

## *Original Paper*

# Mexico Evidence on the Regional Retail Impacts of Violent Crime

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### **Abstract**

*Prior research reports mixed results regarding the economic impacts of crime. This study employs data from all regions of Mexico, including border regions in both the north and the south, to examine the effects of homicides on retail activity across Mexico during a period of escalating violence. The results indicate that one additional homicide within a municipality eliminates one retail establishment and one paid job in the retail sector. Furthermore, the negative consequences of violent crime for retailers are augmented by proximity to an international border. This is consistent with previous research findings that cross-border shopping is a key feature of commerce along the international boundaries of Mexico. It suggests that crime waves may disproportionately impact border city retail activity by partially diverting customer traffic to stores located in neighboring countries. This result is also consistent with the finding of recent research that violent conflict in northern Mexico resulted in increased retail activity in some United States border cities.*

### **Keywords**

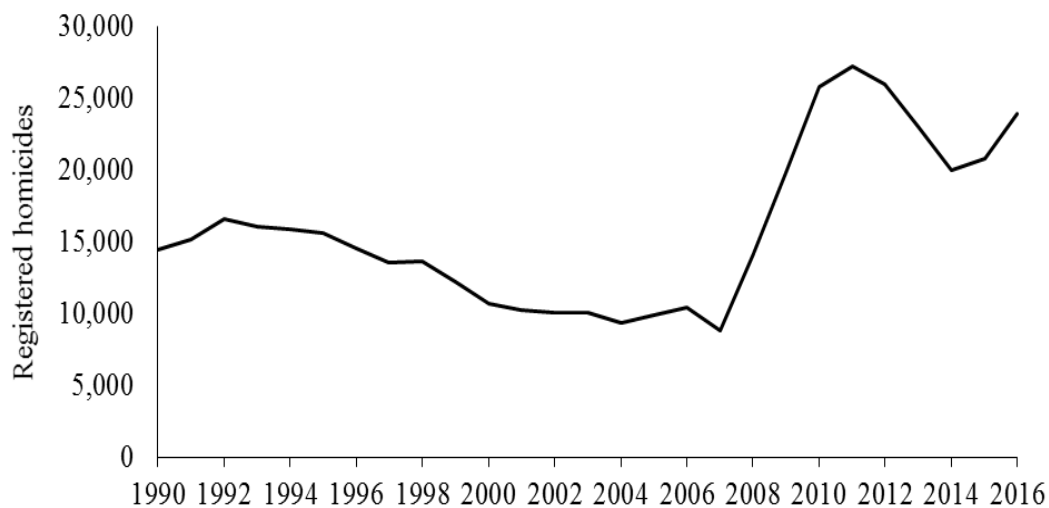
*Retail Activity, Homicides, Economic Impacts of Crime, International Boundaries, Cross-Border Shopping, Mexico*

### **JEL Codes**

R12 - Size and Spatial Distribution of Regional Economic Activity; K42 - Illegal Behavior and the Enforcement of Law; L81 - Retail and Wholesale Trade; O54 - Latin America

## 1. Introduction

In 2008, Mexico experienced a spike in violent crime, primarily as a consequence of turf wars between competing drug-trafficking organizations (Rios, 2014). Figure 1 shows that the number of registered homicides generally decreased in Mexico between 1992 and 2007 before abruptly reversing course. Between 2007 and 2011, the national homicide count more than tripled. The crime wave was characterized not only by a numerical increase in homicides, but also by highly visible displays of violence perpetrated by organized criminal groups. Gun battles in public places became more common along with attacks on law enforcement and execution-style killings (Heinle et al., 2017). Such incidents received considerable media coverage. At the same time, many drug trafficking organizations diversified into other activities, contributing to a greater incidence of robbery and extortion (Robles et al., 2013).



