristics | | | |
| Geographical distance | 0.9917 | −0.0264 | 0.0075 |
| Relative tourism prices | 0.0678 | −0.0007 | 0.0034 |
| Foreign spending | 0.0120 | 6.08e–06 | 0.0011 |
| Tourism consumption | 0.0119 | −3.06e–06 | 0.0010 |
| Exchange rate | 0.6410 | 0.2315 | 0.2037 |
| GDP per capita_Des | 0.0132 | −8.01e–05 | 0.0017 |
| Developing | 0.0253 | 0.0010 | 0.0085 |
| Tourism income | 0.0135 | 0.0001 | 0.0032 |
| Data characteristics | | | |
| Panel data | 0.0429 | −0.0028 | 0.0165 |
| Time series | 0.1670 | 0.0169 | 0.0418 |
| Observation | 0.8278 | −0.0343 | 0.0196 |
| Cross section | 0.0204 | −3.50e–06 | 4.62e–05 |
| Specification characteristics | | | |
| GDP | 0.7938 | 0.1120 | 0.0691 |
| Real GDP | 0.2539 | −0.0264 | 0.0500 |
| GDP per capita | 0.0182 | −0.0005 | 0.0065 |
| Real GDP per capita | 0.0266 | 0.0011 | 0.0093 |
| International tourism receipts | 0.9480 | 0.1349 | 0.0491 |
| Real international tourism receipts | 0.0126 | 8.77e–05 | 0.0088 |
| Per capita international tourism receipts | 0.7022 | 0.0999 | 0.0765 |
| Tourism revenues | 0.1556 | −0.0138 | 0.0371 |
| Tourism expenditure | 0.0430 | 0.0039 | 0.0228 |
| Number of international tourist arrivals | 0.0268 | 0.0006 | 0.0104 |
| Total tourist arrivals | 0.0910 | −0.0102 | 0.0379 |
| Per capita tourist arrivals | 0.0690 | −0.0085 | 0.0370 |
| Tourism receipts as % of exports | 0.6499 | −0.1277 | 0.1105 |
| Tourism receipts as % of GDP | 0.4835 | −0.0743 | 0.0874 |
| Long-run | 0.9994 | 0.1589 | 0.0402 |
| Estimation characteristics | | | |
| Log | 0.0142 | 0.0020 | 0.0049 |
| OLS | 0.0165 | 0.0005 | 0.0074 |
| Fixed effect | 0.0940 | −0.0079 | 0.0288 |

*(continued)*

**Table 4. (continued)**

| Response Variable: PCC | Bayesian Model Averaging (BMA) PIP | Post. Mean | Post. Std. |
|---|---|---|---|
| Random effect | 0.0173 | −0.0007 | 0.0110 |
| Pooled OLS | 0.0491 | 0.0038 | 0.0205 |
| GLS | 0.3113 | −0.0425 | 0.0716 |
| DOLS | 0.0186 | 0.0099 | 0.0116 |
| ARDL | 1.0000 | 0.2893 | 0.0548 |
| GMM | 0.0188 | −0.0006 | 0.0079 |
| VECM | 0.0124 | 0.0001 | 0.0060 |
| ECM | 0.2174 | 0.0384 | 0.0830 |
| FMOLS | 0.9579 | 0.1107 | 0.0411 |
| Publication characteristics | | | |
| Year | 0.0891 | 0.0009 | 0.0033 |
| Crisis | 1.0000 | −0.1682 | 0.0354 |
| No. of observations | 545 | | |

Note: All computations for the BMA are based on birth–death Markov-chain Monte Carlo (MCMC), Zellner's *g* benchmark prior structure, uniform model prior with 100,000 burn-ins and 2,000,000 iterations. PCC = partial correlation coefficient; PIP = posterior inclusion probability; GDP = gross domestic product; OLS = ordinary least squares; GLS = generalized least squares; DOLS = distributed ordinary least squares; ARDL = autoregressive distributed-lagged model; GMM = generalized method of moment; VECM = vector error correction model; ECM = error correction model; FMOLS = fully modified ordinary least square.

