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# FINANCIACIÓN DEL TURISMO SOSTENIBLE EN MÉXICO MEDIANTE EL IMPUESTO SOBRE HOSPEDAJE.
# FINANCING SUSTAINABLE TOURISM IN MEXICO THROUGH HOTEL ROOM TAX.

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## RESUMEN

El turismo es una industria dinámica en México. Sin embargo, puede ser perjudicial para el medio ambiente y los espacios públicos (Dogan et al., 2017). El impuesto sobre hospedaje (HRT), un impuesto que depende de las facultades fiscales de los gobiernos estatales de México, puede ser una opción para recaudar los ingresos necesarios para afrontar con éxito este desafío, sin gravar a los proveedores de hoteles ni a la población. Esta recomendación se basa en los resultados de una estimación de mínimos cuadrados generalizados viables utilizando una base de datos de panel del 2004 al 2015.

**Palabras clave**: Impuesto sobre hospedaje, Alquileres a corto plazo, Economía colaborativa, Turismo y desarrollo, Gobiernos locales, México.

**JEL Classification**: H25, H54, H72, Z32, Z38

## ABSTRACT

Evidence shows that tourism is a dynamic industry in Mexico. However, it can be detrimental to the environment and to public spaces (Dogan et al., 2017). Hotel room tax (HRT), a tax resting within the fiscal powers of Mexico's states governments, may be an option to levy the revenue required to successfully address this challenge, without taxing hotel providers, nor the population. This recommendation is based on the results of an

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estimate of feasible generalized least squares using a panel database for 2004-2015.
**Key words**: Hotel Room Tax, Short term rentals, Sharing Economy, Tourism and Development, Local Governments, Mexico.

**JEL Classification**: H25, H54, H72, Z32, Z38

## 1. INTRODUCTION

Evidence shows that tourism has contributed to economic activity in countries where this industry has progressed significantly (Song, Dwyer, Li & Cao, 2012; Sokhanvar, Çiftçioğlu, & Javid, 2018; Lv, 2019). Mexico is no exception (Shahbaz, Ferrer, Shahzad & Haouas, 2018). In 2016, by ranking the country eighth on the list of major international tourist arrivals, the World Tourism Organization (2019) acknowledged Mexico as a touristic nation. However, despite the positive and sizable impact of this industry in Mexico, scant attention has been paid to the generation of the resources required to make tourism sustainable in the long run (Dogan et al., 2017).

It is time that Mexican local governments begin to seriously plan for the preservation of tourist destinations through, on the one hand, the financing of infrastructure and, on the other hand, upgrading these destinations with a view to successfully addressing the ecological needs associated to this activity, avoiding the depletion of public spaces and improving the quality of life of the population.

Mexico is a federal republic comprised by 31 states and a capital city (Mexico City). Since 1980, central government collects the main tax revenues in the country and then distributes these among the federal states through a system of intergovernmental transfers. States have become dependent on these transfers and public debt (Díaz & McLure, 2000; Guillermo & Vargas, 2017). State governments could scan the Hotel Room Tax (HRT) as an alternative to meet the expenses required to promote, support and maintain tourism.

The literature indicates that if a tourist destination applies HRT to generate resources two factors must be considered: the level of tax revenue and, to protect the hotel industry, the "exportability" of the HRT to tourists or visitors. The aim of this research is to analyse the fiscal effort at the state level in Mexico from 2004 to 2015 relying on a panel database for the 31 Mexican states and applying Feasible Generalized Least Squares model (FGLS).

We show that an increase in HRT is a viable option to improve the fiscal performance of states in light of the possibility that they can transfer the tax burden to visitors. This suggests that it would be possible to set in place a state financing system that, first, enhances local public funding without undermining the hotel industry and, second, by increasing public revenue, can contribute to the conservation of the resources (natural, human, etc.,) that make tourism possible in the first place, allowing for the sustainable growth of the industry. Having said that, with a view to preventing asymmetric competition in the lodging market, fiscal policy has to be applied both to formal suppliers, i.e., hotels, and informal ones, i.e., Airbnb and similar providers. A consistent policy across the full spectrum of the market, in combination with transparency in the use of public revenue, would result in HRT having a better chance of being accepted both by traditional lodging suppliers and tourists.

At the general level, this research adds to the literature on the effects of HRT on lodging, which has mainly focused on the case of the United States. At the narrower level, our work contributes to the study of tourism and hotel dynamics in Mexico. To our knowledge, this paper constitutes the first evidence-based study of these dynamics.