**Figure 1. Number of Reported Homicides in Mexico, 1990-2016**

The objective of this study is to examine the impacts of the post-2008 crime wave on retail activity across Mexico using data for more than 2,100 municipalities. Prior research finds that the retail sector often suffers disproportionately from surges in violent crime (Greenbaum & Tita, 2004; Rosenthal & Ross, 2010). However, much of the previous research on this topic examines the impact of violent crime on the distribution of retail activity at the neighborhood level rather than at the municipality level. For consumers, switching shopping destinations from high-crime neighborhoods to alternative low-crime districts is sometimes feasible and worthwhile. However, frequenting stores located in different urban areas is typically more difficult (Rosenthal & Ross, 2010). While the effects of crime are usually observed at the neighborhood level, the recent crime wave in Mexico may have induced sufficiently strong reactions from consumers and businesses to reduce aggregate economic activity at the municipal level (Robles et al., 2013). This study examines that possibility for the retail sector using data from the 2009 and 2014 Economic Censuses, which bracket the peak in homicides depicted in

Figure 1.

The first principal research question investigated is whether the large increase in violent crime witnessed in Mexico since 2008 had measurable effects on municipal-level retail activity. The severe and prolonged crime wave may have convinced some business owners to curtail investment or even to terminate operations completely in conflict zones, while entrepreneurs and skilled workers may have been persuaded to relocate to areas perceived as safer (Pan et al., 2012). Furthermore, retail customers are likely to consider the risk of victimization when choosing where to shop and may, consequently, prefer relatively safer districts (Bowes, 2007). Thus, violent crime in one municipality may drive consumers to patronize retail outlets in neighboring municipalities with better public safety records, as proxied by homicide rates. The high visibility and widespread media coverage of homicides, especially those related to organized crime, is likely to influence public perceptions of safety in particular municipalities and thereby sway decisions regarding where to do business.

The second principal research question examines whether the impact of violent crime on retail activity is different in border regions. Several cities along Mexico's northern border have periodically experienced episodes of increased violent crime in recent years (Rios, 2014). The retail sectors of those cities are distinguished from those in other regions by the existence of cross-border shopping opportunities (Coronado & Phillips, 2007; Sullivan et al., 2012; Fullerton & Walke, 2014). When consumers have a choice between shopping destinations in different countries with distinct security environments, an outbreak of violence on one side of the boundary may divert customer traffic to the other side. While there are differences in the operation of public safety institutions across municipalities and states in Mexico, cross-national differences in law enforcement capabilities and judicial systems tend to be much larger. Increases in local violent crime rates may lead to more noticeable effects on retail activity in areas where shopping in a neighboring country is feasible for many residents.

The economic impacts of violent crime are receiving more attention in the academic literature (Rosenthal & Ross, 2010). This is especially true in the case of Mexico (González Andrade, 2014). The next section surveys the existing literature on the impacts of crime on economic activity at the regional level and factors influencing the distribution of retail activity in border areas. The methodology is then discussed, followed by a presentation of principal empirical results. The final section summarizes general conclusions and policy implications.

## **2. Literature Review**

Prior research provides mixed evidence on the relationship between crime and economic growth. Some studies report that crime is positively correlated with business activity. Using data from a 1992 survey, Bates and Robb (2008) find that firms reporting a strong negative business impact of crime appear to be somewhat more likely than other firms to remain in business over the 1992-1996 period in the United States. Firms entering high-crime niches seem willing to accept increased safety risks, but only

in return for greater profit opportunities, which neutralize any potential negative impacts on survival probabilities. In a study of Mexico, Pan et al. (2012) document that lagged crime rates are positively related to growth in real per capita gross state product. This is attributed primarily to the injection of public expenditures into states afflicted by organized crime. However, there is a small negative correlation between crime rates in neighboring states and home-state economic growth. The latter might occur because crime in neighboring states drives capital, businesses, and skilled labor away from the region as a whole.

