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## **Tourism and Economic Growth**

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## **Abstract**

Whether international tourism can lead to economic growth is an important macroeconomic question for both policy makers and investors. We extend the literature by investigating if tourism development is an additional determinant of income in the presence of the standard income determinants (such as capital accumulation), or if the effects of tourism development on economic growth work through the standard income determinants, instead. Empirically, we develop a tourism-growth model that is an extension of Solow (1956) and estimate our model with a cross-section of 109 countries. Our findings indicate that investments in tourism in and of itself appear to be insufficient for economic growth. Instead, tourism's contribution to the long term growth of an economy comes through its role as an integral part of a broader development strategy that is more generally focused on standard income determinants.

**Keywords:** Long-term growth; Tourism development; Tourism-led growth hypothesis; TLGH, Standard income determinants, Tourism impacts, Economic development

## **1 Introduction**

Whether a country's investments in international tourism can be used as an engine for economic growth is an important question for policy and decision makers. Tourism boosters consistently lobby for investments and support based on the assumption that tourism is an effective mechanism for economic growth, whether through the creation of new attractions (Waite, 2001; Getz, 2008) or through infrastructure and enhancements (Briedenhann & Wickens, 2004; Becker & George, 2011; Liasidou, 2012). There is no doubt that international travel and tourism comprises a major part of the global economy and is the largest service sector in international trade (Lew, 2011). It is within the top five sources of international export income for over 80% of countries in the world (UNWTO 2001a). International tourism has proven relatively resilient to global economic downturns, continuing a healthy growth in international arrivals despite retraction in other global sectors (Song & Lin, 2010; Abiven, 2012). Destinations see tourism as a way to use their comparative advantages in natural and cultural supply side resources to draw tourist money into the local economy, thereby generating foreign exchange, creating jobs, and enhancing government tax revenues (Hindley & Smith, 1984; Mihalič, 2002;). As an approach to economic growth, tourism may also have fewer environmental and social impacts than extractive industries, such as timber and mining (Hall & Lew, 2009).<sup>i</sup> From a macroeconomic perspective, international tourism contributes to the export income of a destination.<sup>ii</sup> This is crucial because investment in export-led growth is major part of the development objectives of most economies that see it as the most secure means of achieving long-term economic growth and livelihood (Nowak et al., 2007). As a result, there is a growing body of academic literature on the empirical relationship between tourism development and economic growth.

The World Travel and Tourism Council (WTTC) succinctly summarized the important role that travel and tourism play in the development and growth of the global economy as follows:

*In 2013, Travel & Tourism's total contribution to the global economy rose to 9.5% of global GDP (US \$7 trillion), not only outpacing the wider economy, but also growing faster than other significant sectors such as financial and business services, transport and manufacturing. In total, nearly 266 million jobs were supported by Travel & Tourism in 2013 - 1 in 11 of all jobs in the world. The sustained demand for Travel & Tourism, together with its ability to generate high levels of employment continues to prove the importance and value of the sector as a tool for economic development and job creation.*

(WTTC, 2014, Foreword)

This statement hints at an important distinction that exists between economic growth and economic development, which is more clearly explained by Cárdenas-García et al., (2013, 1-2):

The expansion of the economic activity influences positively the economic growth of a country... Tourism is considered as an economic activity with the potential to stimulate global economic growth because of its complementarity with other economic activities, its contribution to gross domestic product (GDP), job creation, and foreign exchange generation, etc... Nevertheless, the real importance of tourism lies not only in the fact that it contributes to the growth of the economy, in general, but also in the fact that this tourism growth can, given the right circumstances in its structural foundations, influence the economic and cultural progress of society, improving the welfare of the resident population.

Our focus in this paper is on the channel between tourism development and overall economic growth, rather than that between economic growth and more specific economic development. For the latter, readers may refer to Lee and Chang (2008), and Sánchez-Rivero, Pulido-Fernández, and Cárdenas-García (2013).

The perceived importance of international tourism development on economic growth has motivated a growing body of academic literature testing the tourism-led growth hypothesis (TLGH) that underlies this approach (West, 1993; Uysal & Gitelson, 1994; Archer, 1995). Most studies find a positive long-run association between tourism development and economic growth. This has been suggested for Greece (Dritsakis, 2004), Italy (Massidda & Mattana, 2013), Mauritius (Durberry, 2002) Spain (Balaguer & Cantavella-Jorda, 2002), Taiwan (Kim et al., 2006), Turkey (Gunduz & Hatemi-J, 2005; Ongan & Demiroz, 2005), four Pacific Island countries (Narayan et al., 2010), seven major Mediterranean countries (Dritsakis, 2012), 21 Latin American countries (Eugenio-Martin et al., 2004), 55 OECD and non-OECD countries (Lee & Chang, 2008), and 144 countries (Cárdenas-García et al., 2013).<sup>iii</sup>

The present paper intends to extend extant TLGH literature by investigating the economic mechanism underlying the positive association between tourism and growth. Our main objective in this paper is to investigate a fresh and important research question: *Is tourism development an additional determinant of income growth in the presence of standard income determinants (such as capital accumulation) or do the effects of tourism development on economic growth work through the standard income determinants, instead?*

This question is important because the answer can lead to dramatically different policy directions. If tourism is an additional determinant of income growth, the policy implication is that “all governments should commit to helping their tourism industry expand as much as

possible” (Dritsakis 2012, p. 814). On the other hand, if the effect of tourism growth on economic growth works through the standard income determinants, the policy implication is that governments should help the tourism industry expand to the extent that it promotes growth in the standard income factors (e.g., capital accumulation), because investment in tourism that does not lead to growth in the standard income factors may be a less effective benefit for the economy in the long term.