This article is organized in three parts. Part 1 presents the economic aspects of collecting tax from tourism services reported in the literature, with a particular emphasis on lodging. In part 2, we describe the importance of the tourism industry in Mexico, and the creation and evolution of HRT in the Mexican states. The model for the estimation, and the corresponding results, are presented in part 3. The article closes with a conclusion.

## 2. ECONOMIC ASPECTS OF TAXING TOURIST HOTEL SERVICES

Governments interested in improving their public finances can apply taxes to the tourism industry (Hughes, 1983). The fiscal impact of these depends on the structure of the market, the relationship between the types of sectors that serve the industry and the characteristics of the rest of the economy.

General taxes can be applied to tourism. For example, sales tax and value added tax (Forsyth & Wyer, 2002). Gooroochurn & Sinclair (2005) list more than 40 indirect taxes in over 10 sectors related to the tourism industry worldwide. Owing to the significant revenue generated by the lodging industry, we have chosen to study the indirect taxes applied to this industry (WTO, 1998, Bird, 1992).

At the theoretical level, the introduction of a hotel tax triggers two questions. The first one is related to the level of tax revenue. The second one has to do with the incidence of the tax itself. Most studies on HRT have focused on the American case. Lee (2014), Hiemstra & Ismail (1993) and Spengler & Uysal (1989) present cases in which, as a result of demand being more elastic than supply, the tax has a detrimental effect on consumption and, therefore, on the local hotel industry. However, Bonham, Fujii, Mi and Mark (1991), Bonham & Gangnes (1996), Fujii, Khaled and Mak (1985) and Combs & Elledge (1979) find that the tax is mostly transferred to tourists when demand is inelastic compared to supply. In these cases, owing to the exportability of the HRT to the tourist, hotel occupancy does not decrease: the use of this tax is justified to generate revenue for local governments.

Among the few exceptions to the study of the American case is Vallés and Zárate (2013) who studied 56 mountain destinations in Spain. They found that taxes on non-residents are used to meet the growing expenses associated to keeping these destinations up to standard, without affecting the hotel industry. Likewise, in 2012, the Parliament of Catalonia introduced an HRT (known as “tourist tax”).

In order to account for differences in the demand for lodging, the tax varies from €0.50 to €2.50 per night per person, depending on the type of accommodation and location. The rates being applied for tourists over 16 years of age in the conventional lodging market are as follows: €2.5/night in five-star hotels and cruise ships, €1.25/night in four-star hotels in Barcelona and €1/night across the rest of Catalonia. The tax is applied only for a maximum of seven overnights. Also, users of informal lodging services, such as Airbnb, are required to pay €0.75 per night in Barcelona and €0.50 everywhere else (Sefeld, 2017).

This tax has not resulted in a reduction of overnight stays (CatalanNews, 2015; Generalitat de Catalunya, 2015). Actually, the number of foreign tourists visiting Catalonia has increased. Consequently, owing to the introduction of this tax, the Catalan Government's revenue has also increased (Sefeld, 2017). The successful introduction of HRT in Catalonia is to a large extent the result of the Catalan government being clear, right from the start, that the point of the tax was to levy revenue to support the protection and conservation of the region’s touristic attractions with a view to making tourism sustainable.

This study seeks to contribute to the literature on the effect HRT on lodging i.e. hotel industry, by studying Mexico, where tourism is one of the fastest growing economic activities. In particular, we will assess whether HRT would result in the improvement of local public finances without harming the hotel industry. If this is indeed the case, the ensuing revenue could be used by local governments to finance the expenditures tourism requires and, in this way, make this activity sustainable.



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## 3. THE IMPORTANCE OF THE TOURISM INDUSTRY AS A DRIVER OF ECONOMIC GROWTH IN MEXICO

The most visible expression of the relevance of tourism for the Mexican economy is given by the generation of foreign currency. The average annual growth of foreign currency earnings associated to tourism in 2000-2018 was 5.7 percent, while the number of international visitors coming to the country increased on average 3.9 percent in the same period (BANXICO, 2019). From 2013 to 2018, both variables experienced double digit growth (10 and 11.4 percent respectively).

The benefits derived from tourism have improved economic performance. According to the National Institute of Statistics and Geography (in Spanish Instituto Nacional de Estadística y Geografía or INEGI), tourism’s share of the Gross Domestic Product (GDP) was 8.2 percent in 2011, rising to 8.7 percent in 2016 (INEGI, 2018). As a result, the International Monetary Fund (2012) included Mexico in the list of tourism-dependent countries.