Using census tract data for five cities in the United States, Rosenthal and Ross (2010) discover that employment levels in the retail and wholesale sectors are positively correlated with the incidence of violent crime. One potential reason for this correlation is that areas with high concentrations of retail activity are prime targets for criminals, thereby attracting crime. However, the study also finds that retailers are less likely to locate in areas with increases in violent crime relative to wholesalers, which is consistent with the argument that retailers outbid wholesalers for relatively safe locations. The study suggests that the co-location of crime and retail activity may mask the ways in which businesses seek to minimize vulnerability to crime. Bowes (2007) finds evidence that, although crime is attracted to census tracts with high retail employment densities, retailers nonetheless seek to avoid locating in areas with high incidences of violent crime.

Greenbaum and Tita (2004) ask whether zip code areas that experience sharp increases in violent crime, relative to historical benchmark levels, suffer adverse economic consequences. Such episodes are found to significantly reduce the numbers of retail and personal service establishments, but not the total number of business establishments in operation across all industries. In a similar study conducted for Mexico, Robles et al. (2013) also examine spikes in violence surpassing a certain threshold relative to historical averages. That study uses municipal-level electricity consumption as a proxy for economic activity due to the lack of municipal-level output data. Labor market variables are employed as supplementary measures of economic performance. The results suggest that the violence-afflicted municipalities observed a 4% decline in electricity usage with respect to safer towns and cities across Mexico.

Several other studies find that crime exerts negative impacts on regional economic activity in Mexico. González Andrade (2014) reports that crime is generally associated with small negative impacts on per capita gross state product. Verdugo-Yepes et al. (2015) find state-specific crime shocks to be associated with a 0.5% reduction in per capita gross state product, albeit with substantial variability among individual state reactions. BenYishay and Pearlman (2014) use survey data to examine the effects of robbery and other forms of crime on microenterprise expansion in Mexico. A one percentage point increase in the incidence of robberies is found to reduce the probability of planned business expansion by 0.9 percentage points.

The other major strand of literature that is relevant to this analysis concerns retail activity in border regions. Several studies note that residents of Mexico represent an important segment of the customer

base for retailers in the southern border zone of the United States (Patrick & Renforth, 1996; Coronado & Phillips, 2007; Sullivan et al., 2012). Fullerton and Walke (2014) find evidence that cross-border shopping affects the volume of retail sales on the Mexico side of the border as well. Furthermore, that study reports that aggregate retail activity in northern Mexico's border cities declines in response to increases in violent crime. The latter findings, taken together, might suggest that residents of these border cities consider the comparative safety of cross-border, versus local, retail centers in deciding where to shop.

Two related studies suggest that violent crime in northern Mexico has yielded some unexpected benefits for border communities in the southern United States. Niño et al. (2015) hypothesize that El Paso, Texas, a border city with among the lowest violent crime rates in the United States, may have attracted retail customers from neighboring Ciudad Juárez, Mexico, during a period of intense inter-cartel rivalry in the latter municipality. Also, Trevino and Genna (2017) find that increased crime in Mexican border states is associated with higher levels of retail sales in Texas border communities. The latter studies provide further evidence suggesting that a surge in crime on one side of the border pushes some portion of retail activity to the other side of the border via changes in cross-border shopping flows.

A number of prior efforts examine other factors that affect cross-border shopping patterns near international boundaries elsewhere in North America and in Europe. Campbell and Lapham (2004) find real exchange rate movements to affect food stores, gas stations, restaurants, and drinking places along the border between the United States and Canada. Real depreciation of the Canadian dollar reduces the number of establishments in operation and the average number of employees per establishment in northern border counties of the United States. Both theoretical and empirical research also suggests that tax rate differentials between neighboring countries have the potential to affect cross-border retail market sizes (Kanbur & Keen, 1993; Ferris, 2000; Nielsen, 2001; Asplund et al., 2007). Other factors that may influence the volume of cross-border shopping activity include the stringency of border security controls (Clark, 1994) and the number of cross-border work commuters (Banfi et al., 2005). Like national sales taxes and real exchange rates, violent crime may potentially affect the volume of cross-border shopping and the spatial distribution of border-region retail activity.

