# The effects of crime on tourism: A multiple regression analysis

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**ABSTRACT**

Safety has become one of the most decisive factors when planning and organizing a trip in the 21st century. Accordingly, different tourism industry and government organizations have established policies and mechanisms to inform and warn their citizens about the dangers or risks of traveling to other places around the world. Homicide is the most important factor for issuing these official notices. This article evaluates the effect of the number of homicides recorded from 2006-2016 on the influx of domestic and foreign (American and Canadian) visitors to a destination on the Mexican Pacific coast, using econometric techniques such as multiple linear regression. Some of the results establish a relationship between homicides and the level of tourism. Similarly, the statistical evidence shows that the number of homicides has a moderate influence on travel by foreign visitors to this destination but not on their actual stay there.

## 1. INTRODUCTION

Travel and tourism have become a sector of great economic importance around the world in the 21st century. Data published by the United Nations World Tourism Organization indicate that in 2016 this activity accounted for 10% of worldwide GDP, generated one out of every ten jobs, and represented 7% of world exports totaling USD 1.4 billion. Likewise, there were 1.235 billion international tourist arrivals in 2016—3.5% more than the previous year.

Even though the international travel and tourism industry is growing according to the latest estimates of the UNWTO, there are regions that show inconsistent and declining trends during certain periods. This suggests that several factors converge to decrease the level of competitiveness in the tourism sector of certain nations competing for the same market. For example, according to the ranking by nation of international tourist arrivals that the UNWTO publishes annually, Mexico went from tenth to thirteenth during 2012. A year later it would drop two more rungs to fifteenth place. Despite this, it climbed back to tenth place in 2014 thanks to a 20.5% increase in visitors over the previous year. It rose to ninth place in 2015 and then to eighth place one year later.

In the case of Mexico, several domestic studies link the decrease in its main tourism indicators, its deteriorating image and the negative perception of the destination with the gradual increase in the crime rate in the country. This situation resulted in a reduction in visitor flows and in various tourism and economic indicators, segments, and activities and, consequently, a decrease in competitiveness [7, 18, 21-22, 24]. In 2009, this increase in the crime rate caused an unprecedented security problem in the country, as the federal government adopted a strategy of declaring war on drug trafficking, specifically against organized crime. This unleashed a spike in various crimes, especially homicides [17].

In this national context, we examine the tourist port of Mazatlán in the Mexican state of Sinaloa, a state that is usually associated with a perennial fight by the government against cartels dedicated to all types of drug trafficking [8, 24]. Since the end of the 20th century, drug trafficking has been identified as the number one criminal activity worldwide (Benítez, 2000). This situation, coupled with the increase in violence around the state since 2009, has caused Sinaloa to be classified as unsafe, with a number of related travel alerts. In addition, the governments of Canada and the U.S., two countries that are the top sources of tourists to this travel destination, have recommended avoiding non-essential travel to Sinaloa.

Nevertheless, official figures show the dynamism of the tourism sector in Mazatlán, the main Sinaloan tourist destination, *"whose natural and scenic beauty is due to its beach and natural resources"* [24]. Mazatlán had 181 places of lodging registered in 2015: 138 hotels, 14 motels, 8 guest houses, 1 cabin, 6 inns, 9 trailer parks, and 18 other types of lodging such as bungalows, camping facilities, condominiums, apartments, hostels and villas. This provides a total of 11,457 rooms offered as accommodation [18].

The tourism business is clearly sensitive to external and internal factors that demotivate interest in travel, one of them being security. In this regard, this article aims to answer the following questions: Does the traveler value safety when planning travel and during travel? Do travel alerts such as the ones issued by the Canadian and U.S. governments influence travel decisions by their citizens? Is the homicide rate a relevant factor when assessing travel safety? With respect to this last question, one of the purposes of this study is to evaluate the influence of homicide rates using econometric techniques.

## 2. SECURITY AND TOURISM: A THEORETICAL-METHODOLOGICAL APPROACH

In current times, while security is a concept linked to law, territory or state [19], in a globalized society, it has diverse definitions, manifestations and compositions; thus, it is a multi-faceted word [6]. However, regardless of the emphasis or context, it is clear that most tourists will not spend their money to visit a destination where their safety and well-being may be in danger [9]. Consequently, consumer behavior in the purchasing process, especially in the case of tourism products, is very sensitive to the perception of the safety and risk of the destination to be visited [10].