Hotel services in Mexico account for the highest percentage of the total expenditure of tourists visiting the country (SECTUR-DATATUR, 2014; INEGI, 2018). In Mexico, not all states levy the same number of taxes nor do they apply the same rates. The most common taxes are levied on four categories: HRT, lotteries and raffles, payroll, and entertainment. Each local government determines the rate applicable for the HRT during each fiscal year.

Currently, among the states that charge HRT, it fluctuates between 3 and 5 percent (Santos & Martínez, 2012). In 2015, HRT collection reached 1,897 million pesos, a considerable amount when compared to the revenue collected by the states (INEGI, 2018). Figure 1 shows the distribution of HRT collection for 2015. On top of the list is Quintana Roo state, which received more than fifty percent of the total of international tourists staying at hotels across the country (SECTUR-DATATUR, 2017).

Two particular cases are the State of Mexico and Sonora, which until 2012 the only ones were not charging HRT (they introduced this tax in 2013). In the same year, Tamaulipas dropped this tax, with Puebla following suit in 2015. Despite the variations between states collecting HRT, the amount raised by this tax rose by 87 percent from 2004 to 2015 in real terms (INEGI-SIMBAD, 2017).



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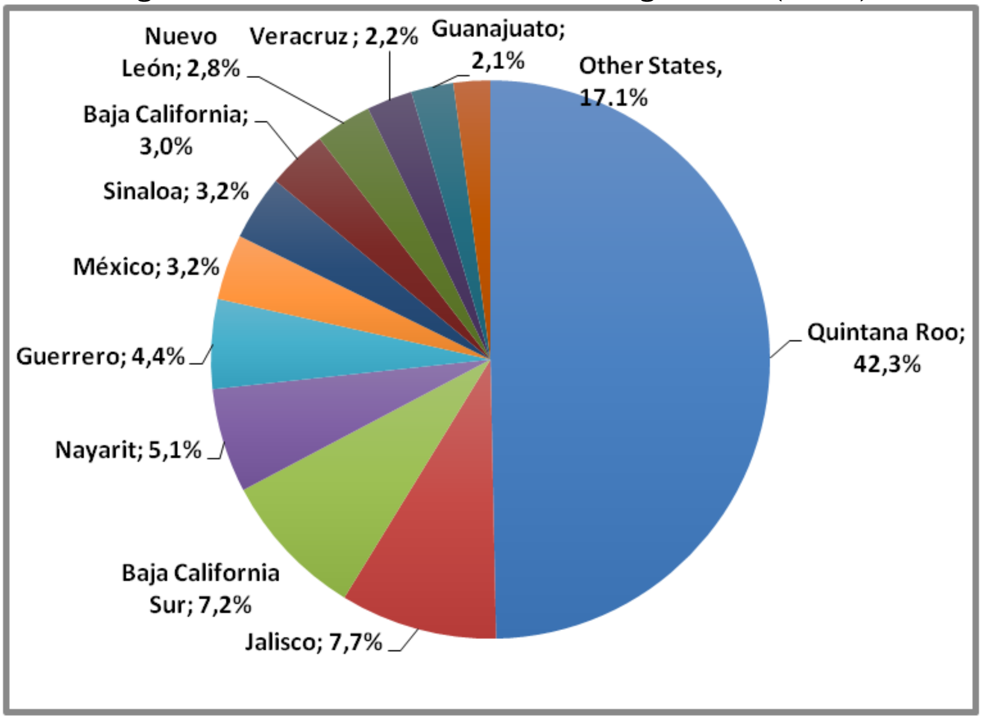
**Figure 1. HRT distribution among states (2015)**




*Source*: Own elaboration. INEGI-SIMBAD database (2017).

In Mexico, tourism is a growing industry with great potential for expansion. However, touristic activity can harm the environment (Frost & Lawrence, 2006). Actually, as tourism increases employment opportunities, governments in developing countries have in the past agreed to touristic projects poorly planned and designed. These can indeed result in environmental degradation (Bozkurt, *et al.*, 2016).

As explained above, HRT collection may be a convenient option for state governments to raise the revenue required to successfully address the challenges tourism poses (Sefeld, 2017) without damaging the hotel industry. Overall, HRT may result in the strengthening of tourism in Mexico.

## 4. MODEL AND ESTIMATION OF THE STATE FISCAL EFFORT IN MEXICO

The Mexican federal government levies the main taxes applied in the country (income and consumption), and then distributes the corresponding revenue among states through conditional transfers (Branch 33 of the federal budget) and non-conditional transfers (Branch 28) (Canavire-Bacarreza & Espinoza, 2013)[3].

