TOURISM AND ECONOMIC GROWTH: A meta-analysis of panel data studies

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Abstract

Although for decades it has been acknowledged that tourism likely contributes to economic growth, theoretical models that consider a causal relationship between both are a recent phenomenon. From a sample of 11 studies based on panel data techniques published through to 2011, and for a total of 87 heterogeneous estimations, a meta-analysis is performed by applying models for both fixed and random effects, with the main objective being to calculate a summary measure of the effects of tourism on economic growth. While the results obtained point to a positive elasticity between economic growth and tourism, the magnitude of the effect was found to vary according to the methodological procedure employed in the original studies for empirical estimations.

KEYWORDS: Panel data, Tourism, Economic Growth, Meta-analysis, Elasticities.

JEL Codes: C33, C83, L83, O40, O50.

1. INTRODUCTION

Although for decades it has been recognized that tourism could contribute in some way to economic growth, theoretical models that consider a causal relationship between tourism and economic growth are a recent phenomenon (Kim et al., 2006). Lanza & Pigliaru (2000) were the first to investigate this relation from an empirical point of view, while Balaguer & Cantavella-Jorda (2002) were the first to analyse the *tourism-led growth hypothesis* (TLG) – i.e. the hypothesis according to which tourism generates economic growth – from an econometric perspective. From the first attempt, an increasing number of articles with the same objective – although for different countries, using different methodologies and obtaining different results –have been published.

Most of the studies are based on time series and refer to a single economy. Among them, and without providing an exhaustive list, several warrant mention such as that of Dritsakis (2004), Durbarry (2004), Ongan & Demiroz (2005), Gunduz & Hatemi-J (2005), Oh (2005), Kim et al. (2006), Katircioglu (2007, 2009, 2010), Lee & Chien (2008), Brida & Risso (2009). Brida et al. (2010), Chen & Chiou-Wei (2009) Jin (2011), Lean & Tang (2010), and Arslanturk et al. (2011). Of these, most support the TLG hypothesis.

Among these studies there is a group which uses panel data analysis to investigate the TLG hypothesis. Although the number of these studies is smaller than that for time-series studies, a larger number of countries are included. This permits an understanding to be gained of the relationships that occur across a group of countries (Lee & Chang, 2008) and an evaluation to be made of the broader or global impact of tourism (Sequeira & Nunes, 2008). Further to this, the relation between Gross Domestic Product (GDP) and tourism in these studies is usually not isolated because other variables that are essential for growth are also considered.

The aim of the present work is to verify whether tourism contributes to economic growth and to determine the magnitude of this contribution by calculating global measures based on published scientific evidence available through until 2011. To this end, meta-analysis techniques have been used, which allow the quantitative synthesis of numerous estimations obtained in previous studies, as well as to determine how certain methodological approaches influence values obtained in these estimates.

We will only consider those studies based on panel data to corroborate the TLG hypothesis as they provide global estimations which, consistent with Lee & Chang (2008), refer to large samples of countries. Despite the extraordinary growth of the studies examining the relationship between tourism and economic growth using panel data, in such a short time, no quantitative systematic review that integrates all of the information has yet been made.

The use of meta-analysis was introduced by Glass, (1976). In contrast to the traditional narrative review, the basic purpose of meta-analysis is to provide the same methodological rigor to a literature review that is required for experimental research (Rosenthal, 1995). In the case of economic growth and development studies, this technique has been used to integrate findings on the effects of fiscal policies (Nijkamp & Poot, 2004; Phillips & Goss, 1995), the influence of income inequality conditions or political structures (De Dominicis, Florax, & De Groot, 2008; Doucouliagos & Ulubasglu, 2008), the contribution of social capital to economic growth (Westlund & Adam, 2010) and population growth (Headey & Hodge, 2009), or the effectiveness of development aid (Doucouliagos & Paldan, 2008). In the field of tourism, general applications of this technique can be found in tourism research (Dann, Nash & Pearce, 1988), tourism forecasting (Calantone, Di Benedetto & Bojanic, 1987), and more specifically on tourist and economic impact studies (Wagner, 2002; Wagner & Wober, 2003).

