

STATISTICAL EVIDENCE OF POSITIVE CHANGES IN REGARD TO TOURIST ARRIVALS AND COLLECTION OF LODGING TAX IN QUINTANA ROO, MEXICO

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Abstract

The state of Quintana Roo has been the main creator of foreign exchange for tourism in Mexico. After the creation of the State in 1974, there was only a change of the ruling party in mid-2016. Faced with this new reality, the article aims to measure, through meta-analysis, the statistical changes between arrivals of foreign tourists and the collection of lodging tax. With this, the question of whether the administration change can be identified with an improvement of the variables of interest is answered. All the comparisons of the months of 2019 with respect to those same months of the previous 19 years, make it possible to assert that there were great positive changes.

Key words: foreign tourists, lodging tax, meta-analysis, new government administrations, tax collection.

EVIDENCIA ESTADÍSTICA DE CAMBIOS EN RELACION A LAS LLEGADAS DE TURISTAS Y LA RECAUDACIÓN DEL IMPUESTO SOBRE HOSPEDAJE EN QUINTANA ROO, MÉXICO

Resumen

El estado de Quintana Roo ha sido el creador principal de divisas internacionales por turismo de en México. Después de la creación del estado en 1974, solo hubo un cambio en el partido gobernante a mediados de 2016. Ante esta nueva realidad, el artículo pretende medir, a través de meta análisis, los cambios estadísticos entre llegadas de extranjeros y la recaudación de impuestos por alojamiento. Con esto, la pregunta de que si el cambio de administración puede ser identificado con un mejoramiento de las variables de interés. Todas las comparaciones de los meses del 2019 con respecto a esos mismos meses de los 19 años anteriores, hacen posible afirmar que hay grandes cambios positivos.

Palabras clave: turistas extranjeros, impuesto por hospedaje, meta-análisis, nuevas administraciones de gobierno, recaudación de impuestos.

Código JEL: Z38, H71, C12

1. Introduction

The year 2017 was unique in several aspects. Firstly, the United Nations Organization named it as the *International Year of Sustainable Tourism for Development*, given the relevance of this economic activity in generation of jobs, currency acquisition (mainly US dollars), and therefore prosperity (World Travel and Tourism Council, 2018). The aforementioned aspects concentrate the economic neoliberal vision for accumulation of capital (Govea, Macías, & Oropeza, 2019), in spite of the repercussions and ways in which it develops, therefore, the discourses issued by the International Organizations promoting tourism, regarding the levels of growth of Gross Domestic Product (GDP) that it causes.

Therefore, Governments arguments are always aimed to highlighting growth levels of foreign tourist arrivals and their spillover effects, not to mention the repercussions that this economic activity causes as it constitutes an axis of capital accumulation (Palafox, 2013). In this regard, it has been pointed out that 1,322 million international tourists traveled in the world in 2017, having an increment of 6.7% over the previous year, which allows to project that 2018 will present an increase of approximately 5% (Secretaría de Turismo, 2018).

In this sense, Mexico received 39.3 million international tourists in 2017, and SECTUR¹ projected a growth of 6.9% for the following year (2018). The goal was to reach 42 million international tourists; this was consistent with tourism revenues, which were 21.3 billion US dollars in 2017 and were projected to increase 7.8% to reach 23 billion US dollars by 2018. The continuous increase in tourism figures in Mexico becomes relevant internationally, as it allows Mexico to return to the Top Ten list of the World Tourism Organization. This increase repositioned Mexico brand in the global arena, as one of the countries with the ability to motivate movements and meet the needs of specific markets, particularly the North American.

This reunion with the international tourism scenario reinforces the idea of the positive impact of tourism on the national and international economy, which seeks the regional development proposed by the political speeches of the nineties, that is definitely not reflected due to the high index of inequality presented by Mexican tourist destinations promoted by the State, as well as their increase in poverty levels (González, 2017; Pérez & Camberos, 2015a; Pérez & Camberos, 2015b; Pérez & Gaxiola, 2017), situation which has encouraged communities to empower

¹ Ministry of Tourism in Mexico

themselves to leave the crossroads that the State provokes through the New Community Rurality.

Cancun is a tourist city located on the coast of the state of Quintana Roo, in Mexico. Its origin dates back to the 1960s when a group of investors began exploring the region in search of a suitable place to build a world-class tourist destination. At that time, Cancun was a small island with just a few inhabitants and some fishermen's houses.

