Does violent crime scare tourists away? Panel data evidence from 32 mexican states[1]

¿El crimen violento ahuyenta el turismo?
Evidencia con datos en panel de 32 estados mexicanos

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- **Abstract:** The scaling up of violent crime in México is often characterized as detrimental to the Mexican tourism industry. However, no econometric study so far challenges this claim with data. This paper therefore empirically analyzes the impact of crime on the arrivals of tourists in México for the period 1990 to 2010. Using a panel data set for the 31 Mexican federal states and México City, I find a negative and significant effect of homicides on the number of tourists arriving. This finding is robust to alternative estimation techniques and samples. Furthermore, when disaggregating the tourist arrival data into local and international, I find that international tourists seem to be more intimidated from homicides than locals.

- **Keywords:** Violent crime, tourist arrivals, panel data.

- **JEL classification:** C33, C36, O17, O54.

- **Resumen:** El aumento del crimen violento en México ha sido considerado como negativo para la industria turística mexicana. Sin embargo, no se cuenta con un estudio econométrico que confronte este argumento con datos estadísticos. El presente artículo analiza empíricamente el impacto que el crimen violento tiene en las llegadas de turistas a México para el periodo 1990 a 2010. Utilizando datos panel para los 31 estados mexicanos y la Ciudad de México, encuentro un efecto negativo y significativo de los homicidios sobre las llegadas de turistas. Este hallazgo es robusto a diferentes técnicas de estimación y muestras. Además, cuando se desagrega la información de llegadas de turistas en locales e internacionales, encuentro que los turistas internacionales se intimidan más por la presencia de crimen violento que los turistas locales.

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■ **Palabras clave:** Crimen violento, llegadas de turistas, datos del panel.

■ **Clasificación JEL:** C33, C36, O17, O54

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■ *Introduction*

Does violent crime deter tourists from visiting México? According to the United Nations World Tourism Organization (UNWTO 2016), México was ranked in 2016 as the 8th place to visit in the preferences of international tourists. Conversely, the country was ranked 142 out of 163 countries by the Global Peace Index (2017), with 163 being the most violent country. In the year 2006 the Mexican government decided to give a frontal fight to the different drug trafficking organizations (henceforth DTOs) operating all across the Mexican territory. As a result of this strategy violent crime in the form of homicides started to dramatically increase (Ríos 2012). Thus, it was not uncommon to read since the end of 2006 the headlines of international and national newspapers reporting the increasing wave of violence in México. This has had a negative impact on the Mexican society. For instance, Braakman (2012) provides evidence on some of the non-monetary costs of crime in México. His results show that men and women in México change their behavior in response to victimization risks or actual victimization. These changes include the carry of a weapon for men and the change of transportation methods for women.

Moreover, after the intensification of violence from early 2007 onwards, analysts in the U.S. and México argued that there was a strong similarity between terrorism and attacks by the DTOs in México.[3] Other scholars directly maintain that the Mexican DTOs are terrorists and explain that the tactics, organization and their goals are homogenous to those used by terrorist organizations, (Longmire and Longmire 2008). For instance after the detonation of hand grenades in a crowded public square in Morelia, capital of the state of Michoacán on México´s Independence Day in September 2008, local and international media have gone as far as qualifying these attacks as terrorism. Local newspapers reported the getaway of tourists on the following day.[4] Further examples of terrorism-like events occurred in 2008, 2010 and 2011 in the states of Sinaloa, Chihuahua, Tamaulipas and Nuevo León where vehicles deliberately went off either in parking lots or near to police stations.[5] Following on this, more than one country[6] has recommended their citizens not to choose this country for holidays. Travel warnings for international tourists describe this kind of events in their alerts and express their worries about the integrity of people, as pointed out by the Australian Department of

[3] See: The Economist, November 15th 2010, http://www.economist.com
[4] See: The Economist, May 27th 2012, http://www.economist.com
[5] See: El Sol de Hidalgo, September 17th 2008, http://www.oem.com.mx/elsoldehidalgo
[6] Travel Warning as of February 8th 2012 U.S. Department of State. Bureau of Consular Affairs. Travel Warning as of April 4th 2012 Foreign Affairs and International Trade Canada.

Foreign Affairs and Trade in their Travel Advice for México: *"Travellers may become victims of violence directed against others"*.[7] It has been documented in Neumayer (2004) that tourists are sensible to violent events happening in their holiday destination and which can harm their physical integrity. He points out that if violent events repeatedly occur and increase their intensity, the authorities of the origin of tourists start warning their citizens against visiting that particular destination. Despite the importance of the tourism industry for the Mexican economy, there is no empirical evidence analyzing the extent to which violent crime affects tourism in México. This paper aims at filling this gap in the literature. For this purpose, I use a unique dataset on tourist arrivals in each of the 31 Mexican states and México City. The advantage of these data is the distinction between arrivals of international tourists from those of local tourists for the 1990-2010 period. I expect international tourists to be more intimidated by crime than local tourists. The latter benefit from their location in the country and thus directly know what is occuring, while the former are mainly informed by what they read, hear or see in the news. In this respect, different scholars in economics, criminology and psychology have studied the implications of these information asymmetries for tourism as a result of political conflicts among countries and terrorism. For instance, Fielding and Shortland (2009) analyze how the US tourist flows to Israel are affected as a result of the actual intensity of the Israeli-Palestinian conflict and the intensity reported in US television news coverage. Their results suggest that if alternative sources of information are costly, then tourists may infer the current level of risk in travelling to Israel from the television news. A similar conclusion is provided by Romer *et al*. (2003) who argue that viewing local television news is related to increased fear of and concern about crime. Furthermore, Sunstein (2003) argues that one or two terrorist incidents will have a significant impact on thought and behavior of people, with exaggerated risk perceptions being a likely result of the substantial publicity given to such incidents. Following on this, due to social interactions, knowledge about terrorist incidents spreads rapidly through the population and this in turn greatly aggravates fear. Earlier on, Morley (1998) highlighted that individuals are assumed to overcome missing information about destinations thanks to the contact with people which previously visited those countries. Moreover, Clerides *et al*. (2008) argue that information gaps are solved thanks to the activity of tour operators and travel agencies. They find that tour operators provide a better matching for quality with price and result in a more efficient market outcome. Given these previous studies it is plausible to argue that violent crime in México is likely to facilitate a generic impression of unrest being spread all over the country.

Due to the availability of tourism flow data, the period of study is restricted to 1990-2010. However this period takes into account the scaling up of crime during the years 2007-2010 when the Mexican government started to directly fight organized crime. The findings show that international tourist flows are more affected than local tourist flows after controlling for violent crime, income, price level, urbanization, weather,

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7 See: Australian Department of Foreign Affairs and Trade, May 12th 2012, http://www.smartraveller.gov.au

and infrastructure. As a starting point I propose a dynamic panel data model with fixed effects. According to Nickell (1981) the inclusion of the lagged dependent variable in a model with fixed effects results in biased estimates when the time dimension of the panel is small. Thus, in order to correct for this bias I implement the Least Square Dummy Variable estimator (LSDVC) developed by Bruno (2005a, 2005b) for unbalanced dynamic panel models. Next I propose the use of two instruments to account for the potential reverse causality in the tourist arrivals and violent crime variables. This procedure allows me to account for the potential reverse causality only but not for the bias arising from the lagged dependent variable. Following on this, I obtain the fitted values of the first stage regression from the 2SLS procedure and use them in the LSDVC estimation instead of the violent crime variable. This allows me to control not only for the lagged dependent variable bias but also for the potential reverse causality in the variables tourism arrivals and violent crime.

