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Towards a sustainable tourism competitiveness measurement model for municipalities: Brazilian empirical evidence

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Abstract: This study aims to contribute to sustainable tourism destination competitiveness research by proposing a systemic model for identifying the factors that impact Brazilian municipalities' ability to create and integrate value-added tourism products to meet the needs of local communities and visitors and maintain the tourism competitiveness. It proposes that the available destination competitiveness models can be divided into three groups: i) aggregate indices; ii) conceptual and descriptive; and iii) explanatory and predictive. Six sustainable tourism competitiveness determinant factors were formulated: Tourism Infrastructure, Information and Communication Technology Infrastructure, Education, Heritage and Culture, Socioeconomic Development and Environmental Preservation. Four dependent factors related to tourism activity success were also postulated: Tourism Flow, Jobs, Wages and Revenue. All constructs were based on secondary indicators for Brazil's 5,565 municipalities. The theoretical model was tested using Structural Equation Modeling (SEM).
Keywords: Sustainable Tourism Competitiveness; Structural Equation Modeling; Formative Construct; Destination Competitiveness; Measurement Model; Brazil.

Hacia una competitividad de medición turismo sostenible modelo para municipios: evidencia empírica de Brasil

Resumen: The Charter for Sustainable Tourism of Lanzarote, signed in 1995, is a key document in setting the sustainability commitment of tourism. Later it became a part of the Global Code of Ethics for Tourism (GCET), which defines Tourism Ethics. However a question prevails: how does tourism assumes this duty? And more specifically, how does tourism assume sustainable development? Based on an assessment of 360 degrees on tourism in Cancun (tourists, residents and tourism professionals), the present study explores the perception of sustainability in this destination under the guidelines of GCET. The results show that the perception of tourism as a factor for sustainable development is not uniform among the central players, showing a better assessment by tourists, and a more critical view by the resident population and professionals.
Palabras Clave: Turismo sostenible; Competitividad; Modelo de ecuaciones estructurales; Constructos formativos; Competitividad de destinos; Modelo de medida; Brasil.

1. Introduction

As globalization and technological advancements relativize concepts such as the distance between countries, tourism destinations draw closer together, increasing the competition for tourists at the national level and between international destinations with similar characteristics.

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This phenomenon is associated with another trend noted during the last 60 years in the tourism and travel sector: international tourism flow deconcentration and the subsequent inclusion of new destinations in tourism routes. This outlook has also intensified tourism destinations' efforts to sustain their competitiveness.

In 1950, the top fifteen receiving countries (located at Europe, United States, Canada and Mexico) concentrated 97% of the international tourist arrivals. In 2008, 45% of all international arrivals occurred outside of those countries.

Despite the potential positive impact of tourism on local economies, the negative impact has also been discussed in the literature, including the adverse effects of tourism activity development on destinations and their populations (OMT, 2003; Steck, 1999).

Tourism activity has repercussions for local economies, though the intensity of these effects depends on the local economy's degree of dynamism and diversification.

The tourism sector can bring both benefits and trouble to a community's residents, whether or not they are involved in tourism activities. Those with the closest contact with such activities suffer the greatest impacts arising from it, whether negative or positive (Gollub, Hosier, and Woo, 2002; Slob and Wilde, 2006).

Therefore, competitiveness and growth are fundamental issues when discussing the role of tourism as an economic development instrument (Fernández and Rivero, 2010).

Tourism Destination Competitiveness and Sustainability

However, as noted by Fernández and Rivero (2010), although a large body of literature about tourism destination competitiveness has been produced - including measurement model applied to it -, primarily between 2000 and 2010, it is a topic that still offers a wide range of research opportunities.

Regarding tourism sustainability the literature is quite restricted. However there is a consensus in the literature that one of the greatest obstacles to tourism sustainability studies is the difficulty in measuring it due to the lack of globally accepted indicators. Additionally, the difficulties created by the multivariate nature of sustainability and competitiveness are compounded by the inherent difficulty in aggregating the required amount of information of both (Fernandez and Rivero, 2009:278).

Tourism destinations are composed of known tourism products, which in turn are structured by tourist resources or attractions found at the destination (Valls, 2006).

Therefore, although the conflict between growth (especially economical) and sustainability (or the controversial concept of sustainable development) is not exclusive to the tourism, finding a solution is an urgent matter for this sector. Resources and attractions, especially natural resources but also those related to the cultural heritage of the destination, can be deeply impacted by poorly-planned tourism development that can permanently damage the destination's image, jeopardizing its future as a tourist destination or even as a place to live.

Nevertheless, as recognized by the World Tourism Organization (WTO), progress towards sustainable tourism has been slow and disappointing. Though monitoring models for tourism sustainability have lately been adopted, there is no indicator that such systems are being effectively developed (Fernandez and Rivero, 2009).

This study seeks to contribute to fill this gap by determining which factors have a greater influence on the called Sustainable Competitiveness of tourism destinations and how these factors are related to each other and to the success of a destination's tourism activities.

2. Literature Review

The conflict between growth and sustainability is not uniformly reflected even in the general competitiveness models that take explicitly into account the sustainable aspect of tourism development.

Most tourism destination models use isolated or simultaneous inclusion of environmental, cultural and social indicators to develop a specific construct of sustainability measurement. Unsurprisingly, however, few of the models employ the second approach because it introduces greater complexity into the model (Fernandez and Rivero, 2009).

