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An Empirical Analysis Of The Ciudad Juárez Homicides: The Impact Beyond An International Border

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Dedication

In dedication to those who have lost their lives or have lost a loved one as consequence of the violence in Mexico.

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by

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Abstract

Homicides, induced by the drug war, in Ciudad Juárez drastically increased beginning in 2007. Few studies have been carried out which asses the economic impacts of crime and homicides. Furthermore, the existing literature lacks regional assessment efforts (Rios 2008). Because of geographical proximity and close economic ties, this paper reviews some of the potential impacts the Ciudad Juárez homicides may have on the El Paso regional economy. A time series data approach is employed to assess potential impacts on factors including the El Paso metro business cycle index, El Paso employment, and El Paso retail sales. Findings indicate that fluctuations in the number of Ciudad Juárez homicides impact the El Paso metro business cycle index and El Paso employment in a direct and statistically significant manner while the results for retail sales are inconclusive.

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Chapter 1: Introduction

El Paso and Ciudad Juárez together form one of the largest borderplex metropolitan economies in the world. According to the U.S. Census Bureau and Mexico's Censo, population reached over 2.1 million individuals in the El Paso-Juárez region by the year 2010. This U.S.-Mexico borderplex region is the most populated in Texas and second in the nation only to the San Diego-Tijuana borderplex. The U.S. Bureau of Transportation Statistics indicates that in 2010 there were more than 25.2 million crossings of individuals through the El Paso ports of entry to make way into El Paso from Ciudad Juárez, Mexico. These individuals cross into El Paso to engage in numerous activities directly impacting the El Paso economy. They often visit relatives who reside in El Paso or shop for everything from automobiles and designer clothes to soft drinks (Cañas 2002). It is also not uncommon for Ciudad Juárez commuters to be employed and or have children that attend school in the U.S. side of the Rio Grande River (Payan 2006). Although the number of commuters into El Paso during 2010 was large in magnitude, it was nearly 42 percent lower relative 2006 (U.S. Bureau of Transportation Statistics 2012). The number of north bound commuters was not the only noticeable variable that experienced contraction during this period. Other El Paso key economic factors such as employment, metro business cycle, and retail sales did so as well. This may be highly attributable to the so-called Great Recession that began in 2007. Economic indicators show that the El Paso's economy did in fact join the 2007-2009 recession; however, the local economic downturn was milder. It is reported that El Paso ranked as one of the strongest metro economies during the recession (Brooking's Rankings 2012). The question then turns to, are there perhaps factors beyond the traditional border-economics convention that may have helped the El Paso economy weather the recession?

While the Great Recession was underway in the U.S., homicides, induced by the drug war, in Ciudad Juárez drastically increased beginning in 2007. For instance, in 2007, there were 136 documented homicides (Presidencia de la República 2011). This number itself is alarming. However, by 2010, the number increased by 20 times to a startling 2,738 homicides for that year. Undeniably, the crime and violence in Mexico may be attributed in large to the major drug cartels (Widner et al 2011). Ciudad Juárez has been at the epicenter of Mexico's widespread drug trade trafficking violence. It is publicized that cartels in Ciudad Juárez, and many northern border –cities, have waged a war over the major corridors into the United States (Widner et al 2011, Payan 2006, Congressional Research Service 2011, Salazar and Olson 2011, WSJ 2009). These events have left many dead and a region in fear.

Few studies have been carried out which asses the economic impacts of crime and homicides (Rios 2008). Furthermore, the existing literature lacks regional assessment efforts. Because of geographical proximity and close economic ties, this paper reviews some of the potential impacts the Ciudad Juárez homicides may have on the El Paso regional economy. A time series data approach is employed to assess potential impacts on factors including a metro business cycle index, employment, and retail sales on the El Paso side of the border. Findings indicate that fluctuations in the number of Ciudad Juárez homicides impact the El Paso metro business cycle index and El Paso employment in a direct and statistically significant manner. Correlation between the number of Ciudad Juárez homicides and El Paso retail sales produce statistically inconclusive results.

The succeeding section of the paper includes a concise discussion of the literature concerning economic ties between border cities in the U.S. and Mexico as well as some insight about the current drug war in Ciudad Juárez. Section three discusses the data and methodology employed for the study at

hand. Section four is a presentation of the empirical results. Summary and closing remarks are provided in the concluding section.

Chapter 2: Literature Review

2.1 Cross Border Economic Integration

It is of importance to note that the study of border regions is not a straight forward undertaking. This is due in part because such regions, like El Paso, face influence not only from U.S. business cycles but also national business cycles in Mexico, as well as regional business patterns in Ciudad Juárez (Fullerton 2001). Although a textbook for the topic of border economics is yet absent, several topics of importance can be identified. Topics include business cycles transmissions, exchange rates, industrial development, and labor markets, just to name a few (Fullerton 2003).

Cross-border trade is a key component of economic conditions along the U.S. and Mexico border. It is of no surprise that because of factors such as geographical proximity and economic linkages, these two economies have evolved from competing with each other to being complements (Cañas 2002). Border economic research has become attractive in recent decades due in part to the acceleration in demographics, commercial, and industrial expansion as a result of trade liberalization and other forms of business deregulation between border economies (Fullerton 2003). After the mid-1990s, perhaps when the North American Free Trade Agreement (NAFTA) was enacted, research shows that there was an escalation in economic integration between U.S.-Mexico border city-pairs (Cañas et al 2011). Chiquiar and Ramos-Francia (2005) study the effect of NAFTA on correlation patterns between Mexico and the U.S., paying emphasis to the manufacturing sector. Findings indicate that prior to NAFTA, the cross-correlations between Mexico and U.S. manufacturing output are statistically insignificant at all lags for the observed series, while those for the business-cycle components of the series are relatively small and appear significant only at 7-10 quarter lags. After NAFTA, the correlation between Mexican and U.S. manufacturing output became stronger; a significant long-run link between

them seems to have evolved; and their cyclical movements have inclined to become roughly contemporaneous (Chiquiar and Ramos-Francia 2005). This further infers that interdependence of cross border business cycles has grown over time, due in part to NAFTA.

Trade between these neighboring economies has evolved significantly. From 1993 to 2003, total trade between the U.S. and Mexico increased by 189 percent from $81.4 billion to $235.5 billion. Since then to 2010, trade has increased by an additional 53 percent totaling $360.4 billion (U.S. International Trade Commission 2012). It is noted that a large number of industries underwent large increases in intra-industry trade over the first five year after NAFTA (Clark et al 2001). Gilmer (2004) reports that about 80 percent of U.S.-Mexico trade is intra-industry trade; a key feature that may have played a role in the countries' increased economic synchronization. It is of value noting that Texas is by far the largest trading U.S. state with Mexico. Exports to Mexico from the state of Texas increased from $41.561 billion in 2003 to $72.627 billion in 2010 (World Institute of Strategic Economic Research 2012). Furthermore, in the U.S., the El Paso/southern New Mexico region is the second largest land port in terms of trade with Mexico with a share of 21.7 percent of total exports and 21.7 percent of total imports. The El Paso region is second after only the Laredo/south Texas region that captures 60.4 percent of exports and 53.2 percent of imports (Texas Center for Border Economic and Enterprise Development 2012).

Coincident economic indicators are frequently used to study business cycles and determine whether an economy is in recession, recovery, or expansion. It is of modest surprise due to some of the findings reported in this section that between 1993 and 2004, the correlation coefficient between the coincident indices of economic activity in the U.S. and Mexico increased. Gilmer (2004) reports an

increase in the correlation coefficient between the coincident indices from 0.73 to 0.96 by 2004. This may be interpreted as evidence of the increased economic integration between the U.S. and Mexico

There has been a growing body of research that attempts to build regional coincident economic indicators, also known as regional business cycle indexes. Phillips and Cañas (2006) study how the business cycles of four MSAs in Texas are connected to those of the broader economies that surround them. Their findings indicate that since 1994, the business cycles of the southern border MSAs of Brownsville, McAllen, and Laredo have moved in a more like fashion to the business cycle in Mexico. They report that El Paso's economy has become relatively more aligned with cycles in Texas and the US. More so, spectral analysis provided statistically significant evidence that the relationship between El Paso and the economies of Mexico and Texas had increased. Note that the maquiladora industry has heavy integration with the U.S. and Texas economies. In 2001, when there was a sharp decline in the maquiladora industry, as a result of U.S. manufacturing decline, El Paso's business cycle declined more than the other border cities (Phillips and Cañas 2006). This may be explained because of the strong economic ties that El Paso has with the maquiladora industry in Ciudad Juárez. This being, while the other three southern MSAs depend on Mexican national's retail activity more heavily than El Paso does.