From a scientific perspective, the determination of the importance and influence of safety in tourism has been presented in various academic studies and scientific research, particularly those that analyze the perceptions of visitors about a specific destination using different methodological strategies, primarily surveys and questionnaires [2, 4, 12, 15, 16, 28]. On the other hand, Santamaría and Flores [24] suggest approaching and understanding this phenomenon on the basis of four possible scenarios in which certain related events may affect a particular tourist destination in various ways. These related events include not only those that have violent manifestations but also those that cause insecurity but may not necessarily result in physical or economic damage. However, their model is not capable of evaluating the real impact of violence or insecurity on a tourist destination with mathematical precision.

In addition, it has been suggested that the crime with the greatest impact on tourism activity is theft [20], while others claim that the crime that causes the largest decrease in a destination's tourism competitiveness is intentional homicide. However, beyond theoretical and descriptive approaches, there are also scientific publications in different disciplines that attempt to link tourism with security or violence from a more comprehensive perspective by applying various mathematical and statistical techniques, ranging from elementary correlations of one or two elements to the use of methodologies and tools with a greater degree of empirical depth.

For example, Baker and Stockton [3] evaluate the relationship between the number of tourists and crime by comparing two U.S. cities over a 12-year period (2000-2012), using crime data that they transformed into crime indices. The Pearson correlation coefficient was used to establish the scope of the relationship (number of visitors and crime rate). However, the study reveals a significant decrease in crimes and crime rates over the last eight years. Although they note that both Las Vegas, Nevada, and Honolulu, Hawaii, show a significant correlation between the number of visitors and certain crimes such as theft or assault, determining how specific crimes or numbers of crimes are associated with decreases or increases in visits to these destinations is impossible. That is, the same weight is given to all crimes.

Furthermore, Altindag [1] applies an econometric perspective based on European country data recorded over a 9-year period and analyzes the influence of crime on international tourist activity in order to estimate its influence in 35 European countries. Although the use of diverse databases and subsequent aggregation to derive rates involves a more complex methodological design, there are weaknesses. For example, the results of the study are very general, and they do not specify the countries in which the crime rate has a significant impact on income from international tourism.

Ceron and Silva [7] also apply an econometric analysis perspective and use the number of homicides as a variable to evaluate the tourism-insecurity relationship based on the number of international visitors to Mexico. Notably, their results indicate that any significant change in homicides produces a negative and significant effect on the time series of the number being evaluated. Finally, Flores and Leyva [13] assess the public safety of sunshine and beach tourism municipalities in Mexico using a multi-criteria analysis tool based on the ELECTRE III method and the use of a multi-purpose evolutionary algorithm. This results in a recommendation, or rather a ranking of places in descending order base on level of public security, that is useful for identifying the places with a higher value or security level than others with respect to crimes or crime rates.

## 3. METHODOLOGY

This study was conducted in a context where security assumes an important role when deciding to leave one's residence, coupled with the ongoing practice of providing recommendations or alerts to foreign citizens about visits to Mexico as a country or a particular geographic space regardless of whether there is a quantifiable or merely subjective danger. The method used to carry out data collection and thus fulfill the proposed objectives is based on documentary research techniques with a quantitative focus that uses a multiple linear regression model.

Tourism indicators, such as the number of visitor arrivals, lodging occupancy rate and the number of domestic and foreign flights and passengers grouped into time series from 2006 to 2016, were collected from the Integrated Information System for Tourism Markets database [25]. Crime data, specifically the number of homicides, were obtained from the Executive Secretariat of the National Public Security System.

The aim of the multiple regression is to analyze a model that purports to explain the behavior of a variable (endogenous, explanatory or dependent variable), designated Y, using information yielded by the values of a set of explanatory variables (exogenous or independent), designated $X_1, X_2, ..., X_k$. Both the exogenous and the endogenous variables are quantitative. The linear model (econometric model) is thus given in the following form:

$$Y = b_0 + b_1X_1 + b_2X_2 + ... + b_kX_k + u$$

The coefficients (parameters) $b_1, b_2,..., b_k$ denote the magnitude of the effect that the explanatory variables (exogenous or independent) $X_1, X_2, ..., X_k$ have on the explanatory variable (endogenous or dependent) Y. The coefficient $b_0$ is the constant (or independent) term of the model. The term $u$ is the error term of the model. A set of $T$ observations is available for each of the endogenous and exogenous variables. Thus, the model can be written in the following form:

$$Y = b_0 + b_1X_1 + b_2X_2 + ... + b_kX_k + u \qquad t: 1, 2, 3, ..., T$$

The presence (not necessary) of an independent term in the model can be interpreted as the presence of a first variable $X_0$ whose value is always 1.