To answer our research question, we develop a tourism-growth model that takes into account not only tourism development, but also standard income factors such as capital accumulation as the potential factors (independent variables) that affect economic growth. We estimate our tourism-growth model using data available from the World Development Indicators database. Our expanded Cobb-Douglas based production model is estimated using ordinary least squares regressions and the estimated results are checked for distributional robustness using quantile regression and model misspecification robustness using an assortment of different proxy variables.

## 2 A model of tourism and growth

The empirical specification of the relationship between tourism and growth in extant literature typically takes the following form (e.g., Dritsakis, 2012):

$$GDP_{it} = \beta_{0i} + \beta_{1i}TOUR_{it} + \beta_{2i}EXR_{it} + \varepsilon_{it} \quad (1)$$

where  $GDP$  is real GDP per capita,  $TOUR$  is either tourism receipts or the number of international tourist arrivals, and  $EXR$  is the nominal effective exchange rate. TLGH hypothesizes that  $\beta_{1i}$  is greater than zero; increases in tourism activities are associated with increases in GDP (i.e., economic growth). It is important to note that such a specification helps estimate the *association* between tourism development and economic growth, but does not help in understanding the economic mechanism underlying the association. More specifically, Eq. (1) does not help answer the question: *Is tourism development an additional determinant of income in the presence of the standard income determinants (such as capital accumulation) or do the effects of tourism development on economic growth work through the standard income determinants instead?* Motivated by this observation, we develop a tourism-growth model in this section which is an extension of Solow (1956).

In his landmark work on economic growth, the 1987 Nobel laureate, Robert Solow (1956), points out that an economy's output/income over the long term depends on its supplies of factors of production and available technology, which can be captured by the (aggregate) production function. The Cobb-Douglas production function is the most commonly used production function in macroeconomics because of its well-known and superior properties (see Solow, 1956). For instance, the Cobb-Douglas production function is consistent with the law of diminishing returns, which is an essential feature of modern growth theories. As a result, the Cobb-Douglas production function remains the standard aggregate production function in

macroeconomics textbooks (e.g., Mankiw, 2013), and is still widely used (e.g., Nordhaus, 2006; Horowitz, 2009; Ng & Zhao, 2011, and the references therein). Hence, following the growth literature pioneered by Solow (1956), we assume that an economy's output/income can be described by a Cobb-Douglas production function:

$$GDP_i = A_i (CAP_i)^\alpha (POP_i)^{1-\alpha} e^{\nu_i} \quad (2)$$

where  $GDP_i$  is the real GDP of country  $i$ ,  $CAP_i$  is its capital,  $POP_i$  is its population,  $A_i$  is its productivity, and  $\nu_i$  is a random disturbance term. Based on this, real GDP per capita (which determines the living standard of a representative person) is

$$\frac{GDP_i}{POP_i} = A_i \left( \frac{CAP_i}{POP_i} \right)^\alpha e^{\nu_i} \quad (3)$$

Eq. (3) implies that per capita GDP (or income) is primarily a reflection of capital per person and productivity, which is the core concept of modern growth theory. To linearize the production function for appropriate estimation, we perform logarithmic transformation on both sides:

$$\ln\left(\frac{GDP_i}{POP_i}\right) = \ln(A_i) + \alpha \ln\left(\frac{CAP_i}{POP_i}\right) + \nu_i \quad (4)$$

Research and development (RND) and education (EDU) are well-known to have important influence on productivity (e.g., Romer, 1990; Hall & Jones, 1999). Therefore, we model productivity as a function of these relevant determinants as follows:

$$\ln(A_i) = \lambda + \delta \ln(EDU_i) + \gamma \ln(RND_i) + u_i \quad (5)$$

Combining Eqs. (4) and (5), we have

$$\ln\left(\frac{GDP_i}{POP_i}\right) = \lambda + \alpha \ln\left(\frac{CAP_i}{POP_i}\right) + \delta \ln(EDU_i) + \gamma \ln(RND_i) + \varepsilon_i \quad (6)$$



where  $\varepsilon_i = v_i + u_i$ . Eq. (6) summaries the growth theory model pioneered by Solow (1956), but does not incorporate or allow international tourism to have separate effects on income per capita. To test if tourism development is an additional determinant of income in the presence of these standard income determinants, we extend Eq. (6) to the following:

$$\ln\left(\frac{GDP_i}{POP_i}\right) = \lambda + \alpha \ln\left(\frac{CAP_i}{POP_i}\right) + \beta \ln(TOUR_i) + \delta \ln(EDU_i) + \gamma \ln(RND_i) + \varepsilon_i \quad (7)$$

to capture tourism development. Eq. (7) says that the *log* per capita GDP of a country is a function of tourism activities (TOUR) in combination with other income factors. If tourism is an additional determinant of income, we expect that  $\beta > 0$ .