The rest of the paper is organized as follows: "Leterature review" provides a review of the literature on tourism demand and crime. "Data and method" explains the data selection based on the literature on tourism demand and presents the empirical methodology. "Empirical results" discusses the results, while the last section concludes. The conclusion is followed by an appendix including graphs and robustness checks.

■ *Literature review*

Tourism demand and crime

The literature on crime and tourism is small. Most work on the impact of crime on tourism concentrates on qualitative evidence as for instance, De Albuquerque and McElroy (1999) for the Caribbean, and Ferreira and Harmse (2000) for South Africa. Both studies rely on comparing available tourist crime victimization data in order to illustrate how crime affects tourism. De Albuquerque and McElroy (1999) first revise the recent history of violent and property crime in several Caribbean destinations and then highlight three hypotheses regarding the link between tourism and crime. The first of these hypotheses states that tourists in mass destinations are more likely to be victims of serious crimes than residents. The second hypothesis looks at the crime and victim type, and claims that tourists are more likely to be victimized by property crime and residents by violent crime. Lastly, the third hypothesis argues that the victimization rates are influenced by tourist density levels. Albuquerque and McElroy (1999) use data on victimization of tourists provided by the Royal Barbados Police Force for the period 1989 till 1993 and data of Barbados` resident victimization rates. By residents they refer to the inhabitants of Barbados and not to local tourists. Basically they compare the datasets of tourist victimization with the resident´s dataset and arrive at their conclusions without implementing any econometric methodology. They acknowledge the need to explore whether overall crime rates and victimization come along with mass tourism development, or whether observed crime rates are influenced by island-specific determinants. In the same vein Ferreira and Harmse (2000) offer a qualitative study for South Africa. They gather statistics on the 37 most committed crimes in the main urban areas of this country for the year 1997. Their work does not offer an econometric analysis and concentrates in the comparison of crime across the main South African urban areas. Moreover they also describe that tourists can change their preferences for a specific holiday destination if crime is present and in this way a so called spillover effect is expected. Different to the previous studies, the work by Levantis and Gani (2000) is one of the few quantitative studies on the issue. They study how crime affects the arrivals of tourists in four small Caribbean and four South Pacific islands states. As dependent variable they use the country`s share of total tourism flows to the region. They prefer this tourism measure over tourist expenditure, because the former better captures the deterrent effect of crime on travel to the desired destination. This is similar to Neumayer (2004), who also prefers tourism flows as a dependent variable since this is a more precise variable than tourists` expenditures. Levantis and Gani (2000) construct time series data from 1970 to 1993. Regarding the crime variable they argue that is not possible to compare crime rates across nations since the data availability and crime classifications are different across their sample. After constructing an index of the incidence of crime for each country in order to compare the trends in crime. They find that crime negatively affects the demand for tourism.

Tourism and crime in México

Several developing countries have seen tourism as a strategy for economic development. As the United Nations World Tourism Organization documents, tourism provides about 9.6% of the world´s total employment. This includes jobs indirectly supported by the industry. Furthermore, it accounts for 28.2% of the world´s exports of services (UNWTO 2017). More specifically, for México the tourism industry contributed 7.4% of the country´s GDP in the year 2016 and is after oil exports and remittances the third source of foreign currency for the country (WTTC, 2017). As of now there is no empirical evidence arguing that organized crime is targeting the tourism industry in México as a way to exert political pressure on the Mexican government. According to Dell (2011), the motivation for violence among the DTOs is the fight to take over the control of the routes of drugs from México to the United States. Following on this, the increasing violence in México consists primarily of drug traffickers killing each other. More recently, Ríos (2012) has investigated why violence has dramatically increased in the last 4 1/2 years in México. According to her research, the wave of violence hitting México can be explained, on the one hand, by homicides as a result of traffickers fighting each other when competing for territories and on the other, by the enforcement operations taken by the Mexican Federal Government to arrest drug traffickers. These enforcement operations have had a negative externality on the country. Ríos (2012) calls this a self-reinforcing equilibrium; more precisely, the situation in which the government weakens the structure of the DTOs and this in turn fuels the incentives of DTOs to fight among them and eliminate the weakest DTOs. In the short run the costs of this strategy are reflected in an increase in violence. In the long run, the DTOs will weaken enough so that violence will stop. Undoubtedly, this situation has put lot of burden on the Mexican society and damaged the reputation of the country. Given that tourism represents one of the most important industries in México, I analyze whether there is an effect of violence on the tourism industry.

■ *Data and method*

The data used in the paper is a panel dataset across 31 Mexican states and México City during the 1990-2010 period. The following specification estimates the tourists arrivals (TA_{it}) (logged), in state i in year t as a function of past tourist arrivals, $\ln TA_{it-1}$, homicides $\ln H_{it}$ and a vector of control variables Z_{it}:

$$\ln TA_{it} = \alpha \ln TA_{it-1} + \gamma \ln H_{it} + \beta Z_{it} + v_i + \lambda_t + \omega_{it}, \quad (1)$$

where v_i denotes state fixed effects to control for unobserved state specific heterogeneity in the panel dataset, λ_t represents time specific dummies and ω_{it} is the error term. On the one hand, México is a very diverse country in terms of traditions, culture and geography. All these factors are captured by state fixed effects. On the other hand, the time specific dummies capture common year's shocks such as tourism advertising abroad on behalf of the central government through the Mexican Tourism Ministry, and potential fluctuations in the purchasing power of international tourists. The inclusion of a lagged dependent variable is theoretically plausible since it allows me to control for the loyalty of tourists to the different Mexican states and México City. For the dependent variable I follow Neumayer (2004) and use the log number of tourists arriving in each of the 31 Mexican states and México City. The data report the amount of tourists arriving in hotels in state *i* in México in year *t,* reported by the National Institute for Statistics and Geography (INEGI hereafter) for the 31 Mexican states and México City. The main task of INEGI is to conduct the population and economic censuses across Mexican states and Municipalities. Through their local offices INEGI collects the arrival of tourists' data from each of the local Tourism Ministries in each state and México City. By law, hotels in México have to report the amount of tourists who required overnight accommodation to the local Tourism Ministry. These figures form part of the statistical yearbooks of each state and México City. Through its website, INEGI provides all the statistical yearbooks for all states and México City which contains, among several other variables, the arrival of tourists as explained above.[8] An advantage of these data is the fact that the number of tourist arrivals can be separated into international and national tourist arrivals. Unfortunately, the dataset does neither provide information on the different nationalities of international tourists nor on the states of origin of the local tourists. I use three variables of tourist arrivals. First, I look at overall arrivals of tourists. Second, I separate the international tourist arrivals from the national tourist arrivals and compare the effect that violent crime has on both tourist categories. In order to capture violent crime, I use the number of deaths resulting from homicides reported in state *i* in year *t*. The rationale for this is that violent events leading to several killings attract more the attention of local and international media. The dataset on homicides comes