The fundamental problem addressed is the following:

assuming that the relationship between the $Y$ variable and the set of variables $X_1, X_2, ..., X_k$ is as described in the model and that a set of $T$ observations exists for each of the endogenous and exogenous variables, then how can numerical values be assigned to parameters $b_0, b_1, b_2, ..., b_k$ based on the sample information? These values will be called parameter estimates.

Once the model parameter estimates have been determined, it is possible to make predictions about the future behavior of the $Y$ variable. Therefore, the linear model was formulated based on the following hypotheses:

- Variables $X_1, X_2, ..., X_k$ are deterministic (they are not random variables), since their value is a constant derived from the sample taken.
- The $u$ variable (error term) is a random variable with zero expectation and a constant diagonal covariance matrix (scalar matrix). That is, for all $t$, the variable $u_t$ has a mean of zero and $r_2$ variance not dependent on $t$. In addition, $Cov(u_i, u_j) = 0$ for all $i$ and for all $j$ that are different from each other. The fact that the variance of $u_t$ is constant for all $t$ (not dependent on $t$) is called the hypothesis of homoscedasticity. The fact that $Cov(u_i, u_j) = 0$ for all $i$ different than $j$ is called the *no auto-correlation* hypothesis.
- The $Y$ variable is random since it depends on the random $u$ variable.
- The absence of specification errors is also assumed. That is, it is assumed that all the $X$ variables that are relevant for explaining variable $Y$ are included in the definition of the linear model.

- The variables $X_1, X_2, ..., X_k$ are linearly independent. That is, there is no exact linear relationship between them. This hypothesis is called the hypothesis of *independence*, and when it is not met, it is said that the model presents *multicollinearity*.
- Sometimes, the hypothesis of normality of residuals is considered, as long as the $u_t$ variables are normal for all $t$.

Finally, this research does not purport to ascribe or align some economic, social or political theory to the data; the intention is to provide a model based on the evidence. Thus, an annual time series (2006-2016) is considered. The exercise was conducted in SPSS version 19. We sought to fit the model with the R and R squared results.

## 4. RESULTS

The analysis presented above aims to demonstrate the relationship between homicides and hotel occupancy, including the occupancy percentage rate of domestic and foreign tourists. Tables 1 and 2 summarize the essential characteristics of the model and the ANOVA table, whose p-value for the F statistic indicates joint significance of the model's estimated parameters because it is very small. The result obtained for the Durbin-Watson statistic is 2.860, which, since it is above 2, indicates the absence of correlation problems. In addition, the R and R squared values are close to 1, which confirms a correlation between the variables used in the model.

**Table 1.** Summary of the model

| Model | R | R squared | R squared adjusted | Standard error of the estimate | Change statistics | | | | | Durbin-Watson |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Change in R squared | Change in F | gl1 | gl2 | Sig. F-change | |
| 1 | .876ᵃ | .767 | .581 | 72.440 | .767 | 4.115 | 4 | 5 | .076 | 2.860 |

a. Predictive variables: (Constant), PExt, PNac, TurExt, TurNac.
b. Dependent variable: Homicide.
Source: Prepared by the authors.

**Table 2.** ANOVAᵃ

| Model | | Sum of squares | gl | Quadratic mean | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 86378.406 | 4 | 21594.601 | 4.115 | .076ᵇ |
| | Residual | 26237.994 | 5 | 5247.599 | | |
| | Total | 112616.400 | 9 | | | |

a. Dependent variable: Homicide.
b. Predictive variables: (Constant), PExt, PNac, TurExt, TurNac.
Source: Prepared by the authors.

Tables 3 and 4 present the estimations of the coefficients model (homicides = 848.736 + 0.002 TurNac + -0.001 TurExt + 50.856 PNac + -81.909 PExt) and their 95% confidence intervals. The individual significance of the estimated parameters is very good, as the p-values (Sig. column) are very low for national tourism and for the percentage of national occupancy.

