

Examining the business cycle of the tourism industry in Mexico at the state level using the Markov Switching Model (1992 to 2017)



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Abstract Despite being a popular tourist destination, state-level research on the business cycle in Mexico's tourism industry is lacking. This study aims to answer three research questions: Are the growth stages of the international tourism market similar across states? Are the growth stages of the domestic tourism market similar among entities? Is there a relation between the economic cycle of the international tourism market and the domestic market? We use the Markov Switching Model to estimate the business cycle of the tourism industry in each Mexican state from 1992 to 2017. We identify the most attractive states for international and domestic tourists. Notably, eleven of the coefficients belong to the economic cycle of the foreign tourist market, indicating a greater economic impact compared to the domestic market. The results show that each state has its own business cycle, requiring individual projections for each market. This information is relevant for tourism planners and policymakers to address the challenges posed by the SDGs.

Keywords: industrial policy, business cycle, autoregressive model, Mexico.

1. Introduction

Tourism is one of the largest economic sectors globally: it supports 1 in 10 jobs worldwide and generates on average 10.4 percent of global GDP (WTTC 2019). In 2017, the Travel and Tourism industry experienced growth of 3.9 percent, higher than the global economy (3.2 percent). This industry alone created one in every five new jobs in the five years following 2019 (WTTC 2019).

The World Tourism Organization (UNWTO) defines tourism as “a social, cultural and economic phenomenon related to the movement of people to places outside their usual place of residence for personal or business/professional reasons” (OMT, 2017). The tourism industry exports goods and services such as transportation, accommodation, meals, entertainment, and leisure, among others (Vega & Vivas 2007). Therefore, tourism also stimulates the generation of foreign exchange flows. The United States ranked first among the countries most benefited by tourism, achieving a total of 488 billion dollars (Sala-i-Martin 2016). China followed with 224 billion dollars, almost half of the United States' income, and Germany in third place with 130.8 billion dollars. The gap between the proportion of tourism income of the United States and the rest of the countries remained at this magnitude from 2012 until 2018. Mexico ranked 14th, 15th, and 16th in 2016, 2017 and 2018, respectively (SECTUR 2019).

In 2017 Asia and the Pacific were the regions with the highest growth in international tourist arrivals (9 percent) followed by Africa (8 percent), and Americas in the third place with a growth rate of 3 percent (OMT 2017). In terms of countries, France received the highest number of tourists in 2017 with a total of 86.9 million arrivals, followed by Spain (81.9), the United States (76.9), China (60.7), Italy (58.3), and Mexico (39.3) (SECTUR 2019). The ranking of these countries from 2011 to 2017 did not change significantly, except for Mexico, which advanced four places in the last years of this period (SECTUR 2019). In summary, during the period of 2012 to 2017, France, the United States, China, Spain and Italy were the economies with the greatest significance in the industry worldwide, while Turkey, Germany, the United Kingdom, Thailand, and Mexico alternated between sixth and tenth place. The sum of tourist arrivals to each of the 10 countries mentioned represented 41.5 percent of global tourism during 2016 and 2017. During these years, Mexico fluctuated between the ninth and eighth places until 2017, when the country occupied sixth place.

The positive impact of this sector on economic activity is considered a driver of growth and economic development due to the foreign exchange earnings it generates and the creation of new jobs (Song et al., 2012). In 2016 the tourism sector in Mexico was very successful, capturing 2.83 percent of total international tourists worldwide and ranking as the eighth most preferred destination in the world. The arrival of foreign tourists in 2016 grew by 9.3 percent compared to the previous year (OMT, 2017). Despite the significance of the tourism industry in the Mexican economy, there has been a lack of research into the economic cycle of the international and national tourist market at the state level.



The Markov Switching Model (MSM) is a robust methodology that can be used as a tool for studying complex systems such as tourist flows at the state level in Mexico. The objective of this work is to analyze the economic cycle of the market for foreign and national tourists at the state level in Mexico to generate evidence on the local dynamics of this industry. With this objective in mind, the growth rate of international and national tourist arrivals in the 32 states (federal entities) of the country during the period from 1992 to 2017 is analyzed using the MSM.

This study aims to address three research questions related to the tourism market: 1. Are the growth stages of the international tourism market similar across different states? 2. Are the growth stages of the domestic tourism market similar among different entities? 3. Is there a relation between the economic cycle of the international tourism market and the domestic market? Through this research, we will explore the potential similarities between the boom and contraction of the business cycle in each of these markets at the state level in Mexico.