8 See: http://www.inegi.org.mx

from the yearly mortality statistics gathered by INEGI[9] and corresponds to the period 1990-2010. The homicides are registered in the agency of the Public Ministry of the municipality where the crime took place. This information is then delivered to the local INEGI offices across the different states and forms part of the Mortality Statistics of INEGI. It is important to mention that for all crime data in México provided by INEGI there is the distinction to be made between the so called "register year" and "occurrence year." The former represents the year in which a criminal offence was registered and the latter shows the exact year in which a criminal offence took place. It is usually the case that criminal offences are not always, for several reasons, reported to the authorities when they happen. Thus the raw data show that there are crimes which for instance occurred in 1990, but are not registered until 1998. Using the occurrence year data I only consider homicides which took place from 1990 onwards since the availability on tourism data starts from 1990 onwards. The highest number of total tourist arrivals in the 1990-2010 period took place in México City, Veracruz, Jalisco and Quintana Roo in this order. The states with the most international tourists arrivals were: Quintana Roo, México City, Baja California and Jalisco. These states are internationally known for their beaches in the Caribbean Sea and the Pacific Ocean and are home of several archeological parks and Mexican folklore. On the other hand, most national tourists visited México City, Veracruz, Jalisco and Guerrero during the same period. Looking at the homicide data it is noticeable that most homicides took place in the following states: Estado de México, México City, Chihuahua, Baja California, Guerrero, Michoacán, Oaxaca, and Sinaloa. Most of these states have been also victims of intense drug violence between the drug cartels and the state police and military forces (Ríos 2012). Furthermore, for the period under study, Chihuahua was the most violent state followed by Sinaloa and Guerrero. This is in line with the work by Ríos (2012) mentioned above. Next, figures 1, 2, 3 and 4 show the raw data for homicides, international, national and overall tourists at the country level respectively. There are interesting issues to be observed in these four figures. First, while the number of homicides decreases from approximately 1995 onwards, the number of international and national tourists increases. Second, as the number of homicides skyrocketed from approximately 2006 onwards, the number of international tourist arrivals decreased to levels of 2002. Third, in relative terms, this drop was less for the national tourist arrivals and fourth we see that national tourism recovers but this is not the case for international tourists.

Having described the two main variables of interest I turn now to the vector of control variables (Z_{it}) which includes other potential determinants of tourist arrivals reported in state *i* during year *t*. I select these control variables from the existing literature on the subject.

The literature on tourism demand has focused on the study of international tourism while neglecting the study of national/local tourism. This literature can broadly be divided in two groups: The first group corresponds to contributions whose aim is to forecast tourism statistics as number of nights of stay, expenditures by tourists and /or the number of tourists arriving. For instance, the work by Witt and Witt (1995),

9 For details on mortality statistics see: www.inegi.org.mx.

Lim (1997a, 1997b and 1999) and Li *et al*. (2005) provide a good overview of articles on tourism demand forecasting. The second group of contributions concentrates on explaining its determinants. Within this group, the papers by Crouch (1994), Poirirer (1997), Cothran and Cothran (1998), Sonmez (1998), Sonmez and Graefe (1998), Neumayer (2004), and Clerides *et al*. (2008) provide an overview of the determinants of international tourism flows. Crouch (1994) reviews the literature on the determinants of international tourist flows. He argues that research in the 1980´s has found income elasticities of demand above unity confirming in this way the view that foreign travel is a luxury good.

I use the natural logarithm of the gross domestic product per capita in state *i* during year *t* as a proxy. I expect a positive and significant effect. A better economic environment enhances appropriate conditions for the stay of tourists. Furthermore researchers have used a wide variety of variables to represent prices in their models. In the context of international tourism demand, the variables used to represent prices have been foreign currency prices of tourist goods and services in destinations, the cost of transportation between origin and destination country and the effect of exchange rate variations on purchasing power. Put differently, as consumers, tourists also decide where to go based on the price of the goods they want to purchase; for instance holiday packages, which in some cases include flights and hotel reservations. In order to account for the differences in prices I use the price levels[10] of the main cities in each Mexican state and México City. These data were computed by the Mexican Central Bank and are used in the construction of the main national inflation index. Since the summer 2011, INEGI is responsible for conducting the inflation measurement and for reporting it to the Federal Government and to the public. However, since I only consider the period 1990-2010, these data are taken from the Mexican Central Bank. I expect a negative and significant impact of this variable. Higher prices can induce tourists to visit some other cheaper destination. Another important determinant of tourism demand is nature. Within this literature, one of the earliest studies addressing how climate in the tourist destination affects the arrival of tourists is the work by Abegg and Koenig (1997) in which they evaluated how predicted changes in weather conditions affected the winter tourism industry in Switzerland. They found that under “winter-normal” climate conditions, 85% of all Swiss ski areas are reliable for the practice of winter sports. Nevertheless if temperatures would rise by two grades Celsius, this number would drop to 63%. Along these lines the papers by Faulkner (2001) and Murphy and Bayley (1989) have offered qualitative assessments as to how to deal with natural disasters in tourist locations. Following on this and given the geographic location of México with a coast length of 7,828 kilometers on the Pacific Ocean side and with a coast length of 3,249 kilometers on the side of the Gulf of México and the Caribbean Sea, the country experiences throughout

[10] These data are measured as regional consumer price indexes with base year 2010. Indeed the real exchange rate U.S. dollar- Mexican Peso is another control variable for prices. Please note that its use imposes limitation in the variation across groups in the panel data set. To allow for variation I multiplied this real exchange rate with the price level across states. The results of the control variables of interest are not changed when using this product. Since this variable is not the control variable of interest, I do not delve further in to it. These results are available upon request.

a year several tropical storms which derive in hurricanes of high intensity. Thus, I use the number of hurricanes which caused the worst floods in state *i* during year *t* and construct a dummy variable which takes the value of one if a state was hit by a hurricane in year *t*. In general, a hurricane can hit more than one state in the same year. The data are from the Meteorological National Service[11] and from the Engineering Institute of the National Autonomous University of México (UNAM).[12] I also include a control variable which accounts for urbanization. This is the amount of people living in urban areas as a share of total population in state *i* during year *t*. I expect a positive and significant effect of this variable since urban areas are known for providing a wide range of amenities for tourists, for instance health services and public transport. This variable is drawn from the population census data compiled by INEGI. Additionally, I control for the transport infrastructure within the country by using the log of the number of kilometers of roads available in state *i* during year *t*. The data are from the Transportation and Communications Ministry of each state. These statistics are as well provided to INEGI and form part of the statistical yearbooks of each state too. I would expect a positive and significant effect of this variable on the arrivals of tourists. Once in the country, tourists might be willing to visit other cities or towns near to their first destination. It is true that some tourists would prefer to use air transportation. However, there is not much variation trough time in the number of airports in each state.

Endogeneity

It can potentially be the case that the number of tourists visiting a country originates more crime. Tourists are new to the destination they visit; this lack of information puts them in a riskier situation more easily than local people. Thus, criminals may see in them an easier prey. This applies to both national and international tourists. Moreover, while I am not aware of any variable which at the same time exerts any form of variation in the number of tourist arrivals and the number of homicides and is omitted from my specification, in general, the endogeneity problem in an econometric model can not only be due to the reverse causality as outlined above but also due to third omitted variables which affect both of the variables involved.

In order to account for potential endogeneity I employ a Two Stage Least Squares (2SLS) model. The validity of an estimation based on this method relies on the choice of a proper instrument. The instrumental variable must fulfil two criteria. The first one refers to the relevance of the instrument, i.e., it must induce sufficient exogenous variation in the explanatory variable in question, in particular, $Cov[Z, Homicides] \neq 0$. According to Bound, Jaeger and Baker (1995) the F-statistic of the excluded instruments in the first-stage regression should be examined in order to assess the relevance of the instruments. In a further contribution, Staiger and Stock (1997) argue that the selected instruments would be relevant when the first stage regression model´s F statistic reaches the thumb rule threshold of 10. This F-statistic has been criticized in the literature as an insufficient measure of relevance (Stock *et al*. 2002; Hahn and Hausman 2002 and

11 See: http://www.smn.cna.gob.mx (Accessed on October 1st 2017).
12 See: http://www.iingen.unam.mx (Retrieved on October 1st 2017).

