

## **Measure of Tourism Productivity and its Relationship with Domestic Tourism Product in Mexico**

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### **Abstract**

In this paper, the main object of the study is to obtain a measure of tourism productivity and a measure of the level and type of relationship between the value of production of tourism and tourism productivity of Mexico tourism for the period 2008-2013. The Methodological framework was the input-output matrices, to correlate standardized values of the production value with tourism productivity for the 30 “tourism” subsectors. Considering that the explanation for the economic growth is very different and complex in all the countries, but the correlation study only manages that is possible to identify the variations of the tourism productivity, and that they are associated directly to the value of tourism production. The results show that the sectors with negative productivity are other hosting services, foreign buses, pharmaceuticals, films, photography, movies and car rentals, and positive productivity sectors are: handicrafts, hotels, food, beverages, restaurants and bars, trade and other financial and insurance services. Also, a direct relationship between production and productivity was found.

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**Keywords:** Tourism productivity, input-output, Mexico.

### **1. INTRODUCTION AND ANTECEDENTS**

The key to the growth and health of many economies is the rate of economic productivity growth, broadly defined as the level of production of an industry or of the economy as a whole by input unit. Exploring different measurement methods, this productivity has been an active area of analysis for economists in the last two decades (Aulin-Ahmavaara, 1999). A series of

measures of productivity can be easily expressed in terms of input-output as specified in Wolff's (1985) and Raa's works (2005).

There are two types of productivity measures that are used to evaluate the economic performance of a country, region or industry. One of them is partial productivity of both, the work or the capital, that is, it only considers one single production factor. As a measure of productivity, the productivity of work is used much more often since it is important to determine the growth potential of the per capita income levels. The other measure of productivity is the overall productivity of the factors, which considers not only the work and the capital but also other factors such as technology, human capital, etc. (Dwyer et al, 2011).

The consequences of this productivity deficit in the tourism industry translates into an increase in relative prices, a constant and greater competition on the benefits in the industry, a deficiency in the investment capital and a decline in competitiveness (Smeral, 2003).

Productivity increase can occur in different ways, for example: better allotment of resources; introduction of better, newer technology / innovation that leads to: a) efficient ways of doing things; b) changes in the business operation environments; c) increase in the operation's scale and; d) eliminating social, economic and physical obstacles, etc. (Smeral, 2007).

Tourism represents a significant contribution to the Mexican economy due to its production, value added and employment. In 2014, tourism contributed 8.6% of the country's gross domestic product and participated with 7.8% and 8.5% in the gross domestic value added in the years 2014 and 2015 respectively. In the third quarter of 2015, the tourism sector generated 3.8 million jobs that accounted for 8.3% of the total number of people with employment at the national level and it represented a 3.64% rise with respect to the same period of the previous year (DATATUR, 2015).

Despite all that, little or no research has been conducted on productivity in our country. The main reason for this deficiency is the fact that tourism is not an industry or product in international statistics norms, but rather it is defined according to the nature of the products demanded by the visitors (Hara, 2000).

The above poses great challenges when it comes to representing independently tourism activities from economic activities in general and generating specific measures of productivity of the activities inherent to tourism as well as its comparison and relationship with other variables; therefore, the main objectives of the work are to estimate tourism productivity and measure the level and type of relationship existing between this tourism productivity and the tourism product in Mexico in the 2008-2013 period.

The institutional way of integrating tourism activities and the rest of the economic activities in a homogeneous framework of national accounting

within the Sistema de Cuentas Nacionales de México (The System of National Accounts of Mexico, SCNM) has been via the Cuenta Satélite de Turismo (The Tourism Satellite Account, CST). This account does not generate a division of tourism and non-tourism sectors, but rather it establishes a classification on a double level: product and activity (Marquina, 2006).

With respect to products (goods and services), they are divided in those whose demand is caused basically by the visitors, referred to as specific products, and the others. In turn, specific products are subdivided in characteristic and related products. Specifically, the classification will depend on what is determined in each country and it may be different for different countries. The classification of specific products may be represented as: a) characteristic product: the one that would not exist in considerable amounts but for the tourism demand, for example, air transport of passengers, accommodations, travel agencies, etc. and; b) related products such as those whose production or existence would be seriously affected if tourism demand did not exist, regardless of the level the latter has. Related services are rendered, for example, by taxis, museums, some shows, etc.

It is also important to mention that estimation of tourism consumption in related products poses an additional difficulty because the list of related products in the sector of tourism is very likely to vary considerably in different countries and even among different types of visitors. Therefore, in each case, and under the panorama of specific data of other supplementary information and previous experiences, it would be possible to determine a certain threshold from which a given product is considered related with the tourism activity (Kido, 2016).

