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Testing the empirical link between tourism and competitiveness: evidence from Puerto Rico

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This study examines the empirical relationship between tourism and the competitiveness of a destination. It uses the cointegration and error correction model (ECM) in a bivariate context as a precondition to apply the Granger causality test. This procedure was carried out in the case of Puerto Rico's tourism industry during 1960–2004. The study found cointegration in the intertemporal rather than the contemporaneous effects, as well as a one-directional causality running from changes in tourism spending to changes in competitiveness. This result highlights the long-run equilibrium spending behaviour of tourists as a major concern of destination managers.

Keywords: competitiveness; tourism spending; error correction model; cointegration; Granger causality; Puerto Rico

For the past three decades, tourism has played an increasingly important role in the global economy and is part of a sectoral structural change that has taken place globally (Smeral, 2003). As an industry, tourism seems to be growing faster than the world economy, demonstrated mainly by a continuous increase in the share of national income and employment. Lured by the potential economic benefits sought from tourism activities, competition is evidenced by the increased number of destinations and the limited number of origin countries that pursue them (Vanhove, 2005). Many studies about tourism's competitiveness provide intercountry patterns of competitiveness performance (Alavi and Yasin, 2000; Dwyer *et al.*, 2000, 2001; Mangion *et al.*, 2005; Mazanec *et al.*, 2007). At the same time, others have looked into the specific factors that

determine tourism competitiveness (Dwyer *et al*, 2004; Enright and Newton, 2005; Gooroochurn and Sugiyarto, 2005; Mangion *et al*, 2005; Mazanec *et al*, 2007). Even though both streams of research implicitly suggest that there is a causal relationship between destination performance and competitiveness, none of these studies, however, provide an empirical validation of this relationship. Therefore, since very little is known about the empirical relationship between the two, this study fills this gap by investigating the direct empirical relationship between inbound tourism and competitiveness.

The competitiveness of tourist destinations has become increasingly important, both from an academic perspective as well as from a policy perspective. Competitiveness has been identified in the tourism literature as a crucial factor for the success of tourist destinations (Crouch and Ritchie, 1999; Kozak and Rimmington, 1999; Buhalis, 2000; Mihalic, 2000; Dwyer and Kim, 2003; Gooroochurn and Sugiyarto, 2005; Mazanec *et al*, 2007; Chen *et al*, 2008). As a result, three prominent journals have dedicated special issues to this subject, namely *Tourism* (1999), *Tourism Management* (2000) and *Tourism Economics* (2005).

Tourism has become a competitive activity among regions that are compelled to enhance their performance in order to attract more tourists and to increase their revenues (Crouch and Ritchie, 1999, 2005; Dwyer *et al*, 2000). More noticeable is the attempt of policymakers to increase the market share of travel and tourism by constantly undertaking a plethora of new initiatives (Hawkins and Mann, 2007). This is particularly true in the case of developing countries, where tourism is viewed as an engine of economic growth to generate jobs, much-needed foreign exchange to cover imports, business opportunities and tax revenues. Globalization, rapid technical change and shrinking economic distance have propelled an 'obsession' with tourism competitiveness.

Therefore, by testing this link empirically, this study provides relevant insights on how the ability to formulate policies is harnessed effectively by destinations. In this study, we are not interested in analysing factors contributing to competitiveness but in examining the direct link between competitiveness and tourism. Our claim is that there is a direct empirical relationship between tourism and competitiveness. More specifically, the study answers three questions:

- (1) Is there an empirical relationship between tourism and competitiveness?
- (2) If there is, what is the nature of that relationship?
- (3) What is the causality direction of this relationship?

As more countries engage in tourism development by spending millions in tax dollars on product development and expansion, it is imperative to determine the empirical link between tourism and competitiveness. It is surprising that large amounts of investment in tourism development are taken at face value and on the promise of tourism being a driver of quality of life without examining this link empirically. By addressing such an important topic, this study fills this gap, thereby contributing to the debate about tourism's relevance in enhancing the quality of life of the citizens of tourist destinations.

Defining competitiveness

The literature on competitiveness reveals diverse perspectives vis-à-vis definition, understanding and measurements (Fagerberg, 1996; Krugman, 1996; Lall, 2001). This diversity revolves around identifying the relevant entities involved and the corresponding concept of competitiveness. While competitiveness is readily defined at the firm level, it becomes somewhat ambiguous at the industrial and national level (Krugman, 1996; Lall, 2001). Several studies extend the concept of competitiveness from the firm level to the national level, thereby assuming that the nature of competition in both firms and countries is identical (Lall, 2001). For example, unlike at the firm level, a falling market share in tourism does not necessarily imply a loss of national competitiveness, but simply a shift in comparative advantage (Krugman, 1996; Lall, 2001). This reflects the fundamental tenet of the theory of comparative advantage underlying the traditional theory of international trade; therefore, extending the concept of market share and profitability to the national level leads to problems.