In fact, federal transfers account for close to half of the states' revenue, i.e., 42%. Many studies show that intergovernmental transfers have reduced the fiscal effort at the state level (Salazar, Musi & Cervantes, 2001; Ibarra, Sandoval & Sotres, 2005; Sobarzo, 2006; Bonet & Rueda (2011) and Salazar & Mollick, 2010). However, the majority of these analysis rely on cross-sectional models or time series analysis. We instead use panel data analysis.

This is key as the number of observations per individual (states) increases the degrees of freedom, and at the same time, decreases the possibility of multicollinearity among the explanatory variables. These two factors minimize the problem of omission of relevant variables, which is very common in empirical estimations (Hsiao, 1993). The functional form of the model to estimate fiscal effort at the state level in Mexico including the HRT is as follows:

$$logFE_{it} = \alpha_0 + \beta_1 logNCT_{it} + \beta_2 logCT_{it} + \beta_3 logHRTC_{it} + e_{it} \quad (1)$$

Where

$\alpha$ = Constant

$\beta_1$ = Coefficient for non-conditional transfers

$\beta_2$ = Coefficient for conditional transfers

$\beta_3$ = Coefficient for HRT collection

$FE_{it}$ = Own revenue in state i divided by state GDP for year t

$NCT_{it}$ =Share of non-conditional transfers in state i divided by total state income in year t

$CT_{it}$ = Share of conditional transfers in state i divided by total state income in year t

$HRTC_{it}$ = HRT collection in state i for year t

e = Error term

$i$ = State ($i$ = 1…31)

t = Year ($t$= 1…12)

[3] Non-conditional transfers are intergovernmental transfers where the level of government making the transfers to the lower level does not place restrictions on how the funds are to be used. In the public finance literature, these unrestricted transfers are referred to as "general revenue sharing". By contrast, conditional transfers are restricted transfers, i.e., the funds must be used for a specific purpose. Currently, the calculation of non-conditional transfers (participations) received by states is based on the general revenue sharing (Recaudación Federal Participable in Spanish or RFP), which consists of 100 percent of the revenue generated by income tax (ISR), value-added tax (VAT), tax on new cars (ISAN), and 85.3 percent of oil tax. This latter component explains the high dependency of participations on national oil sales.

INEGI is the main source for the data. The data on states' revenues (revenue raised by states and total revenue for each state) were drawn from the State and Municipal Database System (SIMBAD), which is an INEGI application that provides various groups of statistics presented in a disaggregated format by state or municipality (INEGI-SIMBAD, 2017). Owing to the specific fiscal and legal status of Mexico City in relation to the states, it has not been included in the analysis.

The dependent variable is the fiscal effort (FE), which is calculated as the ratio of the state's own revenues within the state GDP[4]. The independent variables are: 1) non-conditional transfers (NCT) out of total state income; 2) conditional transfers (CT) out of total state income and 3) HRT collection adjusted for the National Consumer Price Index for 2011. The sign of $\beta_3$ is expected to be positive; $\beta_1$ and $\beta_2$ are expected to be negative.

First, we estimate the pooled model, the fixed-effects model and the random effects model (Tables 1, 2 and 3).

**Table 1. Pooled model**

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| | | | | Number of obs | 372 |
| | | | | Prob > F = | 0.0000 |
| Model | 13.202 | 3 | 4.401 | R-squared = | 0.1875 |
| Residual | 57.222 | 368 | 0.155 | Adj R-squared = | 0.1808 |
| Total | 70.424 | 371 | 0.190 | Root MSE = | 0.3943 |

| ln FE | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ln NCT | -0.723 | 0.120 | -6.010 | 0.000 | -0.959 | -0.487 |
| ln NCT | -0.287 | 0.099 | -2.900 | 0.004 | -0.482 | -0.093 |
| ln HRTC | 0.088 | 0.017 | 5.210 | 0.000 | 0.055 | 0.122 |
| cons | -6.258 | 0.175 | -35.740 | 0.000 | -6.603 | -5.914 |

*Source*: own estimations

[4] Own revenue consists of tax revenue, fee collection, uses and products. The GDP is used to quantify state production expressed in monetary terms (millions of pesos at current prices, using 2008 as the base year).