Meta-analyses of particular importance in this field concern those performed on tourism income multipliers (Baaijens, Nijkamp & Van Montfort, 1998), regional tourism multipliers (Baaijens & Nijkamp, 2000), and tourism demand (Crouch, 1995; Lim, 1999). More recently, reports have been published concerning specific branches of tourism such as that by Carlsen & Boksberger (2011) on wine tourism, Weed (2009) on sports tourism and Sariisik, Turkay & Akova (2011) on yachting tourism.

This work is divided into six sections which describe the meta-analysis approach taken with respect to tourism-economic growth.

2. METHODOLOGY.

Following Glass et al. (1981) and Lipsey & Wilson (2001), the meta-analysis method consists of deducing a *summary effect* based on the combination of different estimations (*effect sizes*) from a selected sample of studies by means of different statistical techniques: the *fixed-effects model* (FEM) and the *random-effects model* (REM).

Under a FEM (Borenstein et al. 2009) the selected studies are combined on the premise that there is no heterogeneity among them and the only determinants of the weight of each study in the meta-analysis would be its sample size and its own variance or *within-study variance* (*inverse variance weighted method:* Birge, 1932 and Cochran, 1937). Assuming a sample of "m" estimates or effect sizes, (i = 1, 2… m), representing a measure of an analyzed effect called T_i, a summary effect $\overline{T}$ may be formulated as (Borenstein et al., 2009): $\overline{T} = \frac{\sum w_i T_i}{\sum w_i}$ [1], where w_i is the statistical weight of the i-th estimation: $w_i = 1/v_i$ [2], and v_i the variance of the i-th estimation, so that: $\sum w_i = 1$.

It is possible that the variability among studies is higher than that expected by pure randomness, which would be detectable in the first instance by testing the hypothesis of homogeneity. The most widely used test was originally developed by Cochran (1954); it calculates the parameter Q, according to: $Q = \sum w_i\,(T_i - \bar{T})^2$ [3].

Because of the low power of this test, highlighted by Takkouche et al. (1999) it is recommended that a *subgroup analysis* of studies or that additional procedures to quantify the possible heterogeneity, such as the parameter I^2 (Higgins et al., 2003), which indicates the proportion of the variation between studies (*between-studies variance*) in the total variation due to heterogeneity: $I^2 = \frac{\tau^2}{\tau^2 + \sigma^2}$ [4], where τ^2(Tau-Squared) is the *between-studies variance* and σ^2 the *within-study variance* (due to randomness).

If heterogeneity is detected, a REM should be appropriated (Borenstein et al., 2009), which considers that the estimated effects of the included studies are only a random sample of all those possible, and the true effect sizes for them would be distributed about a *mean effect* (with two possible sources of variation: that exist within the studies or random error and the variation between studies or true dispersion). Applying the *variance weighted method*, under the REM, expression [2] is transformed and we have, for each i-th estimation, adjusted weights (w_i^*) according to [5]:

$w_i^* = \frac{1}{\frac{1}{w_i} + \tau^2}$ [5], where τ^2(Tau-Squared) is the between-studies variance and w_i the statistical weight for an i-th estimation under a FEM.

With regards to the summary effect $\bar{T}$ (i.e. a *mean effect* obtained from "a distribution of effect sizes") we can calculate: $\bar{T} = \frac{\sum w_i^* T_i}{\sum w_i^*}$ [6].

The possibility of obtaining a biased summary effect must be assessed, which is derived from the presence of *publication biases* as a result of the fact that many completed studies are not actually published because they do not achieve significant effects, because they are unfavorable or because they have negative outcomes (Sterne et al., 2000; Thornton & Lee, 2000).

Analytically, the publication biases can be detected by the statistical methods of Begg (Begg & Mazumba, 1994), and Egger (Egger et al., 1997), and graphically by the namely *funnel plots diagrams*. However, the limitations of these methods (Thorntoln & Lee, 2000; Macaskill et al., 2001), require application of *Duval and Tweedie's Trim and Fill technique* (Duval & Tweedie, 2000), which allows the number of missing studies to be determined and added to the analysis, following which the combined effect is recomputed.

Finally, to assess the robustness or stability of the calculated summary effect, sensitivity analysis is performed.