In 1970, the Mexican government decided to invest in the construction of a tourist infrastructure in Cancun, which included the construction of the international airport and the expansion of the coastal road. These investments were essential to attract international tourists, especially from the United States and Europe. The first hotel in Cancun, Hotel Playa Blanca, opened its doors in 1974.

Since then, Cancun has experienced rapid growth and has become one of Mexico's and the world's most popular tourist destinations. The city boasts a wide variety of hotels, restaurants, bars, and tourist attractions, as well as white sand beaches and crystal-clear waters that make it ideal for sun and beach tourism. The success of Cancun has been made possible through a combination of public and private investment, as well as the natural beauty and tropical climate of the region.

In 2015 tourism accounted for 87% of GDP of Quintana Roo state and provided 80% of the jobs (Gobierno del estado de Quintana Roo, 2023); showing the relevance of the sector for state.

Quintana Roo state was ranked no. 1 in the Tourism Index Competitiveness of Mexican States (Tello, Cerda, & Pardo, 2012). According to this index, Quintana Roo's major strengths infrastructure and trained staff. Regarding the collection efficiency of federal taxes, Quintana Roo state ranked 13th for Value Added Tax (IVA for its acronym in Spanish), and 8th Income tax (ISR for its acronym in Spanish).

Considering the above, especially the relevance tourism for Quintana Roo state, this article analyzes data from 2000 to 2017, with special emphasis on the behavior of the latest records, using two variables: a) arrivals of foreign tourists to Quintana Roo and b) the collection of Lodging Tax (a state tax) in Quintana Roo. These important aspects allow us to infer that tourism sector had significant losses in the revenue collection through tax collection until 2016. Therefore, the assumption that there was a significant tax evasion in that 17-year period is inferred. This inefficiency in the collection of taxes derives in the impoverishment of the State, since it

fundamental, because it is the “main component of the income [...] that the Mexican State receives on the occasion of the fulfillment of its activities” (Hernández, 2017).

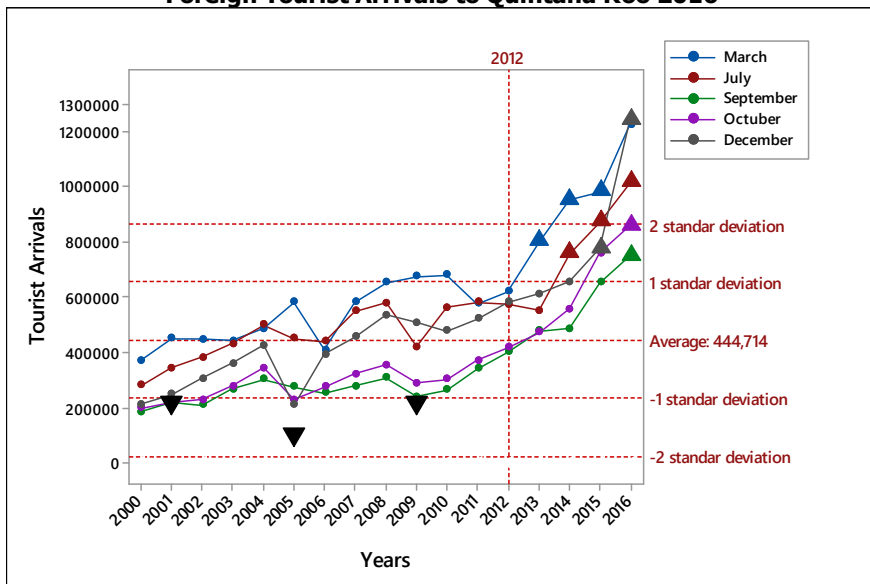
2. Background

Arrivals of foreign tourists and collection of lodging tax in Quintana Roo, had already been analyzed as independent variables (Lagunas & Palafox, 2020) throwing interesting, atypical results, over all the cases considered from 2016, year when the ruling party changed for the first time in history, since Quintana Roo was established as a federal state. Shortly after the conclusion of the administration, Public Accountant Roberto Borge Angulo was arrested for various crimes against the estate of the state, being displaced in office by Public Accountant Carlos Joaquín González in September 2016. Sour & Cerón (2020) analyzed lodging tax effect per state in Mexico; according to their findings, the demand for hotel rooms is inelastic in relation to changes in this tax. A more recent study related to changes in tourist arrivals with respect to other economic variables is article by Rocha & Lagunas (2023), in which they compare the evolution of the number of tourists and tax collection in Quintana Roo applying similar statistical methods.