**Table 2. Fixed effects model**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Fixed-effects (within) regression** | | | | **Number of obs** | **= 372** | |
| **Group variable: codigonumero** | | | | **Number of groups** | **= 31** | |
| **R-sq: within = 0.2746** | | | | **Obs per group:** | **min =** | **12** |
| **between = 0.0071** | | | | | **avg =** | **12** |
| overall = 0.0402 | | | | | max = | 2 |
| | | | | **F(3,338) =** | **42.65** | |
| **corr(u_i, Xb) =** | **-0.5441** | | | **Prob > F =** | **0.00000** | |
| **ln FE** | **Coef.** | **Std. Err.** | **t** | **P>\|t\|** | **[95% Conf.** | **Interval]** |
| **ln NCT** | **0.456** | **0.180** | **2.540** | **0.012** | **0.103** | **0.810** |
| **ln NCT** | **-1.135** | **0.143** | **-7.910** | **0.000** | **-1.417** | **-0.852** |
| **ln HRTC** | **0.084** | **0.027** | **3.090** | **0.002** | **0.031** | **0.138** |
| **cons** | **-5.720** | **0.161** | **-35.490** | **0.000** | **-6.037** | **-5.403** |
| **sigma_u** | **0.437** | | | | | |
| **sigma_e** | **0.239** | | | | | |
| **rho** | **0.769** | **(fraction of variance due to u_i)** | | | | |
| **F test that all u_i=0:** | **F(30,338) =** | | **22.13** | | **Prob > F =** | **0.00000** |

*Source*: own estimations



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**Table 3. Random effects model**

| | | | | | | |
|---|---|---|---|---|---|---|
| Random-effects GLS regression | | | Number of obs | = 372 | | |
| Group variable: codigonumero | | | Number of groups | = 31 | | |
| R-sq: within = 0.2645 | | | | Obs per group: | min = | 12 |
| between = 0.0341 | | | | | avg = | 12 |
| overall = 0.0815 | | | | | max = | 12 |
| | | | Wald chi2(4) = | | 112.28 | |
| corr(u_i, X) = 0 (assumed) | | | Prob > chi2 = | | 0.000 | |
| ln FE | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. Interval] | |
| ln NCT | 0.060 | 0.156 | 0.390 | 0.699 | -0.245 | 0.366 |
| ln NCT | -0.830 | 0.125 | -6.660 | 0.000 | -1.075 | -0.586 |
| ln HRTC | 0.091 | 0.025 | 3.690 | 0.000 | 0.042 | 0.139 |
| cons | -5.897 | 0.164 | -36.050 | 0.000 | -6.218 | -5.576 |
| sigma_u | 0.320 | | | | | |
| sigma_e | 0.239 | | | | | |
| rho | 0.642 | (fraction of variance du to u_i) | | | | |

*Source*: own estimations

Subsequently, we select fixed-effect model as a result of Hausman Test (Table 4).

**Table 4. Hausman Test**

| | (b) fixed | (B) random | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| ln NCT | 0.456 | 0.060 | 0.396 | 0.090 |
| ln NCT | -1.135 | -0.830 | -0.304 | 0.071 |
| ln HRTC | 0.084 | 0.091 | -0.006 | 0.012 |

**b = consistent under Ho and Ha; obtained from xtreg**
**B = inconsistent under Ha, efficient under Ho; obtained from xtreg**
**Test: Ho: difference in coefficients not systematic**
**chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)**
**= 19.72**
**Prob>chi2 = 0.00020**
**(V_b-V_B is not positive definite)**

*Source*: own estimations



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However, the Wooldridge test indicates the presence of Autocorrelation (Table 5).

**Table 5.**
**Wooldridge test for autocorrelation in panel data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Linear regression** | | | | **Number of obs = 341** | | |
| **F(3, 30) = 3.34** | | | | | | |
| **Prob > F = 0.0323** | | | | | | |
| **R-squared = 0.0422** | | | | | | |
| **Root MSE = .2341** | | | | | | |
| **(Std. Err. adjusted for 31 clusters in codigonumero)** | | | | | | |
| **Robust** | | | | | | |
| **ln FE** | **Coef.** | **Std. Err.** | **t** | **P>\|t\|** | **[95% Conf.** | **Interval]** |
| **ln NCT D1** | **0.014** | **0.146** | **0.100** | **0.922** | **-0.284** | **0.313** |
| **ln NCT D1** | **-0.427** | **0.230** | **-1.860** | **0.073** | **-0.897** | **0.043** |
| **ln HRTC D1** | **0.088** | **0.043** | **2.030** | **0.052** | **-0.001** | **0.177** |
| **Wooldridge test for autocorrelation in panel data** | | | | | | |
| **H0: no first-order autocorrelation** | | | | | | |
| **F( 1, 30) = 30.814** | | | | | | |
| **Prob > F = 0.0000** | | | | | | |

*Source*: own estimations

Also, the Lagrangian Multiplier test by Breusch and Pagan shows that the variance of the residuals is not equal to zero and, therefore, the model presents heteroscedasticity and is inefficient, i.e., the estimator does not have minimal variance (see Table 6).

