Impacts of tourism and the generation of employment in Mexico

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Abstract

Purpose – This paper aims to study the relationship between employment and tourism activities as well as economic variables for the 32 states of Mexico for the period 1999-2014.

Design/methodology/approach – To study the case of Mexico, the authors use panel data and cointegration panel data. They also use geographic information systems to observe changes over time between the variables, which is useful in the empirical evidence.

Findings – The main results obtained by the models are as following: domestic tourism is the variable with the greatest impact on the generation of direct employment in the tourism sector, a finding supported by both methodologies; economic growth (measured by state gross domestic product) also directly impacts the generation of employment; and the cointegration of the panels causes a long-term equilibrium among the states and some variables.

Research limitations/implications – The model used leaves out other variables that may influence the performance of the tourist activity. In addition, given the availability of official and homogeneous information, it only covers what has been documented up to 2014.

Social implications – The aim is to measure the impact of tourism on the variables at the state level, where the economic activities could be based on public policies, as well as the importance of tourism activities in generating employment. In this sense, the impact would be in channeling efforts to support the main economic activities and could serve as a starting point for the evaluation of programs to promote domestic tourism.

Originality/value – This paper reviews the relationship that exists between tourism activity and its effect on other variables, especially employment. It is the first time that these topics are studied for the Mexican economy.

Keywords Tourism, Panel data, Employment, Cointegration panel data

Paper type Research paper

Introduction

The rapid advance of tourism and its potential for growth has accelerated even further in recent years, particularly in developing countries, as is the case with Mexico. Tourism activities, in the widest sense of the term, are considered a key variable in local, regional,

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national and international economic growth, due to the fact that they are based on foreign currency income, as well as generating employment and creating services and related activities.

According to the United Nations' World Tourism Organization (UNWTO, 2013), tourism has undergone continuous expansion and diversification, becoming an important and growing economic sector on a global level. On an international level, in 2012, it contributed 9 per cent of gross domestic product (GDP), creating, on average, one out of every eleven jobs and generating income that represented around 6 per cent of world exports. In real terms, in the same year, income grew by 4 per cent, reaching a record US$1tn 75bn. In terms of this indicator, this growth is similar to the 4 per cent increase in visits by international tourists, making evident the strong correlation between the two indicators. The most recent data indicates that this activity contributes 10 per cent of global GDP, generating one out of 10 jobs and US$1.6tn in exports, which represents 7 per cent of global exports and 30 per cent of services (United Nations World Tourism Organization, 2017).

According to the Economic Census conducted in Mexico in 2014, the tourism sector represented 11.7 per cent of the economic units of the national total, generated approximately 6.5 per cent of GDP, comprised 12.7 per cent of formal national employment, and provided 7.9 per cent of the national total for wages (National Institute for Statistics, Geography and Information, INEGI, 2017). Moreover, in 2016, the tourism sector represented 8.7 per cent of GDP, employing approximately 10 million people (De la Madrid, 2017a). In fact, in the first half of 2017, approximately 19.2 million international tourists visited Mexico, generating an income of US$11,104bn for this period (De la Madrid, 2017b). According to the Travel and Tourism Competitiveness Report 2017[1] [World Economic Forum (WEF), 2017], Mexico had risen eight positions from its 22nd place in the 2015 rankings. According to this report, emerging economies, of which Mexico is one, are gaining on advanced economies.

In some countries, international tourism has acquired ever-greater importance, representing, in Mexico, at least the third largest source of international income, behind income from petroleum and remittances sent home by Mexican migrants. Furthermore, the Organization for Economic Cooperation and Development (OECD, 2017) has documented that, in Mexico, national tourism contributed 88 of every 100 pesos spent in the sector, having a direct impact on host communities. Compared to the flow of international tourists, which is concentrated in destinations such as Cancun or Los Cabos, national tourism is distributed across the entire national territory.

The positive evolution of tourism and its potential for growth have increased over recent years, establishing tourism as a source of growth (*tourism-led growth hypothesis*), especially in developing economies, as is the case with Mexico.

In general, it is thought that, like exports, the growth of tourism contributes positively to economic growth. However, despite the robust verification of the hypothesis postulating exports as a motor of growth, many studies have not found that exports contribute definitively to a country's capacity to produce goods and services (Darrat, 1986; Dodaro, 1993; Hsiao, 1987). Given that tourism may play a similar role in the economy of every country, the question has been asked for years as to the contribution of national tourism to economic growth.

This relationship is important as it enables the private and public sectors to plan and manage tourism activities with the objective of maximizing the benefits they provide. The general thesis is that tourist areas will generate a sufficient flow of visitors to drive economic growth at a regional, state and, therefore, national level.

Highlighted among the effects considered for measuring the impact of tourist destinations are the increase in foreign currency income, the generation of sources of local income with the externality effects of driving increased activity in other economic sectors, and the growth in direct and indirect employment. In terms of this last effect, however, other studies have established that tourism activities have no effect on formal employment, given their seasonality.

A generalized idea of tourism, one proven in the literature, is that this sector, further to increasing resources via foreign currency income, is able to create employment opportunities. Although empirical research has been undertaken in this area, it should be noted that the use of the Granger causality test to study the causal relationship between tourism and economic growth could cause three relevant problems:

(1) the question as to whether annual data are sufficient for representing the long-term relationship between both variables;

(2) the inability of the annual data to eliminate the problems of short-term fluctuations due to economic cycles and structural changes; and

(3) the inability to delineate economies with special characteristics in terms of distinct causal relationships.

An important advantage of tourism is its generally high level of income elasticity given the demand for tourist services (Baretje and Defert, 1972). A recognized disadvantage is that the concentration of tourist activities could lead to a more vulnerable economic structure, given the natural absence of relationships with the industrial and/or productive sector in general.

In terms of public policy, the promotion of balanced economic development requires a detailed analysis of the determinants and effects of tourism activity. Highlighted among the important variables to consider in the development of tourism at a national level are the growing demand for associated services and the affinity with the geographical, natural and cultural characteristics of the regions in which it is based. While it is certain that a high number of tourists represents a considerable source of income at a local level, negative impacts on natural capital and cultural resources are also often observed.

In both the short and long term, tourism (both local and domestic) may make a significant contribution to a nation's economic growth, while its potential generation of income and employment may be limited by its ability to offer the goods and services demanded by tourists. This may result, for example, from the fact that intermediate imports are commonly brought in from their countries of origin to meet tourists' consumption habits. Despite this, given the offer of tourism and the infrastructure available, the income from tourists has a considerable effect on well-being and economic activity in the host countries. At an international level, tourist exports, in terms of people, services and foreign currency, result from increased levels of income in the countries of origin, local labor policy, and the reduced cost of international, principally air, transport. Moreover, it is important to note that the attraction of international currency improves balance of payments indicators and contributes to generating stability in the exchange rate system.

It should also be noted that, to a great extent, the majority of the organizations operating in the tourism sector correspond to micro, small and, in some cases, medium-sized enterprises. Furthermore, in terms of factors of production, the sector is work intensive, absorbing labor in the primary and service sectors and, thus, in some senses, reducing the indicators associated with local unemployment.

The relationship between human capital and productivity in tourism activity has been analyzed in developing economies, particularly the elements associated with the scarcity of

personnel trained for work in this sector. The importance of personal services in this industry, in which national and foreign tourists interact constantly with staff from this sector, requires the consideration of variables, such as the educational level of tourism workers and the quality of the services and/or products. The difficulties of delimiting the tourism sector complicate the study of human capital and the extant abilities required by this economic sector. Some of the most relevant questions relating to human capital in this sector refer to the contribution of labor, either vocationally or academically trained, to the productivity of the sector and the generation of related public policy, among others.

Rodríguez and Brown (2012) state that, in Mexico, the expansion of the tourism industry is very recent, having begun approximately 35 years ago. With tourism a pillar of the Mexican economy, the number of establishments offering services in this sector grew rapidly at the beginning of the 1960s, as a result of the internationalization of the port of Acapulco, in the state of Guerrero. This growth continued with the beginning of operations, in 1975, at what is now one of the main international tourism destinations, the city of Cancun, in the state of Quintana Roo. However, Brenner (2005) describes how the tourism boom coincided with the development of luxury resorts in the 1970s. This was supported by a government seeking to increase foreign investment, generate employment and integrate, into the national economy, peripheral regions with clear signs of social marginalization, the presence of *shantytown*[2] enclaves and environmental deterioration.

The present study examines the relationship between tourism activity and the generation of employment in the 32 federated states of Mexico, via the use of panel data methodology and the cointegration of said panel data, to respond to the following research questions:

RQ1. What has been the impact of economic variables and the tourism sector on the generation of formal employment in the federated states of Mexico in the period 1999-2014?

RQ2. Is it possible to identify long-term relationships among the variables that explain employment in the tourism sector?

While said relationship has been already studied by other disciplines, such as administration, anthropology and psychology, the present study comprises pioneering quantitative research for Mexico on these relationships and variables.

The first section of the study presents a theoretical review of the literature on the relationship between employment and the activity of the tourism sector. The second section presents the empirical evidence that enables the observation of the possible relationship among the variables of interest, such as employment, economic growth, national and international tourists, exchange rate, and tourism infrastructure. The models and results are presented in the third section. Finally, the last section presents the final considerations and the public policy recommendations resulting from this research.

Theoretical review

Johnson and Thomas (1990) state that analysis of the relationship between tourism and employment reveals three main trends:

(1) studies of the generation of potential employment by tourism and the role it has been attributed to play in the economic revival of depressed regions;

(2) the description of trends that help to explain the structural changes and generate prognoses that assist with planning; and

(3) studies may comprise the evaluation of a policy or a specific program.

In the same vein, Ladking (2011) establishes that tourism has been present in the economic agenda since the 1980s, finding that the majority of studies on the tourism-employment relationship analyze impacts, the generation of income and wages, and the evaluation of the economic benefits that tourism has brought to destinations and tourism developments. The results of said studies can be used in the design of industrial policy strategy and in decision-making processes; however, they also indicate that many of the economic benefits associated with tourism activity are often exaggerated.

Gómez and Pérez (2014) establish that, in terms of public policy, the promotion of balanced economic development requires a detailed analysis of the determinants and effects of the tourism sector. Within this framework, it is necessary to analyze those variables of great relevance to the development of tourism that, to a large extent, are represented by the growing demand for associated services and the affinity of tourism sites with the geographical, natural and cultural characteristics.

It should be noted that tourism is recognized as an intensive activity in labor terms (Pais, 2006) and, similarly, that its nature is such that its multiplier and *spillover* effects are expected to be higher than those in other sectors. Moreover, this activity generates employment at all levels and categories of ability, as well as a higher degree of competitiveness. In the same vein, the *spillover* effect presents when the affluence of tourists increases demand for local goods and services, due to either direct or indirect expenditure, or multiplier effects (Kadiyali and Kosová, 2013).

In the same vein, Habibi *et al.* (2018) indicate that the tourism sector can, without doubt, be a long-term objective of economic policy, given its potential to increase employment and growth, by:

- generating greater efficiency and economies of scale for goods and services, based on demand;
- sending signals to the market for the entry of new participants, generating a positive impact on goods and services; and
- competition and more consumer choice options may raise quality of life.

Becerra (2009) argues that tourism generates local employment, both directly in the same sector and also in various support and resource management sectors. Moreover, it would stimulate profitable national industries, such as the hospitality sector, transport systems, artisanal manufacturing and tourist guide services, as well as driving improvements in transport, telecommunications and basic community infrastructure. She continues that it generates distribution facilities that could be used for either local communities or national and/or foreign tourists and stimulates and contributes to financing the conservation of historical sites, buildings and neighborhoods.

Along the same lines, Onetiu and Predonu (2013) describe how employment in the tourism sector attracts the labor surplus from other sectors, thus helping to reduce the unemployment rate; moreover, these new employees renew the labor market, increase consumption and, thus, contribute to GDP growth, while also improving the levels of welfare in the region.

According to Leiper (1999), there is some confusion over the generation of employment by tourism, due to the fact that the national statistics are based on tourist spending and do not focus on those industries in which the work itself is carried out, thus ignoring the concept of partial industrialization. This concept is relevant for understanding the impacts of tourism on the local environment. Although Witt and Witt (1995) concur on the point that the evaluation of the employment generated in the sector is important, they do state that

there is no standard industrial classification. This is a sector defined by demand and extending to other economic activities, partially measuring the employment created in those activities characteristic of the sector, such as hotels and restaurants and, for example, accounted for in the Tourism Satellite Account.

Studies such as those by Crouch and Ritchie (1999) document the role played by tourism as a generator of prosperity and quality of life, both for tourists themselves and the host communities. They also identify the economic impacts, among which are the generation of employment and the concomitant increase in prices. García and Siles (2015) establish that the tourism-employment relationship has also been examined by numerous studies on the competitiveness of tourism destinations (Dwyer and Kim, 2003; Dwyer *et al.*, 2003; Craigwell, 2007). The competitiveness of the destination generates employment, which, in turn, is translated into prosperity, well-being and increased income for local inhabitants in host regions.

Castillo *et al.* (2017) indicate that the promotion of tourism via public policy is not an objective *per se*, rather the income via foreign currency, economic growth and the generation of employment that its expansion would bring. The latter may be direct, indirect or induced, with a wide range of possibilities (instruction, specialization, occupation and size), and may empower vulnerable groups, given that women, young people and adults would be employed. Furthermore, the tourism sector has the advantage of having few obstacles to entry, thus opening the possibility for the starting of small enterprises and the generation of self-employment.

For the Mexican economy, at a federal and state level, the tourism-employment relationship has been important, because it has been the basis for the design of development policy, as this is considered a priority sector due to its effect on the economic structure and capacity to drive the creation of sources of employment (Barrón *et al.*, 2014). However, to date, few studies have measured the contribution of the tourism sector at a state level in both aggregated and differentiated terms. Moreover, in terms of the sector's contribution to employment, the available statistics correspond to official data rather than academic studies that quantify the volume of job vacancies generated, as well as the specialization and productivity in the sector and their variations in the communities, as associated with the seasonality of tourist activity[3].

Balaguer and Cantavella-Jordá (2002) studied the relationship between the variables of economic growth and tourism activity in Spain via a time series model, seeking to ascertain whether or not said relationship is a long-term one. For this latter objective, they used the Johansen cointegration methodology with GDP data, income from international tourism and the exchange rate, based on the fact that the Spanish economy is a small open economy. For these authors, the tourism industry is today of vital importance for the global economy and, in particular, those countries that depend on this sector (mainly via employment and the export of services), arguing that attention has not been paid to the study of the contribution of this sector to economic growth. These authors conducted their research in Spain as they sought to establish whether the growth in international tourism had made a significant contribution to the development of the national economy over a period of 22 years. The theoretical basis of Balaguer and Cantavella-Jordá's (2002) study is the hypothesis of export-led growth, taking into account, in part, the non-tradable goods sector, of which tourism forms part. They found that the income generated by international tourism positively affected the growth of the Spanish economy for the period 1975-1997. The impact that tourism has had on Spanish economic growth and the magnitude of the parameter verify the long-term effects, prompting the authors to argue that this finding strengthens the predictions made in other studies that have focused on tourism as a service and a

non-tradable good. They also observe that, contrary to the prediction made by means of the export-led growth hypothesis, the growth of the tourism sector is not specific in developing economies, the income of which is based on the comparative advantage found in certain sectors of the economy.

Neves and Campos (2005) analyze the causal relationship between economic growth and tourism, using a panel data model on a sample of countries that have a tourism sector playing a significant role in their total economic activity. The studies they review approach said relationship from the point of view of a time series or other analytical tools, such as panel data, based on which, as well as data from Latin American countries, a greater per capita flow of tourists is found to generate higher levels of growth in nations with low and medium income. This relationship is not observed for wealthier economies. Therefore, Neves and Campos (2005) found that the conditional impact of tourism is not significant, while, in some sub-samples, an unexpected negative impact occurs, confirming the results found in the complete sample. The sign and significance of the parameters related to the variables of the tourist sector are relevant in Africa and Latin America as they are all found in the variables for the sub-sample, which assume a comparative advantage in the tourism sector. The authors conclude that tourism, on its own, cannot contribute significantly to the high rates of growth of those economies that specialize in tourism. The most surprising finding of this study is that, when there is a significant relationship between economic growth and tourism, the sign is negative.

Barro (1991) and Islam (1995) underestimate the presence of a causal relationship between tourism specialization and economic growth, a conclusion consistent with economic theory, which establishes that growth in a country is based more on the productive sectors than services. Oh (2005) analyzes the causal relationships between the growth of tourism and the expansion of the economy of South Korea under the focus proposed by Engle and Granger, doing so in two stages and using a bivariate vector autoregressive model. Among the main findings, the cointegration results do not indicate a long-term relationship between the two series while, secondly, the results of the Granger cointegration tests indicate a unidirectional causal relationship for the economic growth either directed or caused by the growth of the tourist sector. Thus, according to this author, the hypothesis that tourism is a source of economic growth is not sustained in the case of the South Korean economy. The same conclusion is sustained by the sensitivity tests for causality conducted under distinct delay selections. The results obtained by Oh (2005) for the South Korean economy contrast with those obtained by Balaguer and Cantavella-Jordá (2002), who used the same techniques for the Spanish economy.

Oh argues that the results of the tests indicate that the economic growth of the South Korean economy in recent years has tended to attract international tourists only in the short-term, given that international trade is known to be closely related to economic expansion. Therefore, while it would be rational to think that tourism is strongly affected by economic growth, the above-described positive effects are not maintained over the long-term. The author concludes that it would be desirable to include other variables, such as the exchange rate, which were perhaps not fully considered in his study. Economic policy recommends that care should be taken with the design of public policy that promotes tourism as a driver of economic development, given that the results obtained reveal economic growth to generate the growth of the tourism sector and not the reverse.

Lee and Chan (2008), on the other hand, use the technique of heterogeneous panel data cointegration to explore the co-movements and the causal relationships between the same variables for a group of countries in which the tourism sector is important, for the period 1990-2002. The application of the panel data methodology reveals a relationship between the

evolution of GDP and the development of tourism. They also document that, in countries that do not pertain to the OECD, the development of tourism has a greater impact on GDP compared to that found in countries that do pertain to said organization. Similarly, they also find that:

- If the variable of tourism income is taken into account, the greatest impact is observed in sub-Saharan African countries.
- The real exchange rate has significant effects on economic growth.
- In the long-term, the causality revealed by the panel tests shows that, while the development of tourism has a univariate directional relationship with economic growth in OECD countries, these relationships are bidirectional in countries external to the organization.

In particular, Lee and Chan (2008) analyze the economic policy implications of their results and, specifically, argue that the long-term relationship between the development of tourism and real GDP means that both variables are causally related in some way, in at least one direction. However, they do not find the relevant data to resolve the question as to whether economic growth generates economic development or vice versa. One of their most important conclusions with regard to globalization is that it is preferable to compare the relationships between tourism and economic activities by groups of countries rather than individually, namely that the regional effects should be taken into account, as should the fact that the efficacy of the models is improved.

Po and Huang (2008) use cross-sectional data for the period 1995-2005 from a sample of 88 economies, with the objective of analyzing the possible non-linear relationship between the development of tourism and economic growth when using a limit variable. The degree of specialization in tourism, defined as q_i, is the earnings from international tourism as a percentage of GDP and is used as the threshold or limit variable. The results of the linearity tests indicate that the economies considered here should be separated into three distinct groups (or regimens) to analyze the possible nexus of tourism and economic growth. These authors observed that when q_i presents a value below 4.049 per cent (Regimen – 157 countries) or above 4.73 per cent (Regimen 3 – 23 countries), a positive and statistically significant relationship between tourism and economic growth is observed. Despite this, when q_i is within the range of 4.049 per cent – 4.73 per cent (Regimen 2 – 8 countries), evidence that confirms the relationship between these variables is not found.

Similar to the above-mentioned authors, Pablo-Romero and Molina (2013) indicate that the empirical study of this relationship could be attributed, in the first instance, to the work of Lanza and Pigliaru (2000), who observed that countries highly specialized in tourism activity share the characteristics of being small countries with a rapidly increasing per capita income. This results in what is known as the *tourism-led growth hypothesis*. To explore this relationship, the authors undertook a review of 87 studies, finding that a univocal relationship is observed between tourism and economic growth in 55 of them and a bidirectional relationship in 16, while nine studies either verify that the relationship runs from growth to tourism or find no relationship at all. The differences among the results respond to the selection of the specification of the model and the econometric techniques used. In general, all the studies conclude that tourism contributes to economic growth; however, the magnitude differs not only among studies but also within the same studies and the estimators obtained. Therefore, they propose the determination of the contribution based on the calculation of the global measurements with the published empirical evidence,

namely via meta-analysis, which will enable the integration and synthesis of estimations obtained in prior studies.

Empirical evidence

The data used in this study are taken from various sources of information: the Satellite Account for the tourism sector; the Mexican System of National Accounts and the Economic Census (both available from INEGI); DataTur, the Ministry for Tourism's monitoring system; the National Population Council; the United Nations Development Programme (UNDP); and, the Bank of Mexico. The impact of economic variables on both employment in the tourism sector and development was studied in the 32 states of the Mexican Republic in the period 1999-2014.

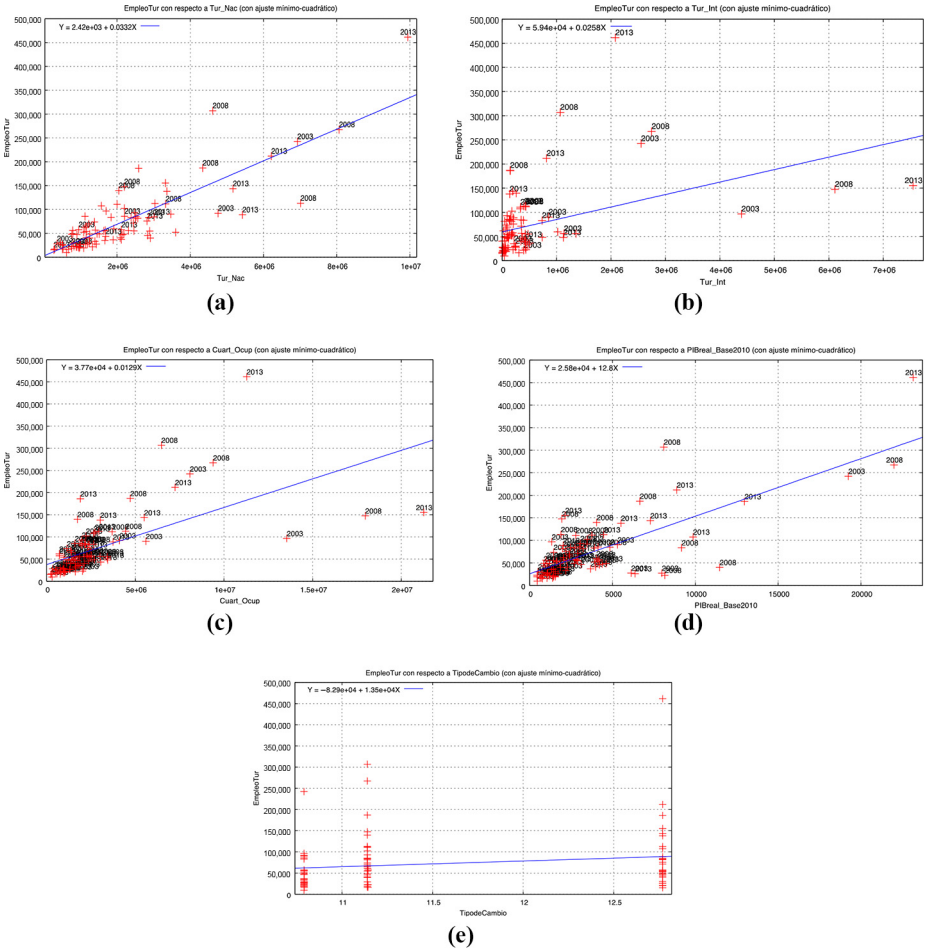
The following variables were considered for the analysis: Staff Employed ($EmpleoTur_{it}$) in hospitality activities and tourism sector services, with data taken from the Economic Census for the years 2003, 2008 and 2013; National Tourists (Tur_Nac_{it}) – the number of national tourists per federated state i in year t; International Tourists (Tur_Int_{it}) – the number of international tourists received per federated state i in year t; Rooms Occupied ($Cuart\_Ocup_{it}$) according to the DataTur tourism compendiums for each federated state i in year t; Real GDP at 2010 prices ($PIBreal_{it}$) for each federated state i in year t; Exchange Rate ($TipodeCambio_t$) in year t; the Human Development Index (IDH_{it}); and, the average annual temperature ($TemperaturaPromedio_{it}$) for each federated state i in year t.

The empirical evidence for the variables considered in the economic literature for analyzing the impacts of the tourism sector indicates a positive relationship among said variables. The literature on this matter considers these variables to be of the greatest relevance for analyzing the impacts of and employment generated by the tourism sector. Figure 1 shows the figures for the spread of data between two variables – employment in the tourism sector and the economic variable(s). All show a positive relationship, namely, the higher the numbers of national and international tourists, rooms occupied, and real GDP at 2010 prices, the more employment is created in the tourism sector. To date, the results are consistent with the results found in the literature.

The correlation coefficients, similar to the scatter plots, indicate a positive and statistically significant relationship with the following values: $\rho_{EmpleoTur,TurNac} = 0.834$; $\rho_{EmpleoTur,\ TurInt} = 0.424$; $\rho_{EmpleoTur,\ CuartOcup} = 0.625$; $\rho_{EmpleoTur,\ PIBReal\_Base2010} = 0.763$; and, $\rho_{EmpleoTur,TipodeCambio} = 0.1705$. The variable that shows the lowest coefficient is the exchange rate. While the literature considers the exchange rate a key variable, it only indirectly impacts employment, although it does directly impact international tourists in particular.

Other results observed in the empirical evidence concur with the data for tourism employment taken from three years of economic censuses in Mexico (2003, 2008 and 2013), wherein, over the years, this source of employment has grown in the federated states of Mexico, suggesting that tourism activity has helped to increase employment.

The variables pertaining to international tourists, national tourists, state GDP and tourism employment are considered from a geographical perspective here to conduct a differentiated analysis of the states of the Mexican Republic. The maps – using geographical information systems – are presented in Figure 2. The first panel presents GDP at 2010 prices for the states of the Mexican Republic in the years 2003 and 2013, with the central and northern states presenting the most growth for these years. The states of Guanajuato, Campeche, Tabasco and Puebla showed a significant state GDP increase, while others, such as those from the south (Guerrero and Oaxaca), reduced their levels of production. In the case of the states of Campeche and Tabasco, the GDP growth may have been due to the



Notes: (a) National tourists and employment in the tourism sector; (b) international tourists and employment in the tourism sector; (c) occupied rooms and employment in the tourism sector; (d) real GDP and employment in the tourism sector; (e) exchange rate and employment in the tourism sector

Source: Own elaboration

Figure 1.
Dispersion graphs between tourism employment and tourist activity variables

increase in international petrol prices and the concomitant increase in production. Over the same period of time, there were states whose production levels decreased significantly, as is the case with Baja California, Chiapas, Oaxaca and Chihuahua.

Over the 2003-2013 period, an increase is observed in the numbers of international tourists visiting the states of Campeche, Yucatán and Baja California Sur; however, these numbers decreased in various states, such as Sonora, Coahuila and, to a slight degree, Chiapas. However, in absolute terms, it can be seen that the number of international tourists increased for all of the federated states. National tourists increased in number, in particular

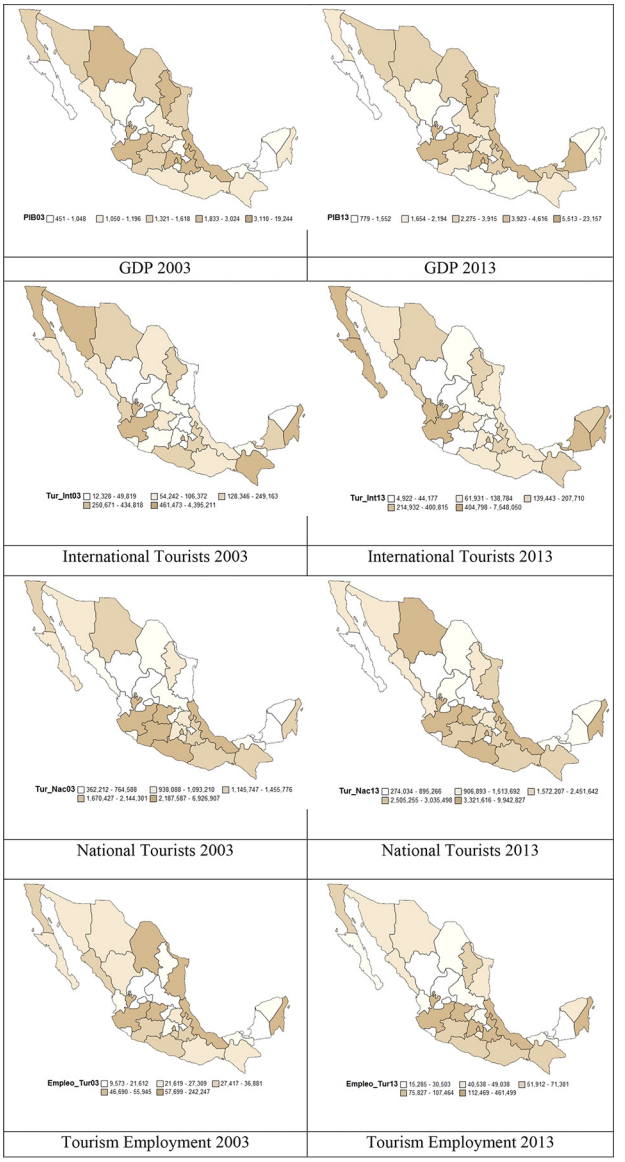


Figure 2.
Geographic information system maps

Source: Own elaboration

in states from the center to the south of the country, as well as in the northern states of Chihuahua, Sinaloa, Nuevo León and the two states of Baja California.

In terms of the generation of employment via distribution and hospitality activities, according to the economic censuses, a significant decrease was observed in employment associated with tourism activities from 2003 to 2013 in the states of Coahuila, Tamaulipas

and Durango, which have been characterized by insecurity and violence in recent years. On the other hand, there are states, such as those in the center and south of Mexico, which maintained and, in some cases, increased their tourism-related employment levels, which is the case with Puebla, Baja California Sur, Guanajuato, Oaxaca, Chiapas and the State of Mexico. Such employment levels did not significantly increase in the rest of the states of the Mexican Republic.

Model and results

The data and the empirical evidence described in the previous section allows the a priori expectation that the tourism sector in the 32 federated states of Mexico could have a positive effect on formal employment, as reflected in jobs available within the sector itself. To measure the impact of the variables considered in the present study on employment in the tourism sector per federated state, we used panel data models and data panel cointegration. This enables us to explore the qualities of both the cross-sectional and time series data, and to establish whether there is a long-term balance among the related variables.

According to previous studies from the literature on employment in tourism and related activity, the models estimated enable the identification of relationships among the variables to study the impact of tourism activity and other relevant variables on employment.

Data panel models

The data panel model took into account the period-to-period evolution of the variables for the tourism sector for each of the states of Mexico. The annual evolution may help to build "expectations" for the future. Moreover, heterogeneity is observed among the tourism sector variables for the 32 federated states of Mexico, thus reinforcing the efficacy of observing the states per variable and per each year of the sampling period. For example, not all of the states in Mexico share the same tourism characteristics, given their economic structure, institutions, population, temperature and level of development, etc., meaning that each federated state would converge to distinct steady states. Moreover, the variables for the tourism sector may be measured imperfectly, while the measurement errors for a state may persist over time. All of these factors reinforce the idea of using panel data techniques for studying convergence in a set of heterogeneous states. With the objective of eliminating bias in the measurements of the variables, all are expressed logarithmically.

The review of the literature on the generation of employment in the tourism sector considers those variables that would have an impact on it:

- national tourists;
- international tourists;
- rooms occupied;
- state GDP (SGDP) at constant 2010 prices;
- exchange rate (pesos per dollar);
- annual average temperature; and
- the human development index.

With various studies in the literature also including variables such as cultural elements and mean state temperature, we include the latter variable in the data panel models. In the case of Mexico, it is a complicated task to include other variables due to problems with the availability of data.

As a first model, we estimate the following equation:

$$l\_EmpleoTur_{it} = \alpha + \beta_1 l\_TurNal_{it} + \beta_2 l\_TurInt_{it} + \beta_3 l\_CuartOcup_{it} + \beta_4 l\_PIBReal_{it} + \beta_5 l\_PIBReal_{it-1} + \beta_7 l\_TipoCambio_t + \beta_7 l\_IDH_{it} + \beta_8 l\_TemperaturaProm_{it} + \varepsilon_{it} \quad (1)$$

where the variables are defined in the same way as in the empirical evidence section.

Given the restriction of information on employment in the tourism sector for all the federated states, we use the Economic Census for those years (2003, 2008 and 2013) for which official data exists. The restricted models estimated here enable the results presented in Table I to be obtained.

The Hausman contrast, used for measuring the endogeneity between the regressors and errors, indicates that the generalized least squares estimators are not consistent. Thus, the fixed effects model is the best model for predicting the relationship among the generation of employment in the 32 federated states of Mexico, the economic variables, and the variables pertaining to the sector itself. In the models proposed, the variable explaining employment in the tourism sector for the 32 federated states of Mexico in the period 1999-2014 is the state GDP, in pesos and at constant 2010 prices. The additional variables considered in the model are not relevant. While we also include the GDP lagged for a period to observe the impact and inertia of economic growth in employment in the tourism sector, this was not found to be statistically significant in any of the models.

Specifically, the growth of employment in the sector depends on state GDP at constant prices. The interpretation of the coefficient is that, for each percentage point by which GDP increases in the previous year, employment grows by 0.48 percentage points in the tourist sectors, namely the hospitality and tourism services sectors.

The second model uses the annual employment variations in the tourism sector with the objective of observing the year-on-year changes for all variables and, thus, best exploiting the dynamic and temporal heterogeneity. The study period is 1999-2014. We have called this variable $StaffEmployed_{it}$. The results for these data panel models are presented in Table II.

Variable	Random effects model (MCG) empleo tur	Fixed effects model empleo tur	Fixed effects model log empleo tur	Random effects model (MCG) log empleo tur
Constante – α	−7515 (−0.1973)	36406.5 (1.017)	−0.2799 (−0.0918)	−1.739 (−1.044)
$TurNac_{it}$	*0.0111* (*2.458*)	0.0028 (0.6246)	0.1976 (1.431)	*0.2838* (*2.913*)
$TurInt_{it}$	*−0.0279* (*−2.162*)	*−0.0593* (*−2.024*)		−0 − 0298 (−0.5217)
$CuartOcup_{it}$	*0.0156* (*3.160*)	*0.0334* (*2.705*)	0.3115 (1.069)	0.4248 (3.603)
$PIBReal_{it-1}$	*6.5125* (*4.402*)	*12.3152* (*1.756*)	*0.4780* (*2.182*)	*0.2325* (*3.107*)
$TipoCambio_{it}$	402.243	−6500.17 (−1.564)	0.0309 (0.0431)	0.3948 (0.7530)
Observaciones	94			
R^2		0.8827	0.8635	

Table I.
Panel data models

Notes: *t* Statistic in parenthesis; Dependent variable: Tourist employment (*empleo tur*) and logarithm of Tourist Employment (*log empleo tur*); Census 2003, 2008 and 2013
Source: Own elaboration

Variable	Fixed effects model	Random effects model (MCG)	Between model
Constante	0.7635 (1.227)	0.1759 (2.738)	*0.1995* (*2.338*)
$PersonalOcupado_{it-1}$	*0.7084* (*18.76*)	*0.9675* (*52.57*)	*0.9777* (*75.97*)
$TurNac_{it}$	−0.0048 (−0.3110)	*−0.0204* (*−2.463*)	*−0.0158* (*−1.810*)
$TurInt_{it}$	*0.0115* (*1.983*)	0.0014 (0.5141)	0.0001 (0.0386)
$CuartOcup_{it}$	0.0348 (1.448)	*0.0280* (*2.957*)	*0.0204* (*1.893*)
$PIBReal_{it}$	*0.0369* (*3.314*)	0.0102 (1.186)	0.0029 (0.1572)
$PIBReal_{it-1}$	0.0298 (1.576)	0.0059 (0.9375)	0.0102 (0.5229)
$TipoCambio_{it}$	*0.1551* (*5.782*)	*−0.0410* (*−1.895*)	*−0.0617* (*−2.424*)
IDH_{it}	*1.101* (*2.289*)	*−0.1791* (*−2.272*)	*−0.1409* (*−2.055*)
$Temperatura\ Promedio_{it}$	*0.3542* (*2.424*)	0.0065 (0.4677)	0.0094 (0.5026)
Observaciones	334	334	32
R^2	0.9967		0.9998