**Table 5.** Meta-regression Results (With Robustness Check).

| Response Variable: *t* Statistics | Mixed Effects ML Coefficient | Mixed Effects ML Robust Standard Error | OLS Coefficient | OLS Robust Standard Error | IV-2SLS Coefficient | IV-2SLS Robust Standard Error |
|---|---|---|---|---|---|---|
| Constant | −5.3012*** | 0.6677 | −5.3012*** | 0.6690 | −5.3012*** | 0.6671 |
| $1/Se_{PCC}$ | 2.8173*** | 0.8532 | 2.8173*** | 0.8676 | 2.8173*** | 0.8524 |
| Country characteristics | | | | | | |
| Geographical distance | 0.0057 | 0.0064 | 0.0057 | 0.0065 | 0.0057 | 0.0064 |
| Exchange rate (unit) | −0.3309* | 0.1775 | −0.3309* | 0.1805 | −0.3309* | 0.1773 |
| Data characteristics | | | | | | |
| Time series | 0.0919 | 0.0672 | 0.0919 | 0.0683 | 0.0919 | 0.0671 |
| Observation | −0.1627*** | 0.0194 | −0.1627*** | 0.0197 | −0.1627*** | 0.0193 |
| Specification characteristics | | | | | | |
| GDP | −0.3844*** | 0.0690 | −0.3844*** | 0.0701 | −0.3844*** | 0.0689 |
| Real GDP | −0.0195 | 0.0460 | −0.0195 | 0.0467 | −0.0195 | 0.0460 |
| International tourism receipts | 0.1969 | 0.0388 | 0.1969 | 0.0394 | 0.1969 | 0.0388 |
| Per capita international tourism receipts | 0.1235** | 0.0603 | 0.1235** | 0.0613 | 0.1235** | 0.0602 |
| Tourism revenues | 0.0593 | 0.0524 | 0.0593 | 0.0533 | 0.0593 | 0.0524 |
| Tourism receipts as % of exports | −0.0638** | 0.0286 | −0.0638** | 0.0291 | −0.0638** | 0.0286 |
| Tourism receipts as % of GDP | −0.0160 | 0.0262 | −0.0160 | 0.0266 | −0.0160 | 0.0262 |
| Long-run | 0.0917*** | 0.0355 | 0.0917*** | 0.0361 | 0.0917*** | 0.0355 |
| Estimation characteristics | | | | | | |
| GLS | −0.0147 | 0.0218 | −0.0147 | 0.0222 | −0.0147 | 0.0218 |
| ARDL | 0.3391*** | 0.0721 | 0.3391*** | 0.0733 | 0.3391*** | 0.0720 |
| ECM | 0.0303 | 0.0780 | 0.0303 | 0.0793 | 0.0303 | 0.0779 |
| FMOLS | 0.2122*** | 0.0591 | 0.2122*** | 0.0601 | 0.2122*** | 0.0591 |
| Publication characteristics | | | | | | |
| Crisis | −0.0315 | 0.0268 | −0.0315 | 0.0273 | −0.0315 | 0.0268 |
| No. of observations | 545 | 545 | 545 | | | |

Note: The regression model includes only variables with a PIP greater than 0.1. ML = maximum likelihood; OLS = ordinary least squares; IV-2SLS = instrumental variable for two-staged least squares; GDP = gross domestic product; GLS = generalized least squares; ARDL = autoregressive distributed-lagged model; ECM = error correction model; FMOLS = fully modified ordinary least square. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