**Table 6. Breusch and Pagan test**

| | | |
|---|---|---|
| **Breusch and Pagan Lagrangian multiplier test for random effects** | | |
| | **Var** | **sd= sqrt(Var)** |
| **ln FE** | **0.190** | **0.436** |
| **e** | **0.057** | **0.239** |
| **u** | **0.103** | **0.320** |
| **Test: Var(u) = 0** | | |
| **chibar2(01) = 686.21** | | |
| **Prob > chibar2 = 0.0000** | | |

*Source*: own estimations

Consequently, we turn to the Feasible Generalized Least Squares (FGLS)[5] method, checking for omitted variables

[5] Hansen (2007) shows that the FGLS method estimates more efficient estimators in fixed effects panel with autocorrelation than the OLS method. For an application of the FGLS method, see Yong (2014).

through the Ramsey RESET test[6]. This test confirms no variables are being omitted (see no significance in yhat squared in Table 7)[7].

**Table 7. Ramsey Regression Equation Specification Error (RESET) test**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Cross-sectional time-series FGLS regression** | | | | **Panels: heteroskedastic** | | |
| **Coefficients: generalized least squares** | | | | **Correlation:no autocorrelation** | | |
| **Estimated covariances = 31** | | | | **Number of obs = 372** | | |
| **Estimated autocorrelations = 0** | | | | **Number of groups = 31** | | |
| **Estimated coefficients = 5** | | | | **Time periods = 12** | | |
| **Wald chi2(4) = 177.27** | | | | | | |
| **Prob > chi2 = 0.0000** | | | | | | |
| **ln FE** | **Coef.** | **Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** | |
| **ln NCT** | **1.217** | **1.308** | **0.930** | **0.352** | **-1.346** | **3.780** |
| **ln NCT** | **1.030** | **1.108** | **0.930** | **0.352** | **-1.141** | **3.201** |
| **ln HRTC** | **-0.141** | **0.151** | **-0.930** | **0.352** | **-0.438** | **0.156** |
| **yhat** | **0 (omitted)** | | | | | |
| **yhat2** | **-0.351** | **0.264** | **-1.330** | **0.184** | **-0.869** | **0.167** |
| **_cons** | **6.291** | **9.305** | **0.680** | **0.499** | **-11.947** | **24.529** |

*Source*: own estimations.

The FGLCS results are as follows. In Table 8, the sign of both $\beta_1$ and $\beta_2$ confirms the negative relationship between intergovernmental transfers and the states' fiscal effort that the literature has extensively documented. In addition, the sign of $\beta_3$ indicates a positive and significant relationship between HRT collection and the fiscal effort of the states, contrary to the effect of the intergovernmental transfers. Whilst the coefficient for HRT is lower in absolute terms (0.0593) than those for non-conditional transfers (-0.5175) and conditional ones (-0.4386), our results indicate that HRT is an option state governments could rely on to support sustainable tourism: a 1 percent increase in HRT results in a fiscal effort increment of 5.9 percent.

[6] This test consists of running the original regression keeping the estimated dependent variable. The original regression is then run but the squared estimate of the dependent variable is added as an independent variable. If the squared estimate of the dependent variable is found to be significant, a variable is indeed being omitted.

[7] Models using panel data do not often have multicollinearity problems. However, in order to rule out this possibility, we estimated the severity of the multicollinearity through the Variance Inflation Factor (VIF) test. We found that the model does not exhibit collinearity.

**Table 8. Econometric results**

| Independent Variables | Coefficient |
|---|---|
| Non-conditioned Transfers | -0.5171*** [0.079] |
| Conditioned Transfers | -.4386 *** [0.066] |
| HTR Collection | 0.0593 *** [0.0104] |
| Constant | -6.069 [0.110 ] |
| Observations | 372 |
| Wald chi-squared | 173.43 |

Note: ***significant at 1%, **significant at 5% and *significant at 10%.

*Source*: own estimations.

To complement and enhance the above results, we used the FGLS method to calculate the elasticity of demand for hotel rooms in relation to HRT at the national level. The model for this calculation is as follows:

$$logS_{it} = \alpha_0 + \beta_1 logHRTC_{it} + \beta_2 logGDP_{it} + e_{it} \quad (2)$$

where α = constant, $\beta_1$ = coefficient for HRT collection, $\beta_2$ = coefficient for Gross Domestic Product, and $S_{it}$ = tourists staying in hotels in state $i$ in year $t$. As the estimated value for $\beta_1$ is smaller than 1, the percentage change for demand for hotel rooms is smaller than the percentage change for HRT.