This research contributes to the literature on the impacts of violent crime on retail activity in two principal ways. First, it examines data at a higher level of aggregation than most research on retail-sector reactions to violent crime. Specifically, the focus is on municipal-level impacts. The second distinguishing feature of the analysis concerns the role that national borders may play in shaping the economic repercussions of violence. This is especially relevant to Mexico due to the importance of cross-border shopping for retail activity along the international boundary with the United States. The analysis will examine whether the sharp discontinuities in legal and administrative systems encountered near international lines of demarcation mediate the impact of violent crime on retail activity.

### 3. Methodology

Some areas have higher historical average crime rates than others. Cullen and Levitt (1999) argue that information on average crime levels in different urban areas has, in general, already been incorporated into the past location decisions of households and firms. Similar to that study, this analysis focuses on the effects of changes in crime, rather than levels, in order to determine how those changes affect contemporary economic outcomes. In addition to temporal variation, cross-sectional variation is required in order to identify the effects of proximity to an international boundary. Thus, the nature of the research question at hand necessitates a simultaneous examination of the relationship between violent crime and retail activity across geographical units and over time.

A panel data fixed effects approach is used to control for time-constant factors while also allowing for comparison of the crime-retail relationship in border zones versus interior regions. The starting point for the analysis is Equation (1), where  $i$  identifies cross-sectional units and  $t$  indicates time periods. Two years of data, corresponding to the 2009 and 2014 Economic Censuses, are utilized. Because only two years of data are employed, the fixed effects estimates of the parameters  $\beta$ ,  $\gamma$ , and  $\delta$  are identical to ordinary least squares estimates when the variables in Equation (1) are first-differenced prior to estimation.

$$R_{it} = \alpha_i + \tau_t + \beta X_{it} + \gamma V_{it} + \delta V_{it} B_i + \varepsilon_{it} \quad (1)$$

$R$  is a measure of retail activity,  $X$  represents one or more control variables,  $V$  is violent crime, proxied by homicides,  $B$  is a dummy variable for border cities, the  $\alpha_i$  are cross-sectional fixed effects, the  $\tau_t$  are year fixed effects, and  $\varepsilon$  is a random error term. Important control variables when examining variation in retail activity across metropolitan areas include population and income (Liu, 1970).

The first null hypothesis to be examined is  $H_{0a}$ :  $\gamma \geq 0$ . If  $\gamma$  is a non-negative number, then violent crime does not negatively affect municipal-level retail activity. There are a number of reasons why crime may not have adverse economic consequences in general (Bates & Robb, 2008; Pan et al., 2012). Retail centers may attract criminals who expressly target such locations while stores and shops may be clustered near pubs or entertainment venues with a relatively high risk of violent crime (Greenbaum & Tita, 2004; Rosenthal & Ross, 2010). Furthermore, even if violent crime does drive retail activity into safer neighborhoods, as some previous studies find,  $\gamma$  could still be non-negative if those effects are confined to the neighborhood level of geographic aggregation.

The second null hypothesis is  $H_{0b}$ :  $\delta \geq 0$ . If  $\delta$  is a non-negative number, then border city retailers are not more adversely affected by violent crime than retailers in the interior. That can occur if cross-border retail sales to residents of neighboring countries are of little importance for border regions in Mexico. It can also occur if the level of violent crime in border regions has a minimal effect on the number of customers that reside in Mexico and shop on the opposite side of the international boundary.

Municipal-level data are used to estimate Equation (1). Other studies have used data on municipalities in Mexico to analyze patterns of violence (Dell, 2015) and their economic consequences (Robles et al., 2013). Summary indicators of municipal-level retail activity serve as the dependent variables in this

analysis. These variables are drawn from the 2009 and 2014 Economic Censuses, which capture information corresponding to 2008 and 2013, respectively. The principal unit of observation for the Economic Censuses is the establishment, defined as an economic unit operating on a permanent basis in a single, fixed location, under the control of a single business entity (INEGI, 2015). The measures of retail activity used as dependent variables are the number of establishments, the number of paid employees, and retail sales as quantified by income from the resale of goods and merchandise.