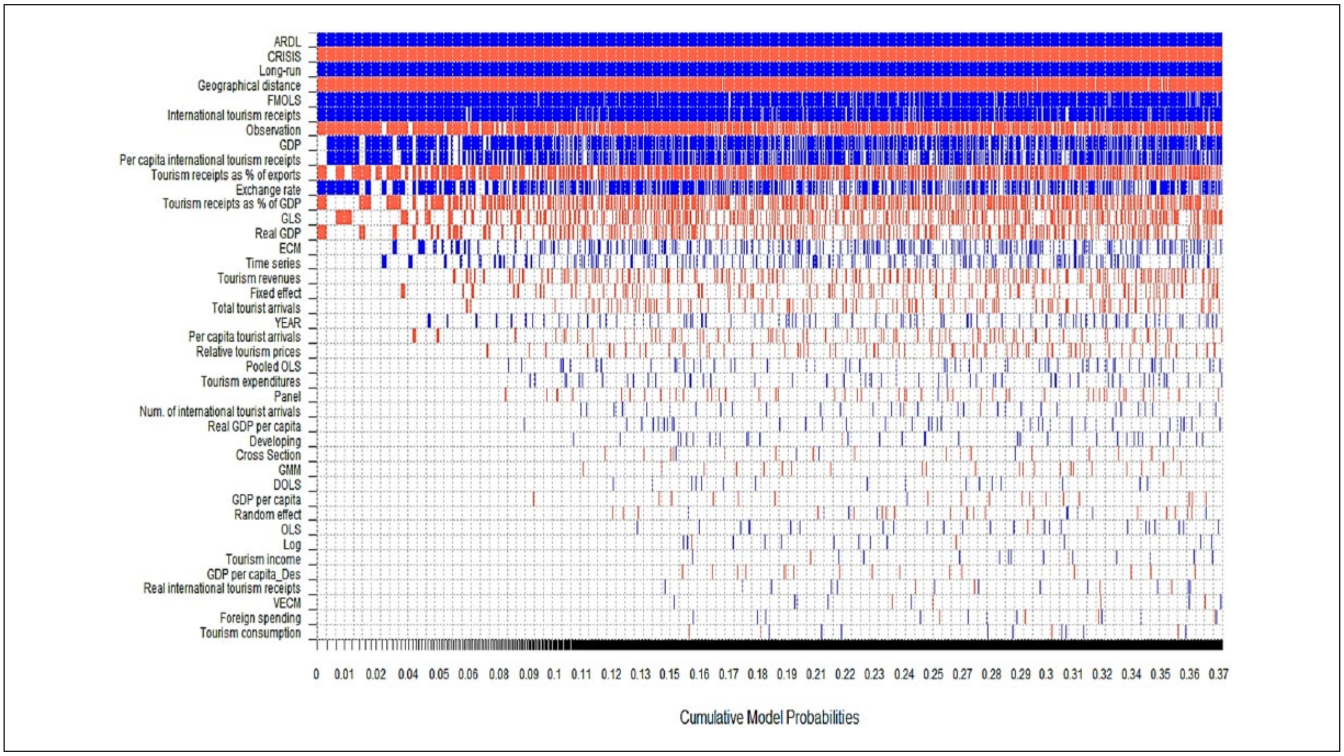


**Figure 6.** Bayesian model averaging (BMA) model inclusion for the tourism and economic growth nexus.
Note: Response variable: partial correlation coefficient (PCC). Columns denote individual models. The variables are sorted in descending order of posterior inclusion probabilities. A blue-shaded cell implies that the variable is included with a positive estimated sign; a red-shaded cell implies that the variable is included with a negative estimated sign; and a blank cell implies that the variable is not included.

growth in support for the TLGH. Researchers may have been tempted to report the "good news" that supports the theoretical postulates of the TLGH in contrast to skeptical findings. Such actions are often motivated by factors such as the researchers' personal agenda, editors' agenda, and organizations' political and ideological view points on certain issues (Neuliep and Crandall 1993; Rothstein, Sutton, and Borenstein 2006; Shadish et al. 2016). However, the problem lies majorly with authors who chose not to publish studies with trivial or null findings (Gage, Cook, and Reichow 2017).

Similarly to our study, Castro-Nuño, Molina-Toucedo, and Pablo-Romero's (2013) meta-analysis also confirms the presence of publication bias in the literature on tourism and economic growth. Therefore, it is not surprising to find the bulk of studies reporting that tourism contributes positively to economic growth, with some few notable exceptions (Brida, Cortes-Jimenez, and Pulina 2016; Li, Jin, and Shi 2018). For example, Pablo-Romero and Molina (2013) reviewed empirical research findings in a sample of 87 studies, and found that 55 of them report a significant and positive relationship between tourism and economic growth, while only four identify an insignificant relationship between the two variables. Brida et al.'s (2016) synthesis of more than 100 studies also suggests that very few studies find an insignificant relationship between tourism and economic growth. While the argument we advance here about publication bias may be new to the tourism and economic growth literature, the problem is common across other areas of research in empirical economics (C. Doucouliagos and Stanley 2013). For example, C. Doucouliagos (2005) identifies substantial bias in the literature on the relationship between foreign aid and economic growth, while H. Doucouliagos and Paldam (2008) report bias in studies on the influence of aid effectiveness on growth. In the light of these findings, it seems reasonable to argue that while there is an authentic link between tourism and economic growth for many countries, we cannot ignore the possibility that researchers may "hide" in their file drawers results that are insignificant or contradict theoretical expectations, and search for results that are easier to publish.