**Table 9. Tourism demand for hotel rooms**

Coefficients: generalized least squares

**Panels: heteroskedastic**
**Correlation: no autocorrelation**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Estimated covariances = 31** | | | **Number of obs = 372** | | | |
| **Estimated autocorrelations = 0** | | | **Number of groups = 31** | | | |
| **Estimated coefficients = 3** | | | **Time periods = 12** | | | |
| | | | **Wald chi2(2) = 1375.53** | | | |
| | | | **Prob > chi2 = 0.0000** | | | |
| **ln S** | **Coef.** | **Std. Err.** | **z** | **P>** | | |
| **logGDP** | **0.165** | **0.019** | **8.560** | **0.000** | **0.127** | **0.202** |
| **log HRT Collection** | **0.465** | **0.013** | **35.460** | **0.000** | **0.439** | **0.491** |
| **cons** | **11.695** | **0.239** | **48.980** | **0.000** | **11.227** | **12.163** |

*Source*: own estimations.

This indicates that the demand for hotel rooms at the national level is inelastic in relation to changes in HRT (this FGLS estimation is available in Table 9).

Based on the above results, we submit that variations in HRT can be an option to finance sustainable tourism in Mexico, without harming hotel providers. In order to explore what states are more likely to require revenue to meet growing expenses associated to an increase in tourism, and therefore could benefit from HRT, following from the above estimations, we controlled for intergovernmental transfers and HRT collection, and analyzed the values of intercepts.

This allows us to assess the individual performance of each state: a higher intercept means a higher fiscal effort. Table 10 presents the numerical value of intercepts for each state.

**Table 10. Intercepts from FGLS method for each state**

| State | Coefficient | State | Coefficient | State | Coefficient | State | Coefficient |
|---|---|---|---|---|---|---|---|
| Chihuahua | -41,276 | Sonora | -47,440 | Tamaulipas | -48,471 | Veracruz | -50,399 |
| Chiapas | -42,828 | Querétaro | -47,625 | Puebla | -48,635 | Coahuila | -50,399 |
| Mexico | -43,042 | Hidalgo | -47,893 | Durango | -48,998 | Jalisco | -50,659 |
| Quintana Roo | -45,150 | Baja California | -47,943 | Michoacan | -49,238 | Aguascalientes | -51,578 |
| Oaxaca | -46,906 | Guanajuato | 48,208 | Yucatan | -49,507 | Morelos | -51,936 |
| Sinaloa | -47,017 | Baja California Sur | -48,353 | Tlaxcala | -49,889 | Tabasco | -54,589 |
| Zacatecas | -47,079 | Colima | -48,375 | Guerrero | -50,029 | Campeche | 60,776 |
| Nuevo León | -47,182 | Nayarit | -48,439 | San Luis Potosí | -50,196 | | |

*Source*: own estimations

In Table 11, we rank states from higher to lower fiscal effort and include their main touristic destinations.



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**Table 11. Priority tourist destinations by state**

| | State | Priority tourist destinations | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Chihuahua | Chihuahua | | | | | |
| 2 | Chiapas | Juárez | | | | | |
| 3 | México | Ixtapan de la Sal | Malinalco | | | | |
| 4 | Quintana Roo | Cozumel | Progreso | Holbox | Benito Juárez | Solidaridad | Tulum |
| 5 | Oaxaca | Oaxaca de Juárez | Santa Mª Huatulco | | | | |
| 6 | Sinaloa | Mazatlán | | | | | |
| 7 | Zacatecas | Zacatecas | | | | | |
| 8 | Nuevo León | Monterrey | | | | | |
| 9 | Sonora | Hermosillo | | | | | |
| 10 | Querétaro | Santiago de Querétaro | | | | | |
| 11 | Hidalgo | Pachuca de Soto | | | | | |
| 12 | Baja California | Ensenada | Tijuana | | | | |
| 13 | Guanajuato | Guanajuato | León | | | | |
| 14 | Baja California Sur | Los Cabos | | | | | |
| 15 | Colima | Manzanillo | | | | | |
| 16 | Nayarit | Saluyita | | | | | |
| 17 | Tamaulipas | Tampico | | | | | |
| 18 | Puebla | Puebla de Zaragoza | | | | | |
| 19 | Durango | Durango | | | | | |
| 20 | Michoacan | Morelia | | | | | |
| 21 | Yucatan | Mérida | | | | | |
| 22 | Tlaxcala | Tlaxcala | | | | | |
| 23 | Guerrero | Acapulco de Juárez | José Azueta | | | | |
| 24 | San Luis Potosí | San Luis Potosí | | | | | |
| 25 | Veracruz | Tuxtla Gutierrez | Tecolutla | Boca del Río | Xalapa | Tlacotalpan | |
| 26 | Coahuila | Torreón | | | | | |
| 27 | Jalisco | Guadalajara | Puerto Vallarta | San Juan de los Lagos | Bahía de Banderas | | |
| 28 | Aguascalientes | Aguascalientes | | | | | |
| 29 | Morelos | Cuernavaca | | | | | |
| 30 | Tabasco | Villahermosa | | | | | |
| 31 | Campeche | Campeche | | | | | |

*Source*: own research.

