# Analysis of hospitality efficiency in main Mexican touristic centers

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## Abstract

Tourism plays an important role in the Mexican economy, representing approximately 8.8% of the Mexican GDP and producing 4.1 million of direct and 6.5 million of indirect jobs. Although a positive trend in arrivals of international tourists to the country has been reported, the whole industry can be quickly negatively affected by the level of insecurity, lower economy performance, as well as by insufficient infrastructure. Therefore, it is important to search possible areas for improvements. In this article, hospitality efficiency of 67 main touristic centers in Mexico is analyzed for the period from 1992 to 2017. The results reveal low efficiency of in-land touristic centers in case of foreign tourists, as the foreign tourism is concentrated in limited number of on-cost centers. On the other hand, national tourism is less centered, although on-coast centers remain within the most efficient. Therefore, there is clear opportunity for in-land tourism in Mexico, which would stimulate the whole industry, as well as the Mexican economy.

Key words: Data Envelopment Analysis, Development strategy, Efficiency, Mexico, Tourism, Window Analysis.

## Análisis de eficiencia de hospitalidad los principales centros turísticos mexicanos

## Resumen

El turismo juega un papel importante para la economía mexicana, representando aproximadamente 8.8% del PIB Mexicano y produciendo 4.1 millones de empleos directos y 6.5 millones de empleos indirectos. A pesar de que se ha reportado una tendencia positiva en las llegadas de turistas internacionales al país, la industria podría ser afectada negativamente por el nivel de inseguridad, el bajo desempeño económico, así como la insuficiencia en la infraestructura. Por lo tanto, es importante buscar posibles áreas de mejora. En este artículo, se analiza la eficiencia del alojamiento de 67 principales centros turísticos de México para el periodo de 1992 a 2017. Los resultados revelan que la actividad turística extranjera en el país se ve concentrada en un número limitado de centros turísticos costeros, por lo que la eficiencia del turismo extranjero en los demás centros turísticos es baja. Por otro lado, el turismo nacional está menos centralizado, sin embargo, los centros turísticos costeros siguen teniendo una eficiencia mayor. Por lo tanto, hay una clara oportunidad para el turismo territorial en México, la cual estimularía a toda la industria, así como a la economía mexicana.

Palabras claves: Análisis envolvente de datos, Estrategia de desarrollo, Eficiencia, México, Turismo, Análisis por ventanas.

# 1 Introduction

Tourism is one of the fastest growing industries in the world and an important piece in economic growth and socio-economic progress, not only for many developing countries, but also for developed countries. Tourism has become one of the principal performers of the international trade and represents one of the main sources of income for many countries. Currently, 9% of the worldwide Gross Domestic Product (GDP) is provided by tourism. What is more, tourism produces one of every 11 jobs in the world and generates USD 1.3 trillion in exports, which is responsible for 6% of international trade and for 6% of the exports of the less developed countries (UNWTO, 2019a). “The United Nations World Tourism Organization (UNWTO) projects that total international tourist arrivals will grow by 3.3% a year to reach 1.8 billion by 2030” (Hussain Shahzad et al., 2017: 223).

Mexico is one of the most popular places for tourists. In 2010, Mexico was ranked in the 10th place in the world in terms of international arrivals, as 21.3 million of tourists visited Mexico in 2010. What is more, there has been a significant positive tendency in the international arrivals UNWTO (2019b) ranked Mexico in the 6th place among the countries that received most international tourists, reaching a total of 39.3 million of international tourists, leaving United Kingdom and Germany behind. The top 5 countries are France with 86.9 million of tourists, Spain with 81.8 million, United States with 75.9 million, China with 60.7 million and Italy with 58.3 million (de la Rosa, 2018). Tourism is the second largest industry in Mexico, as this sector contributed MXN 11.8 billion to the country’s economy in 2013 (Elly, 2013). Secretaría de Turismo (SECTUR), affirmed that touristic activity in Mexico represents approximately 8.8% of the Mexican GDP and produces 4.1 million direct jobs and 6.5 million of indirect jobs (SECTUR, 2019a). The arrival of national tourists to Mexico in January 2018 reached 4.383 million tourists (70.4% from the total amount); meanwhile 1.842 million were international tourists (29.6%) (SECTUR, 2019a). Moreover, these numbers (as well as its increasing tendency) attracts more foreign investments in the sector. For example, 14 national and international hotel groups, such as Posadas, City Express, Marriott, AM Resorts, IHG, among others, announced plans to open more than 350 new hotels in Mexico between 2019 and 2022 (Valle, 2018).

Tourism is an economic activity that can be influenced by many situations, in which tourists can be targets of robberies, murders, crimes or others acts of this nature. According to Sánchez Mendoza (2015), the proximity of these violent or dangerous events for tourists determines the perception of fear of a threat or danger. As a result, such dangerous situations negatively affect the perception about touristic destinations. Therefore, one of the most important factors in tourism industry is the reputation of each touristic destination. According Coelho and Gosling (2015), the reputation of a touristic destination is influenced by four main factors: 1) communication (social media, internet, touristic guides), 2) individual consumers’ evaluations, 3) local specific experiences, and 4) time that creates reputation over longer period. The time factor is considered as the most fragile one, as it can be significantly influenced by one unique occasion, such as natural disaster, terrorism, violence, etc. (Aula and Hermaakorpi, 2008; Lexow and Edelheim, 2004). The reputation is then constructed by diverse set of elements, involving human resources of the destination, organization of human resources, local infrastructure, touristic attractions, sociocultural environment and local business activities (Coelho and Gosling, 2015).

One of the biggest problems that tourism in Mexico is facing are the increasing levels of delinquency and violence, especially in certain touristic points. In 2017, OECD (2017) defined security problems as a one of the main difficulties for the tourism sector in Mexico. On the one hand, INEGI (2019) reported that the perception of insecurity of the Mexican population has decreased by 2.6%, from 73.9% in June 2018 to 71.3% in June 2019. However, in other matters, Expansión Política (2019) reported increasing trend of homicides during the first seven months of the year 2019 by 4.14%. Therefore, the problem of insecurity in Mexico remains and can further negatively affect the whole touristic sector and, consequently, the whole Mexican economy. Tourism is an important determinant of overall long-term economic growth (Balaguer and Cantavella-Jordá, 2002; Perles-Ribes et al., 2017). What is more, there is a clear consensus about the positive reinforcing synergy between tourism and economic growth (Chen and Chiou-Wei, 2009). This positive effect is larger in countries where the tourism share on the GDP is bigger (Holzner, 2011), such as the case of Mexico.

Efficiency in tourism is an important index for measuring the level and quality of tourism development. Many quantitative methods can be applied to measure the performance and/or efficiency in tourism. Non-parametric approach based on Data Envelopment Analysis (DEA) is one of the most common methodologies. In this case, we can identify analyses linked on regional differences, analyses of the hotel industry, or analyses related to determination of influential factors in the tourism industry. For example, Corne (2015) applied Data Envelopment Analysis to analyze efficiency in French hospitality sector in 16 conurbations to identify possible improvement in the sector. Similarly, Liu, Zhang and Fu (2017) evaluated efficiency of 53 Chinese coastal cities from 2003 to 2013 to explore regional differences, whereas Chaabouni (2019) investigated tourism efficiency and its determinants in 31 provinces in China over the period 2008–2013. Song and Li (2019) estimated the efficiency of Chinese tourism industry from the sustainability point of view to increase a touristic attractivity. At the hospitality level, Oukil, Channouf and Al-Zaidi (2016) applied DEA methodology to examine the efficiency in hotel industry in Oman in order to identify variables explaining the inefficiency in the industry. Further, Oliveira, Pedro, and Marques (2013) analyzed the impact of hotel quality (star rating) on the efficiency of 84 hotels in Algarve, Portugal.

Although tourism generates significant revenues, a large percentage of these revenues is sent to the hotels' foreign investors or gained by the local rich individuals, but only a few revenues belong to poor neighbors (Blake et al., 2008; Ely, 2013). Therefore, it is important for government to optimize resource allocation to tourism development, i.e. to foster tourism activities. Although positive trend of international arrivals to Mexico has been identified in recent years, it is of a high importance to identify areas for possible improvements in the touristic industry. Therefore, the objective of the article is to evaluate the hospitality efficiency in Mexico based on the information of 26-year-long period from 1992 to 2017. Secondary objective is to identify whether differences in the efficiency exist regarding foreign and national tourists.

# Materials and Methods

## Data Envelopment Analysis

The Data envelopment Analysis (DEA) allows to evaluate several decision-making units (DMU) regarding their capabilities to convert multiple inputs into multiple outputs (Cooper, Seiford and Zhu, 2011). Each DMU can have several different $m$ input quantities to produce different outputs. If the model assumes consistent yields at scale, you can use the so-called CCR model (Charnes, Cooper and Rhodes, 1978). The CCR output-oriented model for $\mathrm{DMU}_0$ is formulated as follows:

Minimize

$$q = \sum_{i=1}^{m} v_i x_{i0} \tag{1}$$

subject to

$$\begin{gathered} \sum_{i=1}^{m} v_i x_{ij} - \sum_{r=1}^{s} \mu_r y_{rj} \geq 0, \quad j = 1, 2, \ldots, n. \\ \sum_{r=1}^{s} \mu_r y_{r0} = 1, \\ \mu_r, v_i \geq \varepsilon \text{ and } \varepsilon > 0. \end{gathered} \tag{2}$$

Where $x_{ij}$ is the quantity of the input $i$ of the $\mathrm{DMU}_j$, $y_{rj}$ is the amount of the output $r$ of the $\mathrm{DMU}_j$, and $\mu_r$ and $v_i$ are the weights of the inputs and outputs $i = 1, 2, \ldots, m$, $j = 1, 2, \ldots, n$, $r = 1, 2, \ldots, s$ and $\varepsilon$ is the so-called non-Archimedean element necessary to eliminate zero weights of the inputs and outputs. DMU is 100% efficient if $q = 1$, i.e., there is no other DMU that produces more outputs with the same combination of inputs. Whereas, DMU is inefficient if $q < 1$.