To capture the long-run relationship between tourism and growth, we focus on the cross-sectional regression where data are averaged over the entire sample period for each country, as according to the growth literature (e.g., Barro, 1991). Alternatively, one may use a structural simultaneous equation approach to model and estimate all the direct, indirect, and induced effects of tourism, in line with the concept of the tourism economy and inter-sectorial connections within an economy, as in Cárdenas-García and et al. (2013). A fundamental challenge for this structural approach is its complexity: the set of possible channels through which tourism affects the economy can be many. Even if each channel could be enumerated and its operation modelled, how they interact and aggregate to determine macroeconomic outcomes raises additional analytic difficulties.

The major advantage of the structural system equation approach is its use of more information, which may results in more precise parameter estimates. The major disadvantages are that it requires more data and is sensitive to model misspecifications. In contrast, Eq. (7) offers a simple, reduced-form approach, which has the advantage of requiring less data. While it

also provides less precise estimates of parameters, it is more robust in modeling GDP. In the end, all the effects of tourism should be captured by GDP, which is the most comprehensive macro performance measure. This type of reduced form regression approach is widely used in econometrics (e.g., Ng & Zhao, 2011) and is complementary to the structural approach.

### **3 Data and empirical results**

#### ***3.1 Data***

The World Development Indicators (WDI) database is the primary World Bank (2014) collection of development indicators, compiled from officially recognized international sources. It represents the most current and accurate global development data available. WDI contains more than 1,300 annual time series indicators for over 200 economies and more than 30 country groups, with data for many indicators going back more than 50 years. WDI is widely used in the modern economic growth literature for its high quality and international comparability (see e.g., Kim et al, 2012.) Also, we use the international tourism data from WDI not only because of its credibility, but also due to their compatibility with the national income accounting data used in this study. For instance, exports are measured the same way in GDP as in international tourism receipts (% of total exports). Our sample, dictated by the availability of the international tourism data from WDI, includes 109 countries over the period from 1995 to 2011.

Following Gunduz and Hatemi-J (2005), we use the number of international tourist arrivals as our measure of tourism activity (TOUR). For robustness, we also report the results based on international tourism receipts (% of total exports). We focus on international tourist arrivals because such data are available for a larger number of countries over our sample period. Following the economic growth literature, research and development expenditure (% of GDP) is used to measure R&D, and average years of schooling (age 25+) is employed as a proxy for education. Again, for robustness, we also present the results based on alternative measures of R&D and education, namely, patent applications and adult literacy rate (% of people ages 15 and above).

The macroeconomic data on GDP per capita (constant 2005 US\$), international tourism, gross capital formation (constant 2005 US\$), R&D expenditure, patent applications, and adult literacy rate are obtained from the WDI database. The data on average years of schooling (age 25+) are from Barro and Lee (2013). Table 1 presents our summary statistics for the variables used in this study.

<< Table 1 About Here >>

### ***3.2 Ordinary least-squares regressions***

Empirical results from the cross-sectional regression are reported in Table 2. White's (1980) procedure is used to calculate standard errors to take into account possible heteroskedasticity. Panel A presents the main results. In Column (1), we only include the number of international arrivals, which is our proxy for TOUR. Consistent with most previous studies, tourism has a statistically significant positive association with GDP per capita. Our parameter estimate suggests that a 1% increase in TOUR (i.e., international arrivals) can lead to an estimated average of 0.562% increase in GDP per capital. The estimate is not only statistically but also economically significant. Next, we examine the economic mechanism underlying the tourism-growth association. If tourism is an addition determinant of income, we expect that TOUR still remains statistically significant after we add the standard income determinants, such as capital formation. If tourism works through the standard income determinants instead, we expect that TOUR will lose its statistical significance as soon as the standard income determinants are included.

In the next two columns, we include the standard income determinants in our model, Eq. (7). As we can see, as soon as standard income factors are added, TOUR (i.e., international arrivals) becomes statistically insignificant. When the standard income factors are included, the adjusted  $R^2$  is also substantially higher than that in Column (1). Our results suggest that tourism development affects income through the standard income determinants.

<< Table 2 About Here >>

To ensure that our results are not spurious, we carry out a number of robustness checks. The results are reported in Panels B and C of Table 2. In Panel B, we divide the whole sample period into two roughly equal sub-samples and repeat our exercises. As we can see, the sub-sample evidence is consistent with that based on the whole sample. That is, as soon as standard income determinants are included, TOUR (i.e., international arrivals) becomes statistically insignificant.

In Panel C, we experiment with alternative model specifications as well as alternative measures for international tourism, education and R&D. In the “Alternative model specification” section, we differentiate tourism economies from other economies. Intuitively, tourism activity should be more significant for economies that depend heavily on international tourism. Previous studies cited above also mostly focus on tourism economies. We take this into account by adding a dummy variable for tourism economy (Dummy) and an interaction term of the tourism dummy and TOUR ( $\log(\text{TOUR}) \times \text{Dummy}$ ). We define tourism economies as those with international tourism receipts that make up at least 10% of the country’s total exports.