On top of the list is Chihuahua, the state with the highest volume of exports as a percentage of its GDP and the number two, in terms of foreign investment reception (IMCO, 2016). It must also be noted that Chihuahua's economic competitiveness has significantly increased in recent years (IMCO, 2016) and, at the same time, the state ranks sixth in terms of tourist arrivals at hotels in Mexico. Zacatecas and Nuevo León also



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attract a high number of visitors and, like Chihuahua, have improved their economic competitiveness in recent times.

Actually, based on an analysis we conducted pooling information provided by the Secretariat of Tourism through a number of surveys, and controlling for both the residency of the visitors (domestic or overseas) and the flow of expenditures made by tourists in 2007-2013, we estimate that between 14.1 and 15 percent of the people visiting Mexico do so because of work or for business (SECTUR-CESTUR, 2008; SECTUR-CESTUR, 2012; SECTUR-DATATUR, 2011a; SECTUR-DATATUR, 2011b; SECTUR-DATATUR, 2014).

The above suggests that, on the one hand, states are visited by people not necessarily seeking to spend time under the sun at the very famous Mexican beaches (Chihuahua, Nuevo Leon and Zacatecas are land-locked) and, on the other hand, even in states where the fiscal effort is stronger, such as Chiapas, Oaxaca, Quintana Roo and the State of Mexico, an increase in HRT might be required to raise extra revenue to cover the expenses needed to support the ecological demand resulting from a large growing number of visitors. For instance, Quintana Roo was the state with the largest air passenger flow in the national market during 2016 (IMCO, 2016), and is among the three most visited states (CONCANACO, 2017).

The state's most likely to benefit from HRT are therefore those that we would have expected, i.e., those offering traditional touristic attractions. However, states like Chihuahua, where economic activity and the business environment are strong, would also benefit from HRT.

## 5. CONCLUSIONS

In recent years, Mexico has become a touristic nation at the international level. However, the literature on Mexico has to date not explored how to cover the financial needs resulting from the negative effects inherently associated to tourism, nor has it discussed how to ensure tourism sustainability.

This article assesses the possibility of improving the financial position of Mexico's states through the use of HRT. To our knowledge, this is the first study of this kind for Mexico. Our results also contribute to the general literature on HRT and lodging, which mostly focuses on the American case, by showing that, as other studies have also suggested, HRT can indeed increase revenue without necessarily decreasing hotel occupancy.

The results also confirm that, as highlighted in the corresponding literature, the current Mexican fiscal system has resulted in state governments depending on intergovernmental transfers. However, by submitting that HRT can be used to



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enhance local revenue collection, our work indicates that it would be possible to improve local finances within, or as part of, the current Mexican fiscal system.

Whilst the costs associated to tourism sustainability are not negligible (for instance, the cost of water and energy provision, and waste management), we provide evidence showing that the HRT could be used for meeting such costs and facilitating the preservation of tourist attractions without burdening the hotel industry nor the population.

Whilst an increase in HRT can allow state governments to meet their increasing need for public funds, primarily in those states that offer the best business environment or key tourist locations, a detailed analysis must be conducted for each of Mexico's destinations: if HRT can indeed be transferred to the tourist, rather than it being covered by the local service provider, levying HRT will be successful in terms of tax incidence. This is important and should be considered when planning for fiscal measures that could affect the hotel industry (Solnet, Paulsen & Cooper, 2010). In addition, it is key to take into account that, as documented by Guttentag (2015) and Gutiérrez *et al*. (2017), the growth of unconventional lodging providers has adversely affected both conventional providers and residential areas: any HRT to be introduced, or any increases in HRT, should therefore be applied both to traditional and non-traditional lodging suppliers.

When designing fiscal policy, state governments should consider all the relevant factors at the economic and environmental levels. For instance, as the introduction of this tax will not be straightforward, the authorities would need to work with their constituents with a view to securing support for HRT. The more information people have about HRT and its benefits, the more likely they are to be supportive of it. Transparency in relation to the use of public funds is also crucial to secure support for the tax, and for Mexico to consolidate itself as a sustainable tourist destination.

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