In addition, the current literature is not clear on why tourism should have a separate model of competitiveness. For example, Crouch and Ritchie (1999, 2006) and Dwyer and Kim (2003) seem to imply that the nature of the tourism product is different from other, more traditional products and services. However, neither study elaborates on how the implications of this observation might impact the core assumptions of the comparative advantage framework of efficient allocation of resources and perfect equilibrium.

Mazanec *et al* (2007) assert that the only consent in the tourism literature about competitiveness is that competitiveness seems to be the antecedent to the economic welfare and prosperity of the population. One main reason for this ubiquitous situation is the lack of definitions reflecting the cause–effect relationship, thereby hampering hypothesis building and testing. Most of the existing definitions neglect to distinguish the dependent variables from the independent variables, thus revolving around several hidden assumptions. As Mazanec *et al* (2007, p 86) pointed out in reference to Crouch and Ritchie's definition of competitiveness: 'This explication contains more than a mere definition. It seems to include hidden cause–effect assumptions. That is, it points to "satisfying, memorable experiences" as an antecedent of an increase in the number of visitors. It further mentions the destination residents' well-being – an obvious consequence of the profitability also claimed as a condition for competitiveness. Additionally, the criterion of sustainability is required.'

While the end result of realizing a destination's competitiveness might well be economic prosperity for the population, the link between tourism numbers (arrivals and expenditure) and economic contribution is not always obvious. Some studies modelling computable general equilibrium reveal that tourism expansion might 'crowd out' other economic sectors, resulting in a change in the composition of industry rather than an expansion of economic activity (Adams and Parmenter, 1995; Dwyer and Forsyth, 1998). Other studies take issue with these results, pointing to the long-term positive economic effects of tourism on economic growth (Shan and Wilson, 2001; Balaguer and Cantavella-Jordá, 2002; Vanegas and Croes, 2003; Dritsakis, 2004; Durberry, 2004; Eugenio-Martin *et al*, 2004; Kim *et al*, 2006; Croes and Vanegas, 2008).

Based partially on this mixed reality, a large number of factors appeared in several studies to describe and explain the notion of destination competitiveness. For example, Crouch and Ritchie (1999) identified 32 components or factors; Dwyer *et al* (2004) identified 81 factors; Enright and Newton (2004) identified 52 items; Gooroochurn and Sugiyarto (2005) condensed 23 factors into 8 main indicators, which were later taken up by Mazanec *et al* (2007); while Chen *et al* (2008) used 122 indicators based on 9 categories to assess the tourism industry in Cambodia. Delineating activities confined solely to competition with other destinations is not an easy task. Some activities clearly imply competition with other destinations (such as arrival flows, bed-nights, value-add and customer satisfaction), while others have only an indirect effect on competition as inputs (such as land, parts of the infrastructure, transport and hotel services, etc).

The concern with competitiveness has, as its best-known product, the competitiveness index (Porter *et al*, 2002). This is a composite measurement ranking countries based on a wide range of criteria and factors that could affect national competitiveness. Its best-known examples are the Global Competitiveness Report of the World Economic Forum (WEF), the World Competitiveness Report prepared by the International Institute for Management Development (IMD) and the Travel and Tourism Competitiveness Report by the World Travel and Tourism Council (WTTC). These rankings, derived from the indices mentioned earlier, have been the object of criticism. The flaws of these rankings are disclosed especially by Lall (2001) on the definitional, modelling, determinant and indicator aspects of competitiveness, reiterating the inadequacy of such indices in explaining the level of competitiveness in small countries.

Our study argues that the concept of competitiveness is useful and practical at the national (destination) level. The study departs from the comparative advantage framework by relaxing its core assumptions of homogeneous products, full information and fair transactions in the marketplace, with no externalities or scale economies. Because resources are not allocated efficiently by market mechanisms due to distortions, the aggregation of firms' outputs cannot be extrapolated in a straightforward manner to the national level. Market distortions reduce the role of price signals (when market failures exist) and hence affect the optimal allocation of resources; countries can improve their position by intervening to remedy or exploit market failures.

The tourism sector is no exception to this reality. What makes the tourism sector so distinguishable from other economic activities is that its lifeblood is sustained by the existence of market failures due to its consumption and production patterns (Gray, 1982; Eadington and Redman, 1991; Bull, 1995; Sinclair and Stabler, 1997; Mak, 2004). The nature of these patterns is determined by the complementary character of the various service providers at a destination. The discrete business units generate a number of customers through activities (for example, promotion) and affect the activities of other tourist agents. These effects (externalities) could be either positive or negative and affect the business units among themselves, between these units and the community (for example, environmental protection, infrastructure) and between visitors and business units/the community. Internalizing these externalities is associated with the ability of a destination to maximize the benefits derived from tourism in its attempt to realize equilibrium.