An inherent challenge in any tourism destination competitiveness measurement model is defining the unit of analysis (Crouch and Ritchie, 1999). There are two approaches to this problem: either the tourism destination itself or the tourism companies that operate at the destination can be treated as the unit of analysis (Claver-Cortés, Molina-Azorín, and Pereira-Moliner, 2007). If the destination is chosen as the unit of analysis, the challenge of delimiting it remains. The destination can be related to any territorial unit with the responsibility or administrative capability to develop it. Therefore, a destination can comprise one or more countries; one or many regions, states or sub-regions; a group of municipalities; or a municipality, place or community (Valls, 2006).

Studies dedicated to tourism destination competitiveness represent a significant portion of recent tourism research (Kozak and Rimmington, 1999) and have increased since the early 1990s (Crouch, 2006, 2007b) when the concept became central to tourism public policies (Vanhove, 2006).

Although there is consensus regarding the relative and multidimensional character of global competitiveness and consequently of tourism competitiveness, most studies on the topic seek to define a construct that will make this concept operational (Miki, Gândara, and Medina-Muñoz, 2011).

The evolution and enhancement of research on this topic have shown steady progress. However, there is as yet no consolidated theory about tourism destination competitiveness (Croes, 2010; Mazanec and Ring, 2011).

It is proposed that tourism competitiveness models can be divided into three groups according to the approach and methodology used. Such a subdivision highlights the evolution of research over time and reflects the enhancement of theoretical discussions on the topic since the 1990s.

Conceptual and descriptive models

This group includes studies developed between 1995 and 2004. These studies seek to develop theoretical, conceptual and descriptive models for the factors that influence tourism destination competitiveness and are the theoretical basis for the most recent models.

Although they suggest possible variables that could be associated with such factors, the authors of the studies in this group do not indicate which variables are the most adequate and are not concerned with distinguishing independent from dependent variables in tourism destination performance.

This group includes the classic tourism models, and these studies are therefore the most mentioned in the literature. Most of the models were developed by two research groups: Crouch and Ritchie (1995, 1999, 2005; Ritchie and Crouch, 2000, 2003) and Dwyer, Kim and their collaborators (Dwyer and Kim, 2003; Dwyer, Livaic, and Mellor, 2003; Dwyer, Mellor, Livaic, Edwards, and Kim, 2004; Kim and Dwyer, 2003).

These models rely heavily on those used to classic modeling for competitive advantage creation, which were originally developed by Porter (1990) and adapted to the context of tourism competitiveness by Bordas (1994a, 1994b).

Aggregate index models

This category includes empirical models developed since the 2000s. These models attempt to establish a global tourism competitiveness index based on the studies included in the previous group.

Most of these studies conduct comparative evaluations of various countries' tourism sectors using independent variables collected from secondary national data. They then classify economies using a general ranking suggested to be used as a tourism benchmark tool.

The majority of the research in this group consists of studies conducted by large consulting companies on behalf of professional associations or public administration representatives, such as the World Travel and Tourism Council (WTTC); the World Economic Forum (WEF) and the Getúlio Vargas Foundation (FGV) - which conducts research for the Ministry of Tourism in Brazil.

The WTTC model (Gooroochurn and Sugiyarto, 2005; Miller, 2007) is also called the Competitiveness Monitor and was published in three editions between 2001 and 2004 in partnership with the Tourism Research Center of Nottingham University, United Kingdom (Trisnawati, Wiyadi, and Priyono, 2008).

This model was used as the methodological foundation for the WEF model, which was developed based on the Global Competitiveness Report, annually published by the WEF since 1979. These efforts generated the Tourism Competitiveness Reports, which began to be published in 2007 (Blanke and Chiesa, 2007, 2008, 2009, 2011, 2013; WEF, 2015).

These two models have been influential in tourism research, and several researchers have used their data to develop studies that criticize (Crouch, 2007a) or suggest extensions to the WEF methodology, in particular by conducting exploratory multivariate analysis of the data (Alves and Ferreira, 2009; Alves and Nogueira, 2011; Fernández and Rivero, 2010; Gooroochurn and Sugiyarto, 2005; Kayar and Kozak, 2010; Mazanec and Ring, 2011; Mazanec, Wöber, and Zins, 2007).

The model adopted by the Brazilian Ministry of Tourism is also based on the resource-based view (RBV) theory and was developed by researchers from the FGV (Barbosa, 2008b; Barbosa, Oliveira, and Rezende, 2010). It has been published in six editions (Barbosa, 2008a, 2009, 2010, 2012, 2013, 2014). It is used to perform comparative analyses of 65 Brazilian municipalities chosen to become world-class tourist destinations and to promote tourism development regionally (called inducer destinations).

Explanatory and predictive models

This group comprises the most recent studies developed since the late 2000s and represents the current state of the field.

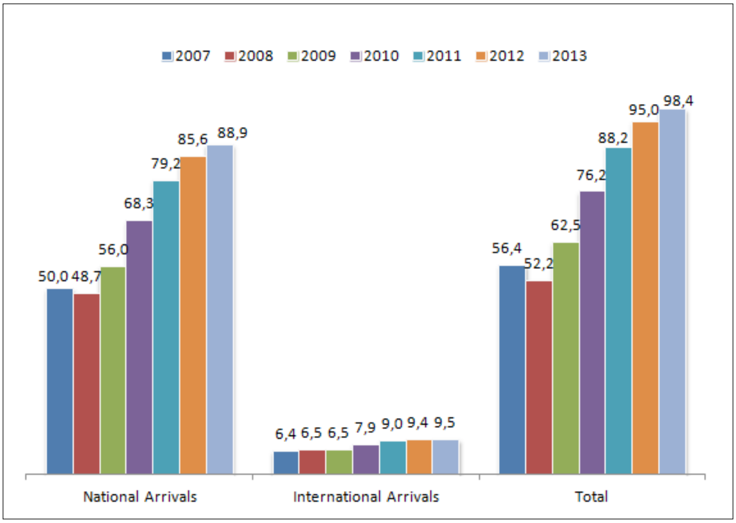
The research in this category includes more robust explanatory models that identify not only the factors that influence tourism destination competitiveness but also the independent variables associated with them and the dependent variables that explain the results observed in their tourism activity performance. Moreover, these models estimate the relative weights for these variables and factors using empirical studies and second-generation multivariate data analysis methods.