To measure DMUs productivity over a longer period, the Windows Analysis (WA) approach can be used. This approach works on the principle of moving averages to detect DMUs performance trends over time (Cooper, Seiford and Tone, 2007). In this case, each DMU in a different period is treated as if it were a different unit. The performance of a DMU in a particular period is compared to its performance in other periods, in addition to the performance of other DMUs. Therefore, there is $nk$ DMU in each window, where $n$ is the number of DMUs in a given period (it must be the same in all periods) and $k$ is the width of each window (same for all windows). This feature increases the discriminatory capacity of the DEA model, as the total number of $T$ periods is divided into overlapping period series (windows), each with a width $k(k < T)$ leading to $nk$ DMUs. The first window has $nk$ DMUs for periods $\{1, \ldots, k\}$, the second period has $nk$ DMUs and periods $\{2, \ldots, k+1\}$, and so on, until the last window has $nk$ DMUs and periods $\{T-k+1, \ldots, T\}$. In total, there are $T-k+1$ separate analyses where each analysis examines $nk$ DMUs.

An important factor is the determination of the size of the window. If the window is too narrow, there may not be enough DMUs in the analysis that lead to a low power of model discrimination. Conversely, a too wide window can yield misleading results due to significant changes occurring during periods covered by each window (Cooper, Seiford and Zhu, 2011). Therefore, the size of the window should consider the structure of the DEA model (mainly with respect to the number of DMUs [Dyson et al., 2001]) and the characteristics of the analyzed area. The attractivity of a touristic destination can be significantly affected by negative reports by media (Aula and Hermaakorpi, 2008; Coelho and Gosling, 2015, Hall, 2002). Negative reputation reported by media can be linked to international conflicts, acts of terrorism, criminality acts, natural disasters or to health concerns (Lexow and Edelheim, 2004). There is no consensus about the length of the recovery time from each reported case. This recovery can range from several months to several years depending the magnitude of each incident and the tourist's personality type (Kapuściński and Richards, 2016; Lexow and Edelheim, 2004). To minimize the effects of the short-term negative events that would cause high volatility in the obtained results, in the case of this article, the length of the window was selected as $k = 3$ (3-year window).

## Data

The data obtained for the analysis comes from the database of DATATUR (Secretariat of Tourism, 2018[1]). For the purpose of the analysis, data related to touristic activities of the 67 main touristic centers (cities) in Mexico were collected for the period from 1992 to 2017. In accordance with Formica and Uysal (2006), Lee, Huang and Yeh (2010) and Oliani, Rossi and Gervassoni (2011), quality and capacity of hotels infrastructure (among others) plays important role in tourism[2]. To express the level of hotel quality, their star rating is commonly used (Corne, 2015; Oliveira, Pedro and Marques, 2013). Therefore, for each touristic center, we selected following variables as inputs: Number of one-star hotel rooms, number of two-stars hotel rooms, number of three-stars hotel rooms, number of four-stars hotels room and number of five-stars hotel rooms. These variables represent the capacity of every touristic center to receive tourists.

The objective of the hospitality sector is usually to maximize the occupancy rate and, consequently, their revenues. That is why, the DEA analysis usually includes occupancy rate, tourists' arrivals and related revenues per available room as outputs (Chaabouni, 2019; Corne, 2015; Liu, Song and Li, 2019; Zhang and Fu, 2017). However, the absolute number of tourists' arrivals avoids reflecting the number of nights tourists stay in each touristic center. Instead, the output part of the constructed DEA model is represented by tourists' nights (TN), which can be expressed as

TN = tourists' arrivals * average number of nights.

Including the average number of nights stayed by each tourist into the model corresponds to the approach presented by Oukil, Channouf and Al-Zaidi (2016).

Three different models were constructed: 1) *overall model* where the output side of the DEA model includes the total number of tourists; 2) *foreign model*, which only includes data for the foreign tourists' arrivals to Mexico; and 3) *national model*, which includes data for the national tourists' arrivals.

To secure correct representativity of all variables in the model[3], we selected $\varepsilon = .1$. As a result, the importance of one-star hotels capacity was 10.28%, two-star hotels 9.63%, three-star hotels 22.84%, four-star hotels 17.16% and five-star hotels 40.10% (regarding the overall model). Considering the basic requirements for DEA model, this distribution is satisfactory. The distribution for the foreign model (considering the same order) was 6.06%, 8.60%, 14.87%, 13.57% and 56.90%, whereas for the national model the distribution was 10.13%, 10.67%, 26.88%, 23.68% and 28.64% respectively.

The advantage of the DEA methodology is the possibility to make a benchmarking of DMUs of different sizes and locations if the homogeneity requirement is not violated (Cooper, Seiford and Zhu, 2011; Dyson et

1 For more details address http://www.datatur.sectur.gob.mx

2 There are other variables that affect tourism efficiency, such as the natural (ecological) characteristics of the touristic centers (archeological zones, beaches, etc.), regional economic level, governmental contribution, as well as the local infrastructure (bars, restaurants, museums, etc.). However, the objective of the article is to analyze the hospitality efficiency in the main touristic centers and, thus, the DEA model only includes variables related to hospitality quality.

3 In this case we talk about the input side of the DEA model as there is only one output and its importance is 100%.

al. 2001). Although we evaluated touristic centers of different sizes and locations, the homogeneity is not violated as all operate on the same market (Mexico) and use same type of inputs. Our approach is similar to Chaabouni (2019), Corne (2015) or Liu, Zhang and Fu (2017). Considering the operation of the Window Analysis method, 201 DMUs were available in each window, resulting in 4,824 analysis in total. This ensured sufficient discriminatory ability of the model (Dyson et al., 2001). Finally, first, the output-oriented DEA model was used as the analysis aims on providing the optimal number of arrivals (TN) based on the input structure of the model. Second, CCR model was selected as there is no competition among the 67 touristic centers. We should rather understand these centers as complementary to each other.

# Results

The results are presented in three main parts. First, the overall efficiency model is presented for all 67 touristic centers. Second, the analysis is divided into efficiency model considering only foreign tourists and, third, considering only national tourists. In all three cases, the efficiency is discussed from the average point of view to have overall perspective, as well as regarding nine different periods with respect to the selected 3-year long window in the DEA model to detect possible volatilities in the efficiency.

Overall model

The average efficiency of all 67 touristic centers for the entire period (1992-2017) was 69.07% with the standard deviation (SD) of 15.28%. 29 touristic centers (representing 43.28%) are evaluated above the national average (Table 1). The best evaluated touristic center is Playacar in Quintana Roo with average efficiency of 97.40% throughout the evaluated period. What is more, Playacar reported very low year-to-year fluctuation as the SD is only 3.54%. The second-best evaluated center is Akumal, also from Quintana Roo with average efficiency of 96.44% (SD 5.77%), followed by Tonalá-Puerto Arista in Chiapas with average efficiency of 95.82% (SD 5.93%). In all three cases, we talk about small touristic centers on the coast. However, in the top 10 most efficient centers, we can also observe in-land centers, such as Tecate in Baja California on 4th place (95.68%, SD 5.40%), Comitán de Domínguez in Chiapas on 8th place (92.53%, SD 10.85%) and Salamanca in Guanajuato on 10th place (89.90%, SD 11.08%).