Table 5 presents the meta-regression results (with robustness check). The finding suggests that the estimate of the relationship between tourism and economic growth is sensitive to a number of factors. The estimate of the TLGH is sensitive to the exchange rate of the destination. A 1 percent increase in the exchange rate of the destination reduces the estimate by 0.3309 unit. Indeed, tourism demand has been found to be susceptible to exchange rate fluctuations. An appreciation of a destination's currency influences the tourism sector adversely by decreasing tourist arrivals, length of stay, and tourist spending (Chi 2015; De Vita 2014; Demir and Gozgor 2018; Falk 2015; Stauvermann et al. 2018).

These have the combined effect of weakening the impact of tourism on economic growth.

The number of observations a study uses influences the reported estimate. Studies using a larger set of observations to test the TLGH are likely to report lower estimates. A one unit increase in the number of observations decreases the estimate by 0.1627 unit. From a statistical standpoint, this is because at a constant *p* value, effect size declines as a function of the number of observations (Greenwald et al. 1996). Our finding is consistent with Valickova et al. (2015), who find that the coefficient of the relationship between financial development and economic growth is influenced by the number of observations used. Although studies on the TLGH that are based on large observations have several advantages, they are likely to report statistically significant results with lower effect sizes at a constant *p* value than studies using smaller observations. Thus, the marginally significant effect of tourism on economic growth observed in studies may mean that, in reality, the relationship may be quite modest and might almost be trivial at the individual country level. This is because statistical significance testing is designed for use in small samples rather than large samples (Kaplan, Chambers, and Glasgow 2014). Thus, in order to achieve the same *p* value, the effect size for studies on the TLGH that are based on a smaller set of countries would need to be significantly larger than studies using a bigger set of observations.

The choice of proxy for tourism and economic growth has some consequences on the reported estimate. Use of GDP as a proxy for economic growth lowers the estimate by approximately 0.3844 unit. On the other hand, the use of real GDP, GDP per capita, or real GDP per capita as proxies for economic growth does not have a significant influence on the reported estimate. Regarding the proxy for tourism, use of per capita tourism receipts increases the estimate by 0.1235 units, while the use of tourism receipts as a percentage of export lowers the estimate by 0.0638 units. Thus, the ways in which variables are measured in a study influence the reported coefficient, a finding consistent with the results of meta-analysis in other areas of empirical economics. For example, Valickova et al.'s (2015) study finds that the measure used to approximate financial development influences the magnitude of its relationship with economic growth. Other meta-analytic studies conclude with similar findings (Havránek 2015).

Some studies investigate the relationship between tourism and growth, differentiating between the short and the long run (Brida, Cortes-Jimenez, and Pulina 2016; Pablo-Romero and Molina 2013). We find that the estimate for the long-run effect of tourism on economic growth is larger by 0.0917 unit than that for the short run. This result corroborates the findings of Castro-Nuño, Molina-Toucedo, and Pablo-Romero (2013) and some meta-analysis carried out in other areas of empirical economics. For example, Valickova et al.'s (2015) meta-analysis of the financial development and growth nexus finds that studies investigating such a relationship over the long run report higher estimates. In the context of the TLGH, the impact of tourism on economic growth becomes more prominent in the long-run (Balaguer and Cantavella-Jordá 2002). Tourism, through its multiplier effects, achieves its full potential in the long run by bringing in foreign exchange that facilitates the purchase of capital goods for producing other goods and services that are necessary for promulgating economic growth. Thus, economies are not likely to derive the full benefits of tourism in the short run, but rather in the long run, although findings with respect to the time varying impact of tourism on economic growth is still inconclusive. For example, while C. F. Tang (2013) finds no evidence that tourism contributes to economic growth in the short run, Jin (2011) finds tourism to have a positive effect in the short run but a negative effect in the long run.

The results of the study also suggest that the estimation techniques used by the various studies influence the reported coefficient. Studies using dynamic econometric models such as ARDL are likely to report a higher estimate than those using static models. An ARDL framework takes into account time-based variances among the explanatory variables and includes lagged dependent variables and causal variables (Hill, Griffiths, and Lim 2010). Dynamic models of TLGH based on an ARDL framework embed the notion that economic growth is dynamic, where growth in one period fosters tourism in another period, which in turn contributes to economic growth in the long-run.