Because data on income are not universally available at the municipal level, two alternative indicators of general economic conditions are utilized. The first is formal-sector employment, which is compiled by IMSS, the national social security agency in Mexico. Aggregate employment is sometimes used as a control variable in retail studies (Bowes, 2007; Rosenthal & Ross, 2010). The second measure is per capita Gross State Product (GSP) scaled using municipal-level employment data. For the aggregate GSP data, output from the petroleum extraction sector is allocated to the states where the extraction takes place, which skews the GSP estimates (Ruiz-Ochoa, 2010; Jordaan & Rodríguez-Oreggia, 2012). To circumvent this problem, the GSP values utilized exclude petroleum extraction. For most states, the correction makes no difference. In the case of the oil-producing state of Campeche, it reduces estimated per capita GSP from more than 6 times the national average to 1.4 times the national average.

While the primary source of retail demand is typically local, shopping by tourists is also important for some regions. Businesses catering to foreigners are commonplace in many tourist destinations and such businesses are economically important in Mexico (Sinclair, 1998). Due to missing data on the number of tourist stays, the number of registered hotel rooms is employed as a proxy measure for tourism activity. Finally, as in some previous studies, violent crime ( $V$  in Equation 1) is proxied by the number of homicides (Greenbaum & Tita, 2004; Detotto & Otranto 2010; Fullerton & Walke, 2014; Verdugo-Yepes et al., 2015). González Andrade (2014) finds that, among various categories of crime, homicides have relatively strong adverse impacts on economic performance in Mexico. Because homicides are typically rare occurrences with a high degree of year-to-year variability, three-year average homicide rates are calculated for the periods 2006-2008 and 2011-2013. The full effects of a shift in violent crime patterns may be manifested only after decision-makers have had time to assess whether the shift is transitory. In the face of a crime wave, entry/exit decisions of firms and the adjustment of shopping habits often occur with a lag (Detotto & Otranto, 2010; Niño et al., 2015).

All of the continuous variables described above are transformed into per capita terms to control for municipality size. Three new municipalities were carved from existing municipalities between 2007 and 2011. For these municipalities, missing values are distributed proportionally based on 2013 population estimates. Also, while reasonably complete data are available for the variables mentioned above, there are some missing values. First, data on formal-sector workers are not disaggregated for Mexico City. The total employment figure for Mexico City is distributed among its 16 administrative units based on population figures. Second, hotel room data are missing for certain municipalities in Jalisco and Guerrero, primarily for 2013. Where possible, those missing values are interpolated using

Economic Census data on establishments in the hotel sector. When Economic Census data are unavailable, which occurs for some municipalities in Jalisco, the interpolation is conducted using 2011 data for the number of hotel rooms (Friedman, 1962; Fernandez, 1981).

In addition to the continuous variables, a border city dummy variable is also developed ( $B$  in Equation 1). The hypothesized effect of the interaction between violent crime and proximity to a border depends mainly on the role of the border as a gateway for commerce, providing cross-border shoppers with access to bargains unavailable in the interior. It is in such a context that a crime wave might be expected to have amplified impacts on the geographic distribution of retail activity in border regions. The definition of border cities used to test hypothesis  $H_{0b}$  therefore excludes primarily rural areas where low population densities and large distances between ports of entry limit the attractiveness of cross-border retail centers (Clark, 1994). Municipalities are coded as one if they: (1) are adjacent to an international border, (2) had a population of at least 100,000 in 2008, and (3) have a major population center within 10 kilometers, or less, of the border. This definition results in a group of 14 municipalities along the borders with the United States, Guatemala, and Belize.

**Table 1. Descriptive statistics**

	2008		2013	
	Mean	Standard deviation	Mean	Standard deviation
Mid-year population, Thousands	43.420	131.162	48.187	138.926
Retail-sector establishments	720	2,371	786	2,507
Retail-sector paid employees	690	3,105	705	3,031
Total retail sales	\$1,062	\$4,928	\$1,085	\$4,805
Per capita GSP $\times$ Local jobs	\$996	\$6,049	\$1,109	\$7,188
Formal-sector employment	5,783	30,676	6,537	33,613
Registered hotel rooms	237	1,408	269	1,556
Homicides, 3-year average	5.0	24.4	11.5	63.5

*Note.* Retail sales and per capita gross state product data are in millions of 2008 pesos.