2003). Thus, the present paper also shows more powerful tests like the Kleibergen-Paap rk LM statistic (Kleibergen-Paap 2006), which is a statistic for testing the null hypothesis that the equation is underidentified. This test is a heteroscedasticity-robust variant of the Anderson canonical correlation test.[13] As long as the Kleibergen-Paap LM statistic is above the critical value of 10 the used instruments are not considered to be weak. The second instrument criteria states that the ideal instrument should show, $Cov[Z,w]=0$ i.e., it must not be correlated with the error term of the second-stage regression. This means that the instrument should not affect the arrivals of tourists through other channels than the endogenous variable, controlled for the other variables in the model.

I propose the use of two instruments in an attempt to control for endogeneity in the model: The first instrument is the adult illiteracy rate within the population older than 15 years across the 31 Mexican states and México City. The data come from the Ministry of Education of México. This variable is intended to be a proxy for social exclusion. The rationale here is that social exclusion directly affects the increase in violent outcomes. For instance, the work by Caldeira (2000); Heinemann and Verner (2006), Borjas (1995); Katzman (1999), Buvinic, Morrison and Orlando (2002) and Beato (2002) show that socially excluded communities have higher illiteracy rates, higher numbers of homicides, higher percentages of employment in the informal sector and higher child mortality. Following on this, illiteracy impedes the opportunities for participation in the labour market and thus reduces the income of individuals and their chances to be included in society. For instance, using data from two groups of British adults born in 1958 and 1970, Parsons (2002) found a significant association between repeated offending and poor literacy or numeracy scores, particularly among young men.

In addition to these arguments, the work by Lochner and Moretti (2004) states that education may affect crime in several ways. First, it increases the wage rate of individuals, thereby increasing the opportunity cost of committing a crime. Second, if arrested, the punishment would be more costly for the more educated than for the less educated, i.e., the time out of the labor market due to incarceration represents a higher opportunity cost for those educated. They find that education significantly reduces crime. Based on this, it is reasonable to expect that illiteracy exerts variation in the homicide variable. On the other hand, there is no reason to suspect that illiteracy is directly correlated with the dependent variable, i.e., tourists arrivals, in particular when controlling for economic welfare in the estimation. As outlined in the second section of the paper, tourism demand is influenced by different factors than illiteracy.

The second instrument is a proxy for the severity of punishment of committing a homicide. According to Becker´s model of crime and punishment (Becker 1968) an individual would compare the expected utility of participation in legal and illegal activities. If punishment is more severe, it follows that the cost of deviating from "good behavior" is higher and the crime rate is reduced. Thus, such a variable would induce a direct variation in the homicide rate but does not directly influence the arrival of tourists. Following this literature, I construct a variable which proxies for the severity of punishment by calculating the rate of incarceration of people who have committed a homicide

13 See Kleibergen and Paap (2006) for further details.

across the Mexican States and México City within the period 1990-2010. For this aim I use the data coming from INEGI. This dataset registers the criminals who have been arrested on charges of homicide and who have been dictated an imprisonment sentence. Thus I divide the number of imprisoned persons with sentence in state *i* at time *t* by the amount of homicides which took place in state *i* at time *t* and multiply this by one hundred. There is an important point to make here: It could be that more homicides lead to a higher incarceration rate, however the number of imprisonment sentences depends on the quality of the judiciary system and thus an increase in homicides does not necessarily mean that the incarceration rate will increase as well. The judiciary system in each country is responsible for effectively punishing those individuals who have committed a homicide. However, as documented in the media[14] and in the literature, impunity is a rampant problem of the judiciary Mexican system and the incarceration of innocent people is not an exception, (Zepeda 2004). Furthermore, as documented by the UDLAP Global Impunity Index GII-(2017), the correlation between the number of individuals incarcerated for homicide and reported homicide cases in México is low. This is a strong argument in support of the relevance condition for this instrument together with the validity tests for the instruments presented and discussed in next section. Additionally, there is no reason to expect that tourists base their decision to visit México depending on how many people get incarcerated due to homicides throughout the country.

■ *Empirical results*

Table 1 presents the baseline results capturing the effect of homicides on the arrival of overall tourists, international tourists and national tourists implementing the model outlined above.[15] Beginning with column 1 in table 1, the results show that, when using the homicide data from INEGI and holding other factors constant, a one percent increase in homicides leads to 0.12 percent decrease in tourism, at the 5% significance level. It is interesting to ask whether this effect is similar or not for international and national tourists. I expect that international tourist are more deterred by violent crime than national tourists. The latter have more information about what is happening in the country. Thus, they have the advantage of better knowing where violence is worst and where not. The former receive the information about crime in México through the international news. When a criminal event of high impact takes place, this is promptly communicated in the international media. Following on this, the countries of origin of the international tourists warn their people not to visit certain places in the country or better to choose completely other destinations for holiday. In order to consider this, column 2 shows the effect of violent crime/ homicides on the arrival of international tourists. When holding other factors constant, a one percent increase in homicide leads to a 0.31 percent decrease on the international tourist arrivals. This effect is significant at the one percent

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14 See: El Universal, http://www.eluniversal.com.mx/articulo/nacion/seguridad/2017/06/15/homicidios-con-certeza-de-96-de-impunidad-riodoce (Retrieved on June 17th 2017).

15 According to the Hausman test, the fixed effects model is preferred over the random effects model. The test result is available upon request.

level. It is interesting to see that the effect of violent crime on international tourism is bigger than tourism in general. Next, I look at whether this effect is the same or not for national tourists. This is done in column 3 which shows that, holding other factors constant, the effect of homicides on national tourist arrivals is a significant decrease of 0.9 percent at the 10% significance level. In general this first table of results shows that violent crime actually deters both types of tourists however this effect seems to be stronger for the international visitors.[16]

Relying on these results, it is not possible yet to give a definitive answer to the research question of the paper. According to Nickell (1981) and Hsiao (1986), in a short fixed effects panel model, the correlation between the error term and the lagged dependent variable may render the estimates of the parameters biased and inconsistent. This issue is quite serious in panel data sets with a small number of time series observations. Increasing the number of units would not lead to better estimates if the number of time series observations remains small (Anderson and Hsiao, 1982). In order to obtain consistent estimators, one possibility could be to implement instrumental estimators. Nevertheless it is important to note that, although GMM and IV estimators possess good asymptotic properties, these estimators are still biased in a finite sample application, when n is small, (Bruno 2005a, 2005b).

Kiviet (1995 and 1999) introduced a method for implementing the corrected Least Square Dummy Variable (LSDVC) for balanced panels. Bruno (2005a) generalizes the bias approximation of Bun and Kiviet (2003) and extends the analysis for unbalanced panels. If the panel is unbalanced and $T=20$ is more appealing to use the extension of the LSDVC estimator developed by Bruno (2005a). Because of these reasons, I follow Potrafke (2009) and use the Least Squares Dummy Variable Corrected estimator proposed by Bruno (2005a, 2005b). The idea is to correct for the bias of the Least Squares Dependent Variable estimator by an approximation which is based on a consistent estimator like the Arellano-Bond GMM estimator. Specifically, I use the Stata routine XTLSDVC provided by Bruno (2005b) which uses a bootstrap approach to estimating the variance-covariance matrix of the estimated coefficients and in this way take into account the autoregressive data generation process.

The bias-correction procedure involves consistent estimates as a first step. These consistent estimates are based on one out of the three following estimators, namely the Anderson-Hsiao, Arellano-Bond and Blundell-Bond estimators. I choose the Blundell-Bond (1998) system GMM estimator since it is superior with respect to the other two in terms of efficiency (Baltagi 2008).[17] Table 2 presents the results of the model when implementing the Dynamic Bias Corrected Estimator (henceforth LSDVC) proposed by Bruno (2005a, 2005b).