Contrary, the worst evaluated center is San Miguel de Allende (67th position) in Guanajuato with an average efficiency of 42.08% (SD 15.61%). This result may be surprising as the old section of the town is part of a proclaimed World Heritage Site of the UNESCO. However, there is a huge disproportion between the offer of hotels and number of nights the tourists stay. For example, tourists stay in average 3.65 nights in the 10 best evaluated centers compare to only 1.69 nights in San Miguel de Allende. Chihuahua city in Chihuahua is evaluated as the second worst (66th) with an efficiency of 42.72% (SD 5.77%), followed by Toluca on 65th position (44.11%, SD 5.93%). As we can observe in Table 1, the majority of the least evaluated touristic centers are big in-land cities, such as Aguascalientes (62nd position, 46.17%, SD 5.77%), León (61st, 48.37%, SD 12.60%), Valle de Bravo (59th, 51.24%, SD 23.19%), and Monterrey (58th, 52.30%, SD 11.18%).

| Touristic center | Efficiency | Rank | Touristic center | Efficiency | Rank | Touristic center | Efficiency | Rank |
|---|---|---|---|---|---|---|---|---|
| Acapulco | 64.19% | 39 | Ixtapa-Zihuatanejo | 83.18% | 14 | Querétaro | 53.50% | 57 |
| Aguascalientes | 46.17% | 62 | La Paz | 57.93% | 52 | Salamanca | 89.90% | 10 |
| Akumal | 96.44% | 2 | León | 48.37% | 61 | San Cristóbal de las Casas | 74.37% | 22 |
| Bahías de Huatulco | 86.10% | 12 | Loreto | 68.18% | 32 | San Felipe | 62.43% | 42 |
| Cabo San Lucas | 90.94% | 9 | Los Mochis | 59.13% | 50 | San José del Cabo | 77.21% | 20 |
| Campeche | 79.52% | 19 | Manzanillo | 73.67% | 25 | San Juan de los Lagos | 68.78% | 30 |
| Cancún | 92.63% | 7 | Mazatlán | 74.01% | 23 | San Juan del Río | 50.48% | 60 |
| Celaya | 80.75% | 17 | Mérida | 56.32% | 53 | San Luis Potosí | 53.51% | 56 |
| Chihuahua | 42.72% | 66 | Mexicali | 73.78% | 24 | San Miguel de Allende | 42.08% | 67 |
| Ciudad de México | 67.15% | 36 | Monterrey | 52.30% | 58 | Taxco | 45.90% | 63 |
| Ciudad Juárez | 80.98% | 16 | Morelia | 59.91% | 48 | Tecate | 95.68% | 4 |
| Coatzacoalcos | 65.45% | 38 | Nuevo Vallarta | 95.22% | 5 | Tequisquiapan | 58.76% | 51 |
| Colima | 67.71% | 34 | Oaxaca | 67.42% | 35 | Tijuana | 61.53% | 46 |
| Comitán de Domínguez | 92.53% | 8 | Pachuca | 76.48% | 21 | Tlaxcala | 83.28% | 13 |
| Cozumel | 70.76% | 29 | Palenque | 67.73% | 33 | Toluca | 44.11% | 65 |
| Culiacán | 53.60% | 55 | Piedras Negras | 88.39% | 11 | Tonalá-Puerto Arista | 95.82% | 3 |
| Durango | 59.64% | 49 | Playa del Carmen | 94.68% | 6 | Tuxtla Gutiérrez | 61.56% | 45 |
| El Fuerte | 80.21% | 18 | Playacar | 97.40% | 1 | Valle de Bravo | 51.24% | 59 |
| Guadalajara | 56.10% | 54 | Playas de Rosarito | 44.45% | 64 | Veracruz | 62.29% | 43 |
| Guanajuato | 65.97% | 37 | Puebla | 72.42% | 27 | Villahermosa | 60.36% | 47 |
| Hermosillo | 81.71% | 15 | Puerto Escondido | 62.02% | 44 | Xalapa | 71.06% | 28 |
| Irapuato | 64.02% | 40 | Puerto Vallarta | 73.55% | 26 | Zacatecas | 63.52% | 41 |
| Isla Mujeres | 68.36% | 31 | | | | | | |

Table 1: Efficiency of touristic centers, overall model 1992-2017

Average efficiency presented in Table 1 might not be fully representative as the analysis includes 26 years and the efficiency of the touristic centers may vary, as tourists' preferences can change in long-term perspective. Therefore, Figure 1 presents the evolution of the efficiency since 1992 until 2017. We can observe two significant drops in the overall efficiency between years 1996-1999 and 2002-2005. In both cases, these periods are followed by a significant four-year growth that diminished the previous drop. In the first case, the average efficiency dropped from 74.35% in 1996 to 32.78% in 1999, so the efficiency dropped by 13.85% annually. The touristic industry recovered withing the following three years. In the second case, the efficiency dropped from 75.46% in 2002 to 42.51% in 2005, resulting in an average decrease of 10.98%. Similarly, this drop was fully recovered in 2008. In 2009, there was a beginning of the same pattern as the efficiency dropped by 6.59% in 2009. However, since this year, the efficiency of the touristic centers remained more less stable around an average efficiency of 71.33% with SD of 2.95%.

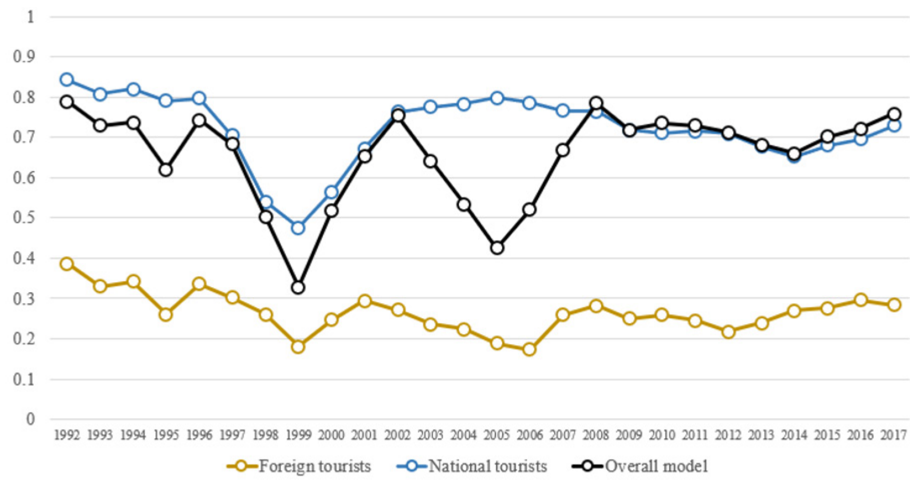


Figure 1: Average efficiency of the touristic centers, 1992-2017

Table 4 (in appendix) divides the average efficiency of all 67 touristic centers presented in Table 1 into nine 3-year-long periods[4] to capture the efficiency change. First, we can observe that there are variations from period to period. For example, the best evaluated centers in the first period were Cancún (99.75%), Valle de Bravo (99.65%) and Pachuca (98.10%). However, Valle de Bravo has been losing its efficiency constantly that resulted in the worst efficiency at the end of the analyzed period (67th position, 37.19%). Pachuca in general remains within top 20 evaluated centers (with an exception in 2007-2009 when Pachuca was ranked at position 56). The most stable evaluation can be observed in case of Ciudad de Juárez (12.55th average position with SD 4.85), Manzanillo (17.22th, SD 5.12), Guadalajara (34.33th, SD 6.56), Cancún (7.77th, SD 6.76) and Veracruz (27.66th, SD 7.04). It is also important to mention that the new- entry touristic centers during 2007-2009 demonstrates even higher stability than those centers represented in the analysis across the whole analysis (in both cases, for the best evaluated, as well as for the worst evaluated). In these cases, the latest-entry centers are usually smaller touristic destinations with limited hotel spaces, which makes them less vulnerable for year-to-year changes.

## Foreign tourists

As the results of the analysis show differences across the analyzed period, we can also assume that similar differences can be observed considering the tourists' origin. Therefore, we calculated other two models for foreign and national tourists. In case of the foreign tourists, the average efficiency of all 67 touristic centers for the entire period (1992-2017) was 29.81% with the standard deviation of 28.27%. Only 24 touristic centers (representing 35.82%) are evaluated above the average. What is more, if we consider the average from the overall model (43.28%), then only 20 centers (29.85%) crossed this level. Further, we can observe many centers with an average efficiency around 10% and below. This indicates that foreign tourism is concentrated in limited number of main centers. The best evaluated touristic center for foreigners is Playacar with average efficiency of 97.51% with very low year-to-year fluctuation as the SD is only 3.55%. The second-best evaluated

4 The 3-year-long periods were chosen considering the size of the analyzed window in the DEA WA analysis.

center is Akumal (96.36%, SD 5.95%), followed by Playa del Carmen (95.70%, SD 3.59%), Tecate (91.89%, SD 8.45%) and Cancún (85.07%, SD 16.24%). Table 2 summarizes the efficiency for all centers.

| Touristic center | Efficiency | Rank | Touristic center | Efficiency | Rank | Touristic center | Efficiency | Rank |
|---|---|---|---|---|---|---|---|---|
| Acapulco | 13.27% | 39 | Ixtapa-Zihuatanejo | 46.76% | 18 | Querétaro | 4.39% | 60 |
| Aguascalientes | 7.38% | 50 | La Paz | 21.84% | 32 | Salamanca | 32.30% | 24 |
| Akumal | 96.36% | 2 | León | 2.94% | 65 | San Cristóbal de las Casas | 71.75% | 7 |
| Bahías de Huatulco | 49.18% | 17 | Loreto | 57.07% | 13 | San Felipe | 56.59% | 15 |
| Cabo San Lucas | 84.31% | 6 | Los Mochis | 5.12% | 54 | San José del Cabo | 62.08% | 12 |
| Campeche | 46.62% | 19 | Manzanillo | 15.66% | 37 | San Juan de los Lagos | 0.02% | 67 |
| Cancún | 85.07% | 5 | Mazatlán | 35.18% | 21 | San Juan del Río | 11.69% | 41 |
| Celaya | 10.75% | 43 | Mérida | 22.64% | 31 | San Luis Potosí | 6.30% | 53 |
| Chihuahua | 8.73% | 47 | Mexicali | 24.03% | 29 | San Miguel de Allende | 18.11% | 35 |
| Ciudad de México | 26.72% | 26 | Monterrey | 11.12% | 42 | Taxco | 19.00% | 34 |
| Ciudad Juárez | 29.22% | 25 | Morelia | 4.78% | 58 | Tecate | 91.89% | 4 |
| Coatzacoalcos | 2.33% | 66 | Nuevo Vallarta | 68.14% | 9 | Tequisquiapan | 9.70% | 46 |
| Colima | 7.02% | 51 | Oaxaca | 33.81% | 23 | Tijuana | 22.67% | 30 |
| Comitán de Domínguez | 56.84% | 14 | Pachuca | 3.95% | 61 | Tlaxcala | 24.93% | 28 |
| Cozumel | 67.69% | 10 | Palenque | 45.22% | 20 | Toluca | 8.01% | 48 |
| Culiacán | 2.99% | 64 | Piedras Negras | 13.02% | 40 | Tonalá-Puerto Arista | 25.89% | 27 |
| Durango | 3.29% | 62 | Playa del Carmen | 95.70% | 3 | Tuxtla Gutiérrez | 4.79% | 57 |
| El Fuerte | 71.47% | 8 | Playacar | 97.51% | 1 | Valle de Bravo | 4.87% | 56 |
| Guadalajara | 10.38% | 44 | Playas de Rosarito | 34.76% | 22 | Veracruz | 3.18% | 63 |
| Guanajuato | 10.04% | 45 | Puebla | 20.17% | 33 | Villahermosa | 6.77% | 52 |
| Hermosillo | 14.29% | 38 | Puerto Escondido | 16.85% | 36 | Xalapa | 4.91% | 55 |
| Irapuato | 4.71% | 59 | Puerto Vallarta | 52.49% | 16 | Zacatecas | 7.55% | 49 |
| Isla Mujeres | 62.62% | 11 | | | | | | |