2.2 MAQUILADORA STUDIES

Maquiladoras have acted as a major economic force along the border since the rise of the maquiladora industry after the enactment of the Border Industrialization program in the 1960s. The main objective of such program was to reduce high unemployment rates in communities along the border following the abolition of the Bracero farm labor program by the U.S. (Ayers and Layton 1974). In-bond assembly activities contribute a large number of jobs and thus influence income, retail sales, and demographic development throughout this region (Coronado et al 2004). Studies show strong linkages

between El Paso and Ciudad Juárez as a response to maquiladora activity. Sprinkle documents that Ciudad Juárez maquiladoras account for one in five jobs created in El Paso during the early 1980s (Sprinkle 1986). Subsequent to NAFTA, El Paso became progressively more dependent on the U.S. economy and implicitly on the Juárez economy. This is due to the ties of the U.S. with the maquiladora industry in Ciudad Juárez, which has the most maquiladora jobs in Mexico (Phillips and Cañas 2003). Findings estimate that a 10 percent increase in maquiladora value added leads to 0.88 percent growth in El Paso employment (Mollick 2006). Hanson (2001) documents that a 10 percent increase in maquiladora production in Mexican border cities leads to a 1.1 to 2.0 percent increase in employment in the U.S. neighbor cities. The study was later updated using additional recent data and indicate that a 10 percent increase in maquiladora production in Mexican border cities leads to a 0.5-0.9 percent increase in employment in U.S. neighboring border cities (Cañas et al 2011). More specific, Cañas et al (2011) also report that El Paso's maquiladora elasticity on employment is 2.8 percent. That is to say, a 10 percent increase in export production in Ciudad Juárez, Mexico leads to a near 3 percent increase in overall nonfarm employment in El Paso. The authors also look at specific sectors across each city. They find that the manufacturing sector does not respond significantly. They note that this is perhaps a response to modern supply chains that mandate just-in-time inventory. The transportation, finance, insurance, real estate, and business and personal services sectors carry significant results for El Paso.

Fullerton and Schauer (2001) utilize short-term time series characteristics of the Ciudad Juárez maquiladora sector in an attempt to clarify labor market behavior. Empirical results indicate that real wages, factories in operation, U.S. industrial performance, and the international value of the peso play significant roles in determining month-to-month fluctuations in borderplex maquiladora payrolls. Such findings further point to the economic linkages these two economies face despite being divided by an international border.

2.3 CROSS BORDER RETAIL

Retail activity is another factor where one can study the economic link between El Paso and Ciudad Juárez. Residents of Ciudad Juárez, and those surrounding from the state of Chihuahua, find themselves within the retail spectrum of El Paso. People make way across the border, in both directions, on a daily basis to purchase goods and services. This is in response to differences in varieties and adjusted prices and also such things as laws, policies, and consumer safety regulations (Coronado and Phillips 2007). Coronado and Phillips estimate purchasing power of local residents using personal income and employment thus enabling them to estimate exported retail sales for El Paso. Reported findings indicate 11 percent of retail sales in El Paso from 1970 to 2001 could be attributed to Mexican shoppers (Cañas et al 2006). In a later study using pooled data across 23 MSAs in Texas, findings indicate that Mexican nationals account for about 1.9 percent of Texas retail trade on average (Coronado and Phillips 2007). The same study reports that El Paso's exportable retail sales during 2001 were about 6 percent. This figure is well below El Paso's 11.3 averages. However, it is significant to mention because it is noted that such low figure may be a result of constricted maquiladora activity that year.

In an unpublished manuscript, Coronado et al (2012), attempt to estimate cross border retail trade. They do so by improving the consumption model used in Coronado and Phillips (2007) by accounting for wealth effects, housing and retirement plans, in addition to income in the estimation. In essence, local retail sales are estimated. The authors then subtract the estimate from the reported actual. The resulting balance is labeled as exported retail activity. More specifically: 40-45 percent for Laredo, 40 percent for McAllen, 30 percent for Brownsville, and 10-12 percent for El Paso. The authors also verify if the exportable retail sales estimates respond to conventional economic factors such as Mexico's

business cycle, fluctuations in the peso/dollar exchange rate, and regional market conditions. Results indicate that exportable retail sales characterize a significant share of Texas border cities retail activity. Results also indicate that retail sales estimates are sensitive to the economic factors mentioned above as well as distance and population size of Mexican northern cities.

Historical national threats have also had an indirect impact on the El Paso local economy. Fullerton (2007) examines the potential impacts El Paso's economy may have experienced as a consequence of the September 11, 2001 events. Although such events took place miles away from El Paso, regional activity involves areas that may be affected such as international ports of entry. Evidence of disruptions for El Paso's retail sector is small. However, findings did indicate that retail sales in Ciudad Juárez exhibit significant positive impacts as shoppers are more likely to remain on the south side of the border. This is due to greater opportunity cost of additional time spent waiting to cross over to El Paso as direct result of tighter security.

Exchange rates are a key influence to the number of commuters into U.S. border cities. This is because fluctuations in the real value of the Mexican peso alter the relative prices of American goods for Mexican nationals and vise versa. This, in turn, directly affects purchasing power and thus alters the behavior of consumers. In response, Mexican customer traffic across the border is impacted by fluctuations in the real value of the peso (Anonymous 1998, Michael and Barta 1997). Fullerton (2000) finds that northbound bridge traffic to El Paso is non-random and follows fairly well defined patterns. Furthermore, the loss of Mexican purchasing power results in a decrease in northbound bridge traffic in the central region of the two cities. In the downtown region, the effect was to increase northbound traffic. Although peso devaluations did not noticeably affect traffic in the eastern portion of the international metroplex, the aggregate impact was shown to be positive for the sample period.

During the "Tequila Effect" peso devaluation that lasted from late 1994 through the first quarter of 1996, the peso was devaluated by as much as 60 percent. As a result, Mexican purchasing power fell by just as much (Cañas 2002).The reduction of such purchasing power was not absent of consequence. Fullerton and Schauer (2001) report that, in El Paso, there was a reduction in overall growth and approximately 60 retail outlets closed. Fullerton and Schauer report that retail activity in El Paso typically hurts when Mexican purchasing power is reduced by large scale devaluations. Cañas reports that during Mexico's 1994 peso devaluation, real wages in Ciudad Juárez declined 13 percent and as a result, El Paso's retail employment declined (Cañas 2002). Patrick and Renforth (1996) surveyed Texas border cities in aim of assessing the impact of retail sales due to the 1994 peso devaluation. Their findings indicate a 41.8 percent decline, however vary by, store type, distance from the border, and relative domestic market size.

Exchange rate analysis has produced mixed results for the El Paso-Juárez retail sector. Coronado and Phillips (2007) estimate correlation coefficients between border retail sales and the real exchange rate. Results indicate that El Paso is the least responsive metropolitan statistical area in Texas to fluctuations in the real exchange rate. They further analyze the relationship by performing Granger causality tests on the sensitivity of overall retail sales for the four MSAs to changes in the real value of the peso. Results indicate that changes in the real exchange rate granger cause changes in retail sales for all border MSAs except in El Paso. Furthermore, they estimate VAR models using log levels of retail sales and real exchange rate. El Paso reports the lowest and most statistically insignificant impacts (Coronado Phillips 2007). It is important to note that Coronado and Phillips look solely at the retail sector. Such findings were also explained by pointing out El Paso's small share of retail to Mexican nationals, relative other border cities that have higher percent shares. Nonetheless, the estimated

11percent share to Mexican nationals is significant and should not be over looked. Despite the mixed findings in the literature, including real exchange rates in this study should prove useful because of the conventional economic knowledge concerning exchange rates and international markets.

2.4 DRUGS AND VIOLENCE

Drug trafficking is indirectly part of Mexico's overall economy; it impacts economic factors such as: employment, cash flows, investment, income, and consumption (Rios 2008). It has been noted that Mexico's economic condition is to some degree influenced by illegal drug activity and could experience a severe destabilization given discontinuance in the flow of drug dollars (Fazio 1998). This illegitimate practice has been estimated to provide primary employment opportunities to more than 450,000 individuals and account for 3 to 4 percent of Mexico's more than $1 trillion GDP on the order of $30 billion per year (Shirk 2011). Low costs of production and high profit margins are what have drawn individuals to enter the drug trafficking industry in Mexico (Payan 2006). Estimates, considering deviations in prices, demand, and loss due to seizures, place profits at $9.91 billion dollars in annual profits to its participants (Resa 2003). Although this figure is only an estimation bounded by limited data, the Mexican illegal drug industry has undoubtedly become a highly profitable and large industry in Mexico.

Because of the efforts brought by U.S. law enforcement to shut down the once powerful drug organization in Mexico headed by Miguel Angel Felix Gallardo during the late 1980s, Felix Gallardo ordered territorial division of his organization. As a result four regions would emerge: the Tijuana, Sinaloa-Sonora, Gulf, and Juárez Cartels and their corresponding corridors (Payan 2006, Salazar and Olson 2011). Post 1980, Colombian cartels have also been using Mexico, with profound assistance from

Mexican Cartels, as a gate way into the U.S. for cocaine smuggling (Payan 2006, Rios 2008, Shirk 2011).

The Congressional Research Service (2011) states that Mexico is a major producer and supplier to the U.S. market of heroin, methamphetamine, and marijuana. It also states that Mexico is the major transit country for more than 95 percent of the cocaine sold in the United States. Payan (2006) estimates that 70 percent of drugs all consumed in the U.S. come across its southwest international counterpart. Such drugs cross the border to meet the demand of 20 million U.S. consumers (Payan 2006). The Congressional Research Service approximates that in 2009, about 21.8 million individuals in the U.S. were current illegal drug users. That figure represents 9 percent of individuals aged 12 and older. It is also reported that between $19 to $29 billion dollars travel annually from the U.S. into Mexico to fuel the operations of the drug trafficking criminal enterprise (Department of Homeland Security 2010). Such high demand has reputedly led the U.S. to be labeled as the most important drug market (Payan 2006, Shirk 2011).

On December 1st, 2006, newly elected president of Mexico Felipe Calderon took office. Only days after taking office, Calderon declared war on drug cartels. Wasting no time, Calderon dispatched 7,000 troops and police to the state of Michoacán to combat drug organizations. Forces of similar size were shortly after sent to Tijuana on the northern border, and to the Pacific resort of Acapulco (The Economist 2007). On January 19th, 2007, the government extradited four drug kingpins and a dozen lesser figures to the United States for trial. Notably, amongst them was Osiel Cárdenas, the head of the so-called "Gulf Cartel", by far the most powerful drug gangster to be extradited to-date. It was clear that Calderon's shift in policy was taking action against the drug organizations. Calderon urged that the main objective of the police in place was political control rather than combating crime. This is why Calderon turned to the army (The Economist 2007). Some may note that Mr. Calderon's war on drug gangs has

defined his presidency (WSJ 2009), while others note that data show that violence has increased sharply under President Calderon (Rios and Shirk 2011).