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16 The difference of the coefficients is statistically significant at the 5% level. I tested for the significance of the difference in a nested model, interacting an international tourist dummy with all explanatory variables and the state and year dummies.

17 As in Potrafke (2009), the results obtained from this method refer to the Blundell and Bond (1998) estimator as the initial one. The instruments are collapsed as suggested by Roodman (2006). I also undertake 50 repetitions of the procedure to bootstrap the estimated standard errors. The results are similar when changing the number of repetitions to 100, 200 or 500.

The estimates of homicides coefficients in table 2 are similar in magnitude to the previous Fixed Effects specification. Looking at the first column and keeping all other variables constant, a one percent increase in homicides leads to a reduction of 0.12 percent in the arrivals of tourists in general; this is statistically significant at the 10% level. Further, column 2 shows the results for the foreign tourist arrivals specification. In this model a one percent increase in homicides results in fewer arrivals of foreign tourists by 0.30 percent, all else equal. This result is similar to its corresponding Fixed Effects version in Table 1. However, the result under the LSDVC estimator is significant only at the 5% level. Until this point the results in table 2 are similar to those in table 1. Looking next at column 3, and contrary to the Fixed Effects specification, the arrivals of national tourists seem not to be affected by violent crime since the significance of the violent crime variable disappears in this model. Thus, violent crime has a bigger negative effect on the arrival of international tourists than on the arrival of national tourists.[18] As previously mentioned, this can be due to information asymmetries in the sense that national tourists might be better informed than the international tourists and thus, they may be less concerned about high criminality in states in general as long as they know how to avoid risky situations.

With respect to the control variables, table 1 shows that prices matter for the local tourists only. We see that, holding other factors constant, a one percent increase in the price level reduces the arrivals of national tourists by 0.3 percent. In contrast, price levels are not a significant determinant of international tourism flows. Most of the international tourists visiting México are coming from the United States, Canada and European countries belonging to the European Monetary Union. It could be argued that since the international tourists possess a higher purchasing power, prices are more a concern for local tourists. However, this effect is only significant at the 10% level. Furthermore this variable is no longer significant in table 2.

Arguably, the higher the concentration of people in cities, the higher are the victimization rates of crimes as pointed out by Gaviria and Páges (2002) in their study on Patterns of crime victimization in Latin American cities. However, cities not only have problems but also advantages as agglomeration of services and amenities which are attractive for tourists. Thus, holding other factors constant, a one percent increase in the share of people living in urban areas leads to a 0.3 percent increase in the arrival of tourists. This effect is significant at the 5% level in table 1 under the fixed effects specification. Table 2 shows for this variable a coefficient of 0.033 percent, at a significance level of 10%. Additionally, international tourists are more attracted to urban areas than national tourists. This is consistent in both tables.[19] However the LSDVC estimations show significance at the 10% level for both types of tourists and tourists in general. Finally, I expect path dependence in tourist arrivals, i.e., past arrivals of tourists explaining a part of today´s arrivals. For instance, if visitors of a certain location have an enjoyable experience during their stay, they might visit the same location or country

18 In the LSDVC Bruno estimation, the difference of the coefficients is statistically significant at the 10% level.

19 In the nested model of both the fixed effects model and the LSDVC Bruno estimation, the difference of the coefficients is statistically significant at the 10% level.

again in the future. They may also influence other fellow citizens when they return back to their place of residence by recommending places to visit. We see in tables 1 and 2 that past tourist arrivals do matter for today´s arrivals. These results remain significant at the 1% level for international and national tourists and both together. Interestingly, I do not find any effects of per capita GDP, storms and highways.

So far the LSDVC estimator has taken into account the bias inherent in the model due to the inclusion of the lagged dependent variable. However there is still a further issue to be dealt with, namely the potential reverse causality of the variables tourism and homicides. Since the dynamic bias-corrected estimator does not account for this problem,[20] as a next step I present in table 3 the results of the 2SLS estimation with state and time fixed effects using the external instruments introduced in the previous section.

Table 3 reports the results for the second stage regressions followed by the first stage regressions for each of the three subsamples; namely total of tourists, international tourists and national tourists. In order to obtain the instrumental variable estimation, I regress the variable homicides on tourist arrivals and all other regressors at the first stage. In this way the predicted values of homicides are obtained which then enter into the second stage regression to obtain an unbiased estimator for the homicide variable. If it happens to be the case, the weakness of the instruments will render the coefficient of the homicide variable biased. By the same token, this bias will be negatively correlated with the first stage F-statistic of the null hypothesis that the coefficients of the instruments (illiteracy rate and incarceration rate) equal zero. Staiger and Stock (1997) argue that in order to avoid this problem the first stage F-statistic should show a value larger than 10. As can be seen at the bottom of table 3, the models show an F-statistic of 22.51, 21.51 and 21.82 for the three tourists specification categories, rejecting in this way the null hypothesis that both of the selected instruments are not relevant. The Kleibergen-Paap underindentification LM test rejects as well this null hypothesis with test scores of 11.71, 11.14 and 11.27 suggesting that the implemented instruments are adequate to identify the equation. Furthermore, the Hansen J-statistic with p-values of 0.88, 0.19 and 0.81 shows that the null-hypothesis of exogeneity cannot be rejected at the conventional level of significance.

Column 1 of table 3 shows that, keeping all other variables constant, a one percent increase in homicides leads to a 0.22 percent decrease of tourism as a whole. This effect is significant at the 5% level. Furthermore, the first stage regression of the first model, displayed in Column 1a, shows that an increase in the illiteracy rate by one percentage point increases homicides by 0.16 percent, all things else hold constant. This result is significant at the 1% level. In this way, illiteracy as a proxy for social exclusion causes violent crime to increase. Next, if the incarceration rate due to homicides increases by one percent, violent crime is reduced by 0.004 percent. This effect is statistically significant at the 1% level.

Interestingly, as column 2 shows, there is no significant effect of homicides on the arrival of international tourists. However, the endogeneity test for all three models at

20 For details see Bruno (2005a) and Bruno (2005b).

the bottom of table I3 shows that the null hypothesis of exogeneity of the homicides variable cannot be rejected (with p-values of 0.35, 0.99 and 0.24). According to this test there is no reverse causality going from tourism to homicides. In this sense, the results of the LSDVC Bruno estimator provide the preferred estimation since this method is superior to the (2SLS) fixed effects estimation which does not control for the Nickell (1981) bias inherent in the lagged dependent variable.

■ *Conclusion*

This paper has investigated whether there is an effect of violent crime on tourism in México for the 1990-2010 period. The contribution of the paper is twofold. First, addressing endogeneity the paper finds that the impact of violent crime on tourism in México is negative and significant. Second, this paper investigates whether international tourists or local tourists are more affected by violent crime. Due to the lack of data, previous research has concentrated only on the analysis of international tourism flows. First, my findings show that tourist arrivals in Mexican states are reduced by increased violent crime. Second, international tourists appear to be more intimidated by violent crime than local tourists. As argued in previous research by Morley (1998) and Clerides *et al*. (2008), information asymmetries play a role in tourism demand. Thus by living in the country, local tourists know better where crime is higher than international tourist do. For instance, an average Mexican would certainly know that violent crime is less in the state of Guanajuato than in the state of Tamaulipas or any other state in the north border to the United States. On the other hand, international tourists obtain information mainly throughout the news. Despite these information asymmetries, Braakmann (2009) shows that the inhabitants of México have changed their behavior in response to crime. He finds that women prefer to change their way to their jobs and men are more prone to carry a weapon. This shows that, it is not that Mexicans became accustomed to live in violence but rather they react to the criminal environment by taking protective measures.