Different economic activities, especially those related with the tourism activity, generally, do not have a homogeneous production, that is, they do not supply a single product, but rather they may produce and supply several and in different quantities. This reality is taken into consideration by the CST, which classifies an activity as *characteristic* if the typical product of its production is a characteristic one.

Once the set of characteristic and related products has been defined, characteristic and related activities are automatically delimited, because they are those whose main production is identified with said products. Nevertheless, a final, transcendental consideration in characteristic and related activities of tourism is that, for them to be considered as such, they must serve the visitor directly, without intermediaries. This way, 30 subsectors are known to exist closely related with tourism and they can be considered tourism subsectors (CST, 2007).

| Table 1. Tourism Concept                         |   |
|--|---|
| Characteristic goods and services of tourism     | Crafts, beachwear and swimwear, baggage, tents, hotels, other accommodation services, airlines, foreign coaches, other transport and related services, travel agencies.   |
| Non-characteristic goods and services of tourism | Food, beverages and tobacco, clothing and shoes, newspapers, magazines and books, pharmaceuticals, photography films, others, restaurants and bars, commerce, transport. movie theaters and shows, toiletries and personal hygiene, car rental, others. |
| Other non-characteristic services of tourism     | Tourism management and promotion, financial and insurance services, recreational services, other services.  |

Source: Marquina (2006).

## 2. METHODOLOGICAL FRAMEWORK

To obtain this productivity measure, it is necessary to generate tourism input-output matrices. To that effect, Marquina's work (2006) allowed us to create two tourism input-output matrices for Mexico for the years 2008 and 2013 (whose technical coefficients are shown in annex A and annex B herein), to finally, correlate standardized values of the production value with tourism productivity in the 30 "tourism" subsectors.

The main limitation of presenting the 2013 results lies in updating the most recent matrix provided by the Instituto Nacional de Estadística y Geografía, INEGI (National Institute of Statistic and Geography), which corresponds to the year 2012. This update was based on the simple RAS method. In addition, direct coefficients of the different tourism sectors were obtained from the data of the goods and services generated by the economic census, which are only available for the years 2003, 2008 and recently the results of the year 2013.

### 2.1 PRODUCTION AND THE MEASURE OF ECONOMIC PRODUCTIVITY

Even when Dwyer et al (2007a) propose estimating tourism productivity from the activities reported within the Cuenta Satélite de Turismo, our work follows Miller's and Blair's proposal (2009) to obtain a measure of the overall productivity of the factors in the tourism industry based on the input-output tables. These authors propose starting with the matrix of technical coefficients  $a_{ij}$ , value added coefficients,  $v_j$  and total production  $x_j$ .

Starting from the basic accounting relation of the relationship among inputs, we can obtain the following expression:

$$x_j = \sum_{i=1}^n a_{ij} + v_j x_j = (\sum_{i=1}^n a_{ij} + v_j) x_j \quad (1)$$

Using the product rule of the differential calculus and applying it to the accounting expression in (1), we see that:

$$dx_j = d\left[\left(\sum_{i=1}^n a_{ij} + v_j\right)x_j\right] = \left(\sum_{i=1}^n a_{ij} + v_j\right)dx_j + \left(\sum_{i=1}^n da_{ij} + dv_j\right)x_j \quad (2)$$

The growth rate of Total Productivity of the Factors (PTF) is usually defined as:

$$\tau_j = -\left(\sum_{i=1}^n da_{ij} + dv_j\right) \quad (3)$$

So that (2) becomes:

$$dx_j = \left(\sum_{i=1}^n a_{ij} + dv_j\right)dx_j + \tau_j x_j \quad (4)$$

In this literature on PTF, it is also common for continual expressions (differential equations) to be transformed in logarithmic terms. From the calculus rule on logarithmic expressions, we have that  $d\ln(z) = (1/z) (dz)$  or also that  $dz = z (d\ln z)$ . This gives:

$$\tau_j = \left[\sum_{i=1}^n a_{ij}(d \ln a_{ij}) + v_j(d \ln v_j)\right] \quad (5)$$

In addition, in the PTF analysis, the value added ( $v_j$ ) usually breaks down into work and capital, which is denoted as  $l_j$  and  $k_j$ . This subdivision is denoted as the sectorial technical change in a continuous way, initially proposed by Leontief (1986).