Mid-year population estimates are retrieved from Mexico's National Population Council (CONAPO). All of the other continuous variables are obtained from the national statistics agency, INEGI. Table 1 displays descriptive statistics separately for 2008 and 2013. The statistics show that most retail establishments are small, having on average gross sales equivalent to approximately US\$ 134,000 in 2008. The approximately one-to-one ratio between retail establishments and retail employment is another indicator of the small size of many retail businesses. Microenterprises constitute the large majority of retail establishments in Mexico and self-employment is widespread in the retail sector (Moreno Pérez & Villalobos Magaña, 2010). BenYishay and Pearlman (2014) find that



microenterprises in Mexican states with high levels of property crime are less likely to expand operations. Microenterprises may be especially vulnerable to crime due to various factors including limited resources for security protections and safeguards. Table 1 also shows that average annual homicides per municipality more than doubled from 5 in the 2006-2008 period to 11.5 in the 2011-2013 period.

#### 4. Empirical Results

The results of regressions controlling for year and municipality fixed effects are summarized in Table 2. The results are based on Equation (1), with both the dependent and independent variables divided by municipal population. Thus, the homicide variable can be interpreted as a homicide rate per 1,000 people. The effects of the independent variables are qualitatively similar for all three retail business activity indicators. Both broad measures of local economic conditions and the proxy measure of tourism-related activity have positive effects, though the latter is not statistically significant at the 5% level. The marginal impacts of hotel rooms on retail activity partially corroborate the argument of Brenner and Aguilar (2002) that tourism has played only a modest role in regional economic development in Mexico.

Coefficients estimated for the primary variable of interest, homicides per 1,000 inhabitants, are negative for all three retail activity measures. In the cases of retail employment and establishments, the parameter estimates surpass the 5% significance threshold. For these two dependent variables, the empirical evidence indicates that the first null hypothesis,  $H_{0a}$ , can be rejected. Violent crime has adverse consequences at the municipal level for the number of retail operations and the size of payrolls. One additional homicide is estimated to result in one fewer retail establishment and one fewer paid retail job in the interior of Mexico after controlling for municipal population. These impacts are small but non-negligible, given that municipalities have, on average, 697 paid retail jobs and 753 retail establishments. These results corroborate previous research findings that violent crime generates negative consequences for economic activity in Mexico (González Andrade, 2014; Verdugo-Yepes et al., 2015).

**Table 2. Estimation Results**

	Retail employment	Retail establishments	Retail sales
GSP*Local employment	0.157 (3.18)**	0.064 (3.52)**	0.190 (1.95)*
Formal employment	0.017 (2.78)**	0.011 (3.23)**	0.024 (2.26)**
Hotel rooms	0.054 (1.01)	0.047 (1.29)	0.096 (1.75)*

Homicides	-1.064 (-3.61)**	-1.056 (-3.09)**	-0.521 (-0.97)
Homicides*Border	-3.522 (-4.09)**	-2.352 (-1.46)	-3.826 (-0.69)
Constant	4.362 (10.90)**	13.687 (73.14)**	5.612 (7.37)**
F-statistic	17.39**	9.63**	10.78**
Cross-sectional units	2,198	2,198	2,203

*Note.* All continuous variables are expressed in per-capita terms; *t*-statistics calculated using robust standard errors are shown in parentheses.

\*\* denotes statistical significance at the 5% level for a two-tailed hypothesis test;

\* denotes statistical significance at the 10% level for a two-tailed hypothesis test.