3. PANEL DATA STUDIES AND ESTIMATIONS.

Details of 13 studies published through to 2011 which use panel data to analyze the relationship between tourism and economic growth are given in Table 1. These studies were identified by literature search techniques using *Scopus, ScienceDirect, Google Schoolar* and the main journals in tourism research[1], using terms as: *tourism*, *economic growth*, *tourism led growth hypothesis* and related terms. Papers from other studies identified were also used, which include not only articles in scientific journals listed in Journal Citation Reports (JCR) or other databases, but also working papers (Wpaper) published on the Internet that have reached a certain scientific recognition on account of their quality or number of citations.

All the studies included in the analysis are shown in Table 1 with an identification code, and the number of estimations in each study. Each of these estimations differs depending on the estimation model, whether or not additional variables were used to explain economic growth, the type of variable used to measure

[1] Ryan (2005) shows the ranking and rating of academics and journals in tourism research.

tourism, whether the sample was classified into subsamples, and the inclusion or not of instrumental variables or dummy variables for econometric estimation.

Table 1: Panel data studies showing the relationship between tourism and economic growth.

Author	Year of study	Code	Classification of study	Sample	Analysed period	No. of estimations
Eugenio-Martin et al.	2004	Eug	Wpaper	Latin American countries	1985-1998	4
Sequeira & Campos	2005	Seca	Wpaper	72 countries	1980-1999	6
Sequeira & Nunes	2008	Sequ	JCR. Q3	Small, poor and normally developed countries	1980-2002	16
Fayissa et al.	2008	Fayi	JCR. Q3	Sub-Saharan countries	1995-2004	4
Lee & Chang	2008	Lee	JCR. Q1	OCDE, Asia, Latin American and sub-Saharan countries	1990-2002	20
Cortés-Jiménez	2008	Cort	JCR. Q3	Coastal regions of Italy and Spain	1990-2000	12
Proenca & Soukiazis	2008	Sou	JCR. Q4	Portugal regions NUT II and NUT III	1993-2001	6
Fayissa et al.	2009	Fay	Wpaper	Latin American countries	1995-2004	4
Adamau & Clerides	2010	Adam	open journal	162 countries	1980-2005	10
Narayan et al.	2010	Nara	JCR. Q3	4 islands	1988-2004	2
Holzner	2011	Holz	JCR. Q1	99 countries	1970-2007	4
Seetenah	2011	Seet	JCR. Q1	Pacific Islands and developed countries	1995-2007	6
Dritsakis	2011	Drit	JCR. Q3	Mediterranean countries	1980-2007	2

Source: Own elaboration.

Two different empirical models are generally estimated: dynamic and non-dynamic. The first is defined econometrically as follows [7], in general terms: $y_{it} = \alpha_t + \phi y_{it-1} + \beta T_{it} + \lambda X_{it} + u_i + \varepsilon_{it}$ [7], where y is the logarithm of real per capita GDP, T is a measure of tourism development expressed in logarithmic terms, X

represents a vector of other explanatory variables, α is a period-specific intercept term to capture changes common to all countries, u is an unobserved country-specific and time-invariant effect, ε is the error term and the subscripts i and t represent country and time period, respectively.

Non-dynamic models are specified similarly, but without the term ϕy_{it-1}. They can be defined in general as follows in [8]: $y_{it} = \alpha_t + \beta T_{it} + \lambda X_{it} + u_i + \varepsilon_{it}$ [8].

The parameter β, which reflects the estimated impact of tourism on the GDP, reaches a different interpretation: in non-dynamic models, it reflects the elasticity of productivity with respect to tourism (because the variables are expressed in natural logarithms); while in dynamic models; it reflects only part of the effect of tourism on productivity (which is produced in the same period). The effects of tourism expand in time, which is to say that tourism has an effect on productivity various periods thereafter depending on the value of ϕ in [7].

Irrespective of whether the models are dynamic or not, the studies also differ in terms of those that use additional variables such as education, physical capital, etc., to explain the growth of real per capita GDP, compared with those that relate only to the tourism growth variable (A or B respectively) . Other important differences can be summarized as follows: 1. Whether the temporal effect is included by virtue of the coefficient α in the estimation (time dummies used); 2. The proxy of tourism expansion, which is used to define T[2] (indicators of tourism arrivals vs. indicators of tourism receipts); 3. Those estimations that using instrumental variables in estimating the function or not; 4. Depending on the wide sample of countries or a specific set of countries that make up the panel data.