There are, therefore, valid reasons for being concerned about national competitive ability under the condition of imperfect markets. One could argue, however, that in developed countries, missing or imperfect markets are not as pervasive as in developing countries; and, hence, even if its discussion seems required from a theoretical perspective, from a practical standpoint it is doubtful whether governments have the ability to intervene successfully. This seems to be Krugman's (1996) line of argument, which expounds the futility of trusting governments in building dynamic comparative advantage.

Our study takes issue with this line of contention. Tourism development is not about tackling the impediments to optimal resource allocation due to the degree of market failures and the stage of a country's economic development, but instead is about overcoming market imperfections caused by the nature of tourism production and consumption itself. This condition makes intervention theoretically justifiable and takes the concept of competitiveness beyond its initial intuitive appeal and into the realm of looking at the ability of destinations to compete with each other. This ability refers to policies that increase the economic potential of a destination. This implies that tourism can only develop or function with regular and robust government management.

The literature seems to suggest that increasing this potential is aimed at generating new jobs and better living conditions (Porter, 1990; Dollar and Wolff, 1993; Krugman, 1996; Crouch and Ritchie, 1999, 2005; Dwyer and Kim, 2003). Evidence, however, indicates that the outcome of the ability of destinations to compete is mixed. For example, Crouch and Ritchie (2006) identified in their conceptual model two distinct but interrelated dimensions; that is, the microenvironment (which includes the tourist players, tourist markets, competitive destinations and stakeholders) and the macroenvironment (the natural environment, economies, demographics and technology). These two dimensions affect the 'competitiveness core', which is defined by four main components ('core resources and attractors', 'supporting factors and resources', 'destination management' and 'destination policy, planning and development').

Crouch and Ritchie (1999, 2006) also postulate that the presence of natural endowments at a destination does not necessarily translate into value for the economy. This, they argue, only happens when the factors of competitiveness are fully developed. Their competitiveness model seemingly implies that a destination's ability to provide for its residents' quality of life is demonstrated by its capability to be superior in several respects compared to other destinations. Other enthusiasts of this model, such as Dwyer and Kim (2003) and Dwyer *et al* (2004), also posit that destination competitiveness is a function of endowed resources, destination management, situational conditions and demand. However, such studies are unable to distinguish clearly between destinations that have activities based on static endowments and that fail to produce growth and value-added and those with a broad competitive base that is capable of remaining competitive as income grows.

Previous research on tourism competitiveness has been inclined to use large numbers of variables, typically eluding distinction and theoretical justification for variables and their causal correlation. Many of these variables take no notice of the destination's market size, the degree of dependence on tourism, its life cycle or current state of economic development. Depending on the destination (for example, developed or developing countries), the impacts on tourism's

demand from variables such as price or human resources are likely to be different, thereby rendering any comparisons or benchmarking futile.

Several studies quietly glide over important theoretical issues, such as factor interaction. For example, consider the countries ranked in the top ten receiving destinations by the World Tourism Organization. Would it be possible to explain theoretically the presence of high prices and high labour costs as occurring in developed countries or more mature tourist destinations while realizing a high tourism performance? Surely, a rise in labour costs should lead to a decline in the competitiveness level of a destination, which would translate into a lower market share. However, empirical evidence indicates that over the long term, market share for exports (tourism) and relative unit costs or prices tend to move together, the so-called Kaldor paradox. Additionally, past studies have failed to answer fundamental questions about the alignment of economic efficiency (the deployment of available resources in an efficient way in order to attract the maximum benefit of tourism demand) and about economic welfare (the improvement of people's quality of life).

In the literature, tourism's competitiveness has been identified increasingly with the capacity of an economy to raise (or at least keep) the population's standard of living. Productivity gains appear to be the mechanism for national competitiveness (Porter, 1990; Dollar and Wolff, 1993; Fagerberg, 1996; Krugman, 1996; Crouch and Ritchie, 1999, 2006). Competitiveness is therefore associated with the ability of a destination to increase tourism spending and to provide memorable experiences to tourists, while enhancing residents' quality of life and simultaneously preserving the integrity of its natural capital (Crouch and Ritchie, 1999, 2006).

The aim of this study, therefore, is to examine econometrically whether there is a link between tourism and competitiveness. To realize this purpose, the study uses a cointegration analysis. In the next section, we establish a framework for our investigation.

Tourism competitiveness: a framework and econometric investigation

The literature review seems to imply that competitiveness itself influences tourism and uses tourism flows, especially arrivals, as the measurement unit for determining the level of competitiveness of a destination. Falling tourism flows, for example, are an indication of the inferior performance of a destination, and hence of decreasing competitiveness. Moreover, tourism is a sector that can only be defined in terms of demand; and the driving force of the economy, at least in the short term, is therefore the visitor. In the long run, this short-term view could be difficult to hold and one is forced to look at reasons for the prolonged growth of tourism. From this angle, the supply side of tourism kicks in, referring to the sources of competitiveness. Determining whether these two variables move apart or together over time and establishing the driving forces underlying the eventual long-run relations between these two variables is the essence of this study.