### *Implications for Theory Development*

This meta-analysis suggests the presence of publication bias in the literature on tourism and economic growth. Publication bias that results from the nonreporting of null or negative findings skews the existing knowledge base and undermine the free exchange of ideas and information that ought to drive scientific endeavors (Rothstein, Sutton, and Borenstein 2006). Therefore, publication bias may result in researchers making overoptimistic inferences about the contributions of tourism to economic growth that in turn may impede theory development. It may also lead to tourism policy interventions that do not have or have little impact on economic growth (F. Song et al. 2000). Therefore, it is important for researchers to understand that advancing our knowledge on the tourism-economic growth nexus does not require us to have only an understanding of the conditions under which the TLGH is valid, but also where and under what circumstances the hypothesis does not hold. Anything lesser than this will hamper our knowledge on the tourism and economic growth nexus, and it may lead to misleading conclusions about the relationship. Therefore, this issue has to be addressed if theoretical advancements are to be made.

Falsification of theory is a virtue of good science (Ferguson and Heene 2012). Tourism researchers should work with the principle that they must provide all information to help others judge the value of their contributions to the tourism-economic growth nexus and to assess the validity of the theory that underpins their study, not just those findings that conform to the theoretical expectations. They should decide to publish their research, irrespective of its findings, provided that it is based on good science (Feynman 1985). Of course, any (null) findings should be accompanied by solid arguments of a theoretical, methodological, and/or contextual nature. At the same time, reviewers and journal editors should be more receptive to null results. Certain reviewers' and editors' reluctance to accept null results may encourage authors to "chase-up the significance" by manipulating the data or increase the sample size until statistical significance is reached (Ferguson and Heene 2012). Editors and reviewers should allow for well-executed studies with trivial, null, or negative findings to be published. In the absence of a true process of falsification and replication, it becomes rather challenging to argue whether the TLGH is falsifiable, impeding theoretical advancements.

Results from the meta-analysis indicate that the estimates reported in the various studies on the TLGH are sensitive to a number of factors such as the exchange rate of the destination, the data, the estimation characteristics, and the specification of the tourism and economic growth variables. While the inclusion of exchange rate as an explanatory variable in a tourism demand equation is fairly obvious, it is important for researchers to control for exchange rate in economic models on the TLGH to have a more precise picture of the relationship between tourism and economic growth. Pablo-Romero and Molina (2013) discuss how the inclusion of the exchange rate variable influences the results of studies on tourism and economic growth. Therefore, beyond the theoretical arguments of such an endeavor, the inclusion of exchange rate in a tourism-economic growth model is necessary to reduce bias in the estimates (Solarin 2018). Furthermore, it may also be of value for researchers to extend this analysis by accounting not only for exchange rate, but also for exchange rate regimes as a control variable in studies on the TLGH given their effects on trade (Adam and Cobham 2007), price levels (Broda 2006), foreign direct investment (Abbott, Cushman, and De Vita 2012), and tourism demand (De Vita 2014).

The influence of the number of observations on the estimate of the effect of tourism on economic growth has important implications for researchers. This result, coupled with the fervent debates on effect size and statistical significance, suggests that researchers should exert caution when interpreting estimates of the relationship between tourism and economic growth, especially for studies based on large observations (Benjamin et al. 2018; Fan 2001; Kaplan, Chambers, and Glasgow 2014). Because an effect size is subject to sampling variability (Kaplan, Chambers, and Glasgow 2014), we recommend that researchers also report confidence intervals for sample size effects (B. Thompson 2002, 2007). This approach combines information on sample size with effect size measure and provides variability estimate for a sample size effect (Fan 2001). Ultimately, researchers should not only ask if a sample result is likely due to chance but also if the effect of tourism and economic growth is replicable and worthy to inform tourism practice. For a more rigorous and accurate reporting of findings, researchers can use the guidelines for combining statistical significance with effect size discussed in various articles (e.g., Fan 2001; Kaplan, Chambers, and Glasgow 2014).

Use of dynamic models such as ARDL was found to influence the estimate between tourism and economic growth. Dynamic models provide more accurate inferences of model parameters and provide more opportunities to capture the complex relationships between tourism and economic growth (Castro-Nuño, Molina-Toucedo, and Pablo-Romero 2013; Perles-Ribes et al. 2017). Studies on the TLGH emphasize on the advantages of dynamic models for inter-country comparison to advance the field theoretically and methodologically (De Vita and Kyaw 2016; Kim, Chen, and Jang 2006). Therefore, the use of dynamic models is advocated to reach more accurate conclusions on the validity of the TLGH (Castro-Nuño, Molina-Toucedo, and Pablo-Romero 2013; Lee and Chang 2008). This is important particularly because the time element has been found to influence the tourism–economic growth relationship, both in magnitude and direction (Antonakakis, Dragouni, and Filis 2015; Wu et al. 2016). Researchers are encouraged to take the full benefits of longitudinal data sets made available by organizations like the World Bank, the World Travel and Tourism Council, the United Nation World Tourism Organization, and others to study the TLGH. Panel data are also increasingly available in developing countries (Banerjee, Cicowiez, and Cotta 2016; Hsiao and Hsiao 2006). Researchers interested in the TLGH should also note that results are sensitive to the way in which tourism and economic growth are measured (Castro-Nuño, Molina-Toucedo, and Pablo-Romero 2013; Perles-Ribes et al. 2017).