[2] Soukiazis & Proenca (2008) use as a proxy for the tourism variable the accommodation capacity of the tourism sector. This proxy is not based on tourism arrivals and tourism receipts, and is therefore not classified in our meta-analysis following this criterion.

Given these differences, the meta-analysis considers different groups of similar estimations, as shown in Table 2. There are two sets of estimations (type 1 scenarios) – dynamic and non-dynamic – because as stated above, the estimated β coefficients are not directly comparable between the two model types. Within each type 1 scenario, 3 clusters can in turn be made: those that contemplate the whole sample for each scenario (overall), and estimations that include only type A or type B estimations (type 2 scenarios). Furthermore, within each type 2 scenario, 9 clusters can be formed: those that contemplate the whole sample of estimations for the scenario (overall) and type 3 scenarios. These combinations give rise to a total of 42 scenarios.

4. META-ANALYSIS RESULTS.

Thirteen studies were identified in our search, but the estimations of Sequeira & Campos (2005) and Fayissa et al. (2009), were excluded from the meta-analysis because the data provided were insufficient. The study thus encompassed the empirical results from 11 previous studies (Table 1) that gave rise to a total of 87 estimations (the sample for our meta-analysis framework) reported in the form of elasticities , which express the impact of the tourism sector on economic growth.

Table 2 summarizes the main results of the meta-analysis performed on that sample.

Table 2: Meta-Analysis Results

Type 1 SCENARIOS	Type 2 SCENARIOS	Type 3 SCENARIOS	No. of Point Estimations (m)	FIXED POINT ESTIMATION / Z-value	RANDOM POINT ESTIMATION / Z-value	HETEROGENEITY MEASURES		PUBLICATION BIAS			
										Duval & Tweedie's Trim and Fill	
						Q test (ρ)	I^2	Begg (Kendall's tau b)	Egger (B0)	No. of missed studies	Re-adjusted Random Point Estimation
DYNAMIC	OVERALL	overall	62	0.000 (5.324)***	0.007 (8.238)***	0.000***	86.544	(-0.392)***	1.824***	27	0.002
		t	40	0.0000 (5.128)***	0.006 (7.238)***	0.000***	90.763	(-0.245)**	2.525***	20	0.002
		no t	22	0.007 (4.738)***	0.007 (4.738)***	0.968	0.000	(-0.141)	0.279*	0	-
		inst	40	0.000 (4.924)***	0.002 (3.250)***	0.000***	71.748	(-0.396)***	1.206***	15	0.001
		no inst	22	0.002 (10.675)***	0.009 (5.224)***	0.000***	89.680	(-0.277)**	2.360***	9	0.001
		travel income	27	0.025 (12.983)***	0.035 (7.168)***	0.000***	71.368	(-0.188)*	1.026**	4	0.029
		arrivals	29	0.000 (4.706)***	0.001 (81.867)*	0.000***	83.719	(-0.321)***	1.299***	9	0.000
		general countries	26	0.025 (13.170)***	0.032 (5.751)*	0.000***	81.031	(-0.172)	0.749	0	-
		specific countries	36	0.000 (4.867)***	0.002 (2.825)***	0.000***	77.085	(-0.382)***	1.466***	16	0.001
	A	overall	56	0.000 (5.154)***	0.006 (7.386)***	0.000***	87.118	(-0.432)***	1.807***	24	0.002
		t	40	0.000 (5.128)***	0.006 (7.238)***	0.000***	90.763	(-0.245)**	2.525***	20	0.002
		no t	16	0.010 (2.036)***	0.010 (2.036)***	1.000	0.000	(-0.284)*	(-0.136)**	0	-
		inst	38	0.000 (4.841)***	0.001 (2.701)***	0.000***	69.946	(-0.426)***	1.122***	14	0.000
		no inst	18	0.054 (16.017)***	0.053 (7.084)*	0.000***	66.270	(-0.131)	(-0.646)	0	-
		travel income	27	0.025 (12.983)***	0.035 (7.168)*	0.000***	71.368	(-0.188)*	1.026**	4	0.020
		arrivals	29	0.000 (4.706)***	0.002 (1.867)*	0.000***	83.719	(-0.321)***	1.299***	9	0.001
		general countries	26	0.025 (13.170)***	0.030 (5.751)***	0.000***	81.031	(-0.172)	0.749	0	-
		specific countries	30	0.000 (4.696)***	0.001 (1.752)***	0.000***	77.020	(-0.441)***	1.353***	12	0.000
	B	overall	6	0.007 (4.323)***	0.009 (2.197)**	0.091*	47.279	0.533*	1.500**	3	0.008
		no t	6	0.007 (4.323)***	0.009 (2.197)**	0.091*	47.279	0.533*	1.500**	3	0.008
		inst	2	0.009 (3.406)***	0.063 (0.911)	0.042**	75.819	-	-	-	-
		no inst	4	0.006 (2.836)***	0.025 (1.281)	0.222	31.691	0.500	1.253	2	0.013
		specific countries	6	0.007 (4.323)***	0.009 (2.197)**	0.091*	47.279	0.533*	1.500**	3	0.008