This information is crucial for developing appropriate policies in each destination, enabling them to maximize the benefits derived from this activity and align with the United Nations' Sustainable Development Goals (SDGs) (Hall, 2021). The SDGs encompass 17 global objectives that aim to address economic, social, and environmental challenges on a worldwide scale, ultimately promoting sustainable development. These goals were adopted as part of the 2030 Agenda for Sustainable Development in September 2015. The findings of this study can assist stakeholders in preparing for the necessary changes to achieve these goals. It is important to recognize that in order to reach the SDGs, cooperation between the government, private sector, and local communities is imperative to promote sustainable and responsible tourism. By involving and empowering local communities, their values can be preserved, leading to community-driven initiatives for sustainable tourism (Suárez, Sánchez and Vásquez, 2023).

The document is structured as follows: The initial section provides figures that demonstrate the significance of the tourism sector in the Mexican economy. The second section contains information about the data set and the Markov Switching Model (MSM). The estimation of the business cycle for both the international and domestic tourist markets at the state level is presented in the third section. Moving on, the subsequent section presents the outcomes and conducts a discussion. Lastly, the conclusions are presented in the final section.

1.1. The importance of the tourism in Mexican economy

The increase in the diversity of the tourism sector's destination offerings has generated greater competition at the international level. That is why Mexico stands compared to other countries, as the Mexican tourism market offers a wide range of destinations and activities. Figures from before 2019 testify to Mexico's trajectory as one of the top 10 most demanded destinations internationally, as shown below.

During 2015, the tourism industry in Mexico grew by 3.8 percent (Faber & Gaubert, 2019), a growth rate higher than other sectors of the economy. In that year, international currency earnings in Mexico increased by 10.8 percent, that is, it went from obtaining 17.734 billion dollars in 2015 to 19.571 billion dollars in the following year (OMT, 2017). This is how Mexico reached the fourteenth position in the classification of international tourism revenue. Currency earnings continued to rise during 2017 with a growth rate of 8.6 percent compared to the previous year, and in 2018 with currency earnings of 22.5 billion dollars (SECTUR, 2019).

The tourism sector in Mexico generated around 2.3 million jobs in 2016, representing 5.9 percent of the country's total employment, surpassing the revenue generated by oil (INEGI, 2018b). The Tourism Gross Domestic Product represented 8.7 percent of the national economy during that same year (INEGI, 2016) and 8.8 percent for 2017 (INEGI, 2018b). The economic activities that contributed the most were accommodation services with 28.8 percent, passenger transportation (19.5 percent), and restaurants, bars, and nightclubs with 15.4 percent. Tourism generated a growth of 0.2 percent of the total GDP in the country (INEGI, 2016).

The arrival of tourists to Mexico, in addition to generating an impact on foreign currency earnings, also modifies the tourism balance, which, in 2016, obtained 17.35 billion dollars in revenues and 8.56 billion dollars in foreign currency expenses, thus achieving a surplus, according to Balance of Payments data provided by the Bank of Mexico. In 2017, the influx of foreign tourists who visited Mexico was 39.3 million people, registering growth rates of 12 percent compared to 2016, and an economic impact of 21.3 billion dollars (SECTUR, 2018). It is worth mentioning that only in December 2017, there was an increase of 9.1 percent in the arrival of international tourists to the Mexican Republic, compared to the same month of the previous year (SECTUR, 2018b).

Another positive aspect caused by the growth of this sector is the promotion of investment (Alonso, 2022). Specifically, the tourism sector represented 3.5 percent of the fixed investment of the total economy in 2014. Private investment was approximately 26 billion dollars, and foreign investment contributed more than 3.1 billion dollars during the period 2012-2014 for the development of the accommodation sector (INEGI, 2014). Within this sector, investment distribution was concentrated in construction, with 80.8 percent, followed by machinery and equipment, with 19.2 percent. The latter can be broken down into the acquisition of units and equipment related to transportation (12.7 percent); computer equipment and peripherals (1.5 percent); and office equipment and others (5.0 percent) (INEGI, 2014). As of November 2017, financing granted to tourism by

commercial banks amounted to 78 billion pesos, while development bank credit reached 20 billion pesos (Jiménez-Rico et al., 2020).