Applying tests of normality and detection of atypical data, it was identified that in 5 of the 12 months of 2016 according to the Grubbs statistic (G), the number of arrivals of foreign tourists was statistically anomalous, too high (positive), in comparison to records 16 years before, in the months of March, July, September, October and December. However, the individual analysis of lodging tax collection showed that only in December there was an incipient increase, even less than two deviations² (Lagunas & Palafox, 2020).

² Therefore, it was not necessary to add the graph of the collection of the lodging tax comparing different periods.

Figure 1. Anomalous positive Behavior in Foreign Tourist Arrivals to Quintana Roo 2016



Source: Own elaboration by using Minitab 17

Figure 1 shows the behavior of foreign tourist arrivals in the atypical months (March, July, September, October and December). Dotted lines were added to the graph, a vertical line that indicates the last semester of government 2011-2017, as well as horizontal lines representing the average number of tourist arrivals and the amounts from \pm one and \pm two standard deviations.

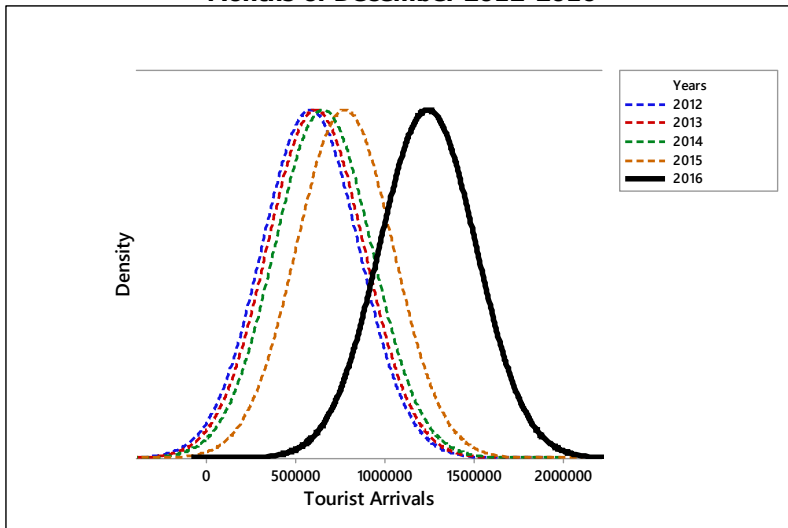
It can clearly be seen in the colored triangles (pointed up, upper right), which represent the months of 2016 (March, July, September, October and December) in which the overly positive anomalies had already been indicated as atypical records

(Lagunas & Palafox, 2020), which are considered difficult to understand by observing the behavior of those same months in 15 previous years (small circles, according to their color).

The above represents unusual situations since, even when analyzing the figures in which adverse phenomena to receive tourists occurred; such as the terrorist attack to the World Trade Center (New York, USA) in 2001, the onslaught of Hurricane Wilma in 2005 or the health contingency given by A (H1N1) flu in 2009. These situations are represented by triangles in black color (with a point down) and none of the cases exceeded -2 standard deviations, unlike the five positive records that exceeded +2 standard deviations.

Another way to notice the large anomalies of increment is the comparison between the averages of a given month in previous years. Previous studies recommend determining the best fit between different statistical distributions in order to obtain a bell shape obtained from the scale, shape and threshold parameters (Lagunas & Ramírez, 2016; Lagunas & Ramírez, 2017); therefore, Figure 2 shown below, exemplifies the comparison of data of the months of December 2012 to 2015 and adding in black the representation of the incredible increase in that month of 2016.

Figure 2. Differences in the averages Months of December 2012-2016



Source: Own elaboration by using Minitab 17

Due to previous background, data until December 2019 will be updated in this article, verifying whether the positive anomalies in tourist arrivals continued and, on the other hand, to know if the collection of the lodging tax remains invariable or with incipient presence of significant increases.

In this regard, we delve using techniques of changes in the means, calculating the Cohen Delta coefficient d , which belongs to the statistics known as meta-analysis (Hedges, 1982; Glass, 1976; Rosenthal & DiMatteo, 2001), applied with great regularity to know the magnitude or size in the changes, commonly called effect size (Nakagawa & Cuthill, 2007; Lakens, 2013).