Table 2: Efficiency of touristic centers, foreign tourists 1992-2017

Clear pattern can be observed regarding the foreign tourists. Within top 10 most efficient destinations eight are costal centers, with the main touristic destination in Riviera Maya in Yucatan (Figure 2). The only two in-land destinations within the 10 best evaluated cities are San Cristobal de las Casas (7th position, 71.75%, SD 26.97) and El Fuerte (8th position, 71.47%, SD 28.95%). In the other matters, through analysis we can observe that the center of Mexico is not that much attractive or well-known for foreigners as the main coast touristic destinations. Within the 10 least efficient centers are San Juan de los Lagos in Jalisco (67th, 0.02%, SD 0.02%), Coatzacoalcos in Veracruz (66th, 2.33%, SD 0.86%), León in León (65th, 2.94%, SD 2.14%), Culiacán in Sinaloa (64th, 2.99%, SD 1.58%) and Veracruz in Veracruz (63rd, 3.18%, SD 1.37%). What is more, there is a huge stability within the least evaluated touristic centers as the average SD is 1.76% across the whole analyzed period. In addition, there is a big difference between the top 10 and the least 10 centers regarding the length of stays per night. Foreign tourists stay in average 3.80 nights in the best evaluated centers compare to only 1.45 nights in the least evaluated centers. If we eliminate El Fuerte, San Cristobal de las Casas and Tecate, then the average of nights increases up to 4.93 nights.

Figure 2: The most (yellow) and the least efficient (gray) touristic centers for foreign tourists 1992-2017

As in the overall model, it is important to analyze the variance of the efficiency across the analyzed period (Figure 2). We can observe similar drop between 1996-1999 as in the overall model. As the average efficiency is much lower in this model (29.81%), the decrease was not that dramatic. The efficiency decreased from 33.52% in 1996 to 18.13% in 1999 (falling by 3.85% annually), which means a total decrease by 45.91% (compare to a decrease of 55.91% in the overall model). The second drop in the efficiency had different pattern as there was not only decrease between 2002 and 2005, but the efficiency began to decrease in 2001 and lasted until 2006. Since 2007, the average efficiency fluctuated around 26.16% with SD 2.27%. Table 5 (in appendix) presents the evolution of the efficiency for each touristic center regarding foreign tourists. Similarly, as in the overall model, many fluctuations can be observed, but several stable touristic centers can be observed. For example, Cancún remains within the best evaluated centers with an average position 4.55 with SD 3.91. Puerto Vallarta in Jalisco has an average position as 11.89th best (SD 5.16), Mazatlán in Sinaloa evaluated as 15.11th best in average (SD 4.70) and La Paz in Baja California Sur as 20.66th best (SD 4.72).

## National Tourists

The average efficiency of the touristic centers for the entire period (1992-2017) in case of national tourists was 70.74% with the standard deviation of 20.53%. The level of efficiency is much higher compare to the foreign tourists. In this case, national tourists are not concentrated in several main touristic destinations. As a result, 42 touristic centers (representing 62.69%) are evaluated above the average (Table 3). The best evaluated touristic center for national tourists is Tonalá-Puerto Arista in Chiapas with an average efficiency of 96.01% (SD 5.71%). The second-best evaluated center is Bahías de Huatulco in Oaxaca (95.96%, SD 4.00%), followed by Piedras Negras in Coahuila (95.53%, SD 4.48%), Hermosillo in Sonora (95.27%, SD 4.11%) and Salamanca in

Guanajuato (94.26%, SD 6.17%). In all five cases, the efficiency is around 95% or above, and the standard deviations indicate very high stability of their score.

What is important to mention, national tourism presents completely different pattern compare to foreign tourism. Similarly, as in the case of foreign tourism, many cost centers are registered within the highest evaluated. However, as Figure 3 highlights, these centers are not located in Riviera Maya, but are located in the South-west coast of Mexico. Centers in Riviera Maya (Akumal 67th, Cancún 56th, Cozumel 64th, Isla de Mujeres 63rd, Playa del Carmen 66th, Playacar 58th) are evaluated as the least efficient. Alike, favorite touristic destinations for foreigners in Baja California and Baja California Sur are not on the top list for Mexicans. Further, in-land centers are visited more by Mexicans as none of the in-land center is evaluated among the ten least efficient.

| Touristic center | Efficiency | Rank | Touristic center | Efficiency | Rank | Touristic center | Efficiency | Rank |
|---|---|---|---|---|---|---|---|---|
| Acapulco | 84.70% | 16 | Ixtapa-Zihuatanejo | 93.27% | 8 | Querétaro | 82.91% | 20 |
| Aguascalientes | 59.46% | 55 | La Paz | 64.95% | 47 | Salamanca | 94.26% | 5 |
| Akumal | 2.51% | 67 | León | 68.01% | 44 | San Cristóbal de las Casas | 64.72% | 48 |
| Bahías de Huatulco | 95.96% | 2 | Loreto | 46.84% | 60 | San Felipe | 47.24% | 59 |
| Cabo San Lucas | 30.99% | 62 | Los Mochis | 66.34% | 46 | San José del Cabo | 44.18% | 61 |
| Campeche | 84.23% | 17 | Manzanillo | 88.58% | 10 | San Juan de los Lagos | 81.55% | 22 |
| Cancún | 59.24% | 56 | Mazatlán | 77.10% | 31 | San Juan del Río | 71.38% | 41 |
| Celaya | 87.00% | 12 | Mérida | 64.22% | 50 | San Luis Potosí | 74.67% | 34 |
| Chihuahua | 60.60% | 53 | Mexicali | 72.52% | 38 | San Miguel de Allende | 54.17% | 57 |
| Ciudad de México | 78.73% | 25 | Monterrey | 74.21% | 35 | Taxco | 60.14% | 54 |
| Ciudad Juárez | 85.35% | 14 | Morelia | 77.84% | 27 | Tecate | 94.06% | 6 |
| Coatzacoalcos | 77.26% | 29 | Nuevo Vallarta | 93.97% | 7 | Tequisquiapan | 77.75% | 28 |
| Colima | 85.08% | 15 | Oaxaca | 69.64% | 42 | Tijuana | 67.34% | 45 |
| Comitán de Domínguez | 92.76% | 9 | Pachuca | 87.62% | 11 | Tlaxcala | 86.43% | 13 |
| Cozumel | 28.06% | 64 | Palenque | 64.23% | 49 | Toluca | 60.80% | 52 |
| Culiacán | 72.55% | 37 | Piedras Negras | 95.53% | 3 | Tonalá-Puerto Arista | 96.01% | 1 |
| Durango | 71.71% | 40 | Playa del Carmen | 6.29% | 66 | Tuxtla Gutiérrez | 76.94% | 32 |
| El Fuerte | 81.96% | 21 | Playacar | 47.96% | 58 | Valle de Bravo | 69.12% | 43 |
| Guadalajara | 73.85% | 36 | Playas de Rosarito | 24.74% | 65 | Veracruz | 83.06% | 19 |
| Guanajuato | 81.28% | 23 | Puebla | 83.72% | 18 | Villahermosa | 78.66% | 26 |
| Hermosillo | 95.27% | 4 | Puerto Escondido | 75.24% | 33 | Xalapa | 80.71% | 24 |
| Irapuato | 71.90% | 39 | Puerto Vallarta | 62.57% | 51 | Zacatecas | 77.12% | 30 |
| Isla Mujeres | 30.47% | 63 | | | | | | |

Table 3: Efficiency of touristic centers, national tourists 1992-2017

Figure 3: The most (yellow) and the least (gray) efficient touristic centers for national tourists 1992-2017

As the national tourism is not dependent on only several main touristic zones, the evolution of the efficiency is more stable (Figure 1). As in both previous cases, the drop in the efficiency between 1996 and 1999 can be observed (from 79.73% to 47.55%). However, the second drop in 2002-2005 is not observable at all. There was, however, a constant decreasing trend by approximately 1.61% annually since 2005 until 2014 (from 79.79% to 65.32%), which was partially recovered during the last three years. The evolution of the efficiency regarding the national tourists is presented in Table 6 (in appendix). Similarly, as in the overall model, many fluctuations can be observed, but several stable touristic centers can be observed. For example, Bahías de Huatulco is evaluated with an average position 6.44 with SD 5.17 positions, Ixtapa-Zihuatanejo with average position 8.33 (SD 3.64) and Hermosillo with position 6.44 (SD 4.06). In these three cases, all record data for the whole period 1992-2017. We can observe other touristic centers with similar (or better) evaluation. Such as Nuevo Vallarta (8.50, SD 7.22), Piedras Negras (5.75, SD 3.94), Salamanca (8.75, SD 4.80) and Tonalá-Puerto Arista (7.25, SD 5.14). However, in these cases, they record does not include the whole period as the first reported data are linked to 2007, respectively to 2008. This inequality can slightly bias their average result.