Tourism had a participation in national private consumption of 17.8 percent, according to figures from the 2015 Tourism Satellite Account of Mexico, with a base year of 2008. This level of consumption resulted in revenue from the Lodging Services Tax amounting to 11,287.3 million pesos, inferring that the corresponding revenue from the Value Added Tax (VAT) in Mexican hotels approached 44 billion pesos. Thus, the lodging industry represented 6.22 percent of the total VAT revenue in the country (SHCP, 2017).

The Mexican tourism market offers a wide range of destinations and commercial activities, increasing its level of competitiveness among international tourists. For example, in 2015, while Mexico City received the most national tourists, Quintana Roo received the most foreign tourists (SECTUR-DATATUR, 2018). This demonstrates the significance of studying the business cycle in both the international and domestic tourism market at the state level. It is crucial for strategizing the growth of destinations that have played a key role in establishing Mexico as one of the leading international tourist destinations. The goal must be to ensure that this growth is sustainable and aligns with the SDG.

2. Materials and Methods

2.1. Description of the econometric model and data base

Tourism demand forecasting has been dominated by the application of econometric techniques (Witt 1995). However, when extensive databases are lacking, the MSM is a robust alternative. Thus, MSM proves to be a powerful tool for studying complex systems such as the business cycle of tourism activity at the state level in Mexico.

The MSM is a random process where all future information is contained in the present state (Markov 1971). That is, future states are reachable through a probabilistic process, rather than a deterministic one. Thus, the future is conditionally independent of the past. At each step, the system can change from current state to another (or remain in the same state) according to a probability distribution (Jeong-Gil et al., 2011).

The MSM considers business cycles as asymmetric processes consisting of two regimes: a low growth cycle and a high-growth cycle (boom). The k th-order stochastic process of the growth rate of tourist arrivals is modeled by the following equation:

$$\Delta_k Y_t = \lambda(S_t) + \sum_{i=1}^k \theta \Delta_k Y_{t-i} + \varepsilon_t \quad (1)$$

Where Y_t is a stationary time series representing the monthly growth rate of tourist arrivals in a particular regime, λ is the constant (intercept) representing the average growth rate of tourist arrivals in each of the regimes, S_t is the regime index ($t = 1, 2, \dots, p$), θ are the coefficients of the autoregressive terms of the $AR(p)$ model; ε_t is a sequence of random variables *i.i.d.* $N(0,1)$ which is usually assumed to follow a normal distribution (Ross, 2014).

The MSM allows estimating both the probability of transitioning from one regime to another and the duration of each regime. The variable S_t is estimated in discrete time. The transition probability matrix is such that:

$$P_{ij} = Pr[S_t = j | S_{t-1} = i] \text{ with } \sum_{j=0}^N P_{ij} = 1 \text{ for all } i \quad (2)$$

Y_t is a stationary series if its expected value and variance are not functions of time $t = 0, 1, \dots, T$ (Tsay, 2005). It is important to verify the seasonality of Y_t , otherwise, it is only possible to analyze its behavior during a specific period and not over time. To verify that the data series satisfy this condition, the Augmented Dickey-Fuller (DFA), Kwiatkowski-Phillips-Schmidt-Shin (KPSS), and Phillips-Perron (PP) tests are used.

The goodness of fit of the MSM estimation is verified by the minimum value of the information criteria: Akaike (AIC), Schwarz (BIC) and Hanna-Quinn (HQ). Each criterion considers the standard deviation of the residuals of the estimated models. Therefore, the optimal number of lags is determined for each of the data series analyzed as they become smaller (Tsay, 2005).

MSM became popular after its success in predicting the economic cycle of the United States (Hamilton 1989). Later, it was used to examine and predict customer behavior from the perspective of brand loyalty (Mckercher & Denizci, 2011). Its use in the tourism sector to represent the business cycle is recent. Countries that have been analyzed include Australia (Valadkhani & Mahony, 2018), Barbados (Moore & Whitehall, 2005), Korea (Chen et al., 2015), Macao (Gu et al., 2018) and Taiwan (Hsu, 2017; Chen et al., 2014; Chen et al., 2015). South Africa, Sweden, Canada and the United States were studied only recently (Botha & Saayman, 2022).

Mexico has positioned itself as one of the main international destinations in recent years. However, to date, the business cycles of its states have not been studied to determine which states have the highest growth cycles (boom) in more detail. Thus, this method can be used as a market research tool to design a reactivation policy according to the origin of each tourist flow and to face the challenges that the development of a sustainable tourism.