Consistent with the results in Panel A, if we do not include the standard income factors, tourism is a statistically and economically significant factor of income growth. However, as soon as we take into account capital accumulation, R&D, and education, tourism activity does not show any marginal explanatory power. Furthermore, the tourism economy dummy variable (Duummy) is statistically insignificant in all the models we investigate. The interaction between the tourism economy dummy variable and TOUR is also statistically insignificant in all the models. Hence, there is no statistically significant difference between tourism and non-tourism economies regarding the impact of tourism activities on GDP per capita. Therefore, our findings suggest that even within tourism economies, tourism development affects income through the standard income determinants.

In the “Alternative measures” section, we try alternative measures of international tourism, education and R&D. In Column (1), we use international tourism receipts to measure tourism activity. In Column (2), we employ adult literacy rate as a proxy for education. In Column (3), we utilize patent applications to measure R&D. Again, the results are consistent with those in Panel A. As soon as we take into account capital accumulation, R&D and education, tourism activity do not show any marginal explanatory power, implying that tourism development affects income through the standard income determinants.

In Table 3, we present the partial correlation matrix among the variables that we use in the study. The partial correlation coefficient between a pair of variables measures the correlation between the pair of variables after removing (partialling out) the effect of the other variables included in the model. Consistent with the results in Table 2, the partial correlation coefficient is not significant between GDP per capita ( $\log(\text{GDP}/\text{POP})$ ) and tourism activities ( $\log(\text{TOUR})$ )

after taking into consideration the effect of other variables being considered, suggesting that tourism development affects income through the standard income determinants.

<< Table 3 About Here >>

### **3.3 *Quantile regressions***

We also perform quantile regressions for the relevant models. The least squares regression results reported in Tables 2 provide estimates of the *average* effects of the various independent variables on the dependent variable, the logarithm of GDP per capita. They depict the impact of the independent variables (tourism and standard income factors) on the dependent variable near the center of the dependent variable distribution. However, the effects of the various economic variables on income may not be the same across different portions of the GDP per capita distribution, as suggested by Lanza and Pigliaru (2000a, 2000b), Eugenio-Martin et al. (2004) and Dritsakis (2012). Least-squares regression is incapable of revealing this sort of potential variation when focusing on the average of the GDP per capita distribution. Quantile regression, on the other hand, is best for identifying these potential differential impacts (Koenker & Bassett, 1978; Lew & Ng, 2012).<sup>iv</sup>

In terms of economic intuition, quantile regression can capture the heterogeneity across countries in terms of their growth experience. As Eugenio-Martin et al. (2004) suggest, tourism activity may impact income differently in nations that have low income (i.e., developing nations) than those that have high income (i.e., developed nations). More generally, the insight of Eugenio-Martin et al. (2004) is that, conditional on a particular level of tourism development, the tourism-growth relationship could be different across countries depending on their growth

experience. Ignoring such heterogeneity would lead to inaccurate inferences. A natural way to take into account such heterogeneity is to estimate the tourism-growth relationship by grouping the countries with similar growth experience (i.e., within the countries with similar GDP per capita, *conditional on* a particular level of tourism development), which is precisely what quantile regression does.

The quantile regression results are presented in an Appendix to this paper, and are consistent with those based on the OLS in Table 2. Thus, through all of these tests, the evidence suggests that tourism development affects growth through the standard income determinants.



## 4 Discussion

We extend extant literature by showing that tourism development affects the economic growth of destinations through the standard income determinants. Our findings have important theoretical as well as practical implications. In terms of theoretical implication, our findings suggest that future research should focus on how tourism development interacts with standard income factors as part of an understanding of the association between tourism development and economic growth. In terms of practical implications, our results suggest that governments should help the tourism industry expand through mechanisms that concurrently support growth in the standard income factors.

To some extent, this is often accomplished through the development process, though it is not always done in an explicit and robust manner. Several growth studies have found that tourism development grows, not independently, but in conjunction with other economic policies. Sugiyarto et al. (2003) argued that the combination of international tourism development with trade liberalization policies generated positive economic impact for Indonesia, including increased economic production, reduced government deficits, and a lower national balance of trade. This has also been seen in smaller destinations that have a high tourism image (Lanza & Pigliaru, 2000b; Armstrong & Read, 2000). For example, Vanegas and Croes (2003) found that, in the case of the Caribbean island of Aruba, international tourism has been the most successful growth oriented sector of the economy since the late 1980s, in large part because it has been part of a broader export oriented and neo-liberal economic policy strategy.<sup>v</sup>

A natural extension of our research is to investigate through which standard income determinants tourism development most affects economic growth. To address this issue, one needs to first develop a more detailed model. The model should describe not only how the

factors of production and technology determine the output of an economy, but also how the factors of production and technology are determined by their relevant determinants, including tourism development. Based on such a model, one then can estimate a system of equations to track down the effects of tourism development. This line of future research will shed considerable light on optimal tourism policies. For instance, if tourism development were found to affect growth mainly through its effects on R&D, then an optimal tourism policy might be to encourage business travel.

## 5 Conclusions

Whether international tourism can lead to economic growth is an important question. Policy makers need to decide where to invest public revenues and how to allocate incentives to encourage the long term economic livelihood of citizens. While exceptions exist, previous studies have overwhelmingly supported the notion that there is a positive association between international tourism and economic growth. Since the late 1990s, those findings have been consolidated into the tourism-led growth hypothesis, which is widely accepted as a general concept by tourism boosters, and has been tested by tourism researchers using a variety of cointegration modeling approaches.