In terms of tourism policy, the findings suggest that better information and promotion of tourism in México abroad could positively affect the image of the country itself. Indeed, the Mexican Federal government promotes tourism in México abroad. Further studies might look at whether these tourism promotion investments have been effective by using impact evaluation techniques as for instance Difference in Differences estimation**.** Moreover, it would be important for tourism policy to know whether tourists move to different locations in order to avoid dangerous regions.

The time span of the paper is one of its main limitations. Due to data availability, it is only possible to build up the panel data set for all Mexican states and México City up to the year 2010. For several control variables data are not yet available. Examples of these variables are recent data on GDP and data derived from the not yet available 2020 census. Furthermore, the panel data results presented here show only average effects at the state level. The paper is not able to look deeper into more disaggregated data at the municipal level since these data are not available. Data disaggregation is relevant since not all regions of the country experience crime in the same way and not all regions in the country are tourism destinations. Further research might look at the relationship tourism and crime using municipal or county level data.

Finally yet importantly, the study of how crime impacts tourism in México can better be determined if more disaggregated data on tourism and crime at the municipal are available.

Table 1
Tourist Arrivals, Total, International and National (1990-2010):
State fixed Effects estimations

	(1)	(2)	(3)
Variables	Tourists Arrivals: Total	Tourists Arrivals: Foreign	Tourists Arrivals: National
LDV (log) t-1	0.580***	0.474***	0.635***
	(0.0629)	(0.0860)	(0.0521)
Homicide (log)	-0.123**	-0.307***	-0.0944*
	(0.0570)	(0.105)	(0.0537)
Price level	-0.0265	-0.0424	-0.0336*
	(0.0225)	(0.0410)	(0.0194)
State per Capita GDP (log)	0.0187	0.490	-0.0161
	(0.318)	(0.550)	(0.300)
Urbanization	0.0282**	0.0603**	0.0296**
	(0.0126)	(0.0268)	(0.0113)
Storms	-0.0293	-0.0357	-0.0338
	(0.0415)	(0.0809)	(0.0391)
Roads (log)	-0.00795	-0.133	0.0183
	(0.0826)	(0.220)	(0.0777)
Constant	5.038***	3.631	3.960**
	(1.825)	(3.389)	(1.776)
Hausman test p > chi2	0.00	0.00	0.00
Year and State dummies	YES	YES	YES
Number of States	31	31	31
Number of Observations	497	492	494
R-squared	0.535	0.326	0.603
Method	Fixed Effects	Fixed Effects	Fixed Effects

Robust standard errors clustered by state in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Own elaboration.

Table 2
Tourist Arrivals, Total, International and National (1990-2010):
Dynamic Bias Corrected Estimator

	(1)	(2)	(3)
Variables	Arrivals: Total	Arrivals: Foreign	Arrivals: National
LDV (log) t-1	0.697***	0.567***	0.730***
	(0.0483)	(0.0515)	(0.0461)
Homicide (log)	-0.118*	-0.295**	-0.0896
	(0.0678)	(0.134)	(0.0673)
Price level	-0.0317	-0.0485	-0.0383
	(0.0276)	(0.0512)	(0.0329)
State per Capita GDP (log)	0.101	0.481	0.0977
	(0.405)	(0.645)	(0.333)
Urbanization	0.0332*	0.0662*	0.0355*
	(0.0201)	(0.0338)	(0.0193)
Storms	-0.0124	-0.0278	-0.0302
	(0.151)	(0.0957)	(0.0506)
Roads (log)	0.0124	-0.108	0.0457
	(0.151)	(0.296)	(0.130)
Year and State dummies	YES	YES	YES
Number of States	31	31	31
Number of Observations	497	492	494
Method	LSDVC	LSDVC	LSDVC

Bootstrapped standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Own elaboration.

Table 3
Tourist Arrivals, Total, International and National (1990-2010):
Fixed Effects 2SLS estimations (Instruments: Illiteracy rate and Imprisonment rate due to homicide)

	(1)	(1a)	(2)	(2a)	(3)	(3a)
Variables	Total Arrivals	First stage regression	Foreign Arrivals	First stage regression	National Arrivals	First stage regression
		Homicide (log)		Homicide (log)		Homicide (log)
Dependent Variable- (log) t-1	0.569***	-0.071	0.478***	-0.063**	0.623***	-0.071
	(0.0549)	(0.0488)	(0.0808)	(0.0299)	(0.0475)	(0.0499)
Homicide (log)	-0.218**		-0.241		-0.207**	
	(0.0901)		(0.2021)		(0.0886)	

	(1)	(1a)	(2)	(2a)	(3)	(3a)
Variables	Total Arrivals	First stage regression	Foreign Arrivals	First stage regression	National Arrivals	First stage regression
		Homicide (log)		Homicide (log)		Homicide (log)
Illiteracy		0.149***		0.147***		0.144***
		(0.0305)		(0.0312)		(0.0302)
Imprisonment rate		-0.004***		-0.004***		-0.004***
		(0.0011)		(0.0011)		(0.0011)
Price level	-0.031	-0.017	-0.046	-0.015	-0.0381**	-0.018
	(0.0216)	(0.0237)	(0.0382)	(0.0244)	(0.0193)	(0.0248)
State per Capita GDP (log)	0.132	-0.049	0.612	0.021	0.0832	-0.025
	(0.3098)	(0.5019)	(0.5023)	(0.4885)	(0.288)	(0.4964)
Urbanization	0.029**	0.039*	0.057**	0.042	0.0310***	0.039*
	(0.0122)	(0.0205)	(0.0269)	(0.0200)**	(0.0108)	(0.0206)
Storms	-0.029	-0.011	-0.038	-0.008	-0.033	-0.011
	(0.0394)	(0.0320)	(0.0759)	(0.0329)	(0.0369)	(0.0326)
Roads (log)	-0.016	0.062	-0.100	0.060	-0.00029	0.056
	(0.0741)	(0.0925)	(0.1911)	(0.0938)	(0.0722)	(0.0948)
F-statistic		22.51		21.51		21.82
Hansen J (p-value)		0.8827		0.1904		0.8187
Kleibergen Paap LM test		11.71		11.14		11.27
Endogeneity test (p-value)		0.3462		0.9893		0.2376
Year and State dummies	YES	YES	YES	YES	YES	YES
Number of States	31	31	31	31	31	31
Number of Observations	494	494	489	489	491	491
R-squared	0.5309	0.5802	0.3273	0.5837	0.598	0.5793
Method	FE-2SLS	FE-2SLS	FE-2SLS	FE-2SLS	FE-2SLS	FE-2SLS

Robust standard errors clustered at the state level in parentheses *** p<0.01, ** p<0.05,*p<0.1.
Source: Own elaboration.

■ *Appendix 1. Outliers*

In order to identify outliers in the previous estimations I implement graphs showing the linear relationship between homicides and (total, international, national) tourist arrivals, controlling for all other explanatory variables. Using these graphs and coding in the Stata do-file, I identified those observations which lie far away from the regression line and removed them from the dataset[21].