The database used for this study contains the monthly number of foreign and domestic tourist arrivals to each Mexican state during the period of 1992-2017 (SECTUR-DATATUR, 2018). The unit of analysis is the monthly growth rate of arrivals to each state. The study analyzed 300 data points for each of Mexico's 32 states from 1992 to 2017, covering a 25-year period. This dataset, based on information from the tourism Secretariat (SECTUR), provides a comprehensive view of the state-level tourism industry. SECTUR releases official data annually through DataTur with a two-year backlog. However, the database has not been updated since 2019. The website was redesigned in 2022 and it does not include any more data on international and domestic visitors at the state level. As a result, the dataset only goes up until 2017, the latest year for which this information is available. The descriptive statistics of each market are shown in Table 1 and 2.

3. Results and discussion

In order to verify whether the data series are stationary, we conducted three tests: the Augmented Dickey-Fuller Expanded (DFA), Phillips-Perron (PP), and Kiatkowski, Phillips, Schmidt and Shin (KPSS) Data series for Michoacán is stationary according to the DFA and PP tests, so the MSM was estimated despite not being stationary according to the KPSS test criteria. Subsequently, the optimal lag numbers were calculated using the correlogram and Schwarz (BIC) information criterion for each state. It should be noted that the international arrivals series in Tamaulipas did not show any optimal lag number, so it was not possible to estimate the MSM.

The estimation of the growth rate in each regime for each state, the transition probabilities from one regime to another, and their duration are shown in Tables 3 and 4 -both for the international and national markets. It should be noted that both markets are characterized by asymmetric cycles, where the expansion duration is shorter than the contraction period in all entities. The results show that Mexico has unique results for each state in both markets. The only common factor found is that in both markets, the business cycle boom has a similar average duration (1.19 and 1.34 months, respectively). The international market is described below.

Table 1 Average growth rate of international arrivals by state (1992-2017).

State	Average	Standard Deviation	Maximun	Minimum
Aguascalientes	0.0899	0.5117	5.2078	-0.7582
Baja California	0.0247	0.2240	1.6667	-0.5288
Baja California Sur	0.0450	0.3380	3.5238	-0.7033
Campeche	0.0913	0.4323	1.7694	-0.7736
Chiapas	0.0664	0.3763	1.5073	-0.7673
Chihuahua	0.0255	0.2253	0.8985	-0.5366
Coahuila	0.0263	0.2333	1.4404	-0.4318
Colima	0.1298	0.6055	3.2716	-0.7780
CDMX	0.0179	0.1770	0.8911	-0.6844
Durango	0.1235	0.7344	6.4261	-0.9232
Guanajuato	0.0320	0.2632	1.7967	-0.5312
Guerrero	0.0921	0.4902	3.4211	-0.6838
Hidalgo	0.6156	4.9014	83.2000	-0.9911
Jalisco	0.0346	0.2853	3.2361	-0.8291
Mexico	0.0798	0.5611	7.1797	-0.5727
Michoacan	0.0977	0.5654	5.0175	-0.7752
Morelia	0.1469	0.8458	9.4011	-0.8364
Nayarit	0.1599	0.9308	10.8623	-0.8996
Nuevo Leon	0.0227	0.1985	1.0885	-0.4707
Oaxaca	0.0751	0.4232	2.3845	-0.7939
Puebla	0.0503	0.3209	1.6517	-0.7119
Queretaro	0.0355	0.2621	1.6951	-0.5627
Quintana Roo	0.0395	0.3707	5.5617	-0.8221
San Luis Potosi	0.0650	0.4394	4.6662	-0.7059
Sinaloa	0.0667	0.3780	1.2684	-0.6594
Sonora	0.0470	0.3493	2.4722	-0.6645
Tabasco	0.0403	0.3189	3.2233	-0.7651
Tamaulipas	0.9894	13.9281	244.9392	-0.9677
Tlaxcala	0.3388	2.6017	43.0851	-0.9198
Veracruz	0.1123	0.7379	7.5723	-0.8629
Yucatan	0.0430	0.3098	2.0805	-0.6938
Zacatecas	0.1033	0.5742	5.9545	-0.7464
National Average	0.1227	1.0598	14.9488	-0.7297

Source: own elaboration based on data obtained from Data Tur information available as of September 25, 2019.