One additional homicide is estimated to reduce total municipal retail sales by approximately one-half million 2008 pesos, roughly equivalent to US\$ 47,000. That parameter estimate does not surpass the 5% significance level. The preponderance of microenterprises in Mexico's retail sector may help explain why the effect of homicides on retail sales is not statistically reliable. Microenterprises account for a majority of employment and establishments in the sector, but large corporations increasingly account for a substantial share of total retail sales (Moreno Pérez & Villalobos Magaña, 2010). As noted above, larger retailers may be more insulated from the impacts of homicides and organized crime due to economies of scale in business security provision. Another possible reason why homicide rates significantly affect the number of establishments and jobs but not the volume of retail sales involves substitution effects at the sub-municipal level. Consumers may switch to shopping destinations in relatively safe neighborhoods within the same municipality, buoying total retail sales, while business closures in heavily-affected areas may not be immediately compensated by new business formations or expansions in safer neighborhoods.

The interaction effect for the estimated retail employment equation indicates that the adverse impacts of homicides are augmented by proximity to an international boundary. This suggests that null hypothesis  $H_{0b}$  can be rejected for this measure of business activity. Along national frontiers, one additional homicide is estimated to generate a loss of 4.5 retail jobs, significantly more than in the interior of the country. The larger effect of violent crime in border regions is most likely due to the combined effects of fewer foreign shoppers entering high-crime border areas and more cross-border shopping by residents of those areas. This aligns with previous findings that retail dynamics in border zones are often affected by cross-border shopping activity (Campbell & Lapham, 2004; Asplund et al., 2007; Coronado & Phillips, 2007). The interaction parameters for the other two retail activity indicators, establishments and sales, are also negative but do not satisfy the 5% significance criterion.

**Table 3. Retail Activity Elasticities**

	Retail employment	Retail establishments	Retail sales
Homicides	-0.022	-0.009	-0.008
Homicides*Border	-0.093	-0.027	-0.068

The estimated elasticities of retail activity with respect to homicides are shown in Table 3. The elasticities are calculated by multiplying the estimated marginal effects by the ratio of the independent and dependent variable means. Comparable to what has been documented in other studies, the estimates are highly inelastic. Fullerton and Walke (2014) find that the elasticity of net retail sales with respect to organized crime-related homicides range from -0.017 to -0.035 for a group of six border cities. By comparison, the retail sales elasticity for border zones reported in Table 3 is slightly larger in magnitude, -0.068. In general, the retail employment indicator registers the strongest negative impacts of homicides. This is similar to the finding of Robles et al. (2013) that the effects of homicide rates are comparatively large for labor market dependent variables.

The estimated effects of homicides on retail employment and establishments in Table 2 are consistent with the argument that consumers take municipal public safety conditions into account when deciding where to shop. As previously mentioned, it is also possible that homicides affect retail activity through other channels. For example, violent crime may directly impact migration and business relocation decisions that, in turn, affect the number of retail employees and establishments. Rios (2014) estimates that violence related to drug trafficking resulted in either internal displacement or international migration for approximately 220,000 residents of Mexico between 2006 and 2010. The migration decisions of highly skilled workers are often especially sensitive to crime rates (Cullen & Levitt, 1999). Outmigration of entrepreneurs and other skilled workers may have affected both retail-sector labor supply and decisions regarding the creation, expansion and closure of retail businesses.

While outmigration may affect retail-sector employment throughout Mexico, it is plausible that the impact might be magnified in border regions. Outmigration was especially severe in some border cities (Rios, 2014) and many business owners moved at least some operations across the northern border during the period of escalating violence (Robles et al., 2013). Twin cities along the international borders offer business owners the possibility of relocating to a different security environment while maintaining at least a portion of their existing clientele due to cross-border shopping. Thus, the presence of an international boundary may affect the distribution of retail activity in various ways, such as through the migration decisions of retail entrepreneurs and skilled workers, the business location decisions of retailers, and the shopping patterns of consumers.