3. Intensity on changes in the averages

A meta-analysis is a statistical technique used to combine the results of several research studies and synthesize them into a single estimate. This technique allows researchers to examine the results of many different studies and analyze patterns that emerge in the data. Meta-analyses are often used to make general estimates of

the effects of a particular treatment or intervention, and to identify any variation in effects based on different factors.

Meta-analysis and Cohen's *d* effect size are useful statistical tools that can be applied to finance to evaluate the impact of events, changes, and investment strategies on a company or market. Meta-analysis enables researchers to combine the results of multiple studies to get a better estimate of the effectiveness of different investment strategies. This information is useful to investors who want to make informed decisions about their investment choices.

Cohen's *d* effect size can also be applied to finance to quantify the magnitude of the effect of a particular event or change on a company or market. For example, a new economic policy can be evaluated by synthesizing the results of previous studies that have evaluated the impact of similar policies. Cohen's *d* effect size can be used to measure the effect of the new policy on the company or market, providing investors with valuable information to help them anticipate the impact of the policy on their investments.

Another application of Cohen's *d* effect size in finance is to compare the effectiveness of different valuation models or technical analysis tools. By synthesizing the results of multiple studies that have evaluated the performance of different tools, investors and analysts can use Cohen's *d* effect size to determine which tools are most effective in different market situations.

Overall, meta-analysis and Cohen's *d* effect size are powerful tools that can be used in various ways to evaluate the impact of events, changes, and investment strategies on a company or market. These tools provide investors with valuable information to make informed decisions and improve their investment outcomes.

To know the magnitude in the changes of a given month of the year 2019 with respect to the same previous months, the statistic known as Cohen Delta (*d*) will be used, as follows (Fritz, Morris, & Richler, 2011; Rice & Harris, 2005; Cohen, 1988).

$$d = \frac{\mu_A - \mu_B}{\sigma} \quad (1)$$

Where:

μ_A = data to evaluate (month of 2019)

μ_B = average per month of nineteen years previously to month of evaluate

σ

= standar deviation of data of nineteen years previously to month of evaluate

The statistic d is used as a means to know the level of change in a situation or behavior in different periods of time, which is more specific than the only acceptance or rejection with the classical criterion of p-value, with a critical measure of $\alpha = 0.05$ because the statistician d has criteria to consider changes of great magnitude, medium magnitude and small magnitude.

To categorize the level of change, it will be the following critical values of Cohen's delta (d) (Cohen, 1988; Morales, 1993):

$d \leq 0.20$ small change

Si $0.20 \leq d \leq 0.50$ medium change

Si $d > 0.50$ big change

The results for the statistic d as well as the level of change according to the levels indicated in the preceding section are shown below.

Table 1. Intensity of changes in the averages for the months of the 2019 with respect to the previous 19 years (2000-2018)

Level of change:
1=small change $d \leq 0.2$; 2=medium change $0.20 \leq d \leq 0.50$; 3=big change $d > 0.50$

Months 2019	Tourist Arrivals					Lodging tax collection				
	μ_A	μ_B	σ	d	level	μ_A	μ_B	σ	d	level
Jan	1,485,286.89	762,845.59	355,311.26	2.03	3	136,630.07	42,718.3	34,314.1	2.74	3
Feb	1,394,360.70	776,903.62	325,711.99	1.90	3	129,117.82	43,472.7	31,699.9	2.70	3
March	1,572,475.13	895,835.65	333,596.50	2.03	3	147,407.58	45,103.2	33,245.7	3.08	3
April	1,452,678.41	824,958.20	330,243.06	1.90	3	139,921.28	47,849.2	32,842.6	2.80	3
May	1,371,723.92	748,974.11	335,480.50	1.86	3	133,067.93	41,310.2	32,038.1	2.86	3
June	1,485,328.01	793,176.31	316,822.58	2.18	3	140,539.12	36,670.7	33,116.5	3.14	3
July	1,616,482.30	937,646.19	354,358.68	1.92	3	160,493.89	38,934.0	36,281.8	3.35	3
Aug	1,485,809.59	840,690.34	348,010.61	1.85	3	145,036.95	42,422.7	32,639.2	3.14	3
Sep	1,116,157.64	556,689.18	255,574.99	2.19	3	106,663.09	35,560.1	25,547.9	2.78	3
Oct	1,186,025.72	587,415.82	284,996.56	2.10	3	112,432.90	29,560.7	25,563.1	3.24	3
Nov	1,363,814.66	671,949.65	320,698.50	2.16	3	128,645.68	31,674.2	30,072.7	3.22	3
Dec	1,595,201.03	771,239.43	363,650.32	2.27	3	146,375.34	37,989.0	33,921.2	3.20	3