Mexico's close geographical proximity to the U.S. and their near 2,000 mile border serve as a comparative advantage. This advantage increases the incentive for drug participation and the longing for territorial dominance. In a passage from "The Three U.S.-Mexico Border Wars", Payan 2006 notes:

> "Thus, much of the drug trade along the border cannot be attributed to the morality or immorality of the border or the good or ill intentions of those who participate in the production and trafficking of illicit drugs, but the sheer economic incentives that the business itself offers and the structural influencing border asymmetries such as differences in income levels, unemployment, and low skill levels of many Mexican workers."

As noted, the desire to maximize these economic incentives for the drug trafficking participants has led to a recent Mexican cartel war over control of the major corridors into the U.S. In Ciudad Juárez, the Sinaloa cartel has been in a constant violent war with the Juárez cartel in hope of capturing the Juárez territory and its ports of entry into El Paso by controlling the individuals that take delivery and transport the drugs.

It is understood that according to the "rational actor model" in the political science discipline, and the "rational consumer model" in economics, individuals will engage in an activity as so long as the expected benefit exceeds the expected cost (Becker 1968). Or, the expected benefit from engaging in a crime is equal to the benefit that such crime may bring times the probability of receiving that benefit. The cost of engaging in a crime is equal to the punishment tied to the crime times the probability of being caught (Widner et al 2011). Thus, the actions of the cartels reflect their benefit from crime

exceeding the cost associated with it. The issue with Juárez, and Mexico at a larger scope, is the ineffectiveness to punish those that engage in unlawful actions. According to surveys, between 70-80 percent crimes go unreported and only 7 percent of those reported crimes go to trial (Azaola and Bergam 2007).

Other reasons for the ineffectiveness are bribes and corruption. Cartels offer bribes to government officials and law enforcement for "protection" from other cartels and or punishment from the law. Those who accept such bribes are often compensated amounts that near or exceed annual earnings (Widner et al 2011). Those who desire not to participate are often not given the option. They are instead waged with the option of "plata o plomo", meaning take the silver or take a bullet (Payan 2006).

An additional outcry of effectiveness is due to the presence of the Mexican military in regions of Mexico, like Ciudad Juárez (Olson 2010). Military forces were deployed to high crime areas as a temporary replacement for civilian police. By early 2010, there were 200 reported cases of human rights violations by the military in Ciudad Juárez. Observers have argued that the ineffectiveness of the military is due to their sole purpose of "presence patrol". That is, dissuasive and reactive without many strategic or intelligence based operations. Salazar and Olson (2011) also reports the limited authority of the military as they have no explicit legal authority to carryout criminal investigations, interrogate suspects, question witnesses, or gather forensic evidence at crime scenes. Although anti-crime efforts in Ciudad Juárez have recently been turned over to federal police, the changeover is likely to take some time.

The drug war has led to many violent crimes and numerous homicides. Cartels often seek violence as means to regulate competition and to adjust accounts among other cartels. In 2011, the cumulative death toll for drug violence since 2006 reached a disturbing 50,000 deaths in Mexico. Such homicides have not only targeted criminal participants. There have been numerous reports of homicides that have targeted law enforcement at all levels, journalists, political officials, and innocent bystanders, including Americans. Violence does not discriminate on any grounds. In 2009, reports indicate that the mayor of Ciudad Juárez, Jose Reyes Ferriz, relocated himself and his family across the U.S. border in El Paso, Texas after receiving numerous death threats. This was shortly after threats pressured Juárez police chief, Roberto Orduña Cruz, to resign (Washington Valdez 2009).

Reports indicate that by 2010, Ciudad Juárez had become the most violent city in Mexico (Rios and Shirk 2011). Additionally, some estimates have gone as far as labeling Ciudad Juárez as not only the most dangerous city in Mexico, but also the world (El Paso times 2010, Consejo Ciudadano para la Seguridad Publica y Justicia Penal 2010). The homicide rate is clearly reflective of such label. The homicide rate, calculated using homicide data from La Pesidencia de Mexico (2012) and annual population data from the Border Region Modeling Project at the University of Texas at El Paso (2012), indicate a growth in violence in the last three years. The homicide rate for Ciudad Juárez increased from 10.001 per 100,000 residents in 2006 to 207.266 per 100,000 residents in 2010 (see Table 12).

In response to the escalated violence in border cities, the U.S. State Department issued the following travel advisory concerning travel to Mexico:

> U.S. travelers should be aware that the Mexican government has been engaged in an extensive effort to counter transnational criminal organizations (TCO) which engage in narcotics

> trafficking and other unlawful activities throughout Mexico. The TCOs themselves are engaged in a violent struggle to control drug trafficking routes and other criminal activity. As a result, crime and violence are serious problems throughout the country and can occur anywhere. U.S. citizens have fallen victim to TCO activity, including homicide, gun battles, kidnapping, carjacking and highway robbery… You should defer non-essential travel to the state of Chihuahua. The situation in the state of Chihuahua, specifically Ciudad Juárez, is of special concern. Ciudad Juárez has one of the highest murder rates in Mexico… Shootings have taken place at busy intersections and at popular restaurants during daylight hours… Local police forces suffer from a lack of funds and training, and the judicial system is weak, overworked, and inefficient.

There are a number of costs that may be associated with homicides and crime. Crime may be thought of as an anti-development phenomenon. Survey data show that crime and corruption are two of the leading barriers to investment in a region (UNODC 2007). INEGI (2012) data indicate that foreign direct investment (FDI) decreased in 2008 by 13.81 percent after having experienced a tremendous growth of 56.52 percent the previous year. By 2009, Mexico registered consecutive negative growth and the largest negative annual growth of the decade at $16.119 billion, down 40.6 percent. FDI seems to have recovered by 2010. However, figures were boosted by the $5 billion takeover of the beer business of Fomento Economico Mexico SAB by Deutsch Brewer Heineken. Excluding such single transaction would again brand the percent change for 2010 in FDI as negative. It is also important to note that some of the contraction in FDI may be attributable in combination to the Great Recession during that period (see Table 13).

Violence also hinders productivity and human capital and creates additional and unnecessary government expenditures. Rios (2008) reports the economic costs generated by drug violence in Mexico and notes negative externalities of corruption on aggregate investment and economic growth. Rios' report estimates that the cost of violence to Mexico is equivalent to 1.07 billion dollars in both costs and loses. Lodono and Guerrero (2002) estimate violence as a consequence to totals economic losses of 12.3 percent of the total Mexican GDP. The Congressional Research Service (2011) tells of the high cost associated with combating the threat of drug trafficking. Between the fiscal year of 2008 and 2010, the U.S. congress provided $1.5 billion for Mérida Initiative programs. The U.S. has since then reportedly been of aid with an additional $425 million. Mexico invested $26.0 billion of its own resources on security and public safety from 2008-2010 with an increase of approximately $3.6 billion since.

Violence in addition creates negative externalities because it instills fear thus impacts migration and lowers quality of life. Violence in Mexico may be creating an "environment of insecurity" and such environment promotes emigration from conflicted areas and from regions nearby. Although the recent decrease in migration may be explained by the economic downturn in the US, homicide rates may in fact help explain some of the increases in the migration flow (Meza-Gonzalez 2011). Meza-Gonzalez (2011) tests the hypothesis regarding a positive relationship between insecurity and migration. The evidence presented suggests a positive relationship between migration and insecurity. Results also indicate that migration occurs in economically dynamic municipalities and although more likely, not necessarily in only the richest.

Residents of Ciudad Juárez, and surrounding areas, may choose to emigrate in response to insecurity. Although a majority may choose to migrate into other regions of Mexico, emigration to El Paso is a strong possibility. El Paso is noted to be among the least violent cities in the United States

(Olson 2010). Rankings by the CQ Press (2011) indicate that El Paso was the safest city in the United States, with a population ≥ 500,000 from 2010-2011 and 2011-2012. Such rankings also rank El Paso among the top three safest in the U.S. for the 2007-2008 and 2008-2009 publications.

Rodolfo Rubio Salas, a professor and researcher at the Juárez campus of Colegio de la Frontera Norte, in a recent interview (Alvarado 2011), states that individuals have fled Ciudad Juárez to the in response to the recent spike in violence in the city. The demographer notes that his research methods indicate that migrants fled to both the U.S. and the interior of the Mexico. Approximately 30,000 to 50,000 individuals have emigrated to the US and approximately 150,000 to the interior of Mexico.

Data reported by the Border Region Modeling Project (see table 14), are reflective of the outflow in population in Ciudad Juárez. In 2010 alone, Ciudad Juárez experienced the largest negative net migration with data going back as far as 1961. At the same time El Paso experienced positive, although relatively small, net migration. It is important to note that individuals that do leave Ciudad Juárez have many destination options. They may choose to migrate to other parts of Mexico. They may also choose to relocate in other cities of the U.S. besides El Paso. At the same time, El Paso's positive net migration may also reflect inflow from other regions other than Mexico. Nonetheless, the insecurity in their home town and the evident security across the border may have directed migration, at least some, from Ciudad Juárez to El Paso.

Given the high levels homicide activity in Ciudad Juárez and high economic integration with El Paso, regional assessment efforts are encouraged to asses potential impacts Ciudad Juárez homicides may have on the El Paso economy. The following section outlines the data and methodology employed to determine if such impacts exists.

Chapter 3: Data and Methodology

3.1 DATA

Due to the close proximity and border-in-nature geography that El Paso and Ciudad Juárez share, it is practical to include data for both the U.S. and Mexico. At the same time, the inclusion of homicides may also prove useful in our assessment.

3.1.1 Dependent Variables

Because of the particular variables of interest and data availability, data gathered for the time series analysis include variables that are recorded at a quarterly and monthly frequency. I use several variables to capture the current stance of economic conditions in El Paso in addition to assessing the potential impacts of the violence in Ciudad Juárez: El Paso metro business cycle index, employment, and retail sales were analyzed as dependent variables. The El Paso metro business cycle index (MBCI) shows the broad movements in the El Paso local economy. It summarizes movements in nonagricultural employment, the unemployment rate, inflation-adjusted wages, and inflation-adjusted retail sales. Such index is produced by the Reserve Bank of Dallas (Phillips and Cañas 2003) with sample period from January 1980 to December 2010. El Paso nonagricultural total employment (EPEMP) is also analyzed as a dependent variable. The data were obtained from the Federal Reserve Bank of Dallas with a sample period from January 1980 to December 2010. El Paso inflation-adjusted retail sales (EPRR) as recorded by the Reserve Bank of Dallas with sample period from 1980Q:1 to 2010Q:4 are also analyzed as a dependent variable.

3.1.2 Homicides

The deaths occurred on suspicion of criminal rivalry *(HOMI)* as recorded at a monthly frequency by Presidencia de la República of Mexico are to be explored as a potential explanatory variable. The

sample period ranges from December 2006 to December 2010. The data are an aggregate of sub categories including death by execution, death by confrontation, and assault to authority (see Glossary). Presidencia de la República of México reports that homicides are defined as regards to Article 302 of the Mexican Federal Criminal Code, which makes the indication that these are cases in the context of rivalry between criminal groups. The sources responsible for generating the data base are comprised hereof: Secretary of Defense (Navy), Public Safety and Federal Government (through Centro de Investigación y Seguridad Nacional, CISEN), and by the Attorney General of the Republic (through Centro Nacional de Planeación, Análisis e Información para el Combate a la Delincuencia, CENAPI).

The data base report indicates that each team member provides credible and reliable information of its state deployments. It further states that data are verified to meet the criteria in the methodology. Cases that lead to doubts, have gaps of information, or did not meet at least three of the criteria in the methodology (See Glossary) are reserved in the section until the information allows them to be included into the database or discarded. Furthermore, the reporting group has begun implementation of systematic random procedure comparison of cases captured with the original source to ensure a higher quality of data and minimize the possibility of errors attributable to the training of personnel responsible of capturing or to the process of systematization of information. The sum of three month data was used to allocate quarterly frequency of deaths occurred on suspicion of criminal rivalry (HOMI). The resulting sample period ranges from 2006:Q4 to 2010:Q4. This was carried out for the analysis of El Paso real retail sales (EPRR).

3.1.3 Other Explanatory Variables

I use several other explanatory variables that would help explain fluctuations in the El Paso economic variables of interest. These explanatory variables include: the U.S. industrial production index, real exchange rate, indicador global de la actividad económica for Mexico, and El Paso unemployment rate. The U.S. industrial production index (USIPI) measures the real output of the manufacturing, mining, and electric and gas utilities industries. Such indices prove useful as they serve as a measure of the overall "health" of the U.S. economy. This index is recorded by the Board of Governors of the Federal Reserve System and is employed with sample period from January 1980 to December 2010 and from 1980:Q1 to 2010:Q4. Another explanatory variable is the real peso-to-dollar exchange rate (REXR). This rate allows us to account for fluctuations in the value of the Mexican peso relative the U.S. dollar. Such variable is recorded by Banco de Mexico with a sample period from January 1980 to December 2010. The rate was also averaged using three monthly frequencies to obtain the sample period 1980:Q1 to 2010:Q4. The Indicador global de la actividad económica in Mexico (IGAE) is also included as an explanatory variable. Such indicator is regarded as Mexico's monthly GDP and may help indicate the evolution of economic activity for Mexico at a monthly frequency. It is also particularly of interest because of it accounts, in part, for industrial activity including manufacturing. This variable is recorded by Instituto Nacional de Estadística y Geografía with as ample period from January 1993 to December 2010. This indicator was also averaged using three monthly frequencies to obtain the sample period from 1993:Q1 to 2010:Q4. The El Paso unemployment rate (EPUR) is assessed as a potential explanatory variable as it may serve as an indicator of overall economic conditions in El Paso. This variable is recorded by the Reserve Bank of Dallas with sample period from 1990Q:1 to 2010Q:4.

3.2 DATA ADJUSTMENTS

Adjustments for inflation of monetary values, EPRR and the MBCI because of its account of retail sales, were carried out by the Federal Reserve Bank of Dallas. The measure of prices used was the U.S. Consumer Price Index as prepared by the Bureau of Labor Statistics with 1978 as the base year. The CPI measures the change in prices paid by urban consumers for a market basket of consumer goods and services. It is primarily used as an economic indicator and as a means of adjusting current period data for inflation (McCully et al 2007). The CPI was used for adjustment as opposed to the Personal Consumption Expenditures Index that is produced by the Bureau of Economic Analysis. The PCE, which measures the change in prices paid for goods and services by the personal sector in the U.S. national income and product account, is primarily used for macroeconomic analysis and forecasting (McCully et al 2007). Research carried out by McCully et al (2007) shows that differences in growth rates between the two measures may be explained by differences in index-number formulas and weights. The larger weight affect was primarily explained by the larger relative weight for rent of shelter in the CPI than in the PCE price index. Over time, both indices capture relatively parallel movements in prices changes. The REXR was adjusted for inflation by the Banco de Mexico. Furthermore, the data were deseasonalized by the reporting source. If this was not the case, it was done using the X-12-ARIMA method as developed by the Census Bureau. This was done in hope of eliminating any cyclical seasonal movements that may exist within the data and extracting the underlying trend component of the series (Pindyck and Rubinfeld 1998). Once the data were adjusted for seasonality and inflation, the data were transformed using natural logs.

An important data adjustment was applied to the homicide data set. In hope of establishing long-run relationship between the dependent and explanatory variables, a number 1 was entered for homicide observations prior December 2006 going back to 1980. Once the data were differenced and logged the

result observation would be a number zero. This was done so that our regression estimates would not be limited to only December 2006-to-present observation once the parameter for homicides was added. The justification for such action is that the type of homicide violence reported in our data set began late 2006. Of course, some homicides may have occurred in Ciudad Juárez prior to 2006. However, not in the volatile and large manner as present in our data set. Because the data are in log-differenced (change in the percent change) form, small changes in the number of homicide prior to 2006 would have a similar impact to our analysis relative adding a number 1 across observations for the same time period.

3.3 UNIT ROOT TESTS

The now-adjusted-data series were tested for stationarity to determine whether the underlying stochastic process that generated the series could be assumed to be invariant with respect to time (Pindyck and Rubinfeld 1998). We want our series to exhibit stationary properties. A unit root test enables a statistical assessment of the series to test if the series are stationary or not. Dickey-Fuller Tests with GLS Detrending (DF-GLS) were performed as proposed by Eliott, Rothenberg, and Stock (1996) with a constant and a linear time trend. Results of the unit root tests using log-level data are recorded in Tables 1 and 5. Results indicate that the data fail to reject the null hypothesis that there exists a unit root for each of the time series. This implies that each time series follows a unit root process and therefore are not stationary in log-levels. Because the hypothesis of unit root cannot be ruled out, estimation at log-level will yield spurious results. The data are then differenced in order to induce first moment stationarity (Box and Jenkins 1976). Dickey-Fuller Tests with GLS Detrending (DF-GLS) were performed on each of the log first-difference time series data. Results of the unit root tests using differenced log-level data are recorded in Tables 2 and 6.Results indicate that the data reject the null hypothesis at the 1% level respectively for all time series except USIPI and Homicides at the quarter frequency and the monthly IGAE. However, the null hypothesis for quarter USIPI is rejected at the 10%

level and at the 5% level for the quarter HOMI series. As a robustness check, Augmented Dickey-Fuller (ADF) unit root test were performed for all the series. All results favored stationary properties.

3.4 Optimal Lag Structure

Furthermore, before the regression estimation method is applied, it is necessary to find the lag structure for all three models. In time-series models a substantial period of time may pass between the economic decision-making process period and the impact of a change in a variable. Because this may be the case in our analysis, lagged explanatory variables should be included explicitly in our models (Pindyck and Rubinfeld 1998). A series of cross correlation functions (CCFs) are estimated to investigate a potential lag structure between the dependent variables and each of the independent variables (Liu and Hanssens 1982, Coronado et al 2004). Lags of both the dependent and independent variables are to be considered for specification as lagged explanatory variables. A cross correlation function with lag k for a dependent variable y and an independent variable x is defined as follows:

$$\hat{r}_{xy}(k) = \frac{\sum_{t=1}^{T-K}(x_1-\overline{x})(y_{t+k}-\overline{y})}{\hat{\sigma}_x\hat{\sigma}_y} \quad \textit{for K= 0,1,2,..., and t=1,2,...,T.}$$

3.5 Residual Diagnostics

Standard diagnostic testing of the residuals will determine if the functions should be expanded to a transfer function model. That is to include autoregressive and moving-average components. In our analysis, one may not rely solely on the Durbin Watson statistic. This being because when one or more lagged endogenous variables are present the DW statistic will often be close to 2 even when the errors are serially correlated (Pindyck and Rubinfeld 1998). The residual diagnostics in this study were carried out with the analysis of the correlograms of residuals and Serial correlation LM tests as further confirmation. Table 9 illustrates that the EMPCI was the only equation to exhibit undesired residual

properties in both the correlogram of residuals and LM test. As mentioned above, the model was augmented with ARMA parameters in response to this.

A general form for a transfer function ARIMA (p, d, q) model with one independent regressor (z) is given below. The simplified model accounts for autoregressive movements noted by $\phi_i\, y_{t-1}$and moving average movements noted as$\phi_j e_{t-j}$. Furthermore, we attempt to capture the remaining movements with the explanatory variable as noted by$b_b z_{t-b}$.

$$yt = c + \sum_{i=1}^{p} \phi_i\, y_{t-1} + \sum_{j=1}^{q} \phi_j\, e_{t-j} + \sum_{b=1}^{k} b_b\, z_{t-b} + e_t$$

Furthermore, in our analysis our equation is modified with the objective of developing a linear transfer function ARIMA model of the El Paso metro business cycle index. The models for both retail sales and employment illustrated desirable residual properties in both the correlogram of residuals and LM test. Because of this and the non statistical significance when included, AR MA terms were not included in the analysis of retail sales while the analysis for employment included one month lag of itself.

3.6 REGRESSION ANALYSIS

Once the lag structure is identified, the equations for EPRR, EPEMP, and EPMBCI may be specified and estimated. The latter was carried out using the least squares method. Such statistical method aims to minimize the sum or squared residuals, that is:

Minimize $\sum_{i=1}^{N}\left(Y_i - \hat{Y}_i\right)^2$

Where $\hat{Y}_i = a + bX_i$ represents a basic single variable equation with intercept a and slope b. Y_i is the actual value of Y for observation i and corresponds to the value of X for that observation, while N is the number of observations. As stated above, the aim of the least squares method is to choose values for a and b which minimize the expression above or the sum of the squared difference between the actual observations for Y and the estimated values $\hat{Y}_i$.

The hypothesized relationships between the dependent variables and each of the El Paso economic variables are as follow: The El Paso unemployment rate is expected to have a negative impact on El Paso retail sales based on the convention that higher unemployment translates to less income and ultimately less retail activity. The U.S. industrial production index is also expected to exhibit positive properties on all three dependent variables. This being because such measure serves as a proxy for the overall "health" of the U.S. economy. An increase in the real peso per dollar exchange rate index is likely to decrease retail activity in El Paso as goods and services became more expensive for Mexican commuters because of a devalued peso relative to the dollar. It is also likely to increase El Paso employment as a devalued peso is likely to increase export oriented employment which has been shown to impact El Paso employment positively. Mexican nationals may also seek employment in El Paso in response to the difference in currency valuations. In return the exchange rate may also share positive properties with the El Paso MBCI. The IGAE is likely to share a positive relationship with all three variables. This is in response to ties of this indicator with industrial and maquiladora activity. An increase in drug-related violence, as proxied by the number of homicides, is expected to cause an increase in all three dependent variables. This is because of the likelihood that Mexican nationals would rather commute to a much safe and location, El Paso, for retail and employment. At the same time, American nationals are more likely to remain in El Paso as opposed to commuting into Juárez for the same activities during high violence times.

In the equation for (MBCI)

$$MBCI_T = f(USIPI_{t-i}, REXR_{t-j}, IGAE_{t-k}, HOMI_{t-l}, AR_{t-g}, MA_{t-h})$$

The expected algebraic signs are as follow:

$$\frac{\partial EPMBCI}{\partial USIPI} > 0, \qquad \frac{\partial EPMBCI}{\partial REXR} > 0, \qquad \frac{\partial EPMBCI}{\partial IGAE} > 0, \qquad \frac{\partial EPMBCI}{\partial HOMI} > 0$$

In the equation for (EPRR)

$$EPRR_t = f\left(EPUR_{t-i}, USIPI_{t-j}, REXR_{t-k}, IGAE_{t-l}, HOMI_{t-m}\right)$$

The expected algebraic signs are as follow:

$$\frac{\partial ERRS}{\partial EPUR} < 0, \qquad \frac{\partial ERRS}{\partial USIPI} > 0, \qquad \frac{\partial ERRS}{\partial REXR} < 0, \qquad \frac{\partial ERRS}{\partial IGAE} > 0, \qquad \frac{\partial ERRS}{\partial HOMI} > 0$$

In the equation for (EMEMP)

$$EPEMP_t = f\left(USIPI_{t-i}, REXR_{t-j}, IGAE_{t-k}, HOMI_{t-l}\right)$$

The expected algebraic signs are as follow:

$$\frac{\partial EPEMP}{\partial USIPI} > 0, \qquad \frac{\partial EPEMP}{\partial REXR} > 0, \qquad \frac{\partial EPEMP}{\partial IGAE} > 0, \qquad \frac{\partial EPEMP}{\partial HOMI} > 0$$

Chapter 4: Empirical Analysis

4.1 El Paso Metro Business Cycle Index

In the analysis of the impact of the Ciudad Juárez homicides on the El Paso metro business cycle index, a total of four regressions are estimated (see Table 9). Each subsequent regression is meant to illustrate the evolution of the initial specification as additional parameters are added. The first regression includes the MBCI regressed against the more commonly expected potential explanatory variables and their respective lags given our border region analysis. Although most coefficients display statistically significant and expected coefficient signs, the regression rejects the null hypothesis of no serial correlation present LM test. With the guidance from the correlogram of residuals, the second and third equations include the addition of AR (3) and MA (2) terms. Such addition corrects for serial correlation as displayed by the failure to reject the null hypothesis of no serial correlation LM test in equation 3. As a robust check, correlograms of the residuals is also referenced. It may also be noted that across all three regressions the signs and magnitudes of most coefficients remain the same implying uniformity. Once satisfied with the specification and diagnostics, the homicide parameter is added in equation 4.

Final results indicate that changes in the El Paso metro business cycle index with a one month lag have a positive and statistically significant impact on current period MBCI. The algebraic sign is positive as expected since conditions in current period are likely to influence the following period in a direct manner. The U.S. industrial production index too shares a positive and statistically significant relationship with the MBCI at a contemporaneous level and three month lag. The Peso/Dollar exchange rate index has an inverse and statistically significant relationship with the MBCI at an eight month lag. Although contrary to the expected positive sign, a more expensive dollar to Mexican nationals may in fact impact most of the activities underlined in the El Paso MBCI such as retail sales and employment in a negative manner. The indicador global de la actividad económica for Mexico shares a direct and statistically significant relationship with the El Paso's MBCI at a contemporaneous level, one month lag,

and seven month lag. As hypothesized, the positive algebraic sign confirms the economic linkages between El Paso and Mexico's economic activity.

Fluctuations in the number of Ciudad Juárez homicides share a direct correlation with the El Paso MBCI. The coefficient for homicides with a four month lag, reported in first-difference-log, is positive and has a 95 percent statistical significance. That's is to say given our data set, an increase in the number of Ciudad Juárez homicides four months back, leads to a statistically significant increase in the current period El Paso metro business cycle index. The positive and significant correlation may reflect the movement of economic activity north of the border in response to the insecurity to a much safer area, El Paso.

4.2 EL PASO EMPLOYMENT

Now that the data have confirmed significant impacts on the El Paso metro business cycle index, further analysis may be applied to some of the underlying components that make up such index. A model is developed to assess the potential impacts of the Ciudad Juárez Homicides on El Paso employment. A total of six regressions are estimated (see Table 10). Each subsequent regression is meant to illustrate the evolution of the initial specification as additional parameters are added. The first regression includes EPEMP regressed against the more commonly potential explanatory variables and their respective lags given our border region analysis. Unlike in our MBCI analysis, the first regression fails to reject the null hypothesis of no serial correlation LM test implying the non-presence of serial correlation. As a robust check, a correlogram of residuals confirms the latter. The significance of the coefficients and desired diagnostics led to the decision to move forward with such model specification. Parameters for lags of homicides are then added in the equations 2,3,4,5, and 6. Once again, it is noted that across all six regressions the signs and magnitudes of most coefficients remain the same implying robustness in the results.

As expected, the U.S. industrial production index shares a positive and statistically significant relationship with EPEMP at a contemporaneous level, three month lag, and eight month lag. The Peso/Dollar exchange rate has an inverse and statistically significant relationship with EPEMP at a 10 month lag. Although the expected sign was positive, a more expensive dollar to Mexican nationals may decrease activities in El Paso thus negatively impacting EPEMP and outweighing any possible positive impacts. The indicador global de la actividad económica for Mexico shares a direct and statistically significant relationship with EPEMP at a contemporaneous level and seven month lag. As hypothesized, the positive algebraic sign verifies the economic linkages between El Paso's and Mexico's economic activity.

Fluctuations in the Ciudad Juárez homicides share a direct correlation with El Paso Employment. The coefficients for homicides with monthly lags four through eight, reported in first-difference-log, are positive and statistically significant. That's is to say given our data set, an increase in the number of Ciudad Juárez homicides four, five, six, seven, and eight months back, lead to a statistically significant increase in current period El Paso Employment. The positive and statistically significant coefficients may reflect the migration of individuals in the form of employment relocation to El Paso in response to the insecurity in Ciudad Juárez. It may also reflect the migration of business activity which may ultimately lead to new or more employment in El Paso.

4.3 EL PASO RETAIL SALES

Our analysis is now extended with focus on El Paso's retail sales. A total of three regressions are estimated (see Table 11). Each subsequent regression is meant to illustrate the evolution of the initial specification as additional parameters are added. The first regression includes RRS regressed against the more commonly potential explanatory variables and their respective lags given our border region analysis. The first regression fails to reject the null hypothesis of no serial correlation LM test implying

the non-presence of serial correlation. As a robust check, a correlogram of residuals confirms the latter. The significance of the coefficients and desired diagnostics led to the decision to move forward with such model specification. Parameters for lags of homicides are then added in the equations 2 and 3. It is of value noting the robustness in the significance and magnitudes of the coefficients across all three regressions.

Final results indicate that changes in the El Paso unemployment rate with a four quarter lag have an inverse and statistically significant relationship with current period RRS. The unemployment rate is generally an indicator of local economic conditions. Higher unemployment translates to less income and ultimately less retail activity. As hypothesized, an increase in the El Paso unemployment rate leads to a decrease in retail activity in El Paso. Also as expected, the U.S. industrial production index impacts RRS in El Paso contemporaneously in a direct and significant manner. An increase in the Peso/Dollar exchange rate decreases RRS in the same period significantly. This is expected as an increase in the real peso per dollar exchange rate index will result in goods and services becoming more expensive for Mexican cross-border commuters because of a devalued peso relative the dollar. The indicador global de la actividad económica for Mexico shares an inverse and statistically significant relationship with RRS at a three quarter lag. The findings are contrary to the hypothesized positive algebraic sign. One would expect, because of the economic ties and border city geography, economic conditions in Mexico to impact RRS in El Paso positively manner. Because the negative coefficient for IGAE was highly unexpected, further options were explored. As a robustness check, the specification for RRS was regressed with Mexico's industrial production index in place of Mexico's IGAE (INEGI 2012). The coefficient for IGAE was confirmed as the coefficient for Mexico's IPI was nearly synonymous in magnitude and significance. The significant and negative sign may explain, given our data, that as economic activity in Mexico improves, Mexico's retail sector may increase availability and variety. This may ultimately lead to the decision of Mexican nationals to engage in purchases south of the border as opposed to incurring the commute cost of coming over to El Paso.

Impacts to El Paso's retail sector in response to fluctuations in the Ciudad Juárez homicides did not yield conclusive results. One and four quarter lags were the most statistically significant, but failed to validate at least at the 90% statistical significance. Despite the insignificance, the statistical signs are worth exploring. One quarter lag depicts an inverse relationship with retail sales. That is, an increase in Ciudad Juárez homicides one quarter back, leads to a decrease in El Paso's current period RRS. The impact seems to vary with respect to time. Homicides with a four quarter period lag have a-now-direct impact on El Paso's retail sector. The data show that an increase in homicides four quarters back increases El Paso's current period RRS. The net impact, or difference between the positive and negative coefficients, illustrates a small but positive impact the Ciudad Juárez homicides have may have on the El Paso economy. However, the negative coefficients seem to generally display higher statistical significance. Note that no additional statistical tests were performed on this difference because of the initial statistical insignificance. A regression including all lags for homicides, one through four, shows the change in impact from negative to positive from lag two to three. Once again, the results ultimately have to be ruled inconclusive because the coefficients did not meet the desired statistical significance.

The results presented here shed light on the believe that some individuals who would otherwise hold employment in Ciudad Juárez or perhaps businesses that would be located there have relocated activity in El Paso. Although believed to be small, there may also be a number of individuals who may have to relocate their place of living across the border in El Paso. We would expect higher retail sales in El Paso in response to the increase in violence and apparent decrease in activity in Ciudad Juárez (see Table 17). The inconclusive results for retail sales are of incentive to further the research in the retail sector as more data become readily available.

Chapter 5: Conclusion

5.1 Conclusion and Remarks

Homicides, induced by the drug war, in Ciudad Juárez drastically increased beginning in 2007. Few studies have been carried out which asses the economic impacts of crime and homicides (Rios 2008). Furthermore, the existing literature lacks regional assessment efforts. Because of geographical proximity and close economic ties, this paper reviews some of the potential impacts the Ciudad Juárez homicides may have on the El Paso regional economy. A time series data approach is employed to assess potential impacts on factors including the El Paso metro business cycle index, El Paso employment, and El Paso retail sales.

Border regions, like El Paso, face influence not only from U.S. business cycles but also national business cycles in Mexico, as well as regional business patterns in Ciudad Juárez (Fullerton 2001). The results presented in this paper, in combination with existing literature further confirm this trend. Given our border region analysis, El Paso economic variables are regressed against both U.S. and Mexico economic variables with statistically significant results. Once the number of neighboring city: Ciudad Juárez homicides are accounted for in our El Paso economic analysis, results indicate the positive and significant impacts of such violence across an international border.

Our empirical findings provide evidence of the positive impacts on the El Paso economy as a result of high violence in its neighboring city of Ciudad Juárez. Furthermore, fluctuations in the number of Ciudad Juárez homicides share a direct and statistically significant correlation with the El Paso metro business cycle index. After the data confirmed significant impacts on the El Paso metro business cycle index, further analysis is applied to some of the underlying components that make up such index. Findings in this study indicate that fluctuations in the Ciudad Juárez homicides share a direct and statistically significant correlation with El Paso employment. The empirical analysis for retail sales in El

Paso analysis did not yield conclusive results. Despite the insignificance, the algebraic signs are worth mention. The data show that homicides initially impact retail sales in El Paso negatively. The impact then becomes positive past two quarter lags.

El Paso is noted to be among the least violent cities in the United States (Olson 2010). Rankings by the CQ Press (2011) indicate that El Paso was the safest city in the United States, with a population ≥ 500,000 from 2010-2011 and 2011-2012. Such rankings also rank El Paso among the top three safest in the U.S. for the 2007-2008 and 2008-2009 publications. The econometric results presented, existing literature on violence, and current safety conditions in El Paso may leads us to assume that the insecurity in Ciudad Juárez, with the number of homicides increasing by as much as 900 percent from one month to the next, have directed some economic activity to the U.S. side of the border.

The reported results may also reflect the leakage of economic activity from the region of Ciudad Juárez (see Table 17). Ciudad Juárez may well find itself in a state of economic downturn in response not only to general economic conditions but also to high violence. Data from the Border Region Modeling Project (BRMP) at the University of Texas- El Paso show that total Ciudad Juárez employment and retail sales experienced noticeable contraction at around the time the violence began. One might argue that this contraction can be explained in greater part by the U.S. economic recession, which in turn affects Mexico and Ciudad Juárez because of its strong economic ties with the U.S. However, given the positive and significant evidence of the impacts on the El Paso economy presented in this paper, it may be safe to assume the negative impacts are grater in Ciudad Juárez itself. Further research is encouraged to extend the research presented as more data become available and to include analysis for Ciudad Juárez and other border regions experiencing the effects of the drug war.

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Glossary

Death by Assault to Authority - Attacks by criminal groups against the authority at any of the three levels of government without a chance to respond. The goal of such actions is to affect the institution or intimidate the security staff.

- The attack is made against:
  - Real estate property owned by the government (federal, state, and municipal)
  - Real estate property used by the authority.
  - Checkpoints.
  - Convoy for monitoring patrols, deterrence, and prevention.
  - Uniformed officers and or marked vehicles.
- No armed response by the authorities.
- Employment of heavy caliber firearms, grenades, and or explosives.
- There is evidence that establishes the attackers as members of a criminal group.
- Can be one or more aggressors.
- In retaliation of action by authority.

Death by Confrontation - Acts of sporadic and isolated of violence, crimes, disturbances of social peace and order against authority, by groups of criminal organizations. Events in which police have to make use of firearms to enforce the law. Events between members of criminal groups, caused by antagonism with other groups or differences within the same group (internal adjustment).

- Offenders are at least three, or being less used high destructive weapons exclusively for the army.
- Criminals violently resist authority, either through the use of weapons or any other lethal action.
- When offenders cannot be subdued or controlled quickly or instantly with only one tactical action.
- A chase during a confrontation is not considered unless it presents the conditions described above.
- When the authority responds to an assault regarding the exchange of fire.
- In extraordinary cases, homicides occurred in prisons are considered.
- The confrontation is against any of the three spheres of government (Federal, State, and municipal)
- The confrontation is between criminal groups.

Death by Execution - The intentional murder where the victim and or perpetrator is presumably a member of a criminal group.

- Victim has impacts of long-firearm and or short caliber.
- Victims show signs of torture and severe injuries.
- Victim’s remains were found after execution.
- Materials found typically connected to mode of operation of criminal groups gas, blankets, tape, etc.
- Circumstances:

  - Alleged relating to criminal group,
  - Victim was previously deprived of freedom,
  - Was performed in ambush or pursuit.
- Criminal messages were retrieved.

NOTE: In extraordinary cases, homicides occurred in prisons are considered

Appendix

Table 1: DF-GLS Unit Root Test [w/ Constant & Linear Time Trend]

DF-GLS Frequency: Monthly	t-Stat	# of Observations	Max. # of Lags	Test Critical Value 1% level	5% level	10% level
Levels (in logs)						
El Paso Employment	-1.1540	248	15	-3.4648	-2.9204	-2.6232
El Paso Metro Business Cycle Index	-1.9174	367	16	-3.4767	-2.8966	-2.5815
U.S. Industrial Production Index	-2.0854	367	16	-3.4767	-2.8966	-2.5815
Real Exchange Rate Peso-Dollar	-2.3754	370	16	-3.4770	-2.8960	-2.5805
Indicador Global de la Actividad Económica	-2.1960	212	14	-3.4612	-2.9276	-2.6358
Mexico Industrial Production Index	-1.4963	215	14	-3.4615	-2.9270	-2.6347
Homicides, Cd. Juárez	-1.9761	47	10	-3.7700	-3.1900	-2.8900

Notes: The monthly data are in levels (in logs). Data for El Paso Employment corresponds to the period 1980:01 – 2010:12; for U.S. Industrial production Index corresponds to period 1980:01 – 2010:12; for the Real Peso/Dollar exchange rate corresponds to period 1980:01 – 2010:12; for Indicador Global De la Actividad Economica corresponds to period 1993:01 – 2010:12; for Mexico Industrial Production Index corresponds to period 1993:01 – 2010:12; for El Paso Real Retail Sales correspond to period 1980:01 – 2010:12; for Ciudad Juárez Homicides corresponds to period 2006:12 – 2010:12. When the calculated t-stat > t-critical we may rejects the null hypothesis that there exists a unit root at each given confidence (in favor of stationary properties).

Table 2: DF-GLS Unit Root Test [w/ Constant & Linear Time Trend]

DF-GLS Frequency: Monthly	t-Stat	# of Observations	Max. # of Lags	Test Critical Value 1% level	5% level	10% level
1st Difference (in logs)						
El Paso Employment	-7.2809	248	15	-3.4648	-2.9204	-2.6232
El Paso Metro Business Cycle Index	-4.4885	367	16	-3.4767	-2.8966	-2.5815
U.S. Industrial Production Index	-6.0717	367	16	-3.4767	-2.8966	-2.5815
Real Exchange Rate Peso-Dollar	-15.1045	370	16	-3.4770	-2.8960	-2.5805
Indicador Global de la Actividad Económica	-2.2339	209	14	-3.4609	-2.9282	-2.6368
Mexico Industrial Production Index	-4.3461	211	14	-3.4611	-2.9278	-2.6361
Homicides, Cd. Juárez	-10.9125	47	10	-3.7700	-3.1900	-2.8900

Notes: The monthly data are in 1st difference (in logs). When the calculated t-stat > t-critical we may rejects the null hypothesis that there exists a unit root at each given confidence (in favor of stationary properties).

Table 3: ADF Unit Root Test [w/ Constant & Linear Time Trend]

ADF Frequency: Monthly	t-Stat	# of Observations	Max. # of Lags	Test Critical Value 1% level	 5% level	 10% level
Levels(in logs)						
El Paso Employment	-1.9944	248	15	-3.9954	-3.4280	-3.1373
El Paso Metro Business Cycle Index	-1.9125	367	16	-3.9832	-3.4221	-3.1338
U.S. Industrial Production Index	-1.8007	367	16	-3.9832	-3.4221	-3.1338
Real Exchange Rate Peso-Dollar	-2.6781	370	16	-3.9830	-3.4220	-3.1338
Indicador Global de la Actividad Económica	-2.1957	212	14	-4.0019	-3.4311	-3.1392
Mexico Industrial Production Index	-1.4971	215	14	-4.0013	-3.4308	-3.1390
Homicides, Cd. Juárez	-3.7232	48	10	-4.1611	-3.5063	-3.1830

Notes: As a robustness check, I also performed the ADF unit root test for all time series to obtain the same results as with the DF-GLS unit root tests.

Table 4: ADF Unit Root Test [w/ Constant & Linear Time Trend]

ADF Frequency: Monthly	t-Stat	# of Observations	Max. # of Lags	Test Critical Value 1% level	 5% level	 10% level
1st Difference (in logs)						
El Paso Employment	-7.3905	248	15	-3.9954	-3.4280	-3.1373
El Paso Metro Business Cycle Index	-4.8825	367	16	-3.9832	-3.4221	-3.1338
U.S. Industrial Production Index	-6.4223	367	16	-3.9832	-3.4221	-3.1338
Real Exchange Rate Peso-Dollar	-15.5463	370	16	-3.9830	-3.4220	-3.1338
Indicador Global de la Actividad Económica	-8.1857	212	14	-4.0019	-3.4311	-3.1392
Mexico Industrial Production Index	-14.0563	214	14	-4.0015	-3.4309	-3.1391
Homicides, Cd. Juárez	-10.8944	47	10	-4.1657	-3.5085	-3.1842

Notes: As a robustness check, I also performed the ADF unit root test for all time series to obtain the same results as with the DF-GLS unit root tests.

Table 5: DF-GLS Unit Root Test [w/ Constant & Linear Time Trend]

DF-GLS Frequency: Quarterly	t-Stat	# of Observations	Max. # of Lags	Test Critical Value 1% level	5% level	10% level
Levels (in logs)						
El Paso Employment	-1.4609	82	11	-3.6484	-3.0876	-2.7940
El Paso Real Retail Sales	-1.9420	123	12	-3.5524	-3.0070	-2.7170
U.S. Industrial Production Index	-1.8130	121	12	-3.5548	-3.0090	-2.7190
Real Exchange Rate Peso-Dollar	-3.4680	120	12	-3.5560	-3.0100	-2.7200
Indicador Global de la Actividad Económica	-2.6430	70	11	-3.6940	-3.1260	-2.8300
Mexico Industrial Production Index	-2.8185	70	11	-3.6940	-3.1260	-2.8300
Homicides, Cd. Juárez	-1.3645	15	3	-3.7700	-3.1900	-2.8900

Notes: The quarterly data are in levels (in logs). Data for El Paso Employment corresponds to the period 1980:Q1 – 2010:Q4; for U.S. Industrial production Index corresponds to period 1980:Q1 – 2010:Q4; for the Real Peso/Dollar exchange rate corresponds to period 1980:Q1 – 2010:Q4; for Indicador Global De la Actividad Economica corresponds to period 1993:Q1 – 2010:Q4; for Mexico Industrial Production Index corresponds to period 1993:Q1 – 2010:Q4; for El Paso Real Retail Sales correspond to period 1980:01 – 2010:12; for Ciudad Juárez Homicides corresponds to period 2006:Q4 – 2010:Q4. When the calculated t-stat > t-critical we may rejects the null hypothesis that there exists a unit root at each given confidence (in favor of stationary properties).

Table 6: DF-GLS Unit Root Test [w/ Constant & Linear Time Trend]

DF-GLS Frequency: Quarterly	t-Stat	# of Observations	Max. # of Lags	Test Critical Value 1% level	5% level	10% level
1st Difference (in logs)						
El Paso Employment	-5.9976	82	11	-3.6484	-3.0876	-2.7940
El Paso Real Retail Sales	-5.8492	121	12	-3.5548	-3.0090	-2.7190
U.S. Industrial Production Index	-2.9463	122	12	-3.5536	-3.0080	-2.7180
Real Exchange Rate Peso-Dollar	-8.3771	122	12	-3.5536	-3.0080	-2.7180
Indicador Global de la Actividad Económica	-6.2069	70	11	-3.6940	-3.1260	-2.8300
Mexico Industrial Production Index	-4.4150	70	11	-3.6940	-3.1260	-2.8300
Homicides, Cd. Juárez	-3.2959	13	3	-3.7700	-3.1900	-2.8900

Notes: The quarterly data are in 1st difference (in logs). When the calculated t-stat > t-critical we may rejects the null hypothesis that there exists a unit root at each given confidence (in favor of stationary properties).

Table 7: ADF Unit Root Test [w/ Constant & Linear Time Trend]

ADF Frequency: Quarterly	t-Stat	# of Observations	Max. # of Lags	1% level	Test Critical Values 5% level	10% level
Levels(in logs)						
El Paso Employment	-1.9762	82	11	-4.0738	-3.4655	-3.1593
El Paso Real Retail Sales	-4.4663	123	12	-4.0343	-3.4467	-3.1483
U.S. Industrial Production Index	-1.4862	121	12	-4.0356	-3.4473	-3.1487
Real Exchange Rate Peso-Dollar	-4.0154	120	12	-4.0363	-3.4476	-3.1489
Indicador Global de la Actividad Económica	-1.7719	71	11	-4.0925	-3.4743	-3.1644
Mexico Industrial Production Index	-2.7706	70	-11	-4.0945	-3.4753	-3.1650
Homicides, Cd. Juárez	-1.0329	15	3	-4.7283	-3.7597	-3.3249

As a robustness check, I also performed the ADF unit root test for all time series to obtain the same results as with the DF-GLS unit root tests.

Table 8: ADF Unit Root Test [w/ Constant & Linear Time Trend]

ADF Frequency: Quarterly	t-Stat	# of Observations	Max. # of Lags	1% level	Test Critical Values 5% level	10% level
1st Difference (in logs)						
El Paso Employment	-5.9396	82	11	-4.0738	-3.4655	-3.1593
El Paso Real Retail Sales	-11.8084	122	12	-4.0349	-3.4470	-3.1485
U.S. Industrial Production Index	-5.7225	121	12	-4.0356	-3.4473	-3.1487
Real Exchange Rate Peso-Dollar	-8.3768	122	12	-4.0349	-3.4470	-3.1485
Indicador Global de la Actividad Económica	-6.1193	70	11	-4.0945	-3.4753	-3.1650
Mexico Industrial Production Index	-4.4725	70	11	-4.0945	-3.4753	-3.1650
Homicides, Cd. Juárez	-3.0375	13	3	-4.8864	-3.8289	-3.3629

As a robustness check, I also performed the ADF unit root test for all time series to obtain the same results as with the DF-GLS unit root tests.