This group includes the studies mentioned previously that propose extensions to the WTTC and WEF models (Gooroochurn and Sugiyarto, 2005; Mazanec and Ring, 2011; Mazanec et al 2007), to which the latest models developed by Assaker, Vinzi, and O'Connor (2011) and by Wu, Lan and Lee (2012) may be added. The model proposed in this study also belongs to this group.

In addition to the models classified in these three groups, a variety of empirical studies about the topic have been developed since the late 1990s. However, none of these have resulted in actual measurement models and are therefore not included in this review.

In general, more complex quantitative models which use multivariate data analysis, specifically those that include dependent variables as tourism competitiveness and causality measures, have only been developed since 2007. However, they continue to represent only a fraction of the studies on this topic and are part of a nascent knowledge field.

Figure 1: National and international tourist arrivals in Brazil (millions). Source: INFRAERO.



The tourism sector in Brazil

Tourism market growth has been particularly rapid in emerging and developing economies. The share in international tourist arrivals received by these countries has steadily risen, from 31% in 1990 to 47% in 2010 (WTO, 2011b:2). Projections made by the World Tourism Organization (2011a) indicate that tourism will continue to grow across the globe at a rate of 4.4% per year in emerging economies and 2.2% in advanced economies until 2030.

In Brazil, although tourism's total contribution to the economy has seen modest growth in the last ten years. According to the WTTC (WTTC and Oxford Economics, 2014), the direct contribution of tourism to the Brazilian economy reached 3.5% of the Gross Domestic Product (GDP) in 2013; Brazil was therefore ranked sixth of the 184 countries analyzed. The WTTC estimated a growth of 3.0% in the Brazilian tourism sector in 2014 and a growth of 3.9% per year until 2024, when it estimates that tourism will contribute BRL 250.2 billion to the economy.

Domestic tourism in Brazil has increased steadily in recent years, as demonstrated by the arrivals statistics between 2007 and 2013 (Figure 1). This tourist activity has compensated for some of the revenue lost from the decreased international tourism flow, a result of the global financial downturn.

A prominent characteristic of domestic tourism in Brazil is intra-regional travel. The Brazilian destinations with the largest population contingents are also, in most cases, the country's top generating and receiving destinations for domestic tourist flow (Andrade, 2007).

Therefore, the regions of the country with greater economic development have become both the target and source of domestic travelers (Andrade, 2007). Southeastern Brazil attracts the highest number of tourists (40.8% outbound, 36.5% inbound) and boasts the country's most-visited destinations and the primary center for tourist generation (43.8% of the total) for domestic tourism (FIPE and EMBRATUR, 2012).

Study Methods

The purpose of this study is to develop a quantitative model for identifying the factors that influence sustainable tourism destination competitiveness and estimating their effects on this construct in Brazilian domestic tourism, using municipalities as the unit of analysis.

A systemic approach to the tourism sector and the concept of sustainable tourism competitiveness are adopted as the central constructs of this model. This approach is suggested by Capra (1996), who argues that from a systemic perspective the only feasible solutions are the "sustainable" ones.

For this purpose, the concept of Global Sustainable Competitiveness proposed by the WEF (Bilbao--Osorio et al 2012; Blanke et al 2011), Tourism Destination Competitiveness construct defined by Hassan (2000) and the idea of Sustainable Society described by Brown (1981, cited in Capra, 1996) are combined and adapted for the tourism activity.

Thus, the Sustainable Tourism Competitiveness is defined on the present study as a destination's ability to create and integrate value-added tourism goods that satisfy the needs of its community and visitors, maintaining its competitive position in the tourism market without diminishing future generations' prospects.

Municipalities are the lowest tier of autonomous units in Brazil's political-administrative organization. Thus, the scope of this research covers the 5,565 municipalities found in the country in 2010 (IBGE, 2011).

Not all Brazilian municipalities have a "tourism vocation" – in other words, tourism attractions that make tourism activities relevant to the local economy. Therefore, "tourism municipalities" represent the target population of this research. Delimiting this municipality subgroup is one of the challenges of this research.

So, in this study the municipalities that did not present a null value in the formal tourism labor market statistics were included in the Tourism Characteristic Activities (TCA) group. More specifically, it were included those economic activities that essentially serve visitors and compose the "TCA core", as defined by Coelho (2011) which also appointed that Brazilian tourism market is restricted to two types of economic activities: tourist accommodations (Hotels and similar) and travel agencies.

This methodological approach resulted in a subpopulation of 1,007 municipalities (19.9% of the total), including 27 Brazilian state capitals in which there is at least one company and one employee with a formal job contract related to these two economic activities.

This study uses two types of secondary sources for data collection at the municipal level in Brazil: statistical and administrative records.

To avoid bias in the statistical analysis results because of differences in municipality size, all size--sensitive variables were expressed using relative units (per capita or percentage of the total residences).

The data collected for the 1,007 municipalities were treated and analyzed in two steps using techniques and softwares applied for univariate and multivariate data analyses.

The first step of the empirical data analysis comprised descriptive statistical measurements and exploratory data analysis performed using SPSS® v.15 software (SPSS Inc., 2006).

The second step was dedicated to the empirical analysis of the proposed theoretical model. Structural Equation Modeling (SEM) using the Partial Least Squares (PLS) or, more precisely, Partial Least Squares Path Modeling (PLS-PM) estimation technique was performed using SmartPLS® 2.0 software (Ringle, Wende, and Will, 2005).