With the end of making use of the input-output data generated, it is common to express the relationships of (2) and (3) as finite differences, where  $dx_j \cong \Delta x_j = x_j^1 - x_j^0$ ,  $da_{ij} \cong \Delta a_{ij} = a_{ij}^1 - a_{ij}^0$  and  $dv_j \cong \Delta v_j = v_j^1 - v_j^0$ . Ignoring "second order" effect, equation (2) becomes:

$$x_j^1 - x_j^0 = \Delta x_j = \Delta\left[\left(\sum_{i=1}^n a_{ij} + v_j\right)x_j\right] = \left(\sum_{i=1}^n a_{ij}^0 - v_j^0\right)\Delta x_j + \left(\sum_{i=1}^n \Delta a_{ij} + \Delta v_j\right)x_j^0 \quad (6)$$

Which can also be rewritten as:

$$x_j^1 - x_j^0 = \Delta x_j = \left(\sum_{i=1}^n a_{ij}^0 - v_j^0\right)x_j^1 - \left(\sum_{i=1}^n a_{ij}^0 - v_j^0\right)x_j^0 + \left(\sum_{i=1}^n a_{ij}^1 - v_j^1\right)x_j^0 - \left(\sum_{i=1}^n a_{ij}^0 - v_j^0\right)x_j^0$$

Where the first part of the expression of the term to the right represents the portion of change in the use of the old technology, reflected in  $a_{ij}^0$  and  $v_j^0$  to meet the new input needs and the second part represents the portion of change in the use of the new technologies, now reflected in  $a_{ij}^1$  and  $v_j^1$ , to meet the old input demands.

In case it is preferred to work with the productivity rate with respect to the initial product, this effect can be obtained by normalizing or (dividing) the productivity growth rate with respect to total initial production in  $x_j^0$ . As it has been mentioned before, finite difference of the productivity rate derives from the equation (3) and it can be represented by:

$$\tau_j = -\left(\sum_{i=1}^n \Delta a_{ij} - \Delta v_j\right) \quad (7)$$

Therefore, increase in the product can be expressed as:

$$\Delta x_j = \Delta[(\sum_{i=1}^n a_{ij} + v_j) x_j] = (\sum_{i=1}^n a_{ij} + v_j) \Delta x_j - \tau_j x_j^0$$

Which, in matrix terms can be rewritten as:

$$\tau = - [(i' \Delta A)' + \Delta v] = - [(\sum_{i=1}^n \Delta a_{ij} + \Delta v_j)] \quad (8)$$

Table 2. Description of the sources of information used to make the tourism input-output tables.

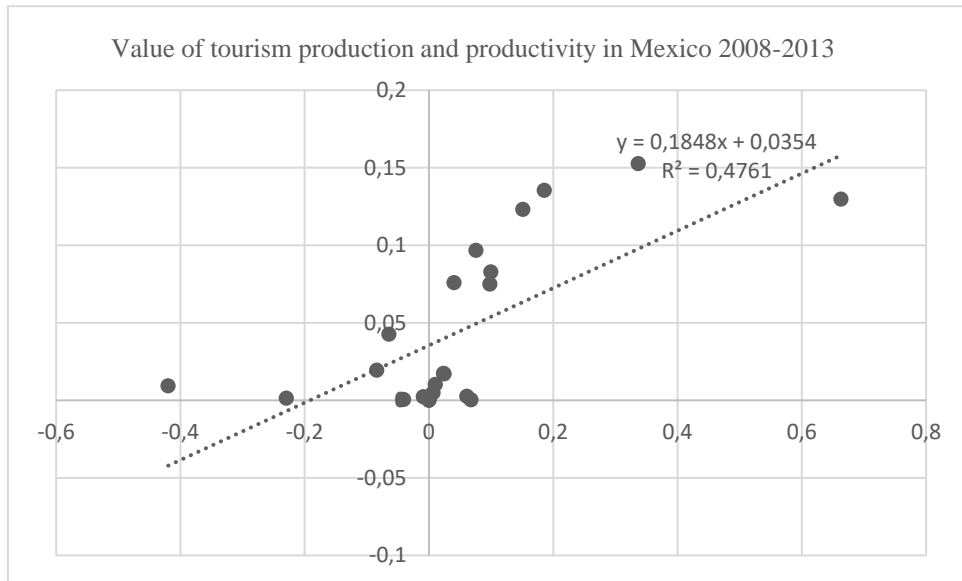
| Table 2. Concept  | Origin   | Source       |
|---|--|--------------|
| Symmetric input-output matrix by subsectors in millions of pesos of 2008 for the years 2008 and 2012. | GDP and national accounts.   | INEGI (2015) |
| Series of tourism intermediate consumption for the years 2003-2014. Base 2008.                        | Economic information bank. National accounts. Cuenta Satélite de Turismo de México. Production accounts, macroeconomic variables.                | INEGI (2015) |
| Series of gross value of tourism production for the years 2003-2014. Base 2008.                       | Economic information bank. National accounts. Cuenta Satélite de Turismo de México. Production accounts, macroeconomic variables.                | INEGI (2015) |
| Series of tourism added value for the years 2003-2014. Base 2008.                                     | Economic information bank. National accounts. Cuenta Satélite de Turismo de México. Production accounts, macroeconomic variables.                | INEGI (2015) |
| Expenditure for consumption of goods and services for the years 2008 and 2013                         | Economic census, 2009 final results (Data referring to the year 2008) and economic census, 2014 final results (Data referring to the year 2013). | INEGI (2015) |