Table 2: Meta-Analysis Results (Cont…)

Type 1 SCENARIOS	Type 2 SCENARIOS	Type 3 SCENARIOS	No. of Point Estimations (m)	FIXED POINT ESTIMATION / Z-value	RANDOM POINT ESTIMATION / Z-value	HETEROGENEITY MEASURES		PUBLICATION BIAS			
										Duval & Tweedie´s Trim and Fill	
						Q test (ρ)	I^2	Begg (Kendall's tau b)	Egger (B0)	No. of missed studies	Re-adjusted Random Point Estimation
NO DYNAMIC	OVERALL	overall	25	0.266 (126.649)***	0.258 (6.754)***	0.000***	99.618	0.187*	(-0.775)	0	-
		t	10	0.198 (68.873)***	0.208 (4.036)***	0.000***	99.592	0.356*	2.662	0	-
		no t	15	0.344 (111.753)***	0.290 (5.375)***	0.000***	99.515	0.000	(-2.606)	0	-
		no inst	25	0.266 (126.649)***	0.258 (6.754)***	0.000***	99.618	0.186*	(-0.775)	0	-
		travel income	14	0.321 (116.239)***	0.2783 (4.563)***	0.000***	99.718	0.121	(-3.446)	0	-
		arrivals	11	0.191 (58.894)***	0.309 (6.773)***	0.000***	98.631	(-0.073)	1.918	1	0.202
		specific countries	25	0.266 (126.649)***	0.258 (6.754)***	0.000***	99.618	0.186*	(-0.775)	0	-
	A	overall	2	0.038 (1.362)	0.038 (1.362)	0.9860	0.000	-	-	-	-
		no t	2	0.038 (1.362)	0.038 (1.362)	0.9860	0.000	-	-	-	-
		no inst	2	0.038 (1.362)	0.038 (1.362)	0.9860	0.000	-	-	-	-
		travel income	2	0.038 (1.362)	0.038 (1.362)	0.9860	0.000	-	-	-	-
		specific countries	2	0.038 (1.362)	0.038 (1.362)	0.9860	0.000	-	-	-	-
	B	overall	23	0.267 (126.902)***	0.279 (6.993)***	0.000*	99.646	0.221**	0.082	0	-
		t	10	0.198 (68.873)***	0.208 (4.036)***	0.000*	99.592	0.355*	2.662	0	-
		no t	13	0.344 (112.277)***	0.290 (5.762)***	0.000*	99.15	(-0.012)	(-1.251)	0	-
		no inst	23	0.267 (126.902)***	0.279 (6.993)***	0.000*	99.646	0.221**	0.082	0	-
		travel income	12	0.324 (116.669)***	0.313 (4.872)***	0.000*	99.756	0.167	(-1.848)	0	-
		arrivals	11	0.191 (58.894)***	0.240 (6.773)***	0.000*	98.631	(-0.072)	1.917	1	0.202
		specific countries	23	0.267 (126.902)***	0.279 (6.993)***	0.000*	99.646	0.221**	0.082	0	-

Note: Significance at ***1%, **5%, *10%, respectively.
Overall is related to all the estimations; each scenario *A* or *B* is respectively related to estimations with / without added exogenous variables of the economic growth; *t* and *no t* mean estimations with /without time dummies; *Inst* and *no inst* are respectively related to estimations with / without instrumental variables; *Travel income* and *arrivals* refer to estimations based on proxy variables of tourism obtained from data series of travel income or tourist arrivals; *general* and *specific countries* are related to estimations obtained for a large / limited sample of countries.