We extend the TLGH literature by investigating the economic mechanism underlying the positive association between tourism and growth. In our analysis, we find that when we did not control for standard income factors in our data, international tourism had a statistically significant association with growth; however, as soon as we took into account the standard income determinants, tourism no longer maintained its marginal explanatory power, even within major international tourism economies, and even if heterogeneity across countries was allowed. Our findings suggest that tourism development affects growth and income through the standard income determinants.

Please note that our findings do not suggest that tourism has no role to play in national or local economic development. It clearly does. However, our findings suggest a redirection of the goals of tourism development from one of investing tourism for its own sake to one where tourism investments are made to strategically support standard income determinants. Tourism does not grow to success in isolation. It is dependent on efficient infrastructure that supports the movement of goods and people; it is dependent on a skilled, creative and entrepreneurial labor

force that can react to new challenges and opportunities in innovative ways; and it is dependent on a government and civil society that supports places that attract people both as residents and tourists. Therefore, for most countries, a broad and diversified economic development strategy is more likely to support international tourism development than a more narrow policy that focuses primarily on tourism in isolation.

Our findings have important implications for future research on the macroeconomics of tourism development. Most important is that studies of the economic significance of tourism to country and regional economies must take into account standard income factors to ensure a more complete understanding of the role and contribution of tourism to growth. Assuming our findings are valid, a second implication is the need for finer detailed understandings of how tourism would best support, and be supported by, standard income factors. Such analysis could help with policy decisions on how to make the tourism investments most effective in supporting long term growth for a destination economy.

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**Table 1 Summary statistics of the variables for the 109 countries**

	GDP per capita (constant 2005 US\$)	Tourism Arrivals	Gross capital formation (constant 2005 US\$)	Average years of schooling (age 25+)	R&D expenditure (% of GDP)
Min	140.6	17294	23.34	0.990	0.02
1 <sup>st</sup> Quartile	1279.7	715118	364.56	6.050	0.19
Median	4773.2	1996118	1017.68	8.550	0.47
Mean	12661.7	6529708	2752.59	7.921	0.81
3 <sup>rd</sup> Quartile	19706.8	6764588	4333.39	9.852	1.08
Max	74590.1	74115824	15954.38	13.000	4.12
Standard Deviation	15935.6	11448920	3363.53	2.721	0.90

The macroeconomic data on GDP per capita (constant 2005 US\$), international tourism, gross capital formation (constant 2005 US\$), and R&D expenditure are obtained from WDI. The data on average years of schooling (age 25+) are from Barro and Lee (2013). Table 1 presents our summary statistics for the relevant variables.

**Table 2. Ordinary least-squares regression results**

Panel A: Main results				
	(1)	(2)	(3)	
Constant	0.253	1.329***	1.487***	
	(0.841)	(0.000)	(0.000)	
Log(TOUR)	0.562***	0.006	0.000	
	(0.000)	(0.791)	(0.987)	
log(CAP/POP)		1.007***	0.997***	
		(0.000)	(0.000)	
log(EDU)			0.009	
			(0.907)	
log(RND)			0.025	
			(0.506)	
Adjusted R <sup>2</sup>	0.314	0.974	0.974	
N	109	109	109	
Panel B: Sub-sample evidence				
	<u>1995-2002</u>		<u>2003-2010</u>	
	(1)	(2)	(1)	(2)
Constant	0.633	1.494***	0.624	1.267***
	(0.567)	(0.002)	(0.643)	(0.000)
Log(TOUR)	0.542***	0.009	0.541***	0.001
	(0.000)	(0.743)	(0.000)	(0.964)
log(CAP/POP)		0.933***		1.031***
		(0.000)		(0.000)
log(EDU)		0.202		-0.025
		(0.111)		(0.753)
log(RND)		0.017		-0.036

			(0.743)		(0.193)
Adjusted R <sup>2</sup>	0.325	0.974	0.302	0.979	
N	86	86	104	104	

Panel C: Alternative model specification and measures

	<u>Alternative models</u>			<u>Alternative measures</u>		
	(1)	(2)	(3)	(1)	(2)	(3)
Constant	2.105 (0.304)	1.636*** (0.000)	1.863*** (0.000)	1.328*** (0.000)	1.418*** (0.000)	1.286*** (0.002)
log(TOUR)	0.451*** (0.000)	-0.017 (0.470)	-0.024 (0.317)	0.051 (0.209)	0.015 (0.522)	0.043 (0.418)
log(CAP/POP)		1.101*** (0.000)	1.007*** (0.000)	1.011*** (0.000)	0.977*** (0.000)	0.902*** (0.000)
log(EDU)			-0.026 (0.717)	-0.010 (0.893)	-0.010 (0.918)	0.196 (0.383)
log(RND)			0.024 (0.523)	0.017 (0.661)	-0.006 (0.877)	-0.020 (0.220)
Dummy	-2.475 (0.355)	-0.861 (0.089)	-0.942* (0.095)			
log(TOUR)×Dummy	0.135 (0.446)	0.055 (0.101)	0.061 (0.105)			
Adjusted R <sup>2</sup>	0.307	0.977	0.977	0.976	0.955	0.944
N	105	105	105	105	97	112

Empirical results from the cross-sectional regression models. The numbers in parentheses are the  $p$ -values of the  $t$  test statistics. White's (1980) procedure is used to calculate standard errors to take into account possible heteroskedasticity. \*Significant at 10%; \*\*Significant at 5%; \*\*\*Significant at 1%.