Tables 1a, 2a and 3a show the regression results after having removed these observations. Table 1a still shows that homicides reduce total tourist arrivals; this effect has a magnitude of minus 0.11 percent and is significant at the 10% level. Interestingly, the

[21] These graphs are available upon request and are not shown in order to save space.

effect of violent crime on national tourist arrivals is now significant at the 5% level and with a value of minus 0.11 per cent. Furthermore, the effect of homicides on international tourist arrivals is now of minus 0.23 percent and significant at the 5%. In general table 1a shows that after excluding the outliers the results are similar to those in table 1 in the sense that the effect of violent crime on the arrival of international tourists is bigger than the effect observed on the national tourist arrivals.[22]

Looking now at table 2a, the results are also similar to those in table 2 Column one of table 2a shows that, all things else equal, a one percentage point increase in homicides reduces tourist arrivals by 0.11 percent. This effect is significant at the 10% level. Further, column 2 indicates that a one percentage point increase in homicides, all else equal, leads to a reduction in international tourist arrivals by 0.22 percent. This figure is significant at the 1 % level. On the other hand, column 3 shows that, all else equal, a one percentage point increase in homicides reduces the arrival of national tourists by 0.11 percent. This effect is significant at the 10% level.

Table 3a shows the results for the 2SLS estimation after removing the above mentioned outliers. Column 1 shows that, all things else equal, a one percentage point increase in homicides reduces tourist arrivals by 0.25 percent. This effect is significant at the 1% level. Column 2 shows that, all things else equal, a one percentage point increase in homicides leads to a reduction in the arrival of international tourists by 0.30 per cent. Different than table 3, this effect is now significant at the 10% level. Continuing with column 3 and keeping all other controls constant, a one percentage point increase in homicides reduces the arrivals of national tourists by 0.24 percent. This effect is significant at the 1% level. Furthermore, after the removal of the outliers, the F-statistic, the Kleibergen-Paap underindentification LM test and Hansen test still lend support to the relevance and the validity of the implemented instruments. In detail, the F-statistic shows the values of 22.43, 21.61 and 22.09 for the total, international and national tourist arrivals respectively. Additionally, the Kleibergen Paap LM test shows the values of 11.7, 11.11 and 11.21 for the three models. These tests strongly show that the used instruments are relevant. Furthermore and as in table I:3, the Hansen J-statistic with p-values of 0.84, 0.45 and 0.88 shows that the null-hypothesis of exogeneity cannot be rejected at the conventional level of significance for all three models. As explained before, the LSDVC Bruno (2005a, 2005b) estimator accounts only for the bias inherent in the lagged dependent variable, while overlooking the potential endogeneity in the homicide variable. In order to correct for this shortcoming, I re-estimate the model with the LSDVC Bruno (2005a, 2005b) estimator using the fitted values of the first stage regression from the 2SLS estimation and replace the homicide variable with them.

Table 4 shows the corresponding results. From column 1 can be seen that, all things else equal, a one percentage point increase in the fitted values which explain homicides, reduces tourist arrivals by 0.18 percent. This effect is significant at the 10% level. Column 2 shows that, all things else equal, a one percentage point increase in the fitted values which explain homicides, reduces international tourist arrivals by 0.29 percent. This effect is significant at the 10% level. The last column shows the effect of a one

22 The difference in the nested model is statistically significant at the 5% level.

percentage point increase in the fitted values explaining homicides on the national tourist arrivals. This amounts to a reduction of 0.17 percent. This effect is significant at the 10% level. These last results show that the negative effect of violent crime on tourist arrivals is not driven by the neglect of the potential endogeneity of the homicide variable in the LSDVC Bruno (2005a, 2005b) estimator.

Table 1a
Tourist Arrivals, Total, International and National (1990-2010): Fixed Effects estimations

	(1)	(2)	(3)
Variables	Tourists Arrivals: Total	Tourists Arrivals: Foreign	Tourists Arrivals: National
Dependent Variable- (log) t-1	0.589***	0.554***	0.630***
	(0.0518)	(0.0534)	(0.0531)
Homicide (log)	-0.112*	-0.229**	-0.106**
	(0.0563)	(0.0959)	(0.0487)
Price level	-0.016	-0.0515	-0.0305*
	(0.0202)	(0.0441)	(0.0168)
State per Capita GDP (log)	-0.349	0.390	-0.322
	(0.288)	(0.522)	(0.278)
Urbanization	0.0377***	0.0604**	0.0359***
	(0.0122)	(0.0231)	(0.0113)
Storms	-0.0329	-0.0353	-0.025
	(0.0343)	(0.0649)	(0.0369)
Roads (log)	0.038	0.001	0.0517
	(0.0660)	(0.204)	(0.0592)
Constant	4.321**	-0.0154	3.866**
	(1.678)	(2.928)	(1.753)
Hausman test p > chi2	0.00	0.00	0.00
Year and State dummies	YES	YES	YES
Number of States	31	31	31
Number of Observations	492	485	490
R-squared	0.914	0.914	0.915
Method	Fixed Effects	Fixed Effects	Fixed Effects

Robust standard errors clustered by state in parentheses *** p<0.01, ** p<0.05,*p<0.

Source: Own elaboration.

Table 2a
Tourist Arrivals, Total, International and National (1990-2010):
Dynamic Bias Corrected Estimator

	(1)	(2)	(3)
Variables	Arrivals: Total	Arrivals: Foreign	Arrivals: National
LDV (log) t-1	0.669***	0.643***	0.714***
	(0.0406)	(0.0611)	(0.0373)
Homicide (log)	-0.107*	-0.219***	-0.102*
	(0.0583)	(0.0821)	(0.0575)
Price level	-0.020	-0.057	-0.033
	(0.0293)	(0.0598)	(0.0254)
State per Capita GDP (log)	-0.285	0.409	-0.229
	(0.336)	(0.667)	(0.345)
Urbanization	0.042***	0.067**	0.041***
	(0.0165)	(0.0262)	(0.0128)
Storms	-0.029	-0.026	-0.0239
	(0.0405)	(0.0659)	(0.0439)
Roads (log)	0.057	0.053	0.071
	(0.130)	(0.287)	(0.129)
Time dummies	YES	YES	YES
Number of States	31	31	31
Number of Observations	492	485	490
Method	LSDVC	LSDVC	LSDVC

Bootstrapped standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Own elaboration.

Table 3a
Tourist Arrivals, Total, International and National (1990-2010):
Fixed Effects 2SLS estimations
(Instruments: Illiteracy rate and Imprisonment rate due to homicide)

	(1)	(1a)	(2)	(2a)	(3)	(3a)
Variables	Total Arrivals	First stage regression	Foreign Arrivals	First stage regression	National Arrivals	First stage regression
		Homicide (log)		Homicide (log)		Homicide (log)
Dependent Variable-	0.572***	-0.071	0.548***	-0.07**	0.616***	-0.068
(log) t-1	(0.0443)	(0.0488)	(0.0478)	(0.0307)	(0.0492)	(0.0500)
Homicide (log)	-0.251***		-0.305*		-0.242***	
	(0.0802)		(0.1821)		(0.0787)	