Proposed model

The indicators of measurement models are classified as formatives or reflexives based on the direction of causality between them and the proposed constructs. In most Structural Equation Modeling (SEM) literature, the constructs are treated as causes of the measurements. In other words, the measurements are understood to be reflexive because they represent manifestations of a latent variable or construct (Bollen and Lennox, 1991).

Traditionally, reflexive models have been more widely applied in social science studies (Joseph F. Hair, Black, Babin, and Anderson, 2009:737). However, the use of formative models is substantially increasing (Diamantopoulos, Riefler and Roth, 2008).

Although the exploratory data analysis (mainly through the observed variables associated with the constructs) can indicate which modeling approach is best (formative or reflexive), one of the few consensus in the literature is that the final decision should be guided by the nature of the construct under study (Jarvis, MacKenzie, and Podsakoff, 2003; Joseph F. Hair et al 2009).

In tourism destination competitiveness studies, the majority of existing predictive and explanatory models adopt the formative approach. Exceptions to this trend are the more recent models proposed by Wu, Lan, and Lee (2012) and by Assaker, Vinzi, and O'Connor (2011) which use reflexive constructs.

The present study adopts the current trend assuming a formative model to the measurement of the main construct sustainable tourism destination competitiveness. The proposed model assumes that the exogenous constructs (Tourism Infrastructure, Information and Communication Technology - ICT, Infrastructure, Education, Socioeconomic Development, Heritage and Culture and Environmental Preservation) associated with central construct (Sustainable Tourism Competitiveness) are formative. As well as that the endogenous constructs (tourism activity-related jobs and salaries at the destination and tourist flow into the destination) are reflexively measured.

Using a formative measurement model and SEM-based multivariate data analysis as the methodology, the collected data corresponding to the model variables were preliminarily examined to identify outliers, verify the impact of missing data, test data distribution normality assumption and the degree of multicolinearity between indicators.

The analysis of outliers (total of 37 cases) did not indicate that any of the cases should be eliminated. Regarding missing data, the complete case (or listwise) approach was adopted to handle the data, only computing values based on complete cases for the analyzed subpopulation.

The database of the 1,007 municipalities showed four data sets with a high volume of missing data from 21 measurement indicators. These data sets include: i) environmental sanitation; ii) age-school year dispersion; iii) municipal expenses per administrative function; and iv) formal jobs (total and average per worker salary for the considered group of tourism-related economic activities).

In the first three data sets (i, ii and iii), to avoid compromising the minimum size of the subpopulation required for SEM analysis, the solution was to eliminate the indicators from the model.

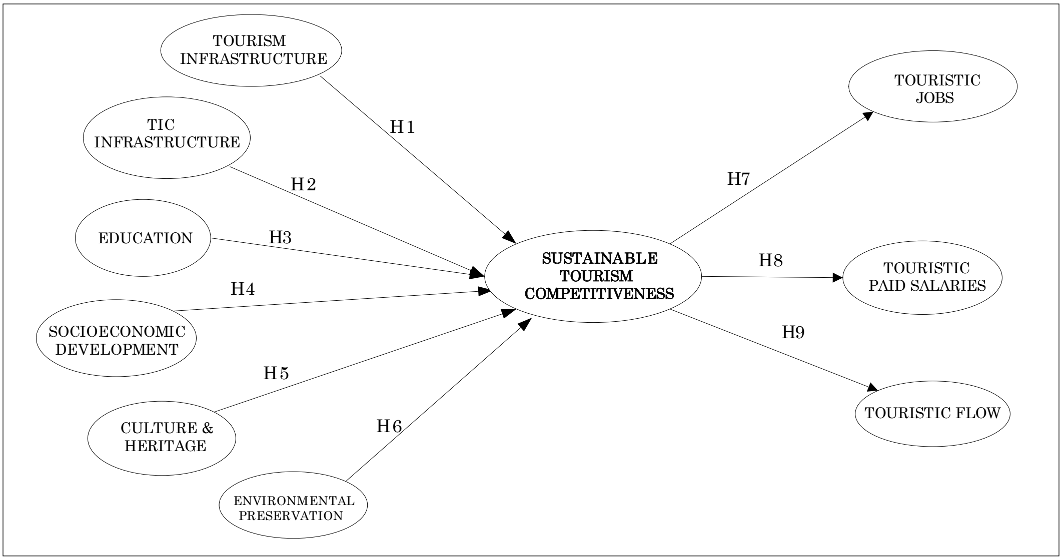
In the last data set (iv), the verified missing data are related to the average salary per worker. These missing values were caused by the lack of formal jobs available in several municipalities in the ten tourism-related economic activities analyzed. However, two of the indicators did not show missing data: Accommodations (hotel and similar) and Total Salary (calculated from the sum of the paid salary data and occupations). These were the only indicators retained in the measurement model for the proposed Salary construct (calculated as average value per worker).

The first diagnostic test for normality was the graphical and visual check of the histograms (as suggested by Joseph F. Hair et al 2009), comparing the observed data values distributions with the normal distribution (resource available in SPSS®). This test indicated that most variables did not present normal distribution. In fact, the nonnormality data distribution on tourism competitiveness destination measurement models is practically a constant, as well as the application of some data transformation procedure (Mazanec, Wöber, and Zins, 2007b; Assaker, Vinzi, and O'Connor, 2011b; Mazanec and Ring, 2011; Wu, Lan, and Lee, 2012).

Logarithmic transformation was applied for the variables that shown the most asymmetric and more severe deviation from normality. Statistical tests for normality (also a resource available in SPSS®) were then applied based on the skewness and kurtosis indices and their statistical values (Joseph F. Hair et al 2009).