**Table 3. Partial correlation coefficient matrix**

	log(GDP/POP)	log(TOUR)	log(EDU)	log(RND)	log(CAP/POP)
log(GDP/POP)	1.0000 [0.0000] (0.0000)	0.0626 [0.6392] (0.5227)	0.1203 [1.2360] (0.2168)	0.0672 [0.6873] (0.4919)	0.9666 [38.4613] (0.0000)
log(TOUR)	0.0626 [0.6392] (0.5227)	1.0000 [0.0000] (0.0000)	-0.1075 [-1.1031] (0.2700)	0.3580 [3.9103] (0.0001)	0.0120 [0.1225] (0.9025)
log(EDU)	0.1203 [1.2360] (0.2168)	-0.1075 [-1.1031] (0.2700)	1.0000 [0.0000] (0.0000)	0.3123 [3.3525] (0.0008)	-0.0067 [-0.0678] (0.9459)
log(RND)	0.0672 [0.6873] (0.4919)	0.3580 [3.9103] (0.0001)	0.3123 [3.3525] (0.0008)	1.0000 [0.0000] (0.0000)	0.0124 [0.1266] (0.8993)
log(CAP/POP)	0.9666 [38.4613] (0.0000)	0.0120 [0.1225] (0.9025)	-0.0067 [-0.0678] (0.9459)	0.0124 [0.1266] (0.8993)	1.0000 [0.0000] (0.0000)

The top number in each cell is the estimated partial correlation coefficient between the corresponding pair of variables while the middle number inside the square brackets is the  $t$  test statistic for the significance of the partial correlation coefficient and the bottom number inside the parentheses is the  $p$ -value of the  $t$  test statistic.

## Appendix

Figure 1 presents the regression quantile coefficients of the independent variable  $\log(\text{TOUR})$  when the standard income determinants are excluded. The top and bottom panels present the estimated regression quantile coefficients for the intercept and  $\log(\text{TOUR})$  across the whole spectrum of the dependent variable distribution for the  $0 \leq \tau \leq 1$  presented on the horizontal axis. For example, the vertical axis of the bottom panel in the figure represents the magnitude of the regression quantile coefficients of  $\log(\text{TOUR})$  across  $\tau$  ranging from 0.1 to 0.9 on the horizontal axis. Moving from the left to the right along the horizontal axis, the vertical distances of the dots in the dot-dash line represent the magnitudes of the regression quantile coefficients for  $\tau = 0.1, 0.2, \dots, 0.8, 0.9$ . The grey band around the dot-dash line in each panel represents the 95% confidence band for the quantile regression coefficients. Hence, the quantile regression coefficient at a particular  $\tau$  value is considered significantly different from zero when the band at that  $\tau$  does not cover the  $y = 0$  axis. The horizontal solid line represents the magnitude of the least-squares regression coefficient while the horizontal dash-lines around it depict the 95% confidence interval for the least-squares coefficient.

<< Figure 1 About Here >>

The regression quantile coefficient for a particular  $\tau$  measures the impact of a one unit change in the corresponding independent variable on the  $\tau$ -th quantile of the dependent variable, holding constant (partialling out) the effects of all the other independent variables. For example, from the lower panel of Figure 1, the quantile regression coefficient of  $\log(\text{TOUR})$  is around 0.7 for  $\tau = 0.5$  (the median regression), which implies that a 1% increase in tourism arrival will induce an estimated 0.7% increase in the median GDP per capita. This estimate is quite a bit higher than the least-squares regression estimate of 0.562 in Panel A of Table 2, which suggests

that there appear to be outliers in the data since the values of estimated average (least-squares regression) and median ( $\tau = 0.5$  quantile regression) effects of  $\log(\text{TOUR})$  on the dependent variable are quite different from each other.