## Discussion

One of the main significant observations revealed by the analysis is the centralization of the tourism in limited number of touristic centers. This observation corresponds with the results from different countries. For example, Oukil, Channouf and Al-Zaidi (2016) found high level of efficiency concentrated mainly in Muscat, the capital of Oman, Corne (2015) showed that Paris is a benchmark for the French hospitality sector, while Liu, Zhang and Fu (2017) observed that highly efficient Chinese coastal cities are concentrated in two main regions. In addition, the results indicate significant differences between the priorities of the foreign and national tourism. The foreign tourism is concentrated in the coast areas, mainly in Riviera Maya in Yucatan. This centralization leads to very low overall efficiency of the tourism. Thus, there is need to prepare strategies that would attract the in-land touristic areas for the foreign tourists. This goes along with the National touristic plan for the period of 2019-2024 of the Mexican government (SECTUR, 2019b). One of the five main projects for this period aims on regionalization of the tourism, to strengthen the tourism within the whole country to make it more equal[5]. As foreign tourists generally stay more nights in one place, the regionalization effort would lead to higher incomes in low efficient touristic places. Tourism contributes approximately by 8.8% to the Mexican GDP. As Holzner (2011) pointed out, it is recommendable to invest apart from tourism specific also into traditional infrastructure, which can be used by both the tourism sector and by the manufacturing sector. In this sense, the project of Mayan train (El Tren Maya), which proposal is to connect main touristic places in Yucatán in a 1,525-kilometre railroad circuit (SECTUR, 2019b) may be a project that would help increase local infrastructure to leading to improvements in tourism industry. However, the results indicate already high efficiency in case of foreign tourism in Riviera Maya. Furthermore, the results also indicate variability of the efficiency across the analyzed period as tourists' preferences are not stable. Therefore, the investments in such huge projects must be carefully planned with long-term perspective, i.e. not to create projects based on current local touristic trends. The impact on the tourism in the whole country must be taken into consideration. Similarly, an environmental aspect of the tourism should not be forgotten. Liu, Zhang and Fu (2017) recommend that improving environmental regulations and consciousness, driving regional tourism environmental protection and ecological balance can have significant effect on the efficiency in the tourism industry.

Tourists satisfaction is one of the important factors in tourism marketing. The consequences of satisfaction with a tourist experience are basically an increase in the intention to return to the destination, as well as recommending it to third parties (Kim and Perdue, 2011). This satisfaction is affected by many factors: human resources in the destination, organization of the human resources, local infrastructure, touristic attractions, sociocultural environment, and local business activities (Coelho and Gosling, 2015). Thus, there are many areas of opportunities to attract tourists into less efficient touristic centers. Oukil, Channouf and Al-Zaidi (2016) investigated that the effect of culture attractions appears as the most influential factors. The culture factor includes traditional villages, world heritage, museums, archaeological and religious sites, crafts, among others. Therefore, SECTUR should target their marketing operations on less efficient touristic centers (including small touristic centers) to promote their culture attractions. Such promotions can include diverse set of operations. For example, Olvera Mejía, Gea Pérez and González Silva (2018) developed a virtual reality to promote tourist attractions in small municipality of Tepeapulco in Hidalgo. The objective of such tools is to publicize the tourist attractions of a region, resulting in more arrivals of tourists. Such strategies aim on both the national and foreign tourists, as each strategy can be adjusted to a specific market. For example, promotion of the in-land destinations for foreign tourists and promotion of small municipalities for national tourism. Promotion of small local municipalities complies with Mexican government strategy to consolidate the internal touristic market (SECTUR, 2019b). However, local problems in such small municipalities can put barriers in promoting local touristic activities (Méndez Méndez et al., 2016).

Similarly, these promotive activities can be ineffective due to the national insecurity. That might be the other reason why foreign tourism is concentrated in few main centers. Building better reputation in new destinations can be easily ruined by worse security situation (Aula and Hermaakorpi, 2008). Satisfaction, perceived value and the destination's image are factors of the destination loyalty (Cossío-Silva, Revilla-Camacho and Vega-Vázquez, 2019; Sun, Geng-Qing and Xu, 2013), which is a key element in marketing strategies, as well

5 "Proyecto está relacionado con la política de regionalización que se hará extensiva a todo el país, para que la actividad turística sea más equilibrada" (SECTUR, 2019b).

as the best predictor of post-visit behavior (Chen and Chen, 2010). Therefore, the investment into local infrastructure should also consider investments in security, which would generate safer image of each touristic destination.

### Limitations of the analysis

The presented analysis has several limitations that must be considered. The obtained results cannot be understood as the analysis of the tourism in Mexico as the article analyses the hospitality efficiency. Including hotel characteristics into the DEA model is only one of the possible variables. To cover the whole perspective of the Mexican tourism, it would be necessary to include variables that reflects the attractivity of the touristic center: Nature (reserves, valleys, caves, beaches, islands, water springs, lagoons, etc.), Culture (traditional, world heritage, museums, archaeological and religious sites, etc.) and Activities (physical activities: trekking, hiking, climbing; shopping; and watching activities: whales, birds, turtles, dolphins), as well as the local infrastructure (bars, restaurants, convention centers, etc.). Similarly, as the efficiency measures the ration of weighted inputs to weighted outputs, financial inputs (governmental investments) should be considered in the overall tourism model. However, such variables are not available for majority of analyzed touristic centers.

Finally, the study aimed to include the highest possible number of the most important touristic centers in Mexico. The metrics and number of touristic centers published by SECTUR is constantly developing. We included touristic centers for which we were able to get data for at least 9 out of the 26 years. That is why, the results do not report efficiency scores for several centers for the period from 1992 to 2006. This may cause higher volatility of the results during the first years and, vice versa, higher stability after 2006 (Figure 1). This volatility could be minimized by a bigger length of the selected window (for example, extending the 3-year window to 6-year window). However, the analysis must respect the total length of the period (26 years) and the impact of the negative incidents' magnitude in tourism.

## Conclusions

This article aimed to evaluate the hospitality efficiency of 67 main touristic centers in the different states of Mexico for the period 1992-2017. For this purpose, annual information from DATATUR was used, with which 3 DEA models were built (overall model, foreign model and national model). The results indicate that the overall efficiency across the whole period was 69.07% (SD 15.28%) with two major drops between 1996-1999 and 2002-2005. Similar pattern was identified in the foreign model, but due to the lower average efficiency (29.01%, SD 28.27%), these drops were not that significant. The main conclusion from the analysis can be linked to significant differences between efficiency in foreign and national tourism. Touristic centers with the highest efficiency for foreign tourists are greatly concentrated in Quintana Roo, and the rest of the country is evaluated very low. On the other hand, the best evaluated centers for national tourists are also on-coast centers (mainly in the South-West coast of Mexico), but the tourism activity is more decentralized. This result suggests that there is a huge opportunity for improvements to regionalize the tourism and to strengthen the tourism within the whole country. Mexican government should consider better promotion of the in-land touristic centers for foreigners. As foreign tourists usually stay more nights in one place, this would generate higher incomes for the local economies, resulting in higher income for Mexican economy. Finally, enlarging the concentration of the foreign tourism would minimize the impact of local insecurity and/or the effect of natural disasters in the main touristic centers. As a result, this would stabilize the industry, as well as secure future steady growth.