The resulting model (Figure 2) consists of six exogenous constructs and three endogenous constructs associated with the central Sustainable Tourism Competitiveness construct (second-order) associated through nine formulated research hypotheses (named as H1, H2, …, H9). The corresponding 32 variables (secondary indicators - 23 independent/formatives and nine dependent/reflexives) are omitted in Figure 2.

Figure 2: Proposed operational model for Sustainable Tourism Competitiveness measurement.



Results and discussion

The proposed operational model for Sustainable Tourism Competitiveness measurement (Figure 2) was modeled by applying SmartPLS® software to the 2010 data of the corresponding variables for the 1,007 municipality subpopulation.

The resulting parameters were analyzed to determine their degree of statistical significance using the corresponding t-values obtained by applying a bootstrapping technique. The analysis considered 5,000 re-sampled cases and 1,007 cases, as suggested by (Joe F. Hair, Ringle, and Sarstedt, 2011:145) for formative models. This procedure is adopted in most of the empirical studies that estimate formative models using PLS-PM (Rigdon, Ringle, Sarstedt, and Gudergan, 2011).

First, the outer model was analyzed to determine which outer and weight loadings were significant (evaluated by the bootstrapping results) and the consistency of their relationships to the other constructs' indicators.

In a second step, the inner model was analyzed to test the estimated path coefficients and the model's predictive capacity from the estimated values for the coefficients of determination (R^2).

The domestic air (flight) seats (Tourism Infrastructure construct), the population and housing densities (Environmental Conservation construct) variables had negative weight loadings unlike the other indicators and were excluded from the measurement model.

However, this exclusion was not enough to solve the convergence and significance problems of the Environmental Conservation construct, which - with only two remaining indicators - yielded an unlikely negative path coefficient. The adopted solution to this impasse was to incorporate those indicators to the Socioeconomic Development construct, then renamed only as Development to express its economic and environmental aspects.

All path coefficients estimated for the structural model were significant at the level of 99.9% ($t > 3.29$) except that corresponding to the Education construct (99%; $t = 2.695$).

Moreover, one of the endogenous constructs corresponding to the Average Salary for the formal tourism activities in the municipality yielded a relatively low R^2 value (0.262). This result prompted the rejection of Hypothesis H_8 (Figure 2) and the respective construct was therefore eliminated from the model.

Therefore, the operational model (Figure 2) was re-specified through the unification of Jobs and Average Salary constructs and their respective indicators, which resulted in a new construct called (Tourism) Revenue, conceptually corresponding to the average worker's income in tourist activities considered in the model.

Regarding the statistical significance of the parameters obtained by SmartPLS® modeling, the results obtained with the re-specified model indicate that:

1) The vast majority of the model weight loadings were significant at the level of 99.99% (t > 3.29) and five of them at the level of 99.9% (t > 2.58);
2) Only one indicator associated with the Development construct (percentage of the population living in residences with electric power) was shown to be of little significance (90%; t = 1.887) and had a low weight loading (0.053). This indicates that it was eligible to be excluded from the model (Joe F. Hair et al 2011).

The resulting final structural model shown in Figure 3 includes all significant variables (detailed at Table 1) and highlights the estimated corresponding values (without the bootstrapping procedure application) for the outer and weight loadings, path coefficients and determination coefficients (R^2), as well as the final seven hypotheses (H_1', H_2', …, H_7') for the re-specified measurement and structural models.

Figure 3: Re-specified measurement and structural models for Sustainable Tourism Competitiveness.