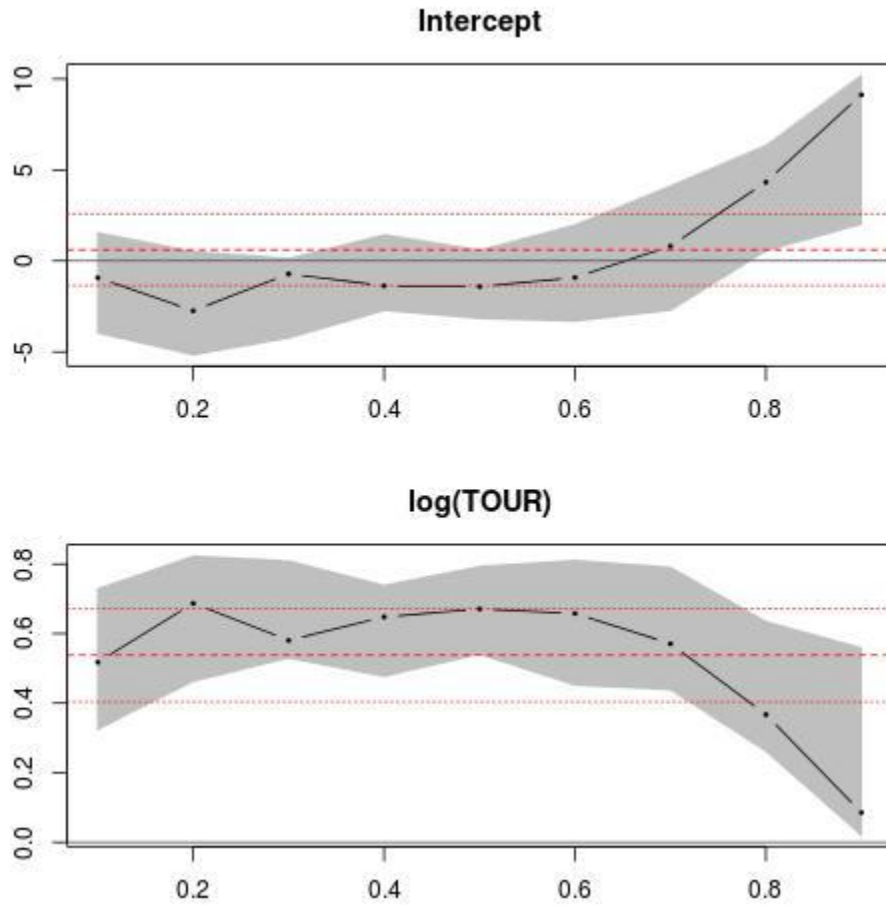
Figure 1 also shows that across different quantiles, the coefficient of  $\log(\text{TOUR})$  is always significant and there is some quantile effect for  $\log(\text{TOUR})$  in the upper tail of the distribution of  $\log(\text{GDP}/\text{POP})$  since the magnitude of the slope coefficient is fairly constant across  $0 \leq \tau \leq 0.7$  and decreases as  $\tau$  increases beyond 0.7. In addition, the intercept term in Figure 1 exhibits strong quantile effect, especially in the upper tail, with increasing positive values as  $\tau$  increases from 0 to 1. This indicates that  $\log(\text{GDP}/\text{POP})$  rises as we move from the left tail of the GDP per capita distribution towards the right tail when all the independent variables have zero values, which is what we will expect. Taken all the evidence together, even when the potential heterogeneity across countries is allowed through quantile regressions, there is still a significant association between GDP per capita and tourism.

Next, we investigate the economic mechanism underlying the positive tourism-growth the association by including the standard income determinants. The results are presented in Figure 2. Figure 2 contains the regression quantile coefficients of the independent variables  $\log(\text{TOUR})$ ,  $\log(\text{EDU})$ ,  $\log(\text{RND})$  and  $\log(\text{CAP}/\text{POP})$ . Similar to the least-squares regression findings, as soon as the standard income factors are included, the number of international arrivals ( $\log(\text{TOUR})$ ) becomes statistically insignificant across the whole spectrum of the dependent variable distribution as we can see that the grey confidence band for the estimated coefficients for  $\log(\text{TOUR})$  contains the whole horizontal axis. The magnitude of the estimated impacts of the growth factors ( $\log(\text{EDU})$ ,  $\log(\text{RND})$  and  $\log(\text{CAP}/\text{POP})$ ) on the different quantiles of logarithm of GDP per capita across the whole range of  $0 \leq \tau \leq 1$  is very close to the average



impact estimated by the least-square regression. Therefore, even if the heterogeneity across countries is allowed in the model, the significant association between international tourism and income growth documented in Figure 1 disappears as soon as the standard income determinants. This finding again suggests that tourism development affects economic growth through standard income determinants.