*Shaded boxes indicate figures above the national average

Table 2 Average growth rate of national arrivals by state (1992-2017).

State	Average	Standard Deviation	Maximun	Minimum
Aguascalientes	0.0278	0.2297	0.7238	-0.4285
Baja California	0.0142	0.1582	0.54473	-0.40135
Baja California Sur	0.0521	0.4180	4.4025	-0.7780
Campeche	0.0251	0.2180	0.7229	-0.4698
Chiapas	0.0468	0.3007	0.9686	-0.5455
Chihuahua	0.0101	0.1295	0.6693	-0.3743
Coahuila	0.0121	0.1512	1.3513	-0.3368
Colima	0.0482	0.3104	1.7439	-0.5645
CDMX	0.0111	0.1244	0.6463	-0.5080
Durango	0.0107	0.1457	0.7859	-0.3448
Guanajuato	0.0211	0.1847	0.6816	-0.3338
Guerrero	0.0751	0.3934	1.3205	-0.6209
Hidalgo	0.0224	0.1930	0.9731	-0.5184
Jalisco	0.0307	0.2483	0.8245	-0.3985
Mexico	0.0217	0.1892	0.7296	-0.4538
Michoacan	0.0234	0.2121	0.8361	-0.5494
Morelia	0.0280	0.2306	0.9441	-0.5486
Nayarit	0.0497	0.3125	1.4331	-0.7168
Nuevo Leon	0.0123	0.1306	0.4272	-0.3051
Oaxaca	0.0589	0.3555	1.3613	-0.5634
Puebla	0.0206	0.1941	2.0929	-0.3693
Queretaro	0.0154	0.1464	0.4177	-0.4321
Quintana Roo	0.0542	0.3408	2.1817	-0.6182
San Luis Potosi	0.0235	0.2095	0.8216	-0.4126
Sinaloa	0.0484	0.3351	2.3101	-0.5693
Sonora	0.0184	0.1876	1.0490	-0.4599
Tabasco	0.0191	0.1794	0.6323	-0.3430
Tamaulipas	0.0275	0.2263	1.4734	-0.7532
Tlaxcala	0.0333	0.2577	1.0683	-0.5323
Veracruz	0.0280	0.2370	0.9953	-0.5100
Yucatan	0.0381	0.2723	0.9321	-0.4624
Zacatecas	0.0424	0.3120	1.4545	-0.5143
National Average	0.0303	0.2354	1.1725	-0.4918

Source: own elaboration based on data obtained from Data Tur information available as of September 25, 2019.

*Shaded boxes indicate figures above the national average

3.1. International market

The results show that the two stages of the economic cycle of the international tourist market have their own dynamics in each federal entity. 14 entities have rapid growth in cycle 1, while in the second it is slow (Table 3). In the case of the remaining 17 entities, the first cycle is slow and the second is rapid. The rate of the boom ranges from 63.7 to 0.08 percent, while that of slow growth ranges from 0.36 percent to a contraction of -0.13 percent. The average boom is 3.8 percent while the average contraction is 0.04 percent. Hidalgo is the entity with the highest boom coefficient (63.73) during the analyzed period.

MSM is effective in representing both the boom and contraction of the international tourist market in 20 federal entities: Aguascalientes, Baja California Sur, Durango, State of México, Guanajuato, Hidalgo, Jalisco, Michoacán, Morelos, Nayarit, Oaxaca, Querétaro, San Luis Potosí, Sinaloa, Sonora, Tabasco, Tlaxcala, Veracruz, Yucatán y Zacatecas. That is, in these states, both the boom and slow growth cycle have significant coefficients. These entities represent 64.5 percent of the entities analyzed.

It should be noted that eleven entities have coefficients greater than one. This indicates that when the economic cycle is in expansion phase, a 1 percent increase in international tourists generates an average growth in the rate of foreign tourists of more than 100 percent. This is the case in Aguascalientes, Coahuila, Colima, Durango, Mexico, Guanajuato, Guerrero, Hidalgo, Jalisco, Morelos, Nayarit, Sonora, Tabasco, Tlaxcala, Veracruz and Zacatecas. Based on the above, we can conclude that the international tourist market in these states contributed to positioning Mexico as one of the ten most demanded destinations internationally during the study period. These entities have greater potential to continue generating growth in the country.