This study's approach is restricted to the bivariate relationship between competitiveness and tourism spending. This approach is fairly common in the

relevant international trade theory literature (Ekanayake, 1999). For the purpose of this study, competitiveness (*Comp*) is defined as the quality of life of a destination's residents. Quality of life reflects a qualitative aspect of the standard of living of a specific population, encompassing not only the objective but also the subjective realities of a person's life. Measuring quality of life is, however, an impossible endeavour. Therefore, a proxy is used for quality of life; that is, real per capita income. There is an extensive literature suggesting the suitability of this measure, partly based on its macroeconomic significance related to the total factor productivity (Porter, 1990; Krugman, 1996; Smeral, 2003). It is claimed that tourism is a positive determinant of productivity, and hence per capita incomes.

Tourism spending (*Tour*) is measured as the share of real tourist receipts of the real gross domestic product (GDP). Typically, the tourist travels to the destination and buys and consumes locally, thereby providing opportunities for selling additional goods and services. Tourism expansion is perceived as having positive economic effects, thereby stimulating the standard of living of a destination's residents (Hazari and Sgro, 1995).

Fluctuations in competitiveness are a function of both recent changes in tourism demand conditions and the degree to which competitiveness, as approximated with productivity, is consistent with the current nature of tourism demand. Therefore, the degree of competitiveness is still expected to be related to the levels of tourism spending, but only as patterns in a moving equilibrium. Thus, the coincidence of a high level of competitiveness and a low level of tourism spending (and vice versa) is permitted, with the expectation that the level of spending will change eventually so as to re-attain an equilibrium related to the competitiveness of the destination.

Rather than unidirectional, we expect tourism spending to be cyclical (implying back and forth movement). When faced with favourable economic conditions at home and globally, tourism spending will increase due to its high income elasticity; while, when economic conditions are less favourable, spending will decrease (Smeral, 2003). The cyclical behaviour of tourism spending, it is hypothesized, will influence productivity in a similar fashion and may therefore be expressed as a moving equilibrium. Consequently, we do not expect the two processes to drift apart and stay away from one another for very long.

Cointegration analysis

The question is, however, for how long will past events influence present behaviour. The order of integration of a series therefore has implications for the manner in which past events influence present behaviour. Incorrectly specifying stationarity could lead to misleading conclusions and to not eliminating uncertainty. In other words, *integration* means that if past shocks remain undiluted, the realization of the series is permanently affected and has theoretically infinite variance, as well as a time-dependent mean (Enders, 1995).

Because a wrong choice of data transformation gives biased results and has consequences for incorrect interpretation, it is important to examine the stationarity of time-series data to set up the correct methodology in the formation of econometric models. Engle and Granger (1987) introduced the concept of cointegration by showing that it was possible for a linear

combination of integrated variables to be stationary. According to them, the conditions necessary for the components of a vector X_t to be cointegrated of order d, b , denoted by $X_t \sim CI(d, b)$, are: (i) all components of X_t are integrated of order d ; (ii) there exists a vector β' , such that the linear combination $\beta' = X_t$ of order $(d - b)$ where $b > 0$. β' is called the cointegrating vector.

In this analysis, the unit root test is based on both the augmented Dickey–Fuller (1979, 1981) and the Phillips and Perron (1988) tests (hereafter ADF test and PP test). The advantage of the PP test over the ADF test is that the PP test is robust to a wide variety of serial correlation and time-dependent heteroskedasticity. These tests enable us to conclude if our two variables are stationary of order 0, written as $I(0)$, or if they follow a non-stationary trend of 1, denoted $I(1)$ or higher.

A variable is said to be integrated of order $I(1)$ if it must be differenced once to become stationary. To test for integration, each variable should be examined based on the following auxiliary equation:

$$\Delta y^t = \alpha + \rho y^{t-1} + \beta t + \sum \tau^t \Delta y^{t-1} + \mu^t \quad (1)$$

where (y^t) is the relevant time-series variable, (t) is a linear deterministic trend and (μ^t) is an error term with a mean of zero and a variance that is constant. In constructing the cointegration regressions, we first include all the variables on the right-hand side of all cointegrating equations. There is a test of the null hypothesis of the presence of a unit root against the alternative that the series is stationary, ρ being the parameter of interest in Equation (1). Ordinary least squares are used in the estimation of these general regressions. The estimated error terms from the final cointegration regressions are then tested for unit roots using the ADF and PP tests.