Source: Own elaboration.

Table 2 shows that, independently of the estimation model used for our meta-analyses (FEM or REM), in all the scenarios a weighted mean (summary effect) is obtained with a positive sign, which means that tourism, in major or minor measure, contributes favorably to economic growth in all cases.

The possible existence of heterogeneity was analyzed in the seventh column by the statistical significance of the Q-test. In 34 of the 42 scenarios, the null hypothesis of homogeneity is rejected (at the 99 % level in most cases). In addition to this test, the ratio I^2 is added: only 7 of the 42 scenarios show homogeneity, and only 9 of 35 of the remaining scenarios have a moderate heterogeneity (I^2<75 %) (according to the classification by Higgins et al., 2003).

This heterogeneity seems to be logical, since the diverse estimations from the studies considered have been obtained by different methods, variables, data and samples. The only homogeneous estimations are those from type A non-dynamic studies, from which we had only 2 estimations.

As a consequence of this heterogeneity, as stated by Takkouche et al. (1999), the estimations obtained by REM (6th column of Table 2 that is shaded) are more appropriated, because they reflect true differences across studies.

To evaluate the possible existence of publication bias, we show the results of Begg's test (Begg and Mazumbar, 1994) and Egger's test (Egger et al., 1997), respectively, in the last column of Table 2. The p-value is significant in 19 of the 42 scenarios, so the null hypothesis of absence of bias could be rejected[3]. Nevertheless, following (Macaskill et al., 2001; Palma & Delgado (2006); Sterne et al., 2001), we also consider the results from the method of Trill and Fill (Duval & Tweedie, 2000).

[3] The methods for detecting publication biases are only viable when the meta-analysis is based on more than two combined estimations.

In only 17 of the 42 scenarios is no study missed that could potentially modify the summary effect. These scenarios are, in general, related to the non-dynamic models, and also to the dynamic models in cases where a large sample of countries is included. In the 25 remaining scenarios (for which the Trim and Fill technique calculates the readjusted point estimations), the existence of publication bias is closely related to the detected heterogeneity and to the insufficient number of estimations that there are.

5. RANDOM POINT ESTIMATION VALORATION

Considering the Table 2, the dynamic scenarios have a greater homogeneity among the 62 estimations computed, although reaching lower random point estimations values. Even though the non-dynamic scenarios involved a minor number of estimations (25), they showed a remarkable heterogeneity, and much higher summary random point estimations values. Also, the dynamic scenarios exhibited publication bias, while non-dynamic scenarios did not in general display this bias.

The random point estimation in the dynamic models has a value of 0.007 for the overall sample when all estimations are taken into consideration. In the other scenarios of the overall sample, the estimate fluctuates around a similar value, with two exceptions: when the study is limited to estimations referred to a general sample of countries, and when travel income is taken as a proxy of tourism. In these cases, the random point estimation increases to a value of 0.032 and 0.035, respectively. However, most of these estimates are biased even though calculation of the re-adjusted random point estimation generally fluctuates around a small value of 0.002.

With respect to dynamic models, this small value only reflects the effect of tourism on economic growth for the current period. However, the dynamic nature of the model means that this effect may persist in time.

The value of the long-term multiplier of tourism must be calculated and it is necessary to know the estimated value of the parameter ϕ [eq. 7] that relates the current period productivity to the productivity of previous periods. However, to calculate this multiplier effect, it is necessary for the estimated function to be stable. This occurs when ϕ is less than unity. Otherwise, the trajectory is divergent and the effect tends to multiply with the passage of time.

In the case where the dynamic functions are stable with a single time delay, the long-term multiplier is equal to: $MD = \frac{\beta}{1-\phi}$ [9].

The value of this multiplier is similar to the concept of the tourism-productivity elasticity of non-dynamic studies, which can help to interpret the effect of tourism on economic growth. In Table 3 of Annex I, estimated values of β and ϕ are given along with the value of the long-term multiplier calculated when the functions are stable[4]. In the last column, it can be seen that the multiplier value, which reflects the total effect of tourism on economic growth, is substantially higher than the estimated value of β. In the last row of Table 3, the average value of the multiplier which summarizes this effect is shown. Its value is 0.179.