3.2. National market

Unlike the international market, 21 states show an expansion in the first cycle, while the remaining 11 have the inverse order. Baja California Sur has the highest coefficient in the entire national market (3.2) within the first group (Table 4). However, the value of this coefficient represents only 5% of the value of Hidalgo's boom coefficient, the largest expansion found in the international market. When analyzing the domestic market of national tourists, we found only one coefficient is greater than one (Baja California Sur). This fact contrasts significantly with the international market where 16 boom coefficients are greater than one.

According to the analysis, it is observed that eleven states show significant coefficients at the same time: Baja California, Baja California Sur, Chiapas, Jalisco, Michoacán, Nuevo León, Puebla, Querétaro, Tabasco, San Luis Potosí and Zacatecas. Thus, the MSM allows identifying the business cycle of the national tourist market in these states. A considerable proportion (90%) of these eleven entities exhibit coefficients below one during their rapid growth phase. This result emphasizes the need for tourism promotion policy planners to reconsider their strategies for promoting these destinations, while ensuring long-term sustainability. This information is also essential for public officials responsible for this sector to have the capacity to anticipate the stagnation of tourist sites and take preventive measures, rather than corrective ones. Table 5 shows the entities for which the MSM represents their business cycle from 1992 to 2017.

The MSM represents the economic cycle of at least one of the tourist markets in most states. This information confirms that Mexico has a diversified portfolio of destinations in both the international and national markets. Based on the significant cycles and coefficients, it can be inferred that although the domestic tourist market is a valuable contributor to the industry, the impact of the international tourist market outweighs it during the analyzed period.

Table 3 International Market.

	FOREIGN TOURISTS							Duration		
	Regime 1	Classification		Z stat	Regime 2	Classification		Z stat	Regime 1	Regime 2
Aguascalientes	0.0864	Slow	***	3.93	2.73	Fast	***	15.43	51.5365	1
Baja California	0.0117	Slow		0.9771	0.5203	Fast	***	6.5814	39.222	1.3812
Baja California Sur	0.0236	Slow	*	1.6172	0.9126	Fast	***	4.1991	56.055	1
Campeche	0.6198	Fast	***	10.1573	0.0018	Slow		0.0717	1.8259	5.5066
Chiapas	0.3201	Fast	***	8.086	-0.0395	Slow		-0.8351	1.0027	2.3286
Chihuahua	0.0804	Fast	**	2.0753	0.0155	Slow		0.7517	1	2.0883
Coahuila	0.016	Slow		1.403	1.4627	Fast	***	6.975	65.1768	1
Colima	1.6714	Fast	***	14.857	-0.0116	Slow		-0.4683	1.0515	12.5002
CDMX	0.0097	Slow		1.0361	0.1801	Fast	***	4.2415	10.8008	1.4247
Durango	4.7591	Fast	***	24.2841	0.0556	Slow	**	2.1946	1	60.9936
Guanajuato	0.0392	Slow	***	3.2069	1.5548	Fast	***	7.1258	89.4296	1
Guerrero	0.0184	Slow		0.7081	1.5102	Fast	***	10.4481	14.8073	1
Hidalgo	0.3641	Slow	***	4.5074	63.7257	Fast	***	14.4017	306.6278	1
Jalisco	3.1113	Fast	***	15.2116	0.028	Slow	**	2.2881	2.9633	307.9455
Mexico	5.2333	Fast	***	20.2851	0.0595	Slow	***	2.8346	1.4975	153.7383
Michoacan	0.0708	Slow	***	3.0206	0.8225	Fast	***	3.3933	20.5565	1
Morelia	0.0866	Slow	***	2.856	3.4866	Fast	***	6.3817	61.0963	1
Nayarit	4.0185	Fast	***	13.364	0.0608	Slow	***	2.5786	1	47.4732
Nuevo Leon	0.0064	Slow		0.4094	0.4261	Fast	***	5.0405	14.0171	1.0455
Oaxaca	-0.133	Slow	***	-6.092	0.4699	Fast	***	13.7871	2.5626	1.3463
Puebla	0.0209	Slow		1.4487	0.8543	Fast	***	13.0246	15.1634	1.1251
Queretaro	0.029	Slow	**	2.4295	0.8528	Fast	***	10.1113	34.0511	1.1835
Quintana Roo	0.9448	Fast	***	11.1139	0.0044	Slow		0.3655	1	28.488
San Luis Potosi	0.0676	Slow	***	3.5026	0.7629	Fast	**	2.2032	110.6112	1
Sinaloa	0.7011	Fast	***	11.8443	-0.0578	Slow	***	-2.7432	1.882	9.178
Sonora	1.5451	Fast	***	7.8778	0.0413	Slow	***	2.5058	1.1829	55.2697
Tabasco	2.5947	Fast	***	13.6105	0.0465	Slow	***	3.2787	1	117.2323
Tamaulipas										
Tlaxcala	0.1564	Slow	***	3.5841	3.6232	Fast	***	5.0964	62.0971	1
Veracruz	4.4232	Fast	***	19.6705	0.0554	Slow	**	2.0744	1	60.8774
Yucatan	0.0498	Slow	***	3.4169	0.5923	Fast	***	3.1874	36.0839	1
Zacatecas	2.4773	Fast	***	10.5613	0.0789	Slow	***	3.2406	1.0001	70.9892

*** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

The economic cycles of the foreign and domestic tourist markets behave differently in each of the states. Actually, there is no direct correlation between the economic trends observed in the national and international markets within each state. The MSM captures 49 percent of the 63 estimated economic cycles at the state level: 20 international markets and 11 domestic ones. In 7 states, the MSM captures the business cycle of both markets (Baja California Sur, Jalisco, Michoacán, Querétaro, Tabasco, San Luis Potosí and Zacatecas). In instances where the boom coefficient exceeds one, these findings hold significance

in formulating strategies that prioritize innovation to foster the growth of a sustainable sector. This information is also important for those states whose boom is less than one. These governments are recommended to adopt sustainable approaches to enhance and innovate their tourism policies.

Table 4 Domestic Market.

	DOMESTIC TOURISTS						DURATION		
	Regime 1	Classification	Z stat	Regime 2	Classification	Z stat	Regime 1	Regime 2	
Aguascalientes	0.3465	Fast	***	10.9491	-0.0099	Slow	-0.6309	1.1835	5.8753
Baja California	-0.0227	Slow	***	-2.8915	0.3056	Fast	***	11.9297	7.3308
Baja California Sur	3.2268	Fast	***	21.3312	0.0326	Slow	***	2.53	1
Campeche	0.0852	Fast	***	6.1361	0.0092	Slow		0.6694	1.0027
Chiapas	-0.0318	Slow	**	-2.4652	0.3373	Fast	***	8.819	1.9955
Chihuahua	0.0096	Slow		1.4317	0.5838	Fast	***	5.5681	127.1941
Coahuila	0.4667	Fast	***	3.248	0.0103	Slow		1.3965	1.6637
Colima	0.0008	Slow		0.0441	0.5115	Fast	***	7.4644	7.5921
CDMX	0.0775	Fast	**	2.1247	0.0019	Slow		0.2281	1
Durango	0.3529	Fast	***	10.1073	-0.0054	Slow		-0.8408	1
Guanajuato	0.0134	Slow		1.2256	0.076	Fast	***	6.907	1
Guerrero	0.5816	Fast	***	19.9935	-0.0255	Slow		-1.5734	1
Hidalgo	0.2377	Fast	***	3.2911	0.0105	Slow		0.8603	1
Jalisco	0.3246	Fast	***	18.791	-0.0326	Slow	***	-3.5442	1
Mexico	0.0104	Slow		0.8156	0.0622	Fast	***	4.7164	1.0153
Michoacan	0.0564	Fast	***	3.8953	0.0367	Slow	**	2.4731	1
Morelia	0.0605	Fast		1.0571	0.0448	Slow	***	3.6759	10.2593
Nayarit	0.0302	Slow		1.2419	0.4071	Fast	***	4.8587	7.5871
Nuevo Leon	-0.0427	Slow	***	-3.2057	0.1544	Fast	***	8.009	3.1414
Oaxaca	0.2049	Fast	***	10.0573	0.0241	Slow		1.1872	1
Puebla	0.6718	Fast	***	7.6606	0.0233	Slow	***	2.8028	1
Queretaro	0.0725	Slow	***	5.834	-0.0362	Fast	*	-1.8752	1.452
Quintana Roo	-0.0107	Slow		-0.675	0.9154	Fast	***	13.026	12.0846
San Luis Potosi	-0.0213	Slow	*	-1.7573	0.3471	Fast	***	9.4942	6.2897
Sinaloa	0.5784	Fast	***	14.0633	-0.0096	Slow		-0.6912	1
Sonora	0.4915	Fast	***	8.1851	0.0073	Slow		0.819	1
Tabasco	0.2468	Fast	***	11.5042	-0.0215	Slow	**	-2.2249	1
Tamaulipas	0.6469	Fast	***	9.5914	0.0029	Slow		0.2514	1
Tlaxcala	0.001	Slow	***	0.0816	0.432	Fast		5.4725	6.9498
Veracruz	0.2696	Fast	***	9.0612	-0.0237	Slow		-1.4903	1
Yucatan	0.4744	Fast	***	20.4979	-0.0007	Slow		-0.088	1
Zacatecas	0.6384	Fast	***	12.2188	-0.0267	Slow	**	-2.1916	1

*** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

While it is important to identify the states with a growth coefficient greater than one to mitigate the fall of the boom, states with moderate growth also offer development opportunities that are worth exploring. The findings suggest a range of dynamics, which highlight the potential to manage tourist destinations in a manner similar to a diversified portfolios for public tourism promotion strategies.

4. Conclusions

Despite being a popular international tourist destination, there is a lack of state-level research in Mexico on the business cycle in the tourism industry, which would help identify the key states contributing to the country's global significance. Accurate understanding of this information is essential for creating effective policies for each destination, as well as ensuring optimal benefits from this sector aligning with the SDG.

With this objective in mind, the MSM is a suitable approach for analyzing intricate systems like tourist movements. MSM serves as a reliable methodology for predicting the economic cycle of each Mexican state between the years 1992 and 2017. While it is confirmed that the supply of international and national destinations in Mexico is wide, the results show that the business cycle of both markets in the federal entities does not present a common pattern between them, nor among states. Each federal entity has a particular business cycle, so projections must be made individually for each market.

During the analyzed period, twelve entities showed a boom a growth rate greater than one. This means that their expansion contributed significantly to the growth of this sector. It should be noted that eleven of these coefficients belong to the economic cycle of the foreign tourist market, a testimony that the economic impact of the international tourist market is greater than that of the national market in the country.

This disaggregated information is relevant for tourism planners and policymakers, who can design an action plan that allows them to transform these attractions considering the challenges that SDG imposed on the industry. Their job is not only to identify the states in which the boom in the international tourist market contributes significantly to the country's tourism growth. They also require data to anticipate stagnation in tourist sites that have not yet developed their potential. Therefore, it is crucial to develop a proactive approach to public policy in this sector rather than a reactive one. States that have substantial tourist markets, both international and domestic, have the potential to predict slowdowns in one market and explore the possibility of substituting it by stimulating growth in the other. In other words, these entities have the ability to adapt their tourism strategies based on the nationality of the visitors in order to diversify their offerings. Gaining a comprehensive comprehension of the economic dynamics of the tourism market will enable the formulation of policies that will aid Mexico in reclaiming its position as one of the highly sought-after global destinations in a manner that ensures long-term sustainability.

Future research should aim to investigate and overcome the limitations of the current study by incorporating data on the different types of destinations available in Mexico, such as sun and beach, cultural, adventure, ethnological, and religious tourism. Additionally, it is crucial to consider the impact of tourism on rural communities and to validate the findings using alternative methodologies. These efforts will provide a more holistic understanding of the tourism industry in Mexico, both at a national and international level.

Table 5 Tourist business cycle represented by the MSM 1992-2017.

State	International Market	National Market
Aguascalientes	X	
Baja California		X
Baja California Sur	X	X
Campeche		
Chiapas		X
Chihuahua		
Coahuila		
Colima		
CDMX		
Durango	X	
Guanajuato	X	
Guerrero		
Hidalgo	X	
Jalisco	X	X
Mexico	X	
Michoacán	X	X
Morelia	X	
Nayarit	X	
Nuevo León		X
Oaxaca	X	
Puebla		X
Queretaro	X	X
Quintana Roo		
San Luis Potosí	X	X
Sinaloa	X	
Sonora	X	
Tabasco	X	X
Tamaulipas		
Tlaxcala	X	
Veracruz	X	
Yucatán	X	
Zacatecas	X	X

Source: Own elaboration.

Ethical considerations

Not applicable.

Conflict of Interest

The author declares no conflicts of interest.

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