### 3. RESULTS

Table (1) shows the main results obtained from the total productivity of the factors in all the sectors in the 2008-2013 period in Mexico. The sectors with positive productivity during the period under study are: agriculture, extraction of oil and gas, building and construction, food industry, manufacture of oil and gas byproducts, manufacture of metal products, manufacture of machinery and equipment, among others. Those presenting negative productivity are: generation and distribution of electricity, chemical industry, computer equipment, commerce, truck transportation, central bank and financial services, real estate and professional services. Regarding the tourism subsectors, the data show that in this period, the subsectors with negative productivity are: other accommodation services, foreign coaches, pharmaceuticals, photography films, movie theaters and shows, car rentals, other management services and, recreational services, 8 of the 30 subsectors considered here. The following sectors stand out due to their high productivity:

crafts, hotels, food, beverages and tobacco, restaurants and bars, commerce and other financial and insurance services.

Table (3). This section shows the results, at the empirical level, of the relationship between the gross value of tourism production and tourism productivity in Mexico during the years 2008-2013. The following graph clearly shows a positive association between tourism production and productivity (once the values were normalized by dividing each value by the total of each series) and the determination coefficient shows a relatively high value of 0.47.



**Table 3**

Considering that the explanation for the economic growth in different countries is a very complex subject, both theoretically and empirically, our correlation study only manages to argue that it is possible to identify, within the range of the data considered, that variations in tourism productivity values are associated directly with variations in the value of tourism production, without this association implying necessarily a random effect among the variables analyzed.

#### **4. CONCLUSION AND DISCUSSION**

This work has presented a measure of tourism productivity based on the creation of two tourism input-output matrices for the years 2008 and 2013 in Mexico. Following Miller’s and Blair’s formulation, productivity of tourism sectors was estimated, and the following sectors stand out because of their positive contribution: crafts, hotels, restaurants and bars. The following subsectors made a negative contribution: other accommodation services,

foreign coaches and car rentals. Finally, the relation between the value of tourism production and productivity was estimated and a positive correlation was obtained between these variables with a determination coefficient of 47%.

This result is noteworthy because it would be more in keeping with the result of the estimation of productivity on the per-capita product in different countries of the study by Lederman, Maloney and Servant, (2005) who place this value at 0.5 and Banda's and Bernal's (2007) who obtained a productivity parameter of 0.58 for the case of Mexico. But it would be far from the parameters obtained recently in the literature, by authors such as Jorgeson and Vu (2010), who estimate it at 0.125 worldwide for the years 1989-1995; at 0.2 for the 1995-2000 period and at 0.37 for the years 2004-2008.

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## ANNEX B

### 2. 2013 TECHNICAL COEFFICIENT MATRIX

| VALUE ADDED  | 47907   | 98503  | 21874  | 10723  | 57924  | 1271604 | 628908 | 123231 | 128797 | 96083  | 11938  | 51474  | 169390 | 81746  | 11433  | 140270 | 89884  | 402196 |
|--|---------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Agriculture, Cattle raising, Forestry, hunting and fishing   | 0.09559 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Oil and gas extraction   | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Metal Ore Mining, except Oil and Gas   | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Electric Power Generation, Transmission and Distribution   | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Natural Gas Distribution and water distribution via ducts to the final consumer                                      | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Industrial Building Construction   | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Food Manufacturing   | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Beverage and Tobacco Product Manufacturing   | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Textile manufacturing inputs and finished textiles, manufacture of textiles, except apparel, manufacture of clothing | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Tanning and dressing of leather and leather products and manufacture of leather and leather substitute materials     | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Manufacture of wood, paper and printing industry and related industries  | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Petroleum and Coal Products Manufacturing  | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Chemical Manufacturing   | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Primary Metal Manufacturing  | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Fabricated Metal Product Manufacturing   | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Manufacture of machinery and equipment   | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Computer, Communications Equipment and Electronic Product Manufacturing  | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Manufacture of accessories, electrical appliances and equipment electricity generation                               | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |