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# Appendix

| | 1992-1994 | 1995-1997 | 1998-2000 | 2001-2003 | 2004-2006 | 2007-2009 | 2010-2012 | 2013-2015 | 2016-2017 |
|---|---|---|---|---|---|---|---|---|---|
| Acapulco | 77.50% | 56.21% | 38.92% | 57.87% | 50.11% | 70.92% | 71.36% | 64.89% | 77.49% |
| Aguascalientes | 47.13% | 42.84% | 24.64% | 60.72% | 30.40% | 54.04% | 50.40% | 50.26% | 59.58% |
| Akumal | - | - | - | - | - | 93.29% | 95.74% | 97.92% | 100.00% |
| Bahías de Huatulco | 95.66% | 98.93% | 98.12% | 98.64% | 85.09% | 73.32% | 72.13% | 70.85% | 80.19% |
| Cabo San Lucas | - | - | - | - | - | 99.92% | 83.82% | 83.46% | 99.37% |
| Campeche | 97.98% | 95.55% | 36.80% | 86.72% | 49.40% | 85.87% | 95.52% | 71.26% | 83.71% |
| Cancún | 99.75% | 99.35% | 93.27% | 94.85% | 90.70% | 83.62% | 84.00% | 93.41% | 96.13% |
| Celaya | - | - | - | - | - | 72.85% | 82.86% | 79.63% | 91.09% |
| Chihuahua | - | - | 25.81% | 51.24% | 35.08% | 50.68% | 44.04% | 38.10% | 51.36% |
| Ciudad de México | 73.67% | 74.24% | 32.63% | 76.74% | 49.36% | 76.78% | 86.82% | 67.75% | 65.98% |
| Ciudad Juárez | 94.74% | 81.19% | 41.81% | 77.05% | 80.22% | 94.20% | 91.76% | 84.33% | 84.76% |
| Coatzacoalcos | - | - | - | - | - | 70.92% | 74.62% | 60.90% | 50.32% |
| Colima | - | - | 68.10% | 68.30% | 42.19% | 78.32% | 76.68% | 61.33% | 84.89% |
| Comitán de Domínguez | - | - | - | - | - | 99.32% | 96.67% | 95.41% | 75.19% |
| Cozumel | 85.90% | 84.23% | 78.23% | - | 63.43% | 65.11% | 60.27% | 59.30% | 68.98% |
| Culiacán | - | - | - | - | - | 51.32% | 56.85% | 51.14% | 55.81% |
| Durango | 93.22% | 85.50% | 35.12% | 37.80% | 25.33% | 63.23% | 70.90% | 57.72% | 59.87% |
| El Fuerte | - | - | - | - | - | 89.95% | 68.20% | 84.63% | 86.71% |
| Guadalajara | 60.75% | 54.15% | 31.43% | 55.27% | 41.64% | 70.40% | 69.13% | 57.13% | 69.50% |
| Guanajuato | 82.65% | 61.88% | 33.15% | 79.42% | 56.66% | 67.54% | 81.90% | 62.38% | 69.27% |
| Hermosillo | 44.51% | 75.54% | 68.37% | 81.57% | 94.17% | 92.36% | 93.43% | 92.90% | 97.96% |
| Irapuato | - | - | - | - | - | 64.85% | 66.52% | 60.81% | 64.25% |
| Isla Mujeres | - | - | - | - | - | 66.98% | 65.87% | 66.89% | 76.39% |
| Ixtapa-Zihuatanejo | 84.96% | 85.02% | 83.06% | 96.80% | 93.27% | 76.45% | 71.70% | 69.80% | 89.70% |
| La Paz | 54.48% | 65.63% | 34.94% | 58.02% | 29.73% | 79.69% | 79.43% | 55.55% | 66.92% |
| León | - | - | 34.94% | 53.78% | 28.76% | 52.15% | 58.27% | 49.78% | 60.48% |
| Loreto | 58.34% | 70.12% | 99.13% | 99.57% | 94.06% | 86.41% | 40.82% | 32.35% | 59.49% |
| Los Mochis | - | - | - | - | - | 61.63% | 61.14% | 50.60% | 65.13% |
| Manzanillo | 93.25% | 73.69% | 40.14% | 77.21% | 51.34% | 84.85% | 89.84% | 69.31% | 88.30% |
| Mazatlán | 95.47% | 62.85% | 38.77% | 54.60% | 46.14% | 91.60% | 94.96% | 91.60% | 98.13% |
| Mérida | 61.20% | 57.36% | 46.28% | - | 38.82% | 65.03% | 63.26% | 55.45% | 56.54% |
| Mexicali | - | - | - | - | - | 79.77% | 65.38% | 80.63% | 70.12% |
| Monterrey | 50.59% | 45.96% | 36.85% | 63.83% | 44.48% | 60.18% | 48.70% | 57.62% | 67.52% |
| Morelia | 86.51% | 57.86% | 30.26% | 61.59% | 38.67% | 74.70% | 64.68% | 45.86% | 73.78% |
| Nuevo Vallarta | - | - | - | - | - | 90.59% | 94.62% | 97.26% | 100.00% |
| Oaxaca | 76.65% | 81.89% | 41.44% | 67.70% | 42.66% | 70.39% | 84.27% | 65.72% | 80.34% |
| Pachuca | 98.10% | 57.48% | 38.71% | 98.03% | 75.69% | 56.02% | 86.50% | 96.68% | 83.49% |
| Palenque | - | - | - | - | - | 72.05% | 72.82% | 62.47% | 61.53% |
| Piedras Negras | - | - | - | - | - | 81.82% | 83.66% | 91.91% | 96.78% |
| Playa del Carmen | - | - | - | - | - | 92.70% | 95.28% | 96.88% | 93.48% |
| Playacar | - | - | - | - | - | 96.87% | 96.91% | 97.27% | 99.13% |
| Playas de Rosarito | - | - | - | - | - | 39.24% | 31.78% | 49.64% | 67.42% |
| Puebla | 93.14% | 58.39% | 38.96% | 84.98% | 42.15% | 73.38% | 83.29% | 89.89% | 95.13% |
| Puerto Escondido | - | - | 77.52% | 85.51% | 31.58% | 76.42% | 60.96% | 53.09% | 58.06% |
| Puerto Vallarta | 53.87% | 81.27% | 63.81% | 80.51% | 63.62% | 88.11% | 78.69% | 73.83% | 80.61% |
| Querétaro | 56.85% | 46.70% | 32.35% | 64.13% | 43.72% | 61.57% | 67.65% | 54.87% | 53.71% |
| Salamanca | - | - | - | - | - | 95.66% | 90.76% | 83.90% | 88.97% |
| San Cristóbal de las Casas | 96.38% | 90.40% | 76.23% | 70.31% | 37.83% | 80.96% | 81.59% | 62.96% | 71.76% |
| San Felipe | - | - | - | - | - | 69.61% | 51.41% | 54.29% | 84.02% |
| San José del Cabo | - | - | - | - | - | 75.90% | 73.59% | 78.81% | 82.20% |
| San Juan de los Lagos | - | - | - | - | - | 65.40% | 68.03% | 70.58% | 72.28% |
| San Juan del Río | 93.75% | 53.76% | 29.45% | 49.66% | 31.47% | 49.23% | 49.93% | 45.53% | 52.08% |
| San Luis Potosí | 40.40% | 50.31% | 22.11% | 56.54% | 34.56% | 56.96% | 64.82% | 75.32% | 94.16% |
| San Miguel de Allende | 42.80% | 68.85% | 22.78% | 41.60% | 27.92% | 40.38% | 44.69% | 43.23% | 48.63% |
| Taxco | 37.42% | 56.09% | 51.99% | 46.83% | 31.42% | 48.38% | 44.06% | 42.22% | 59.09% |
| Tecate | - | - | - | - | - | 94.40% | 99.37% | 91.46% | 98.43% |
| Tequisquiapan | 98.09% | 63.29% | 53.75% | 79.81% | 34.07% | 52.46% | 52.98% | 48.88% | 38.88% |
| Tijuana | 96.69% | 73.76% | 30.47% | 70.18% | 52.74% | 62.63% | 57.54% | 53.33% | 53.87% |
| Tlaxcala | 93.41% | 49.45% | 50.62% | 85.17% | 96.35% | 94.02% | 94.43% | 93.36% | 97.40% |
| Toluca | 39.12% | 49.41% | 21.07% | 39.50% | 25.89% | 54.84% | 59.78% | 55.28% | 56.11% |
| Tonalá-Puerto Arista | - | - | - | - | - | 93.38% | 99.93% | 94.15% | 94.59% |
| Tuxtla Gutiérrez | 71.44% | 61.10% | 34.13% | 81.90% | 56.87% | 65.78% | 67.77% | 57.09% | 56.08% |
| Valle de Bravo | 99.65% | 80.29% | 39.20% | 50.90% | 32.22% | 40.13% | 41.38% | 35.53% | 37.19% |
| Veracruz | 70.31% | 74.54% | 27.34% | 55.81% | 36.39% | 78.53% | 76.86% | 71.52% | 72.85% |
| Villahermosa | 47.47% | 63.62% | 30.81% | 64.13% | 43.55% | 74.26% | 79.09% | 80.21% | 60.01% |
| Xalapa | - | - | - | - | - | 80.01% | 83.13% | 61.77% | 53.47% |
| Zacatecas | 88.78% | 72.52% | 34.30% | 55.20% | 39.77% | 69.43% | 68.82% | 62.57% | 74.00% |
| Average | 75.19% | 68.24% | 45.76% | 68.78% | 49.76% | 72.98% | 72.60% | 68.10% | 74.04% |