	(1)	(1a)	(2)	(2a)	(3)	(3a)
Variables	Total Arrivals	First stage regression	Foreign Arrivals	First stage regression	National Arrivals	First stage regression
		Homicide (log)		Homicide (log)		Homicide (log)
Illiteracy		0.15***		0.15***		0.145***
		(0.0303)		(0.0308)		(0.0301)
Imprisonment rate		-0.005***		-0.005***		-0.004***
		(0.0011)		(0.0011)		(0.0011)
Price level	-0.022	-0.020	-0.06	-0.017	-0.035**	-0.020
	(0.0198)	(0.0237)	(0.0397)	(0.0244)	(0.0174)	(0.0248)
State per Capita	-0.239	-0.068	0.583	0.026	-0.238	-0.056
GDP (log)	(0.2622)	(0.4996)	(0.4862)	(0.4845)	(0.2490)	(0.4937)
Urbanization	0.040***	0.04*	0.060***	0.041**	0.038***	0.040*
	(0.0112)	(0.0204)	(0.0219)	(0.0199)	(0.0101)	(0.0205)
Storms	-0.032	-0.009	-0.035	-0.007	-0.024	-0.009
	(0.0320)	(0.0317)	(0.0606)	(0.0326)	(0.0340)	(0.0326)
Roads (log)	0.020	0.060	0.008	0.0589	0.027	0.057
	(0.0600)	(0.0926)	(0.1758)	(0.0927)	(0.0551)	(0.0950)
F-statistic		22.43		21.61		22.09
Hansen J (p-value)		0.8486		0.4525		0.8801
Kleibergen Paap LM test		11.7		11.11		11.21
Endogeneity test (p-value)		0.1075		0.6083		0.1098
Year and State dummies	YES	YES	YES	YES	YES	YES
Number of States	31	31	31	31	31	31
Number of Observations	489	489	482	482	487	487
R-squared	0.6312	0.5825	0.4529	0.5879	0.6736	0.5797
Method	FE-2SLS	FE-2SLS	FE-2SLS	FE-2SLS	FE-2SLS	FE-2SLS

Robust standard errors clustered by state in parentheses *** p<0.01, ** p<0.05,*p<0.1.

Source: Own elaboration.

Table 4
Tourist Arrivals, Total, International and National (1990-2010):
Dynamic Bias Corrected Estimator

	(1)	(2)	(3)
Variables	Arrivals: Total	Arrivals: Foreign	Arrivals: National
LDV (log) t-1	0.665***	0.570***	0.723***
	(0.0510)	(0.0455)	(0.0520)
Homicide (log) (fitted values) *	-0.179*	-0.288*	-0.173*
	(0.0995)	(0.172)	(0.0952)
Price level	-0.0336	-0.0510	-0.0406
	(0.0306)	(0.0543)	(0.0285)
State per Capita GDP (log)	0.188	0.626	0.179
	(0.439)	(0.732)	(0.369)
Urbanization	0.0329	0.0635**	0.0359**
	(0.0212)	(0.0282)	(0.0176)
Storms	-0.0275	-0.0309	-0.0308
	(0.0601)	(0.0929)	(0.0519)
Roads (log)	0.0142	-0.0743	0.0346
	(0.159)	(0.265)	(0.146)
Time dummies	YES	YES	YES
Number of States	31	31	31
Number of Observations	494	489	491
Method	LSDVC	LSDVC	LSDVC

Bootstrapped standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
* The fitted values of the potentially endogenous variable Homicide (log) are taken from the first stage regression from the 2SLS estimation
Source: Own elaboration.

■ *Appendix 2. Mexican States*

Aguascalientes	Ciudad de México	Morelos	Sinaloa
Baja California	Durango	Nayarit	Sonora
Baja California Sur	Estado de México	Nuevo León	Tabasco
Campeche	Guanajuato	Oaxaca	Tamaulipas
Chiapas	Guerrero	Puebla	Tlaxcala
Chihuahua	Hidalgo	Querétaro	Veracruz
Coahuila	Jalisco	Quintana Roo	Yucatán
Colima	Michoacán	San Luis Potosí	Zacatecas

Source: Own elaboration.

■ *Appendix 3. Descriptive Statistics*

Variables	Mean	Standard Deviation	Minimum	Maximum	Observations
Tourist Arrivals (Total) log	14.15577	1.098107	7.233455	16.31798	589
Tourist Arrivals (Total) log t-1	14.13433	1.107204	7.233455	16.31798	562
Tourist Arrivals (International) log	12.00465	1.668351	5.826	15.62604	586
Tourist Arrivals (International) log t-1	12.00123	1.675661	5.826	15.62604	559
Tourist Arrivals (National) log	13.92622	1.072491	6.952729	16.0395	588
Tourist Arrivals (National) log t-1	13.90193	1.080445	6.952729	16.02846	561
Homicides (log)	5.382426	1.150092	2.484907	8.737774	672
Price Level	57.02784	27.58268	10.48747	98.55759	637
State per Capita GDP (log)	4.146175	.513901	3.386864	6.176142	672
Urbanization	72.61502	14.94279	39.45287	99.76386	672
Storms	.1622024	.368911	0.00	1.00	672
Roads (log)	8.883446	.6622945	7.247081	10.16591	651
Illiteracy Rate	9.54375	5.673183	2.1	29.20	640
Imprisonment Rate	46.57406	39.92938	0.00	247.8261	665

Source: Own elaboration.

■ *Appendix 4. Data Definitions and Sources*

Variables	Definitions and data sources
Total Tourist Arrivals	The logarithm of *total* number of tourist arrivals in state *i* in year *t*. The data were obtained from Statistical Yearbooks of each Mexican state and México City provided by INEGI.
International Tourist Arrivals	The logarithm of *international* number of tourist arrivals in state *i* in year *t*. The data were obtained from Statistical Yearbooks of each Mexican state and México City provided by INEGI.
National Tourist Arrivals	The logarithm of *national* number of tourist arrivals in state *i* in year *t*. The data were obtained from Statistical Yearbooks of each Mexican state and México City provided by INEGI.
Homicides	The logarithm of total number of homicides committed in state in year *t*. The data were obtained from the Mortality Statistics provided by INEGI. This data is available from 1990 till 2010.
Urbanization	Share of the total population living in urban areas in state *i* in year *t*. The data were own construction based on the information data from the population censuses 1990, 2000, 2010 and population counting 1995, 2005 provided by INEGI.
Price Level	Price level of the main cities in each state and México City. The data were obtained from the Mexican Central Bank. The period is 1990 till 2010.

Variables	Definitions and data sources
State per Capita GDP (log)	Own calculation using data on each State GDP and Population in each State. Values are in Mexican pesos, constant prices 2003. The data on State GDP are form the National Accounting System and the Population data are from the population censuses 1990, 2000, 2010 and population counting 1995, 2005. All data are provided by INEGI.
Storms	A dummy variable which takes the value of one if a hurricane hit in state *i* in year *t* and zero otherwise. The data are from the Meteorological National Service and the Institute of Engineering at the National Autonomous University (UNAM) in México City.
Roads	The logarithm of the number of kilometres of highways and paved roads in state *i* in year *t*. The data are from the Ministry of Transport and Communication (SCT México).
Illiteracy Rate	Illiteracy rate of population older than 15 years. Data are provided by the Mexican Education Ministry.
Imprisonment Rate	Rate of imprisonment of people who have committed homicide. Data provided by INEGI.

Source: Own elaboration.

■ *Appendix 5. Homicides and Tourist Arrivals in México1990-2010*

Figure 1

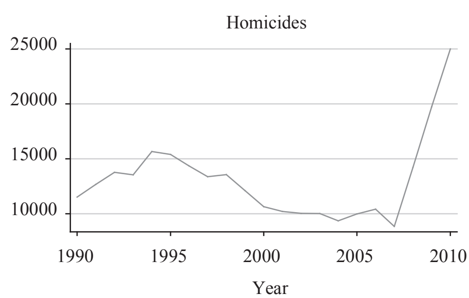
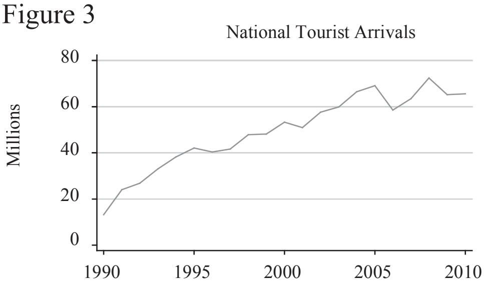


Figure 2

Figure 3



Source: Own elaboration.

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