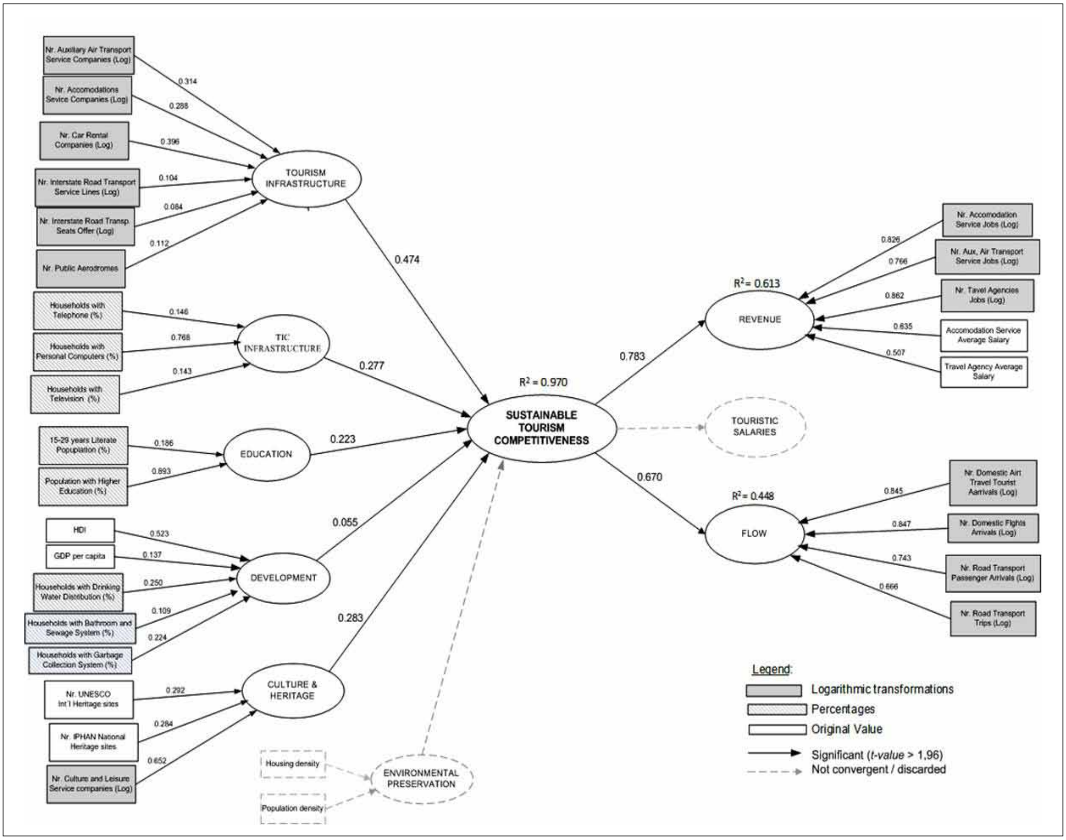


Table 1: Indicators of Sustainable Tourism Competitiveness

Municipality Indicator (Construct)	Code	Format	Source/Reference	Year
Tourism Infrastructure Nr. of establishments for the economic activity accommodation (Hotels, etc.)	Infra2	Logarithmic	The Brazilian Ministry of Labor and Employment (MTE, 2010) http://bi.mte.gov.br/bgcaged/caged_rais_estabelecimento_id/login.php	2010
Nr. of establishments for the economic activity rental car	Infra5	Logarithmic	The Brazilian Ministry of Labor and Employment (MTE, 2010) http://bi.mte.gov.br/bgcaged/caged_rais_estabelecimento_id/login.php	2010
Nr. of establishments for the economic activity air transport auxiliary services	Infra9	Logarithmic	The Brazilian Ministry of Labor and Employment (MTE, 2010) http://bi.mte.gov.br/bgcaged/caged_rais_estabelecimento_id/login.php	2010
Nr. of interstate highways that pass through the municipality	Infra13	Logarithmic	The Brazilian Ministry of Transportation (data directly disposed by ANTT[1])	2009
Nr. of seats offered on interstate airlines	Infra14	Logarithmic	The Brazilian Ministry of Transportation (data directly disposed by ANTT[1])	2009
Nr. of public aerodromes	Infra15	Original	Ministry of Transport (ANAC[2], 2009) http://www2.anac.gov.br/arquivos/pdf/aerodromos/AerodromosPublicos.xls	2009
TIC Infrastructure Total households with television	TIC2	Percentage	Brazilian Census 2010 (IBGE, 2010) http://www.sidra.ibge.gov.br/download/TV%20Resultados%20da%20Amostra.csv	2010
Total households with telephone	TIC3	Percentage	Brazilian Census 2010 (IBGE, 2010) http://www.sidra.ibge.gov.br/download/Telefones%20Municipios.zip	2010
Total households with personal computer and Internet	TIC6	Percentage	Brazilian Census 2010 (IBGE, 2010) http://www.sidra.ibge.gov.br/download/Computador%20e%20Internet.csv	2010
Development Human Development Index (HDI)	Desenv1	Original	The Brazilian Ministry of Cities (SNIS, 2010) http://www.snis.gov.br/Arquivos_SNIS/3_BANCO%20DE%20DADOS/Serie_Historica/InstalaSNIS_2010.zip	2010
Per capita GDP (BRL/inhabitant)	Desenv2	Original	Calculated with GDP - The Brazilian Ministry of Cities (SNIS, 2010) and Population –Brazilian Census 2010 (IBGE, 2010) http://www.snis.gov.br/Arquivos_SNIS/3_BANCO%20DE%20DADOS/Serie_Historica/InstalaSNIS_2010.zip	2010
Percentage of households with adequate water supply	Desenv5	Original (Percentage)	ODM[3] Indicators for Municipalities (ORBIS[4], 2010) http://www.orbis.org.br/sistema-devinfo	2010
Total households with bathroom and sanitary sewage system	Amb4	Percentage	Brazilian Census 2010 (IBGE, 2010) http://www.sidra.ibge.gov.br/download/Esgotamento%20TUDO_Resultados%20da%20Amostra-2.csv	2010
Total households with garbage collection service	Amb5	Percentage	Brazilian Census 2010 (IBGE, 2010) http://www.sidra.ibge.gov.br/download/Domicilios%20LIXO.csv	2010
Education				
Literacy rate of population aged 15-29 (%)	Educ1	Original (Percentage)	ODM[3] Indicators for Municipalities (ORBIS, 2010) http://www.orbis.org.br/sistema-devinfo	2010
Population 10 years and over with full higher education (%)	Educ7	Original (Percentage)	Brazilian Census 2010 (IBGE, 2010) http://www.sidra.ibge.gov.br/download/Nível%20de%20Instrução-7.csv	2010
Heritage and Culture				
UNESCO[5] World Heritage Sites	Pat1	Original	(UNESCO, 2011) http://www.unesco.org/new/pt/brasilia/culture/world--heritage/list-of-world-heritage-in-brazil/#c154844	2010
Nr. of establishment of culture and leisure economic activity	Pat2	Logarithmic	The Brazilian Ministry of Labor and Employment (MTE, 2010) http://bi.mte.gov.br/bgcaged/caged_rais_estabelecimento_id/login.php	2010
IPHAN[6] Brazilian Heritage Sites	Pat4	Original	The Brazilian Ministry of Culture (IPHAN, 2010) http://www.iphan.gov.br/ans/inicial.htm	2010