A general observation of relevance to future studies relates to the paucity of research on TLGH carried out at the regional level. The majority of estimates included in our meta-regression exercise are extracted from tourism growth models tested at the national or country level. However, such models fail to take into account the regional dynamics of tourism (Pratt 2015; Yang and Fik 2014). While national-level indicators may indicate tourism-led economic growth, regional-level growth may exhibit different sensitivities to tourism. For example, not only do tourism growth models tested using national-level data undermine the value of domestic tourism for regional development (Cortés-Jiménez 2008; Ma, Hong, and Zhang 2015; Marrocu and Paci 2013), but they also ignore the constraints regional areas face in terms of resource endowment, agglomeration economies, infrastructure, capital and natural resources, and market access that hinder the impact of tourism on economic growth (Pratt 2015; J. Liu, Nijkamp, and Lin 2017; Yang and Fik 2014). Conventional growth models also fail to take into account the spatial spillover effects of tourism from a tourism-thriving region to other areas. Thus, research on the TLGH can be greatly enhanced by taking into account the spatial heterogeneity and spillover effects of tourism at the regional level (Yang and Fik 2014).

## Conclusion

The empirical investigation of the TLGH has been the focus of numerous studies. This meta-regression study uses 545 estimates drawn from 113 studies to quantify the influence of various factors on the estimates reported by the various studies. Unlike narrative reviews, a meta-analysis makes use of advanced statistical techniques and criteria to summarize, evaluate, and explain the study-to-study variations in the existing empirical literature (Stanley 2001). Furthermore, rather than relying on a data set on tourism and economic growth of a single country or group of countries, we investigate statistical structures emerging as a property of the entire empirical literature on the tourism and economic growth nexus to draw our conclusions, making our study more representative than existing ones. This research makes some important contributions to the literature and reveals important findings useful for theory development. The results of this meta-regression analysis provide support for the TLGH; however, they suggest that the estimates are sensitive to a number of factors. Such sensitivities suggest that greater effort be given in the literature to reporting estimates of the relationship between tourism and economic growth across a variety of data characteristics and specification and estimation choices. The presence of publication bias also suggests that researchers should be cautious when interpreting the results of existing research and deriving theoretical and methodological implications for their own studies.

Aside from the contributions of this study, its limitations should be recognized. First, the quality of the results generated by a meta-regression analysis is dependent on the data reported in the various studies included in the exercise. Therefore, "the aggregated results can only be as good as the studies themselves" (Lim 1999, p. 282). Second, our meta-regression analysis is limited to estimates of the impact of tourism on economic growth. However, a bidirectional relationship between the two variables also exists, where economic growth influences tourism (Bilen et al. 2017; Brida, Cortes-Jimenez, and Pulina 2016; H. Liu and Song 2017). Thus, it is worthwhile for future meta-analysis exercises to take into account the bidirectional relationship that exists between the two variables. Third, while our study is based on a relatively large sample of 113 studies (545 estimates), it is restricted to only those articles that explicitly reported the *t* statistics, standard error, and regression coefficient of the relationship between tourism and economic growth. Therefore, some studies, such as those that utilize the Granger causality test are not included in our sample.

Finally, readers should exert some caution when generalizing the findings to certain countries of the world. The existing body of knowledge on the TLGH is characterized by a paucity of studies on African and Middle Eastern countries (Brida, Cortes-Jimenez, and Pulina 2016). Therefore, such a limitation is also inherent to the sample of studies we include in the meta-regression exercise. Similar cautions should be exerted when applying the findings of this meta-analysis to regional areas because the majority of existing studies utilizes national-level economic and tourism data to validate the TLGH. As we argued before, the regional aspects of tourism development are often ignored in tourism growth models tested at the national level. Despite these limitations, it is hoped that this research provides useful guidelines to scholars and becomes a point of reference for researchers interested in the tourism-economic growth nexus. We invite researchers to criticize objectively, refine, and improve on this meta-regression analysis in order to bring further theoretical and methodological improvements in this important research endeavor.

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