Notes: *t* Statistic in parentheses; Dependent variable: Tourist Employment, years 1999-2014, *logarithms*
Source: Own elaboration

Table II.
Panel data models

The specification for the second model is the following:

$$\begin{aligned} l\_PersonalOcupado_{it} = \alpha &+ \beta_1 l\_TurNal_{it} + \beta_2 l\_TurInt_{it} + \beta_3 l\_CuartOcup_{it} \\ &+ \beta_4 l\_PIBReal_{it} + \beta_5 l\_PIBReal_{it-1} + \beta_6 l\_TipoCambio_t \\ &+ \beta_7 l\_IDH_{it} + \beta_8 l\_TemperaturaProm_{it} \\ &+ \beta_9 l\_PersonalOcupado_{it-1} + \varepsilon_{it} \end{aligned} \quad (2)$$

in which all the variables are defined in the same way as in the first estimated model.

The grouped least squares model imposes the restriction $\beta_{1i} = \beta_1$ in equation (2), namely, the 32 states have the same intercepts, which imposes strong restrictions for all the states, treating them identically without taking the heterogeneity among them into account. If the effects omitted are not correlated with the regressors, the estimations are consistent. The problem with the *between* model is that the units do not have the same perturbation variance, which was verified via the contrast of hypothesis. If the individual differences are correlated, it is possible to estimate the parameters of the model consistently with the fixed effect model.

The estimations for the same variables from the first sample are smaller. Given that this is panel data, there is the probability of intragroup autocorrelation and heteroskedasticity among groups, while the statistics from the *t-tests* could be deceptive or confusing.

The fixed effects model reports the testing of the hypothesis that the individual differences are equal to zero. Accepting this hypothesis leads us to estimations of weighted least squares. The value is close to zero and the equality among intercepts is rejected. The result of the estimation enables us to infer that the hypothesis that the states have an intercept in common is 99 per cent rejected, meaning that the differences among the states of the Mexican Republic are taken into account.

The results for these models indicate variation in the findings, suggesting that the non-observed individual differences are perhaps not correlated with the regressors for the model.

International tourists are a statistically significant variable, although the coefficient is very low. An increase in the percentage of international tourists increases the number of staff employed in the tourism sector by 0.011 per cent. The lagged variable of staff employed

in the tourism sector has a positive and statistically significant impact. This is of great relevance, given that the generation of employment presents an inertia generated by the same variable. Furthermore, real production, exchange rate, annual average temperature and the human development index for the states have positive effects on the generation of employment in the sector. The variables with the most impact on the growth of employment are exchange rate, given that, for every percentage point rise, a 0.155 per cent employment increase is found, and temperature, which, in this case, is also important, with a 0.35 per cent increase in employment found per percentage point increase in average temperature.

Two specification tests were used to verify consistency (Hausman test) and the presence of random effects (Breusch–Pagan test[4]). The Hausman test conducts a hypothesis contrast for the consistency of the estimator for the random effects model, testing whether or not the estimators are consistent and whether they fulfill the condition of orthogonality between the errors of the model and the regressors.

Rejecting the hypothesis means that there is variance for the individual, and (in this model) random, differences. If the rejection fails, it is probably better to use the grouped least squares model.

Panel data cointegration

Additional to the data panel model, we include the cointegration model to test whether, in the period 1999-2014, the series for the 32 federated states in Mexico have a balanced relationship in the long-term. The majority of the tests for the cointegration of panel data used in the literature consider three distinct models: Kao; Pedroni; and, Westerlund. The series for which we apply the three cointegration tests are those which, in the data panel models, were found to be statistically significant in explaining employment in the tourism sector: international tourists; staff employed (employment); state GDP at constant 2010 prices; exchange rate; and, the human development index.

The study of unit roots and data panel cointegration has been fruitful in combining the advantages of receiving and using the information provided by the time series with cross-section data. The main argument is that, using the dimensions in N and T achieves more robust tests and determinants than solely applying the time series.

The literature on the application of cointegration tests on panel data has taken two directions, with the first consisting in establishing the null hypothesis of non-cointegration and applying, in an analogue manner, the remainders derived from the panel to the Engle and Granger (1987) static regression to construct the statistics from the test and tabulate the distributions.

The most general approach is that found in Pedroni (1995, 1997).

With the aim of establishing whether the variables cointegrate, we used the test proposed by Kao (1999), which is based on the Dickey and Fuller (1979) (DF) traditional and residual tests. Consider the following panel data model:

$$y_{it} = x'_{it}\beta + z'_{it}\gamma + e_{it}$$

where y_{it} and x_{it} are I(1) and are not cointegrated. For $z_{it} = \{\mu_i\}$, Kao (1999) proposed augmented DF and DF unit root tests for e_{it} to test the null non-cointegration hypothesis. The tests can be calculated from the remainders for the fixed effects:

$$\widehat{e_{it}} = \rho\widehat{e_{it-1}} + \nu_{it}$$

where $\widehat{e_{it}} = \widetilde{y_{it}} - \widetilde{x_{it}}\hat{\beta}$ y $\widetilde{y_{it}} = y_{it} - \overline{y_i}$. The estimations of the only least squares (OLS) model for r and the statistic t are given by the following expressions:

$$\hat{\rho} = \frac{\sum_{i=1}^{N}\sum_{t=2}^{T}\widehat{e_{it}}\widehat{e_{it-1}}}{\sum_{i=1}^{N}\sum_{t=2}^{T}\widehat{e_{it}^2}}$$

and

$$t_p = \frac{(\hat{\rho} - 1)\sqrt{\sum_{i=1}^{N}\sum_{t=2}^{T}\widehat{e_{it}^2}}}{s_e}$$

Kao proposed four types of DF tests for verifying the relationship between regressors and errors, two based on exogeneity (strong) and two for the relationship between both.