Municipality Indicator (Construct)	Code	Format	Source/Reference	Year
Revenue Nr. of formal jobs in accommodation (hotels,etc.) economic activity	Emprg1	Logarithmic	The Brazilian Ministry of Labor and Employment (MTE, 2010) http://bi.mte.gov.br/bgcaged/caged_rais_estabelecimento_id/login.php	2010
Nr. of formal jobs in air transport auxiliary services economic activity	Emprg4	Logarithmic	The Brazilian Ministry of Labor and Employment (MTE, 2010) http://bi.mte.gov.br/bgcaged/caged_rais_estabelecimento_id/login.php	2010
Nr. of formal jobs in travel agencies economic activity	Emprg7	Logarithmic	The Brazilian Ministry of Labor and Employment (MTE, 2010) http://bi.mte.gov.br/bgcaged/caged_rais_estabelecimento_id/login.php	2010
Average salary (per worker, BRL) for accommodation economic activity	Sal11	Original	The Brazilian Ministry of Labor and Employment (MTE, 2010) http://bi.mte.gov.br/bgcaged/caged_rais_estabelecimento_id/login.php	2010
Average salary (per worker, BRL) for travel agency economic activity	Sal18	Original	The Brazilian Ministry of Labor and Employment (MTE, 2010) http://bi.mte.gov.br/bgcaged/caged_rais_estabelecimento_id/login.php	2010
Flow				
Total air passenger arrivals by domestic flights	Fluxo1	Logarithmic	The Brazilian Ministry of Transport (data directly disposed by ANAC[2] in 2012)	2010
Nr. of domestic flights	Fluxo2	Logarithmic	The Brazilian Ministry of Transport (data directly disposed by ANAC [2] in 2012)	2010
Total passenger arrivals by interstate roads	Fluxo3	Logarithmic	The Brazilian Ministry of Transport (data directly disposed by ANTT[1] in 2014)	2009
Nr. of interstate roads that pass through the municipality	Fluxo4	Logarithmic	The Brazilian Ministry of Transport (data directly disposed by ANTT[1] in 2014)	2009

Notes: (1) Agência Nacional de Transportes Terrestres (The National Agency for Ground Transportation); (2) Agência Nacional de Aviação Civil (The National Agency for Civil Aviation); (3) Objetivos de Desenvolvimento do Milênio (The Millenium Development Goals – MDGs); (4) Observatório Regional Base de Indicadores de Sustentabilidade (The Regional Observatory Base for Sustainability Indicators); (5) The United Nations Educational, Scientific and Cultural Organization; (6) IPHAN - Instituto do Patrimônio Histórico e Artístico Nacional (The National Historic and Artistic Heritage Institute).

The estimated determination coefficient (R^2) values for Tourism Revenue (0.613) and Tourist Flow (0.448) show that there is only a moderate relationship between them and STC, though the latter exerts a significant influence on both constructs, as shown by the estimated path coefficients (0.783 and 0.670, respectively).

Table 2 shows the Communality and Reliability indices - Average Variance Extracted (AVE), Cronbach´s Alpha (a) and Composed Reliability values - as well as the corresponding determination coefficients ($R^{2)}$ and Redundancy indices associated with the structural model (Figure 3). The indices values for Tourism Revenue and Tourist Flow indicate that both constructs are acceptable according to any adopted criteria as they have AVE values above 0.50, as well as Cronbach's Alpha (a) and Composed Reliability indices above 0.7 (Joseph F. Hair et al 2009).

Table 2: Communality and Reliability Indices of the structural model

Construct	Communality	AVE	Composed Reliability	R^2	a	Redundancy
Development	0.527					
Heritage and Culture	0.617					
Education	0.690					
ICT Infra	0.784					
Tourism Infra	0.492					
Flow	0.606	0.606	0.859	0.448	0.782	0.271
Revenue	0.534	0.534	0.847	0.613	0.771	0.326
STC	0.415	0.415	0.728	0.970	0.588	0.140

The t-values listed in Table 3 show that all of the path coefficients are significant at the level of 99.99% (t > 3.3), with the exception of the Education coefficient (t = 2.697) which is only significant at the level of 99.9% (t > 2.58).

Table 3: Structural coefficients

Description of Relationship (Hypothesis)	Path coefficients (w/ bootstrapping)	Standard deviation	Standard error	t-statistics
Tour Infra → STC ($H_1´$)	0.473	0.016	0.016	29.536
ICT Infra → STC ($H_2´$)	0.275	0.028	0.028	9.842
Development → STC ($H_3´$)	0.220	0.028	0.028	7.904
Education → STC ($H_4´$)	0.057	0.020	0.020	2.697
Heritage and Culture → STC ($H_5´$)	0.281	0.036	0.036	7.927
STC → Revenue ($H_6´$)	0.790	0.023	0.023	34.488
STC → Flow ($H_7´$)	0.671	0.019	0.019	34.840

Table 4 shows the values and statistics of the parameters estimated for the structural model using the SmartPLS® bootstrapping procedure and Table 3 shows the correspondent Correlation Matrix.

Table 4: Correlation Matrix

Construct	STC	Development	Education	Flow	ICT Infra	Tour Infra	Heritage and Culture	Revenue
STC	1							
Development	0.7168	1						
Education	0.7711	0.7882	1					
Flow	0.6696	0.2244	0.3878	1				
ICT Infra	0.7769	0.9034	0.8596	0.2779	1			
Tour Infra	0.8250	0.3539	0.5137	0.8135	0.4334	1		
Heritage and Culture	0.5721	0.1147	0.2083	0.3135	0.1621	0.4375	1	
Revenue	0.7831	0.4035	0.5344	0.6437	0.4929	0.8537	0.4645	1

These results show that all of the postulated hypotheses ($H_1´$, $H_2´$, …, $H_7´$) for the re-specified model (Figure 4) were empirically confirmed.