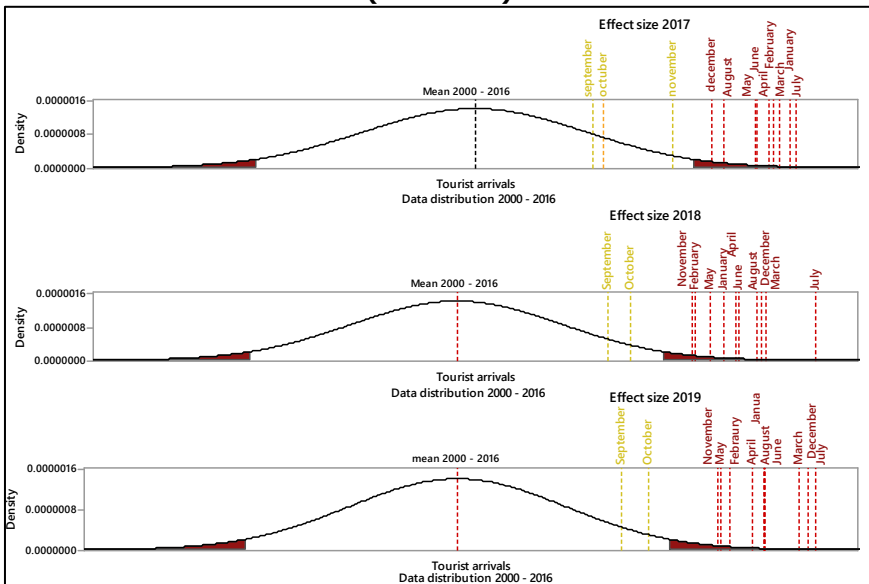
Source: Own elaboration

Table 1 shows that changes in the means, for all cases, can be considered as large changes according to the delta statistic criteria. In order to strengthen these results in a visual way, the graphs with the variations of great significance mentioned above are added, in all of them the images on the left side correspond to the arrival of tourists and those on the right to the collection of the lodging tax.

In Table 1, the information on the number of tourists was obtained from the Mexican Federal Ministry of Tourism (Secretaría de Turismo, 2021). The collection of the Lodging Tax from 2000 to 2015 were obtained from monthly analyses (Secretaría de Finanzas y Planeación, 2017); the collection from 2016 to 2019 was obtained from the Revenue Laws of the State of Quintana Roo (Congreso del Estado de

Quintana Roo, 2016; 2017; 2018), weighting the monthly collection according to the monthly number of tourists in the destination. Below are images showing the positive changes, in variable boot, as of 2017 (Effect size).

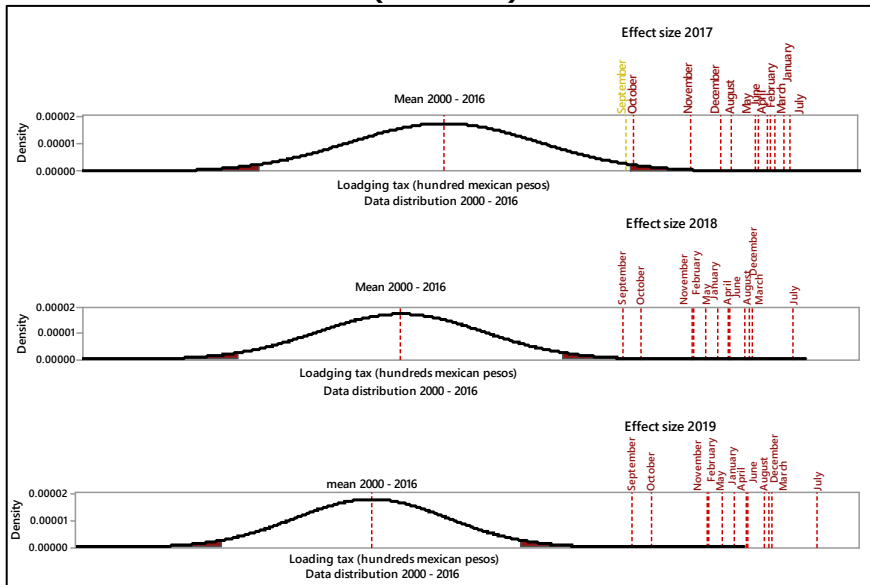
Figure 3. Contrasting values: tourist arrivals monthly 2017 – 2019 (Effect size)



Source: Own elaboration by using Minitab 17

According to Figure 3, the changes in tourist arrivals (effect size) are of great magnitude, with delta values between 1.85 and 2.17. With the exception of the months of September and October, the others have positive, highly significant changes, exceeding the significance level with $\alpha = 0.05/2$. The months with the largest changes in the three years were July, March, August, December, January and June.