The ADF is a one-sided test of the significance of the estimated (ρ) and its critical values are given in Fuller (1976, Table 8.5.2). Lagged terms in (Δy^t) are added to ensure that the residuals are white noise. Because the ADF test will not detect any structural break, we have followed Perron's (1990) suggestion for the modification of the ADF test by introducing the dummy variables. If we do not reject the null hypothesis, the series is non-stationary in levels. Tests are then performed on the series of first differences. If the null hypothesis of a unit root is not rejected, testing for cointegration between non-stationary time series requires running an OLS regression, saving the residuals, and running the ADF and PP tests on the residuals in order to determine if they are stationary. In effect, the non-stationary $I(1)$ series have cancelled each other out to produce a stationary $I(0)$ residual.

Error correction analysis

Engle and Granger (1987) demonstrated that cointegrating variables could be transformed into an error correction equation. This implies that some adjustment process takes place that prevents the variables from drifting apart, thereby correcting for market equilibrium. This model separates the long- and short-run dynamics in such a way that it takes care of the problems of non-stationarity.

In our study, we tested for a cointegration relationship between the two variables based on the static long-run equilibrium regression:

$$Y_t = \beta_0 + \beta_1 X_t + \mu_t \quad (2)$$

All variables are in natural logarithms because this makes parameter elasticities that are easier to understand. Because the properties of the time series are not clear, the model is transformed to an empirical relationship that allows for dynamic adjustment through an autoregressive distribution model:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 X_t + \beta_3 X_{t-1} + e_t \quad (3)$$

where Y_{t-1} is the lag of competitiveness; X_t is the GDP share of tourism spending; X_{t-1} is the lag of the GDP share of tourism spending; and e_t is the error term. In this equation, we add lagged variables to the empirical model and test for cointegration. If the estimated residual term is a stationary process, the two variables of interest are said to be cointegrated.

The next step after establishing the cointegration relationship is to estimate the ECM through:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta x_t - \alpha_2 (y_{t-1} - \beta_0 - \beta_1 x_{t-1}) + \varepsilon_t \quad (4)$$

where $\alpha_1 = b_2$; $\alpha_2 = (1 - b_2)$; $\beta_1 = (\beta_2 + b_3)/(1 - b_2)$; and $\alpha_0 + \alpha_2 \beta_0 = b_0$. The ECM model includes short-run dynamics between the variables combined with the long-run cointegrating relationship, with an adjustment speed given by η_1 , $\eta_3 < 0$. Error correction models (ECMs) are based on the behavioural assumption that variables exhibit an equilibrium relationship that determines both short- and long-run behaviour. Spending falls with poor competitiveness conditions and increases with improved competitiveness. In other words, competitiveness depends on the rate of change in tourism spending and potentially on the deviation from the equilibrium relation between these two variables in the previous period.

Granger analysis

A final procedural step in the process is, therefore, to address if growth in the share of tourism receipts of the GDP (*Tour*) is causing growth in the GDP per capita (*Comp*), or vice versa. To determine the direction of the causality, a Granger test will be performed by regressing ($\Delta \log Comp$) on its own lagged values and on lagged values of ($\Delta \log Tour$). The Granger test will yield four possible findings:

- (1) Neither variable 'Granger causes' the other. In other words, independence is suggested when the sets of X and Y coefficients are not statistically significant in both regressions.
- (2) Causality from X to Y : that is, X causes Y , but not vice versa.
- (3) Causality from Y to X : that is, Y causes X , but not vice versa.
- (4) X and Y 'Granger cause' each other.

According to Miller and Russek (1990), bilateral causality between X and Y only exists if X and Y 'Granger cause'. Based on these assumptions, the null hypothesis that X does not 'Granger cause' Y and Y does not 'Granger cause' X is rejected if the coefficients in the next equations are jointly significant (that is, $\delta_1 \neq 0$ or $\delta_2 \neq 0$), based on the standard F -test:

$$\Delta \text{LogComp}_t = \mu_1 + \sum_{i=1}^j \alpha_{1i} \Delta \text{LogComp}_{t-i} + \sum_{i=1}^k \delta_{1i} \Delta \text{LogTour}_{t-i} + e_{1t} \quad (5)$$

$$\Delta \text{LogTour}_t = \mu_2 + \sum_{i=1}^j \alpha_{2i} \Delta \text{LogTour}_{t-i} + \sum_{i=1}^k \delta_{2i} \Delta \text{LogComp}_{t-i} + e_{2t} \quad (6)$$

where δ_1 and δ_2 are white noise error correction and j, k, l, m are the maximum number of lags. If both, some $\delta_1 \neq 0$ and $\delta_2 \neq 0$, then there is feedback between *Tour* and *Comp*.