Table 4: Touristic center efficiency by period, overall model

| | 1992-1994 | 1995-1997 | 1998-2000 | 2001-2003 | 2004-2006 | 2007-2009 | 2010-2012 | 2013-2015 | 2016-2017 |
|---|---|---|---|---|---|---|---|---|---|
| Acapulco | 33.31% | 23.23% | 18.88% | 22.54% | 8.03% | 4.10% | 3.60% | 3.37% | 2.57% |
| Aguascalientes | 4.19% | 3.46% | 2.60% | 11.10% | 4.60% | 4.21% | 6.66% | 16.75% | 15.59% |
| Akumal | - | - | - | - | - | 92.97% | 95.51% | 98.18% | 100.00% |
| Bahías de Huatulco | 81.01% | 95.92% | 80.03% | 60.85% | 43.20% | 20.34% | 13.84% | 17.69% | 20.01% |
| Cabo San Lucas | - | - | - | - | - | 99.74% | 71.55% | 75.41% | 93.65% |
| Campeche | 85.69% | 85.87% | 21.82% | 69.13% | 14.85% | 20.68% | 29.06% | 37.59% | 46.56% |
| Cancún | 99.34% | 99.82% | 98.74% | 95.38% | 88.95% | 66.13% | 58.14% | 76.00% | 88.98% |
| Celaya | - | - | - | - | - | 5.81% | 5.20% | 20.37% | 12.05% |
| Chihuahua | - | - | - | - | - | 9.50% | 6.40% | 3.96% | 5.46% |
| Ciudad de México | 34.83% | 31.01% | 15.96% | 44.36% | 18.86% | 25.64% | 24.00% | 21.07% | 23.79% |
| Ciudad Juárez | 53.94% | 18.47% | 11.56% | 26.32% | 57.35% | 27.57% | 34.27% | 15.57% | 12.28% |
| Coatzacoalcos | - | - | - | - | - | 1.68% | 2.27% | 3.18% | 2.13% |
| Colima | - | - | 13.28% | 9.14% | 3.04% | 5.55% | 3.80% | 3.66% | 15.61% |
| Comitán de Domínguez | - | - | - | - | - | 54.04% | 67.17% | 53.96% | 48.45% |
| Cozumel | 87.47% | 87.46% | 84.14% | - | 65.34% | 54.41% | 47.05% | 49.34% | 65.68% |
| Culiacán | - | - | - | - | - | 1.66% | 2.81% | 3.50% | 4.48% |
| Durango | 6.05% | 2.34% | 2.64% | 3.47% | 1.55% | 3.29% | 2.03% | 5.81% | 1.65% |
| El Fuerte | - | - | - | - | - | 89.67% | 58.70% | 80.55% | 67.89% |
| Guadalajara | 7.97% | 8.98% | 6.79% | 14.81% | 7.70% | 10.23% | 9.97% | 11.84% | 17.54% |
| Guanajuato | 17.42% | 10.92% | 9.22% | 19.88% | 9.61% | 6.52% | 5.94% | 4.33% | 4.74% |
| Hermosillo | 5.94% | 12.11% | 14.07% | 20.09% | 41.06% | 8.03% | 10.35% | 9.18% | 4.56% |
| Irapuato | - | - | - | - | - | 2.60% | 4.81% | 6.28% | 4.33% |
| Isla Mujeres | - | - | - | - | - | 73.19% | 58.44% | 50.83% | 70.74% |
| Ixtapa-Zihuatanejo | 57.13% | 64.51% | 67.59% | 80.28% | 76.78% | 24.01% | 14.49% | 15.25% | 18.26% |
| La Paz | 21.80% | 30.70% | 16.57% | 26.27% | 9.16% | 25.67% | 22.39% | 20.15% | 24.84% |
| León | - | - | 4.23% | 6.13% | 1.32% | 2.04% | 1.45% | 1.32% | 5.34% |
| Loreto | 57.75% | 68.13% | 97.03% | 100.00% | 83.71% | 55.98% | 22.47% | 20.10% | 40.38% |
| Los Mochis | - | - | - | - | - | 8.46% | 4.90% | 3.30% | 3.16% |
| Manzanillo | 44.52% | 21.42% | 12.12% | 22.52% | 7.71% | 11.70% | 6.06% | 5.87% | 5.76% |
| Mazatlán | 68.52% | 40.30% | 27.47% | 29.21% | 20.34% | 35.74% | 32.30% | 27.26% | 35.63% |
| Mérida | 50.03% | 36.29% | 28.02% | - | 13.59% | 15.97% | 11.60% | 12.25% | 14.12% |
| Mexicali | - | - | - | - | - | 16.23% | 11.65% | 33.82% | 35.73% |
| Monterrey | 10.04% | 9.76% | 9.52% | 17.87% | 11.12% | 11.06% | 6.85% | 10.90% | 13.91% |
| Morelia | 7.20% | 4.48% | 2.51% | 7.62% | 4.14% | 5.35% | 2.48% | 2.29% | 6.87% |
| Nuevo Vallarta | - | - | - | - | - | 64.64% | 45.01% | 76.29% | 95.87% |
| Oaxaca | 60.84% | 68.12% | 28.11% | 38.34% | 14.26% | 22.78% | 21.52% | 23.95% | 22.68% |
| Pachuca | 6.48% | 1.48% | 0.40% | 3.64% | 5.28% | 5.12% | 7.84% | 2.54% | 2.19% |
| Palenque | - | - | - | - | - | 80.55% | 42.22% | 24.50% | 27.79% |
| Piedras Negras | - | - | - | - | - | 15.07% | 12.89% | 11.53% | 13.39% |
| Playa del Carmen | - | - | - | - | - | 94.61% | 95.15% | 96.83% | 96.46% |
| Playacar | - | - | - | - | - | 96.81% | 97.24% | 97.08% | 99.59% |
| Playas de Rosarito | - | - | - | - | | 40.78% | 26.00% | 22.88% | 55.24% |
| Puebla | 21.67% | 12.22% | 9.68% | 30.02% | 9.26% | 12.75% | 14.25% | 44.84% | 30.18% |
| Puerto Escondido | - | - | 41.83% | 39.88% | 7.99% | 15.02% | 8.44% | 8.37% | 11.19% |
| Puerto Vallarta | 37.83% | 70.24% | 63.93% | 69.10% | 50.77% | 52.38% | 40.30% | 39.62% | 46.13% |
| Querétaro | 1.86% | 2.22% | 2.80% | 5.56% | 6.39% | 5.36% | 5.22% | 5.25% | 5.12% |
| Salamanca | - | - | - | - | - | 19.85% | 57.25% | 27.68% | 14.24% |
| San Cristóbal de las Casas | 92.23% | 92.24% | 99.83% | 84.55% | 30.24% | 79.99% | 76.08% | 43.75% | 34.33% |
| San Felipe | - | - | - | - | - | 56.51% | 36.34% | 59.86% | 82.14% |
| San José del Cabo | - | - | - | - | - | 57.31% | 58.05% | 69.01% | 64.88% |
| San Juan de los Lagos | - | - | - | - | - | 0.04% | 0.01% | 0.00% | - |
| San Juan del Río | 84.09% | 4.83% | 2.25% | 4.27% | 0.79% | 1.09% | 1.45% | 1.69% | 1.31% |
| San Luis Potosí | 2.95% | 5.88% | 1.07% | 3.65% | 3.76% | 4.81% | 7.22% | 11.98% | 19.91% |
| San Miguel de Allende | 34.10% | 42.28% | 13.38% | 22.50% | 11.73% | 10.59% | 7.00% | 8.53% | 10.22% |
| Taxco | 24.20% | 29.69% | 43.32% | 26.18% | 7.87% | 1.37% | 0.55% | - | 0.00% |
| Tecate | - | - | - | - | - | 89.08% | 94.34% | 95.64% | 86.81% |
| Tequisquiapan | 72.57% | 2.27% | 1.64% | 4.66% | 0.60% | 0.38% | 0.50% | 1.22% | 0.31% |
| Tijuana | 32.06% | 29.00% | 13.57% | 32.64% | 18.47% | 15.99% | 20.34% | 18.25% | 24.23% |
| Tlaxcala | 8.16% | 5.51% | 10.59% | 45.01% | 64.52% | 25.17% | 18.10% | 23.52% | 23.29% |
| Toluca | 6.75% | 9.61% | 4.79% | 7.18% | 3.51% | 7.69% | 17.96% | 7.66% | 6.46% |
| Tonalá-Puerto Arista | - | - | - | - | - | 4.95% | 11.87% | 35.73% | 100.00% |
| Tuxtla Gutiérrez | 9.55% | 6.67% | 2.49% | 4.93% | 2.03% | 3.66% | 4.51% | 4.81% | 4.25% |
| Valle de Bravo | 22.70% | 11.97% | 2.23% | 1.76% | 1.06% | 0.32% | 0.97% | 0.64% | 0.83% |
| Veracruz | 3.92% | 5.35% | 2.29% | 4.46% | 2.39% | 2.45% | 1.75% | 3.76% | 1.80% |
| Villahermosa | 5.17% | 8.42% | 3.47% | 8.92% | 3.57% | 5.06% | 7.52% | 11.36% | 7.71% |
| Xalapa | - | - | - | - | - | 3.68% | 3.89% | 8.76% | 2.53% |
| Zacatecas | 14.21% | 4.58% | 4.18% | 7.34% | 6.48% | 8.24% | 6.19% | 6.54% | 9.78% |
| Average | 35.27% | 29.94% | 23.73% | 28.29% | 20.48% | 26.92% | 23.97% | 25.98% | 29.30% |