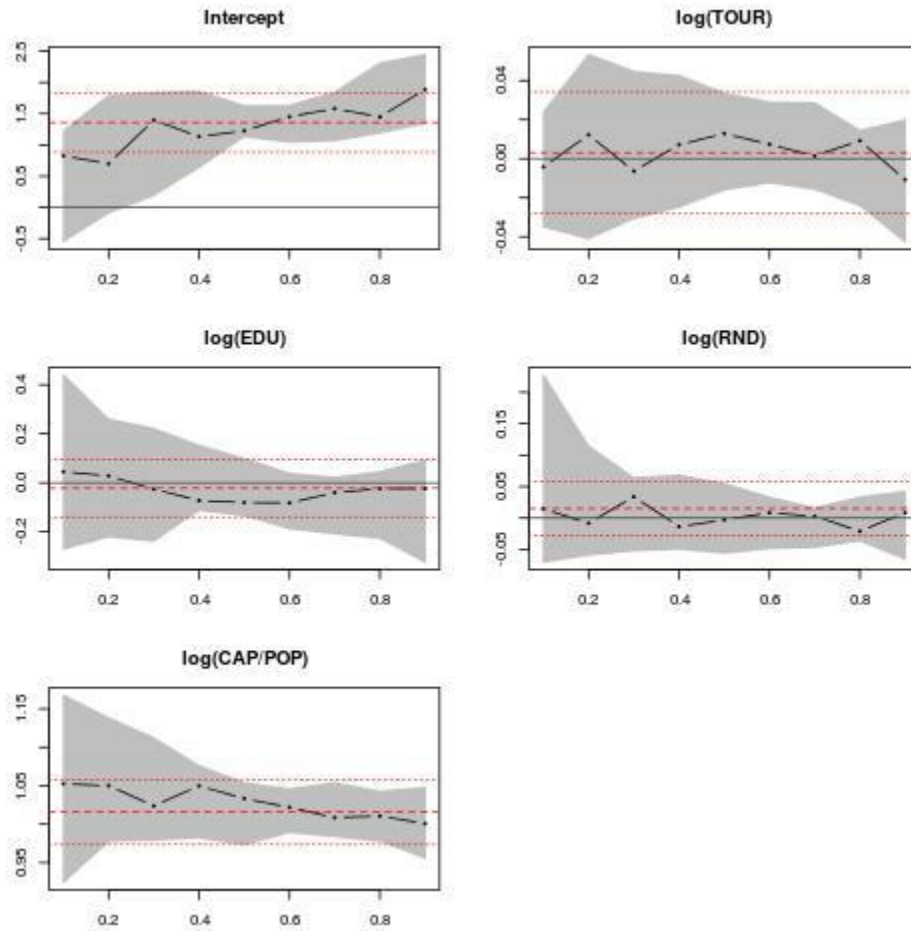
**Figure 1** Quantile regression coefficients plot for the model that omits standard income determinants



The lower panel shows the estimated regression quantile coefficient for the independent variable ( $\log(\text{TOUR})$ ) on the dependent variable ( $\log(\text{GDP}/\text{POP})$ ) across the whole spectrum of the dependent variable distribution for  $0 \leq \tau \leq 1$ . Moving from the left to the right in the panel, the vertical distances of the dots in the dot-dash line represent the magnitudes of the regression quantile coefficient for the  $\tau = 0.1, 0.2, \dots, 0.8, 0.9$  quantiles. The grey band around the dot-dash line is the 95% confidence band for the quantile regression coefficient. The quantile regression coefficient at a particular  $\tau$  value is considered statistically significantly different from zero when the band at that  $\tau$  does not cover the horizontal axis. The horizontal dashed line represents the magnitude of the least-squares regression coefficient while the dotted-lines around it show the 95% confidence interval for the least-squares

coefficient. Hence, the least-squares regression coefficient is statistically insignificant if the horizontal dotted-lines envelope the horizontal axis.

**Figure 2** Quantile regression coefficients plot for the model that includes standard income determinants



Each panel shows the estimated regression quantile coefficient for each of the independent variables ( $\log(\text{TOUR})$ ,  $\log(\text{EDU})$ ,  $\log(\text{RND})$  and  $\log(\text{CAP/POP})$ ) on the dependent variable ( $\log(\text{GDP/POP})$ ) across the whole spectrum of the dependent variable distribution for  $0 \leq \tau \leq 1$ . Moving from the left to the right in each panel, the vertical distances of the dots in the dot-dash line represent the magnitudes of the regression quantile coefficient for the  $\tau = 0.1, 0.2, \dots, 0.8, 0.9$  quantiles. The grey band around the dot-dash line in each panel is the 95% confidence band for the quantile regression coefficient. The quantile regression coefficient at a particular  $\tau$  value is considered statistically significantly different from zero when the band at that  $\tau$  does not cover the horizontal axis. The horizontal dashed line represents the magnitude of the least-squares regression coefficient while the dotted-lines

around it show the 95% confidence interval for the least-squares coefficient. Hence, the least-squares regression coefficient is statistically insignificant if the horizontal dotted-lines envelope the horizontal axis.

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<sup>i</sup> Criticisms of tourism include high leakages, low wages, and dependent economies (Sinclair, 1998; Hall & Lew, 2009).

<sup>ii</sup> Like manufactured goods that are sold abroad, tourism is an export industry to the degree that it generates income and profits from money derived from sources outside of the destination. It is unlike traditional export industries because the consumed goods are experiences and services based on products that seldom leave the destination (Alam, 2003). Tourism's export income benefits can be limited in situations where leakages are high and Keynesian multipliers are low, though this can also be the case for other exports based on foreign direct investments (Nowak et al., 2007). Even in this situation, however, exports can still promote growth through the accumulation of capital investments and goods in the exporting economy.

<sup>iii</sup> For more supporting evidence of the positive relationship between tourism development and economic growth, see Vanegas and Croes (2003), Fayissa et al. (2009), and Belloumi (2010). Alternatively, Oh (2005) and Katircioglu (2009) did not find supporting evidence in Korea and Turkey. The long term growth potential of small, tourism-based economies has also been questioned (Parrilla et al., 2007).

<sup>iv</sup> As a special case of quantile regression, at the 0.5 quantile (or 50<sup>th</sup> percentile), the median regression also serves as a robust (to outliers) alternative to the least-squares regression.

<sup>v</sup> The neo-liberal export-led growth models rely on export (and therefore tourism) to encourage entrepreneurial competition and efficiency, reduce internal monopolistic tendencies through

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more open market structures, and increase knowledge accumulation, technology adoption, and other innovations (Felipe, 2003).