In summary, an outbreak of violent crime on one side of the border is likely to persuade some shoppers to switch retail destinations to foreign locations perceived as more secure and may even induce some businesses to relocate across the border. Consequently, episodes of conflict in Mexico may increase

retail sales in neighboring countries. Trevino and Genna (2017) find that retail sales in Texas border counties are positively affected by homicides in adjoining Mexican states. Similarly, DeGroot (2010) finds that violent conflict in African countries can generate positive spillover effects for nearby countries by diverting trade, investment, and skilled migrant labor to the latter. However, other studies have found that violent conflict in one region or country can also have negative economic impacts on contiguous regions (Ades & Chua, 1997; Pan et al., 2012). Along those lines, Niño et al. (2015) find that the deleterious consequences of violent crime in Ciudad Juárez at least partially offset the positive spillover effects that accrue to the adjacent border city. Thus, the finding that border zone retail activity is especially responsive to changes in violent crime does not necessarily imply that regional economies on the other side of the border garner net benefits.

One final observation concerns the use of homicides as a proxy variable. During the period in question, the increase in homicides was largely attributable to competition between drug trafficking organizations. The rise in homicides was accompanied by escalations in other types of crime such as robbery, extortion, and kidnapping. Drug-trafficking organizations often perpetrate such crimes as a means of financing conflicts with competitors and these types of crimes are more likely to go unpunished when law enforcement resources are thinly stretched by intra-cartel conflict (Robles et al., 2013). Furthermore, decisions regarding business expansion are sensitive to the incidence of crimes such as robbery and burglary (BenYishay & Pearlman, 2014). Thus, the estimated effect of homicide rates on commercial activity may be partly attributable to the relationship between homicides and other crimes such as robbery or extortion that have been closely associated with organized crime activity in Mexico (Ashby & Ramos, 2013).

## 5. Conclusion

Over the past decade, Mexico has suffered a dramatic rise in violent crime catalyzed by illegal narcotics trafficking. This study examines potential impacts of increases in violent crime on the retail sector because research for other regions suggests that retailers are disproportionately affected by violent crime. While neighborhood-level effects of violence on retail business activity have been documented in those previous studies, there is little prior evidence on whether violent crime will affect the distribution of retail activity at higher levels of geographic aggregation. Data on municipalities in Mexico are collected for 2008 and 2013 to investigate that question.

The first null hypothesis is that violent crime has no adverse impact on aggregate municipal-level retail activity. That hypothesis is rejected in two out of three cases. The evidence indicates that one additional homicide is associated with one fewer retail establishment and one fewer paid retail job, on average, in municipalities. The estimated effect on retail sales is also negative, but does not surpass the conventional significance threshold. Overall, these results suggest that violent crime generates damaging effects on retail activity, even at the municipal level of aggregation. Retailers may be forced to reduce payrolls or even close up shop in response to upswings in violent crime. Thus, impacts on

retail activity should be considered when quantifying the economic costs of violent crime.

The second null hypothesis is that the impact of violent crime in border regions is no more severe than the impact observed in non-border areas of Mexico. This null hypothesis is rejected in one of three cases. Homicides appear to have amplified impacts on border city retail employment. The differential impact of homicides in border zones is attributed primarily to the availability of cross-border shopping opportunities, but may also result from other factors such as a greater propensity of border-region entrepreneurs to relocate businesses. In various ways, proximity to an international boundary may provide opportunities for minimizing vulnerability to violent crime, with the consequence that the distribution of retail activity in border regions is especially sensitive to crime waves. Prior research indicates the importance of exchange rate fluctuations and bilateral sales tax differentials for border region retail activity. The evidence from this analysis suggests that violent crime is one additional factor that affects retailers in border zones differently than those in interior regions, at least in the case of Mexico.

The results suggest that, if municipal investments in public safety achieve a reduction in violent crime, then that is likely to help prevent the loss of retail jobs and businesses. Examination of the specific policies that might contribute to improved public safety conditions is beyond the scope of this analysis, but it is an important area for continued research. Furthermore, those seeking to at least partially offset the amplified impacts of violent crime in border zones might make use of mechanisms such as value-added tax incentive programs within designated border zones. Some previous work analyzes similar proposals (e.g., Rietveld et al., 2001) and more research in that area may prove useful.

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