Table 5: Touristic center efficiency by period, foreign tourists

| | 1992-1994 | 1995-1997 | 1998-2000 | 2001-2003 | 2004-2006 | 2007-2009 | 2010-2012 | 2013-2015 | 2016-2017 |
|---|---|---|---|---|---|---|---|---|---|
| Acapulco | 95.44% | 83.72% | 46.38% | 61.60% | 83.75% | 95.56% | 94.31% | 85.23% | 93.75% |
| Aguascalientes | 63.21% | 58.15% | 37.84% | 72.56% | 69.98% | 66.25% | 55.39% | 50.66% | 61.87% |
| Akumal | - | - | - | - | - | 2.66% | 2.09% | 2.55% | 2.88% |
| Bahías de Huatulco | 98.75% | 98.32% | 98.92% | 100.00% | 93.68% | 94.86% | 95.30% | 90.42% | 92.15% |
| Cabo San Lucas | - | - | - | - | - | 50.11% | 28.60% | 24.64% | 15.44% |
| Campeche | 96.57% | 95.98% | 51.14% | 92.43% | 93.04% | 85.06% | 90.57% | 62.39% | 77.63% |
| Cancún | 95.78% | 60.02% | 36.89% | 47.96% | 70.09% | 56.16% | 48.30% | 54.92% | 53.71% |
| Celaya | - | - | - | - | - | 85.36% | 87.26% | 84.30% | 93.10% |
| Chihuahua | - | - | 37.93% | 63.63% | 72.35% | 72.90% | 54.27% | 51.53% | 65.72% |
| Ciudad de México | 93.09% | 82.93% | 39.93% | 76.45% | 94.25% | 84.25% | 90.09% | 75.72% | 68.46% |
| Ciudad Juárez | 93.18% | 92.83% | 60.81% | 86.29% | 82.84% | 92.80% | 90.00% | 84.86% | 84.10% |
| Coatzacoalcos | - | - | - | - | - | 89.32% | 84.40% | 71.53% | 57.04% |
| Colima | - | - | 87.34% | 84.85% | 93.46% | 89.29% | 82.91% | 70.85% | 88.85% |
| Comitán de Domínguez | - | - | - | - | - | 99.58% | 98.02% | 95.68% | 73.65% |
| Cozumel | 33.29% | 27.70% | 9.91% | - | 46.32% | 23.73% | 24.13% | 30.06% | 29.96% |
| Culiacán | - | - | - | - | - | 81.71% | 72.29% | 67.48% | 66.81% |
| Durango | 93.44% | 96.49% | 56.90% | 45.38% | 57.96% | 77.72% | 80.50% | 63.11% | 67.57% |
| El Fuerte | - | - | - | - | - | 90.05% | 70.75% | 85.61% | 89.24% |
| Guadalajara | 83.47% | 76.79% | 49.26% | 67.27% | 83.66% | 86.54% | 76.29% | 66.80% | 74.96% |
| Guanajuato | 89.87% | 84.59% | 45.12% | 88.58% | 95.53% | 81.51% | 92.12% | 74.09% | 79.55% |
| Hermosillo | 95.36% | 92.75% | 96.95% | 91.46% | 100.00% | 96.12% | 94.62% | 92.89% | 98.30% |
| Irapuato | - | - | - | - | - | 74.51% | 72.90% | 70.21% | 70.35% |
| Isla Mujeres | - | - | - | - | - | 14.34% | 29.55% | 41.25% | 39.86% |
| Ixtapa-Zihuatanejo | 96.57% | 87.37% | 89.78% | 91.80% | 95.69% | 95.78% | 94.30% | 89.89% | 99.07% |
| La Paz | 64.79% | 64.14% | 41.95% | 62.45% | 64.12% | 85.08% | 77.08% | 56.64% | 69.96% |
| León | - | - | 60.52% | 65.28% | 70.42% | 70.94% | 71.92% | 63.53% | 72.42% |
| Loreto | 35.52% | 34.26% | 52.33% | 33.18% | 89.80% | 80.24% | 34.56% | 25.61% | 38.54% |
| Los Mochis | - | - | - | - | - | 71.93% | 65.96% | 57.39% | 71.93% |
| Manzanillo | 94.16% | 92.78% | 56.93% | 88.49% | 98.22% | 93.79% | 97.91% | 81.62% | 95.71% |
| Mazatlán | 92.69% | 64.90% | 44.99% | 60.51% | 72.48% | 90.11% | 85.12% | 92.67% | 97.12% |
| Mérida | 51.92% | 50.27% | 45.10% | - | 71.57% | 78.80% | 71.80% | 65.71% | 66.64% |
| Mexicali | - | - | - | - | - | 79.93% | 69.71% | 79.47% | 58.91% |
| Monterrey | 96.88% | 80.20% | 62.87% | 73.91% | 69.27% | 76.38% | 58.17% | 71.00% | 81.76% |
| Morelia | 97.27% | 73.75% | 52.67% | 81.09% | 92.53% | 90.94% | 74.08% | 52.74% | 76.74% |
| Nuevo Vallarta | - | - | - | - | - | 88.58% | 95.57% | 93.73% | 100.00% |
| Oaxaca | 63.25% | 62.15% | 46.29% | 72.21% | 80.91% | 73.35% | 84.07% | 67.27% | 81.05% |
| Pachuca | 98.79% | 79.19% | 61.01% | 99.24% | 88.63% | 85.41% | 88.89% | 99.21% | 88.56% |
| Palenque | - | - | - | - | - | 64.92% | 68.56% | 63.13% | 58.36% |
| Piedras Negras | - | - | - | - | - | 96.02% | 94.53% | 93.22% | 100.00% |
| Playa del Carmen | - | - | - | - | - | 7.43% | 8.55% | 5.42% | 2.52% |
| Playacar | - | - | - | - | - | 35.32% | 66.25% | 37.49% | 55.19% |
| Playas de Rosarito | - | - | - | - | 9.63% | 6.90% | 14.66% | 44.69% | 44.25% |
| Puebla | 93.10% | 69.28% | 56.56% | 93.65% | 81.76% | 85.14% | 88.04% | 93.10% | 97.46% |
| Puerto Escondido | - | - | 82.68% | 92.98% | 80.06% | 86.14% | 65.44% | 58.16% | 61.63% |
| Puerto Vallarta | 73.27% | 67.67% | 38.56% | 52.89% | 60.23% | 66.13% | 62.90% | 68.64% | 77.93% |
| Querétaro | 95.86% | 83.11% | 57.26% | 89.50% | 96.94% | 92.01% | 85.44% | 70.78% | 71.41% |
| Salamanca | - | - | - | - | - | 95.92% | 95.19% | 90.14% | 96.58% |
| San Cristóbal de las Casas | 56.95% | 67.95% | 42.05% | 62.86% | 80.13% | 69.79% | 73.70% | 61.11% | 69.54% |
| San Felipe | - | - | - | - | - | 46.86% | 37.39% | 40.04% | 73.21% |
| San José del Cabo | - | - | - | - | - | 53.03% | 31.82% | 45.32% | 47.75% |
| San Juan de los Lagos | - | - | - | - | - | 83.22% | 78.86% | 82.24% | 82.07% |
| San Juan del Río | 94.59% | 69.93% | 48.42% | 63.88% | 82.21% | 82.24% | 68.77% | 60.67% | 71.91% |
| San Luis Potosí | 77.41% | 83.64% | 34.99% | 69.55% | 79.52% | 83.09% | 74.48% | 79.69% | 97.17% |
| San Miguel de Allende | 46.68% | 92.58% | 25.97% | 41.25% | 48.41% | 52.71% | 56.26% | 58.91% | 70.03% |
| Taxco | 44.71% | 65.89% | 52.79% | 44.37% | 63.48% | 75.26% | 59.29% | 59.34% | 84.06% |
| Tecate | - | - | - | - | - | 93.81% | 96.37% | 89.69% | 97.55% |
| Tequisquiapan | 98.47% | 77.16% | 91.73% | 93.19% | 87.89% | 72.88% | 65.60% | 56.55% | 45.50% |
| Tijuana | 97.09% | 91.83% | 39.26% | 69.66% | 71.99% | 74.28% | 54.97% | 52.93% | 47.35% |
| Tlaxcala | 94.72% | 59.50% | 59.92% | 86.15% | 96.91% | 95.22% | 96.08% | 94.73% | 98.76% |
| Toluca | 75.51% | 87.25% | 33.69% | 51.53% | 54.15% | 61.25% | 53.17% | 65.12% | 67.96% |
| Tonalá-Puerto Arista | - | - | - | - | - | 94.20% | 99.96% | 94.33% | 94.39% |
| Tuxtla Gutiérrez | 71.43% | 75.62% | 52.63% | 90.39% | 97.07% | 82.58% | 81.62% | 71.34% | 66.18% |
| Valle de Bravo | 99.15% | 92.05% | 64.91% | 66.14% | 64.39% | 63.25% | 57.90% | 53.84% | 56.14% |
| Veracruz | 97.30% | 87.96% | 42.05% | 73.71% | 89.44% | 98.95% | 90.01% | 84.45% | 83.98% |
| Villahermosa | 79.86% | 82.16% | 47.78% | 75.04% | 78.61% | 95.80% | 92.60% | 86.91% | 64.47% |
| Xalapa | - | - | - | - | - | 96.26% | 94.88% | 64.84% | 59.95% |
| Zacatecas | 92.55% | 87.38% | 56.70% | 67.48% | 76.22% | 80.67% | 74.02% | 71.22% | 83.00% |
| Average | 82.36% | 76.42% | 53.44% | 72.95% | 77.94% | 75.27% | 71.21% | 67.03% | 71.19% |

Table 6: Touristic center efficiency by period, national tourists