In non-dynamic models, as shown in Table 2, the random point estimation has a value of 0.266 for the overall sample when all estimates are taken into consideration. In the other scenarios of the overall sample, the estimate fluctuates around the same value, with minimum estimates of 0.191 and maximum estimates of 0.344. With the exception of the estimations that use arrivals as a tourism indicator, none of the estimated values are biased. In this case, the random re-adjusted estimation point is 0.202.

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[4] Parameters whose estimates proved to be not significant in the original studies have been omitted from Table 3.

The overall random point estimation is substantially higher than that obtained for the dynamic models. However, when it is compared with the value of the long-term multiplier of dynamic models calculated previously, this difference is considerably reduced. On the other hand, the estimations of the dynamic and non-dynamic scenarios have been further divided into two subgroups A and B due to the heterogeneity present among the estimates. In both scenarios, the distinction between A and B turns out to be relevant, since different random point estimations are observed for each group. In the dynamic model scenarios, 56 estimations are of type A and only 6 are of type B, while, in the non-dynamic model scenarios, 23 estimates are of type B and only 2 of type A.

In both cases, it is noted that the random point estimations, or the re-adjusted values of the type A estimations, are lower than those obtained in each overall scenario (dynamic or non-dynamic overall scenario). On the other hand, the random point estimations of the type B estimations are higher than those obtained in each overall scenario. That is, when additional variables that explain economic growth in the production function are included, in addition to the tourism variable, the impact of tourism on economic growth decreases.

This is especially significant in the case of non-dynamic models, since the random point estimation for type B scenarios is 0.258 while that for type A is only 0.038. Nevertheless this conclusion must be considered with care since the latter scenario contained only 2 estimations.

This sub-disaggregation of estimations into A and B does not seem to be sufficient to eliminate the heterogeneity among them, except for type A non-dynamic scenarios. This suggests that other circumstances exist that also affect the value of the random point estimations. Therefore, other classification criteria based on methodological aspects (discussed in Section 3) have been considered and applied to the overall sample for dynamic and non-dynamic scenarios, as well to their respective A and B subgroups.

It was found that the inclusion of temporary variables and the use of instrumental variables tended to decrease the random point estimations value in all of the type 2 scenarios, and that the random point estimations value obtained for these scenarios were higher when travel income was used to measure tourism than when the number of arrivals was used.

Further to this, the random point estimation tended to be greater when the estimations that consider only large samples of countries (general countries) were used. In such cases, the estimated value is unbiased. If estimations refer only to specific countries, i.e. samples refer only to countries with a certain profile, the elasticity tends to be lower. However, it must be taken into account that groups of countries in this scenario were very diverse, ranging from Asian, Latin American, Mediterranean and sub-Saharan countries, to island groups, economically poor countries, small countries.

This suggests that a more detailed study of elasticities is required based on the characteristics of the countries in those samples.

6. CONCLUSIONS

Theoretical models that consider a causal relationship between economic growth and tourism are a more recent phenomenon. Since 2002, an increasing number of articles that have investigated this relation from an econometric perspective have been published. A considerable proportion of these studies are based on panel data to analyze effects of tourism on economic growth across a large number of countries. According to the meta-analysis presented in this paper, from 87 estimations obtained using panel data techniques we can conclude that tourism positively affects economic growth. However, the duration of this positive effect depends on methodological features of estimations made in the original studies. Thus, the meta-analysis applied to estimations based on dynamic functions shows that elasticity (the productivity with respect to tourism) in the short term is small, yielding a random point re-adjusted estimation of 0.002. However, the initial effect is prolonged in time, so that in the long term the average value of the elasticity is raised to 0.179, for significant and stable estimations.

The meta-analysis applied to estimations based on non-dynamic functions showed that the elasticities had an average value of 0.266 for the overall sample. The value of these elasticities is nonetheless affected by a range of features used in the estimations carried out. We found that as the model becomes more specific, the value of elasticity, irrespective of the case, tends to decrease. Thus, the inclusion of explanatory variables for economic growth, in addition to that of tourism, tends to reduce the value of the elasticity, especially with respect to non-dynamic models. Also, when temporary variables and instrumental variables are considered, the value of the elasticity tends to diminish.