Pedroni (2000, 2004), in turn, proposed various tests for the null panel data cointegration hypothesis that gives a high level of heterogeneity.

While the condition that we establish is that the variables must be non-stationary in levels, when we convert the variables to their first differences they become stationary. We assume that the variables are stationary (once the first differences have been applied to them). Thus, the hypotheses that we establish in the Kao and Pedroni tests are as follows:

H_0. There is no cointegration between the panels.

H_a. All the panels are cointegrated.

In the case of the Westerlund model (a less restrictive model), the hypothesis is:

H_0. There is no cointegration between the panels.

H_a All the panels are cointegrated.

When, taken together, the series are stationary, we can say that they are cointegrated, namely that they have a long-term relationship and, even more importantly, that they work in coordination in the long-term balance.

For the cointegration tests, we assume that the tests used (Kao, Pedroni and Westerlund) have the null non-cointegration hypothesis. The alternative hypotheses for the Kao and Pedroni tests are that the variables are cointegrated in all of the panels.

The Westerlund test has two versions, which is an advantage given that it imposes fewer restrictions than the Kao and Pedroni tests. In one of the tests, the alternative hypothesis is that the variables are cointegrated in some of the panels, while, in the second version, cointegration is considered in all of the panels.

The results of the cointegration tests for the panel data are presented in Table III.

The results for the panel data cointegration models indicate that the data series considered are found to be cointegrated in the long-term balance. The most compelling tests are the Pedroni and Westerlund tests, given that, according to the results, the variables considered are cointegrated for all the panels or that at least the majority of them are cointegrated. In the case of Kao, the results are ambiguous; however, the augmented Dickey Fuller test is statistically significant at 95 per cent, thus confirming the cointegration of the panels in the variables considered. The importance of the results in both cases is that both

Tests	Statistic	*p*-value
Kao test		
Modified Dickey–Fuller *t*	−0.9645	0.1674
Dickey–Fuller *t*	−3.2984	0.0005
Augmented Dickey–Fuller *t*	−1.5797	0.0571
Unadjusted modified Dickey–Fuller *t*	−4.2330	0.0000
Unadjusted Dickey-Fuller *t*	−5.1731	0.0000
Pedroni test		
Modified Phillips– Perron *t*	3.6291	0.001
Phillips–Perron *t*	−2.7829	0.0027
Augmented Dickey–Fuller *t*	−2.0368	0.0208
Westerlund test		
Variance ratio	−2.6452	0.0041

Source: Own elaboration

Table III.
Panel data cointegration models results

the strong cointegration (Kao and Pedroni), in which all the panels are cointegrated, and the weak cointegration (Westerlund), in which some panels are cointegrated, suggest the importance of public policy aiming to strengthen the relationship between the variables studied.

To sum up, the variables pertaining to the number of international tourists, staff employed (employed), state GDP at constant 2010 prices, exchange rate, and human development index are cointegrated for the 32 federated states of the Mexican Republic. In other words, the results of the cointegration tests used here show that these variables maintain a relationship or balance over the long-term.

Conclusions

This paper presents a study conducted, in the context of the Mexican economy, on the relationship among economic growth, tourism activity and employment in the sector. The relevant literature on this area is not definitive in terms of the relationship among these variables, with the studies reviewed here being of various types: time series, cross-sectional, national and international. Among these studies, some conclude that there is a relationship between the increased levels of employment in the tourism sector and variables related to said sector. We use the methodology of panel data and panel data cointegration to prove whether it is possible to find said relationship for the 32 federated states in Mexico in the period 1999-2014.

The results indicate that said relationship can be found, indicating that tourists have an impact on the generation of employment in the tourism sector in the federated states. Moreover, GDP, exchange rate and the human development index for the states have positive effects on the generation of employment in the sector. The results are of great relevance for the period studied, given that they reinforce the public policy established at a federal and state level for the tourism sector.

The public policy recommendations emerge from the results of the models estimated and the analysis based on the geo-referencing undertaken by federated state, economic variable and tourism activity. The results obtained prompt the following public policy recommendations:

- In recent years, the activity of the tourism sector has been growing in Mexico, due to which, the activity of the tourism sector should continue to be fostered, at not only

an international but also a national level, because it is Mexican society itself that most impacts employment in the sector, particularly in hospitality activities and services in the tourism sector.

- Considering that the growth of the sector is not unlimited, those responsible for public policy for the development and growth of the tourism sector in Mexico must be conscious that increased activity in the tourism sector depends on other variables. These variables comprise the economic growth reflected, in part, in household income, economic, political and social stability in Mexico, security, the development of tourist destinations and associated activities, such as production and tourism services.
- Public policy in the sector not only must be oriented toward its growth but must also aim for the social and economic development of both Mexico's tourist destinations and its federated states.
- The long-term relationships that result in a balanced sector are found in the variables of employment, national and international tourists, economic growth, economic development as measured by the human development index and exchange rate variations.

Moreover, the results open new research lines, such as the impact of the programs driving demand in terms of national tourism, such as *Viajemos todos por México* (Let's all travel around Mexico) and *Pueblos Mágicos* (Magical Towns).

Notes

1. It measures the factors and policy that enable the sustainable development of the global travel and tourism sector.
2. Area on the outskirts of a city with a large number of dwellings in conditions of poverty.
3. In Mexico, the Tourism Satellite Account provides information relevant to the sector; however, the level of aggregation would not allow for an instrument that will clearly determine tourism activity. Based on the information from the Economic Census of 2004, the Ministry of Tourism (SECTUR), taking into account geographical demarcation and economic activities, prepares the Tourism Statistics based on the Economic Censuses (Barrón, Castro and Madera, 2014). To date, only the 2009 and 2014 editions are available, given the regularity with which the censuses are conducted.
4. The Breusch-Pagan (or LM) test is based on a Lagrange multiplier:

$$LM = \sqrt{\frac{NT}{2(T-1)}}\left\{\frac{\Sigma_{i=1}^{N}\left(\Sigma_{t=1}^{T}\hat{e}_{it}\right)^{2}}{\Sigma_{i=1}^{N}\Sigma_{t=1}^{T}\hat{e}_{it}^{2}}\right\}$$

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