Data collection

The data used for the analysis are annual time series for Puerto Rico from 1960–2004. Both tourism receipts and GDP figures were obtained in current dollars from the Puerto Rico Planning Board (PRPB) Yearly Statistical Report. All the series were deflated to 1954 dollars as the base year, based on the consumer price index published by the PRPB. The data for tourism receipts were calculated by including only receipts from those visitors who fulfilled the definition of a tourist according to the World Tourism Organization (special visitors and cruise visitors were excluded).

Tourism and Puerto Rico

Puerto Rico, considered a territory of the USA, is a small island located in the north-eastern Caribbean Sea. This particular island is seen as one of the most dynamic economies in the Caribbean region, where manufacturing has surpassed agriculture as the primary sector of economic activity. Although tourism revenues represent less than 10% of the GDP, present-day Puerto Rico has become a major tourist destination and is considered to have the largest Caribbean travel and tourism GDP economic impact (WTTC, 2004). In addition, one of every four inbound travellers from the Americas to small island development states (SIDS) visits Puerto Rico. This is partially due to Puerto Rico's special ties with the USA.

Previous studies on the economic development of Puerto Rico have recommended tourism as a possible catalyst for economic development (US Department of Commerce, 1979). Nevertheless, tourism development in Puerto Rico does not show a similar strong performance as in the remainder of the Caribbean Islands. For example, Perez-Serrano (2005) suggests that Puerto Rico's tourism industry is lagging competitors, such as the Dominican Republic and Mexico, with regards to the number of new rooms and total arrivals and he questions the efficiency of Puerto Rico's agency to boost tourism.

On average, total tourism receipts and their share of the GDP have increased at a rate of 13.01% and 1.14%, respectively. Despite this growth, the portrayal of the tourism sector in Puerto Rico continues to be reviewed by analogies of return on investment in marketing dollars, measured by tourism receipts. For example, in 1985, every US\$1 million that Puerto Rico spent on marketing produced US\$72 million in tourism spending; while 17 years later in 2001 that same US\$1 million was only producing US\$65 million in spending (Fajardo, 2002). When it comes to competitiveness, such parallel comparisons emphasize

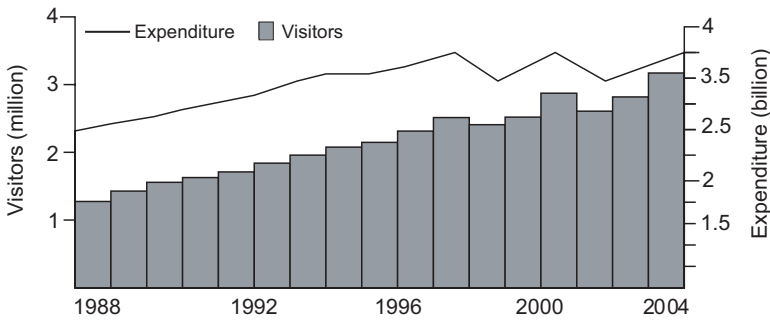


Figure 1. Tourist arrivals and tourism receipts, 1988–2004.

Source: Authors’ own estimates based on tourism statistics from the Puerto Rico Planning Board.

the need for testing empirically the nexus between tourism and quality of life. Therefore, understanding the connection between tourism and competitiveness could provide a platform that allows policymakers to convey a message to taxpayers about the opportunities from tourism policy towards the development of the tourism sector.

Empirical results

Our study examined two variable time series: competitiveness and tourism’s expansion for its unit roots. If the variables are non-stationary, then we need to establish orders of integration. For this purpose, the study used the STATA version 9 software package in order to conduct the ADF and PP tests. Table 1 presents the results of the ADF and PP tests of $\log Comp_t$ and $\log Tour_t$. These tests are used to detect the presence of a unit root for the individual series and enable us to determine if the variables are stationary of the order 0, $I(0)$, or if they follow a non-stationary trend of 1, denoted $I(1)$ or higher.

The results of ADF and PP unit root tests indicate that competitiveness is $I(0)$ at a 5% significance level of MacKinnon’s (1991) critical value. But tourism

Table 1. Unit root tests on $\log Y_{Comp}$ and X_{Tour} .

Variables	ADF levels	ADF first differences	PP levels	PP first differences
$\log Y_{Comp}$	-3.670*	–	-2.971*	–
X_{Tour}	-2.397	–	-2.282	–
$\Delta \log Y_{Comp}$	–	–	–	–
ΔX_{Tour}	–	-5.137*	–	-5.106*

Note: Estimates are obtained from STATA version 9 and correspond to 43 observations. Δ indicates the first differencing of the variables. The ADF tests should be compared to the critical values of -2.614, -2.951 and -3.639 and the PP tests of -2.607, -2.947, -3.621 at the 10%, 5% and 1% levels of significance, respectively.

share, however, is in the I(1) process at a 5% significance level. Because the involved series are in a different order of integration, no cointegration can be concluded. This result suggests that the interconnection between competitiveness and tourism is of a dynamic nature rather than a static one, thereby confirming our initial intuition of the importance of the intertemporal effects of the two variables.

Given the results of the order of cointegration between (real GDP per capita) and (GDP share of tourism), the study applied a cointegration methodology proposed by Johansen (1988, 1991, 1995) and Johansen and Juselius (1990, 1992). Because both variables in the regression are cointegrated, there is an indication of the presence of a stable long-term or equilibrium linear relationship among them.

The study next turned to establishing the number of cointegrating vectors. In empirical applications, trace statistics and maximum eigenvalue statistics should be computed for different lags. This measurable should be selected as the one corresponding to the model, which provides the minimum value for those statistics. Because the sample we are working is relatively small, however, we took into consideration the argument of Cheung and Lai (1993) and considered only the trace test.

The trace test shows more robustness to both the skewness and excess kurtosis in the residuals than the maximal eigenvalue test. A number of lags for each of the variables were included in order to capture the short-run dynamics of the model. The Akaike (1969, 1974) [AIC] and the Schwartz (1978) Bayesian [SBC] criteria were used to determine the order of the vector autoregressive. Both criteria indicated lag one as the optimal lag for the annual data on hand. The residuals from the cointegrating regression were entered into the ECM, in which changes in the dependent process were regressed on changes in the independent process and the previous period's equilibrium error (residuals from the cointegration process). Cointegration results were provided by STATA 9 and presented in Table 2. The trace statistics reported in Table 2 indicate the existence of at least one cointegrating vector at the 5% level between $\log Comp$ and $\log Tour$.

Using the information provided by the cointegration test, an ECM is constructed to obtain the long- and short-term elasticities. Modelling the short-run dynamics provides information concerning how adjustments take place between the two variables, to restore long-run equilibrium. The long-run relationship is captured by the error correction term. The coefficient of this term

Table 2. Results of cointegration tests.

Relationships $R = 0$	Trace $R = 1$	Trace trace (5%)	Critical values
$\log Comp$ and $\log Tour$	34.39	9.88	3.76

Note: Trace is the likelihood ratio statistic for the number of cointegration vectors. Each equation contains linear trends but not quadratic trending; and parameters for the trends are restricted. Estimation has been performed with STATA 9.

will indicate the speed of adjustment; that is, how quickly the system returns to equilibrium after a random shock. It is expected to be negative to ensure convergence. The results of the ECM are:

$$\Delta \log Comp_t = -0.007 + 0.92 \Delta \log Tour_t + 0.56 (\log Comp_{t-1} + 0.15 \log Tour_{t-1}) + \mu_t$$

(-1.76)*
(2.47)**
(14.24)***
(1.78)*

Note: adj $R^2 = 0.862$; $F = 81.31$ ***; $DW = 1.77$; Breusch–Godfrey LM test = 1.105 ($p = 0.2931$); Breusch–Pagan test = 7.10 ($p = 0.0077$); t -values are shown in parentheses; *significant at the 10% level; **significant at the 5% level; ***significant at the 1% level.

The results therefore show that there is a long-run relationship between real GDP per capita and the tourism share of the GDP, and that they have the correct sign. The estimated long-run response coefficient for $\log Tour$ is 0.56. This means that a 1% increase in the real tourism spending share of the GDP will increase the real GDP per capita in the case of Puerto Rico by little more than 0.5%. The EC term is significant and it implies that the system will adjust itself towards equilibrium almost immediately by removing 0.92 (adjustment coefficient is 0.64 with a t -statistic of 14.24) of a unit from the error made in the previous period.

The Durbin–Watson (DW) test and Breusch–Godfrey LM test for autocorrelation were conducted. As presented in Table 3, the results indicate that the null hypothesis of no serial correlation can be rejected ($DW = 1.77$ and Chi-square is 1.105 with a p -value of 0.2931). Finally, a Breusch–Pagan/Cook–Weisberg test for heteroskedasticity was conducted and the result indicates a statistical estimate of 7.10, with a p -value of 0.0077, thereby accepting the null hypothesis of no heteroskedasticity.

Another important issue to be addressed is how the long-run relationship between real GDP per capita growth (competitiveness) and real tourism spending as a share of GDP is causally related (Granger, 1969; Engle and Granger, 1987). While evidence of cointegration suggests that our variables of interest are moving together over time, it remains open to question whether tourism spending actually drives competitiveness, or the other way round. According to Granger (1988), cointegration implies causality in at least one direction. Consequently, we now turn to Granger causality analysis testing both hypotheses to determine the direction of the impulses.

According to Granger, a variable, for example, tourism, causes another variable, competitiveness, with respect to a given information set that includes both variables, if the current level of competitiveness can be better predicted by using past values of tourism than by not doing so. Because the series are

Table 3. Normalized parameter estimates.