Furthermore, the variable used to measure tourism also affects the elasticity. If tourism is measured in terms of travel income, then elasticity tends to be higher than if the tourism is measured in terms of tourist arrivals.

Finally, it should be noted that the average elasticity calculated in our meta-analysis was higher only when the studies included were based on a large sample of type-specific countries. Based on the meta-analysis presented, we were unable to deduce a clear pattern of how elasticity varies across defined groups of countries, because the estimations obtained using panel data for these defined groups were very heterogeneous and difficult to compare in this regard. Thus, it may be interesting to perform a meta-analysis on which the average elasticity is defined for groups of countries and obtained using estimations from time series and related to individual countries.

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ANNEX I

Table 3. Long-Term dynamic multiplier of tourism on economic growth

CODE	Model type	β	ϕ	Dynamic multiplier (DM)
Adam 1	A	0.002** (0.00056)	-0.1** (0.0077)	0.02[a]
Adam 3	A	0.00018** (4.50E-05)	-0.01** (0.0073)	0.018[a]
Adam 4	A	0.00012* (0.00006)	-0.09** (0.017)	0.001[a]
Adam 6	A	0.0041** (0.00096)	-0.101** (0.0076)	0.041[a]
Adam 7	A	0.0039** (0.0012)	-0.101** (0.018)	0.038[a]
Adam 8	A	0.00048** (0.00012)	-0.1** (0.0074)	0.004[a]
Holz 1	A	0.011** (2.00)	0.941*** (35.98)	0.186
Holz 2	A	0.018*** (2.84)	0.95*** (35.49)	0.360
Holz 3	A	0.008** (2.08)	0.97*** (52.93)	0.267
Cort 1	A	0.001** (n.a)	0.895*** (n.a)	0.010
Cort 2	A	0.006* (n.a)	0.884 *** (n.a)	0.052
Cort 3	A	0.001** (n.a)	0.919*** (n.a)	0.012
Cort 4	A	0.006*** (n.a)	0.907*** (n.a)	0.065
Cort 6	A	-0.015 (n.a)	0.891*** (n.a)	-0.138
Cort 8	A	-0.017** (n.a)	0.942*** (n.a)	-0.293
Cort 9	A	0.001* (n.a)	0.831*** (n.a)	0.006
Cort 10	A	0.007*** (n.a)	0.830*** (n.a)	0.041
Cort 11	A	0.001** (n.a)	0.869*** (n.a)	0.008
Cort 12	A	0.006*** (n.a)	0.857*** (n.a)	0.042
Eug 1	A	0.00036* (1.68)	0.777* (19.30)	0.007
Eug 2	A	-0.0002* (2.54)	0.765* (12.64)	-0.001
Eug 3	A	0.00063* (1.92)	0.738* (10.16)	0.002
Eug 4	A	0.00062* (2.63)	0.597* (4.14)	0.002
Fayi 3	A	0.0249*** (0.0081)	0.568*** (0.073)	0.058
Seet 1	A	0.12* (1,95)	0.24** (215)	0.158
Seet 2	A	0.06* (1.95)	0.23*** (2.52)	0.078
Seet 3	A	0.064* (1.96)	0.34*** (2.43)	0.097
Seet 4	A	0.14* (2.04)	0.17* (2.17)	0.169
Seet 5	A	0.033* (1.87)	0.25** (2.15)	0.044
Seet 6	A	0.08* (1.89)	0.37** (2.19)	0.127
Sequ 2	A	0.041**	0.927***	0.562

		(2.42)	(17.47)	
Sequ 3	A	0.026* (1.92)	0.931*** (18.37)	0.379
Sequ 4	A	0.025* (1.85)	0.891*** (20.77)	0.229
Sequ 5	A	0.048** (3.77)	0.943*** (24.73)	0.842
Sequ 6	A	0.041** (2.69)	0.924*** (23.14)	0.539
Sequ 7	A	0.095*** (4.44)	0.87*** (7.96)	0.731
Average value of DM	-	-	-	0.179

Note: Significance at ***1%, **5%, *10%, respectively.

The estimated function is $\Delta y_t = \theta y_{t-1} + \beta t_t$. So $y_t = (1+\theta) y_{t-1} + \beta t_t$, and $MD = \dfrac{\beta}{\theta}$

n.a. Not available.

Source: Own elaboration.