Figure 4. Contrasting values: Lodging Tax Collection monthly 2017 – 2019 (Effect size)



Source: Own elaboration by using Minitab 17

The size of the change in lodging tax collection is surprising, of the 36 months analyzed, 35 of these exceeded the positive significance level. The month of September 2017 did not exceed the significance level, however, the change also can be considered of great magnitude, being close to the significance level along with the other months.

In addition, if the estimate is made to compare the effects on the changes of both variables with respect to 2017 vs. 2015, that is, very close contemporary periods, in both cases there are also great variations.

$$d(\text{tourist arrivals}) = \frac{\text{arrivals 2017} - \text{arrivals 2015}}{\sigma_{\text{arrivals 2015-2016}}}$$

$$d(\text{tourist arrivals}) = \frac{1,071,144.00 - 849,950.77}{143,595.53} = 1.54$$

$$d(\text{collection of lodging tax}) = \frac{\text{collection 2017} - \text{collection 2015}}{\sigma_{\text{collection 2015-2016}}}$$

$$d(\text{collection of lodging tax}) = \frac{98,877.97 - 78,049.25}{11,537.08} = 1.80$$

As it can be seen, even in the comparison with respect to 2015, both variables exceed the 0.50 criterion, also establishing changes of great magnitude in contemporary periods.

4. Conclusions

It is imperative to observe the performance of public administrations, especially state or regional, to identify if the minimum requirements to maintain the position of an industry such as tourism are met, and also if economic activity is generating sufficient resources, as the particular case of the collection of the lodging tax. Particularly in cases, such as the Mexican state of Quintana Roo where the grievance against the public treasury has been demonstrated, for which former governor Roberto Borge Angulo, accused of peculation, among other crimes, is deprived of liberty.

In relation to the foregoing, although it has been demonstrated by the judicial authorities the minimum elements that justified the arrest of the person in charge of the previous state administration, there is still the challenge of knowing if in addition to this, there could have been situations such as anomalies in records of economic activity and tax collection. The reasons that are provided according to the results obtained in the present investigation demonstrate that as from the current government administration initiated in 2017, the statistical records of tourist arrivals and the collection of lodging tax show great positive changes, which was demonstrated when comparing each of the months of 2019 compared to the same months in previous 19 years.

However, it was necessary to demonstrate that changes are not only due to comparisons between 2019 with respect to earlier periods that included data even from the year 2000, which could be interpreted as a large difference in the supply

of hotel rooms. For this reason, tests were also carried out with respect to the period of 2015. As it turns out, a great positive change can be affirmed for both variables, reiterating that from the current government administration in charge of Governor Carlos Joaquin Gonzalez, the statistics show great positive changes.

It is essential to emphasize that although both variables presented can be considered as significant positive changes, the best results were estimated for foreign tourist arrivals, suggesting that the improvement cannot be considered as directly proportional to the collection of lodging tax. The average obtained for delta coefficient in tourist arrivals was 5.44, while in the case of the lodging tax the average of great changes resulted in 2.98, both cases in respect to the comparison with the average of 19 previous years. However, when the tests of all months of 2017 were carried out with respect to those of 2015, the change was greater for the collection, estimated at 1.80 while for foreign tourist arrivals it reached 1.54.

The situation expressed above suggests that during the government administration initiated in September 2016 and with little more than two years of work, there were significant changes statistically demonstrated in tourism activity and also in the efficiency of public revenues, since the results of the meta-analysis allow us to assert collection efficiency, affirming such fact as the positive change in the collection is greater than the change in the arrivals of foreign tourists to Quintana Roo. It remains to be stated that the analysis detailed here led to the recognition of major changes over the previous 19 years. Everything seems to indicate that tourism activity was recorded erroneously, both the reality of the activity and its economic benefit.

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