Dependent variable	Independent variable	Coefficient	t -Statistic	Adjusted R^2	DW
$\log Comp$	$\log Tour$	0.56	14.24 ($p < 0.001$)	0.862 ($p < 0.001$)	1.77

Note: Parameter estimates express the corresponding elasticity values.

Table 4. Granger causality test results.

Null hypothesis	Wald test	
	<i>F</i> -Statistic	<i>p</i> -Value
$\Delta \text{LogComp}$ does not cause $\Delta \text{logTour}$	1.6185	0.203
$\Delta \text{logTour}$ does not cause $\Delta \text{LogComp}$	6.094	0.014

Note: Tests for causality have been carried out for the two variables of the model each time with one degree of freedom at the 5% significance level using STATA version 9.

not cointegrated (they are a mixture of $I(0)$ and $I(1)$ variables), the standard Granger causality test is used (Granger, 1969) without the inclusion of the ECM. The Wald statistic (*F*-statistic) for a joint significant test is applied for testing if the null of X does not 'Granger cause' Y short-run causality. The lag structure has been determined at one.

Table 4 reports the empirical results of the Granger tests. Specifically, these results indicate that the null hypothesis regarding no causation of changes in tourism spending to changes in competitiveness can be rejected at the 5% significance level. On the other hand, the coefficients on the lags of tourism spending are not jointly zero in the equation for competitiveness, indicating that the evidence favours the alternative that tourism spending 'Granger causes' competitiveness. This suggests that changes in GDP per capita are dependent on and determined by changes in tourism spending, supporting the contention that demand-side factors affect productivity increases positively, thereby affecting increases in GDP per capita.

Conclusions and implications

The main objective of this study was to examine the empirical relationship between competitiveness and tourism. The existence of this bivariate relationship was analysed in the case of Puerto Rico, using a cointegration framework. We looked at the time-series properties of the data; that is, we tested for the existence of unit roots. We found that the competitiveness variable was stationary in levels, while the tourism spending variable turned out to be stationary in first difference. No cointegration can, therefore, be concluded.

The study then tested for cointegration in the rates of changes in both variables and found that changes in competitiveness (real GDP per capita) and changes in tourism spending (tourism share of GDP) were integrated, implying that a long-run relationship existed between the two variables. After establishing the existence of cointegration, we were interested in the driving forces underlying the long-run relations between the variables. A Granger causality test was then applied, resulting from the application of an ECM analysis.

The evidence suggests that there is a one-directional relationship between tourism spending and competitiveness running from the former to the latter in the case of Puerto Rico. This suggests that tourism spending promotes productivity gains; and this, in turn, shapes real GDP per capita increases.

Productivity gains, however, are related to decisions made at the destination level to facilitate investment in human resources, promote the acquisition of greater skill intensity in the production process, enhance public infrastructure and generate the payment of the necessary imports. These decisions are captured by the notion of the destination's ability to make adequate market corrections.

The implications of these findings are twofold. The realization or adjustment towards equilibrium points to the ability of a destination to respond effectively to the effects of cyclical change in tourism spending – a major concern in tourism demand analysis. Unanticipated events can occur at any time, affecting the level of tourism spending. The short-term adjustment process to realize equilibrium provides useful information for short-term business forecasting and managerial decisions in terms of promotion and marketing efforts. These efforts reflect the ability of a destination to connect supply-side activities (attractions, services, infrastructures) with demand-side value creation to the satisfaction (marginal utility) of the customers through 'satisfying, memorable experiences' in order to increase spending by the tourists; which ultimately will affect its population's quality of life positively. In other words, they seem theoretically to justify government intervention – an issue that divides scholars (Krugman, 1996).

The following points merit attention, particularly in the context of future research in order to gain more insight into the interaction between competitiveness and tourism spending. Assessing the conditions for functional or structural government intervention is critical in linking competitiveness with successful destination performance. Identifying these conditions could lead to the creation of new factors, markets, institutions and capabilities to overcome market deficiencies that impede the realization of dynamic comparative advantage.

Understanding these conditions, though necessary in propelling tourism as an effective development tool, may not be sufficient, however. Increasing competitiveness may increase tourism spending through improved productivity, but it is important to understand the mechanisms that translate increased competitiveness into enhanced quality of life. The reason is that an increased competitiveness does not necessarily lead to higher employment levels, but could simply alter the distribution of jobs and prosperity between destinations. This would defeat the purpose of the higher quality of life espoused by the tourism literature.

The implications of the study should be taken with caution, however. The study cannot be generalized to other situations or destinations. External validity, therefore, seems to be a limitation of this study, meaning that the results tend to be more specific to the Puerto Rican case and are less generalized to other situations. In addition, the empirical results could be highly sensitive to the selection of variables, the time frame employed and the measurement of the variable of competitiveness used in the analysis. It would be desirable to replicate the present analysis for other island destinations.

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