The validation of the measurement and structural models estimated with PLS-PM allows the proposition of structural regression equations equivalent to the prediction of the Sustainable Tourism Competitiveness Index (STCI) values for Brazilian municipalities from exogenous constructs considered and measured formatively or more precisely from its indicators and the values of structural coefficients (Table 3) and factor loadings for the respective indicators.

The re-specified model (Figure 3) considers five exogenous formative constructs, which is equivalent to a set of five structural regression equations for estimation of the sub-indices of sustainable tourism competitiveness, calculated from its set of indicators and their factor loadings. The Sustainable Tourism Competitiveness Index (STCI) can then be calculated as the sum of these five sub-indices weighted by their corresponding structural coefficients between the exogenous construct and the central macro-construct.

Table 5 presents the results (latent variable scores) estimated by SmartPLS® software in descending order of values for this Index (STCI), obtained from the set of those five structural regression equations, for the TOP 20 Brazilian tourism municipalities.

Table 5. TOP 20 Brazilian municipalities for the Sustainable Tourism Competitiveness Index (STCI)

Ranking	Municipalities-State	STCI	Tour Infra	Development	Education	ICT Infra	Heritage and Culture	Flow	Revenue
1	Rio de Janeiro-RJ	9.606	6.108	1.425	2.550	2.050	17.809	3.978	6.338
2	São Paulo-SP	6.730	6.470	1.496	2.419	2.138	11.495	4.239	10.729
3	Salvador-BA	6.502	4.295	0.921	1.121	1.121	13.013	3.622	3.920
4	Belo Horizonte-MG	5.472	4.916	1.374	2.882	2.233	10.180	3.826	4.118
5	Brasília-DF	4.827	4.465	1.468	2.698	2.098	5.061	4.053	4.592
6	Porto Alegre-RS	4.401	4.437	1.622	3.513	2.242	4.688	3.628	4.152
7	Recife-PE	4.037	4.460	0.635	1.880	0.968	4.537	3.639	3.641
8	Goiânia-GO	3.759	3.965	1.094	2.346	1.344	2.068	3.537	3.146
9	Curitiba-PR	3.586	3.549	1.570	3.484	2.473	4.440	0.633	3.850
10	Florianópolis-SC	3.272	3.830	1.443	4.583	2.810	0.405	3.426	3.508
11	Campinas-SP	3.258	4.168	1.517	2.598	2.224	-0.090	3.700	4.077
12	Ouro Preto-MG	3.182	0.845	0.844	0.593	0.660	8.825	0.013	0.084
13	Vitória-ES	3.164	3.339	1.780	4.597	2.767	0.158	3.429	2.693
14	São Luís-MA	2.974	3.155	0.149	0.774	0.189	2.909	3.083	2.749
15	Foz do Iguaçu-PR	2.960	2.907	0.815	0.760	1.055	2.068	3.066	3.079
16	Fortaleza-CE	2.703	4.555	0.626	0.747	0.331	0.158	3.470	3.350
17	Natal-RN	2.530	2.985	0.627	0.969	0.682	2.266	3.258	2.297
18	Ribeirão Preto-SP	2.521	2.939	1.552	2.474	1.958	-0.139	3.218	2.796
19	Guarulhos-SP	2.394	3.570	1.044	0.487	1.313	-0.139	0.252	4.317
20	Aracaju-SE	2.369	3.317	0.813	1.797	1.040	-0.139	3.065	2.620

Note: Negative values observed in Table 5 are derived from the standardization procedure adopted by SmartPLS® to estimate model constructs (latent variable scores).
The ranking presented in Table 5 is consistent with previous studies (Arias, 2008; MTUR, SEBRAE and FGV, 2008, 2009, 2010, 2012, 2013, 2014) where the state capitals standing out in the first positions.

3. Conclusion

The final measurement model for the Sustainable Tourism Competitiveness (STC) of Brazilian touristic municipalities developed in this study is composed of five endogenous constructs operationalized through variables and nineteen called: Tourism Infrastructure, Technology Infrastructure and Information Communication Technology (ICTs), Education, Development and Culture and Heritage - and two endogenous constructs (dependent factors) - Flow and Revenue, reflexively measured and operationalized by nine variables.

The results show that the greatest impact on the Sustainable Tourism Competitiveness (STC) of the analyzed subpopulation of 1,007 Brazilian municipalities was assigned to Tourism Infrastructure construct (path coefficient of 0.473), followed by Heritage and Culture, ICT Infrastructure and Development constructs (path coefficients of 0.282, 0.275 and 0.220, respectively).

Therefore, to improve municipality tourism, these factors should be considered priorities for public investment. They must also be the target of the strategic objectives of community partnerships, non-governmental organizations and private initiatives. They could, for example, be incorporated into the city's master plan or be allowed to influence local public governance policies to allow the municipality to improve its tourism competitiveness in a sustainable way.

STC is especially reflected in the municipal tourism performance results measured by the Revenue of the workers in the Tourism Activities considered (path coefficient of 0.783 and $R^2 = 0.613$), in particular those economic activities related to accommodations in hotels and similar, air transport auxiliary services and travel agencies. It is also reflected by interstate highway and domestic air travel flows into the municipality (path coefficient of 0.669 and $R^2 = 0.448$).

However, it is important to note that such conclusions may be specific to the subpopulation of 1,007 analyzed municipalities and may not be generalizable to all Brazilian destinations or other world destinations. Further empirical studies are required to test the proposed measurement model in other contexts.

This research contributes to the use of formative constructs in Structural Equation Modeling (SEM) and to the application of Partial Least Squares Path Modeling (PLS-PM) parameter estimation, both seldom-used in the international and Brazilian tourism literature.

Finally, this research may stimulate the use of quantitative studies, especially the application of second-generation multivariate data analyses methods, in tourism research.

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