**Table 3.** Coefficientsᵃ

| Model | | Non-standardized coefficients | | Standardized coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. error | Beta | | |
| 1 | (Constant) | 848.736 | 1107.682 | | .766 | .478 |
| | TurNac | .002 | .001 | | 4.398 | 2.541 | .052 |
| | TurExt | -.001 | .002 | | -.536 | -.662 | .537 |
| | PNac | 50.856 | 18.883 | | 1.530 | 2.693 | .043 |
| | PExt | -81.909 | 38.628 | | -4.028 | -2.120 | .087 |

a. Dependent variable: Homicide.
Source: Prepared by the authors.

**Table 4.** Coefficientsᵃ

| Model | 95.0% Confidence interval for B | | Correlations | | | Co-linearity statistics | |
|---|---|---|---|---|---|---|---|
| | Lower limit | Upper limit | Zero order | Partial | Semi partial | Tolerance | FIV |
| 1 (Constant) | -1998.652 | 3696.123 | | | | | |
| TurNac | .000 | .003 | -.032 | .751 | .549 | .016 | 64.290 |
| TurExt | -.005 | .003 | .619 | -.284 | -.143 | .071 | 14.083 |
| PNac | 2.316 | 99.396 | -.090 | .769 | .581 | .144 | 6.924 |
| PExt | -181.205 | 17.386 | -.342 | -.688 | -.458 | .013 | 77.449 |

a. Dependent variable: Homicide.
Source: Prepared by the authors.

Chart 1 presents a histogram for the dependent variable as well as the normality of the residuals that corroborate this normality. Therefore, the normality hypothesis does not present a problem.
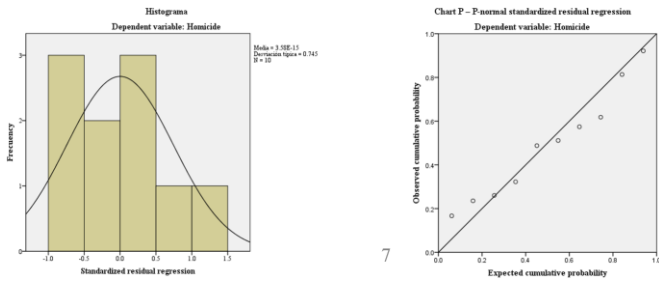
Source: Prepared by the authors.



**Figure 1.** Histogram for the dependent variable and normality of the residuals

## 5. CONCLUSION

In a globalized world, and in the revolutionary context of digital media, the possibility that any region can experience certain conditions of insecurity is more than clear and verifiable. In turn, this represents a constant challenge for the governments of every nation, as it is their responsibility for looking after the interests of its residents and visitors, and they must establish mechanisms to enable the best possible security, even though, regardless of the social context, at no time can absolute security—a zero crime rate—be guaranteed. However, it is possible to optimize measures to reduce the possibility of threats materializing, thus reducing the indicators of insecurity, through concrete spatial studies that include and integrate the social constructs for each scenario in that moment in time. This must be carried out without falling into the dichotomous mirage of establishing two sides, the safe and the unsafe, or as established by Korstanje [19], spaces with civilized people and barbarians.

Likewise, according to the results of this and other similar studies [7, 14], an increase in insecurity as manifested in the principal crime indicators does not necessarily correspond to a significant impact. In every case, the impact is marginal and limited to particular destinations and does not broadly affect the whole industry. Such is the case of this study wherein, although referring to a particular destination, the econometric techniques used identified a moderate decrease in the arrival of foreign tourists and number of flights but no effect on the national market, which even shows an increase.

This situation reflects a contradiction. Although the number of homicides is associated with an increase in insecurity and is also one of the indicators used by the U.S. and Canadian governments to issue their travel alerts regarding the tourist port of Mazatlán and the state of Sinaloa, it is clear that the impact is minimal. In contrast, there is a marked increase in the domestic tourism indicators, especially as of 2013. It is possible, then, that individuals in their own country perceive less danger, or feel that their country is safer, than foreigners do. It is necessary to delve deeper into the topic and perform further analyses in different regions or where violence is more severe such as regions with permanent terrorism problems.

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