Table 9: Regression Results - El Paso Metro Business Cycle Index

El Paso MBCI		**Regression Estimates**		
	(1)	(2)	(3)	(4)
Explanatory variable:				
Constant term	**0.000238 ***	**0.000317***	**0.000197***	**0.000169**
	(0.000126)	(0.000173)	(0.000118)	(1.482719)
El Paso MBCI (-1)	**0.631774*****	**0.601990*****	**0.708090*****	**0.713103*****
	(0.048657)	(0.051169)	(0.055652)	(0.053837)
U.S. Ind. Prod. Index	**0.045538*****	**0.042883*****	**0.045120*****	**0.046715*****
	(0.017801)	(0.016982)	(0.014952)	(0.014600)
U.S. Ind. Prod. Index (-3)	**0.032975***	**0.034674****	**0.026473***	**0.026894***
	(0.018206)	(0.017018)	(0.015441)	(0.015089)
Peso/Dollar Exchange Rate (-8)	**-0.003504**	**-0.006842*****	**-0.005967*****	**-0.005978*****
	(0.002911)	(0.002594)	(0.002496)	(0.002463)
Indicador Glob. Activ. Econ.	**0.026599*****	**0.022397*****	**0.019021*****	**0.018945*****
	(0.007022)	(0.006855)	(0.006651)	(0.006569)
IGAE (-1)	**0.018826*****	**0.017238*****	**0.016347*****	**0.016525*****
	(0.007056)	(0.006906)	(0.006659)	(0.006579)
IGAE (-7)	**0.013399****	**0.012790****	**0.008282**	**0.009195***
	(0.006227)	(0.005908)	(0.005266)	(0.005187)
Autoregressive Terms AR(3)		**0.330100*****	**0.284408*****	**0.286277*****
		(0.068971)	(0.073854)	(0.074276)
Moving Average Terms MA(2)			**-0.308887*****	**-0.335025*****
			(0.084285)	(0.082998)
Juárez Homicides (-4)				**0.000547****
				(0.000268)
Number of Observation:	208	205	205	205
R-squared:	0.649285	0.68706	0.709471	0.715443
Adjusted R-squared:	0.63701	0.674287	0.696062	0.700775
S.E. of Regression:	0.001602	0.001526	0.001474	0.001462
Sum squared resid:	0.000513	0.000456	0.000423	0.000415
Log Likelihood:	1047.774	1043.231	1050.848	1052.976
F-statistic:	52.89487	53.78973	52.91007	48.77608
Prob(F-stat):	0	0	0	0
Durbin-Watson Stat:	2.002257	1.85192	1.952086	1.934967
Breusch- Godfrey Serial Correlation LM Test				
F-statistic	11.25853	8.416484	0.61741	0.46921
Obs*R-squared	21.23894	16.36726	1.302903	0.996486
Prob. F(2,198)	0	0.0003	0.5404	0.6262
Prob. Chi-Square(2)	0	0.0003	0.5213	0.6076
Ho: NO SERIAL CORRELATION	Reject	Reject	Fail to Reject	Fail to Reject

Note: The data are regressed in First Difference-Logs. *** indicates 99 percent statistical significance, **indicates 95 percent statistical significance, and * indicates 90 percent statistical significance. A total

of four regressions are estimated. Each subsequent regression is meant to illustrate the evolution of the initial specification as additional parameters are added as well as a robustness-check. The Breusch-Godfrey Serial Correlation LM tests are reported as the Durbin-Watson statistic may prove limited if there are lagged dependent variables on the right had side of the regression.

Table 10: Regression Results - El Paso Employment

El Paso Employment			**Regression Estimates**			
	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory variable:						
Constant term	**0.000697*** **	**0.000671*** **	**0.000617*** **	**0.000581** **	**0.000506** **	**0.000429***
	(0.000234)	(0.000245)	(0.000245)	(0.000248)	(0.000251)	(0.000251)
El Paso Employment (-1)	**-0.166729*** **	**-0.162934*** **	**-0.160218*** **	**-0.167189*** **	**-0.172265*** **	**-0.182991*** **
	(0.064731)	(0.064894)	(0.064549)	(0.064881)	(0.064639)	(0.064268)
U.S. Ind. Prod. Index	**0.094979*** **	**0.097266** **	**0.103739*** **	**0.107535*** **	**0.115079*** **	**0.129805*** **
	(0.034440)	(0.034546)	(0.034541)	(0.034726)	(0.034842)	(0.035228)
U.S. Ind. Prod. Index (-3)	**0.074246** **	**0.074560** **	**0.071051** **	**0.072079** **	**0.076095** **	**0.082020** **
	(0.036470)	(0.036487)	(0.036336)	(0.036342)	(0.036244)	(0.036033)
U.S. Ind. Prod. Index (-8)	**0.077669** **	**0.078552 ** **	**0.078168 ** **	**0.079259*** **	**0.08109*** **	**0.072864** **
	(0.033811)	(0.033840)	(0.033652)	(0.033661)	(0.033516)	(0.033447)
Peso/Dollar Exchange Rate (-3)	**-0.008755**	**-0.008871**	**-0.009255**	**-0.009293**	**-0.009078**	**-0.009693***
	(0.005888)	(0.005892)	(0.005863)	(0.005862)	(0.005835)	(0.005791)
Peso/Dollar Exchange Rate (-10)	**-0.017346*** **	**-0.017454*** **	**-0.016837*** **	**-0.016891*** **	**-0.016370*** **	**-0.016294*** **
	(0.005929)	(0.005933)	(0.005909)	(0.005908)	(0.005888)	(0.005836)
IGAE	**0.022040***	**0.022214***	**0.020933***	**0.021641***	**0.023816** **	**0.022031***
	(0.012402)	(0.012409)	(0.012360)	(0.012376)	(0.012383)	(0.012302)
IGAE (-7)	**0.025492** **	**0.025884** **	**0.026960** **	**0.025778** **	**0.025379** **	**0.025990** **
	(0.012598)	(0.012611)	(0.012555)	(0.012603)	(0.012545)	(0.012438)
Juárez Homicides (-4)		**0.000579**	**0.00108**	**0.001251***	**0.001191***	**0.001268***
		(0.000636)	(0.000691)	(0.000710)	(0.000708)	(0.000703)
Juárez Homicides (-5)			**0.001240***	**0.001601** **	**0.001860*** **	**0.001832*** **
			(0.000690)	(0.000772)	(0.000783)	(0.000776)
Juárez Homicides (-6)				**0.000744**	**0.001357***	**0.001713** **
				(0.000714)	(0.000791)	(0.000808)
Juárez Homicides (-7)					**0.001220***	**0.001981*** **
					(0.000717)	(0.000796)
Juárez Homicides (-8)						**0.001528** **
						(0.000721)
Number of Observation:	208	208	208	208	208	208
R-squared:	0.225736	0.22896	0.241404	0.245577	0.256617	0.27342
Adjusted R-squared:	0.19461	0.193913	0.202896	0.203237	0.21087	0.224732
S.E. of Regression:	0.00322	0.003221	0.003203	0.003203	0.003187	0.003159
Sum squared resid:	0.002063	0.002055	0.002021	0.00201	0.001981	0.001936
Log Likelihood:	903.0531	903.4871	905.1792	905.7529	907.286	909.6638
F-statistic:	7.252281	6.532898	6.269016	5.800105	5.609523	5.615722
Prob(F-stat):	0	0	0	0	0	0
Durbin-Watson Stat:	1.957297	1.967547	1.982142	1.986728	2.019285	2.02088
Breusch- Godfrey Serial Correlation LM Test						

F-statistic	0.765046	0.75803	0.839426	1.056143	1.06937	1.409065
Obs*R-squared	1.603077	1.596523	1.77549	2.240326	2.2797	3.008811
Prob. F(2,198)	0.4667	0.47	0.4335	0.3498	0.3452	0.2469
Prob. Chi-Square(2)	0.4486	0.4501	0.4116	0.3262	0.3199	0.2221
Ho: NO SERIAL CORRELATION	Fail to Reject	Fail to Reject	Fail to Reject	Fail to Reject	Fail to Reject	Fail to Reject

Note: The data are regressed in First Difference-Logs. *** indicates 99 percent statistical significance, **indicates 95 percent statistical significance, and * indicates 90 percent statistical significance. A total of six regressions are estimated. Each subsequent regression is meant to illustrate the evolution of the initial specification as additional parameters are added as well as a robustness-check. The Breusch-Godfrey Serial Correlation LM tests are reported as the Durbin-Watson statistic may prove limited if there are lagged dependent variables on the right had side of the regression.

Table 11: Regression Results - El Paso Real Retail Sales

El Paso Real Retail Sales		**Regression Estimates**			**Robust**	
	(1)	(2)	(3)	(4)		(5)
Explanatory variable:						
Constant term	**0.004695**	**0.005695**	**0.004446**	**0.003879**		**0.004295**
	(0.003575)	(0.003730)	(0.003906)	(0.003841)		(0.004213)
El Paso Unemp. Rate (-4)	**-0.103888***	**-0.097319***	**-0.098796***	**-0.099830***		**-0.098775**
	(0.059329)	(0.059780)	(0.059731)	(0.059641)		(0.061142)
U.S. Ind. Prod. Index	**0.726674*****	**0.697489*****	**0.779454*****	**0.819264*****		**0.814867*****
	(0.234231)	(0.236431)	(0.248397)	(0.249915)		(0.275192)
Peso/Dollar Exchange Rate	**-0.104569****	**-0.102188****	**-0.102747****	**-0.116889*****		**-0.102566****
	(0.046083)	(0.046189)	(0.046142)	(0.045287)		(0.047124)
IGAE (-3)	**-0.451375*****	**-0.470153*****	**-0.474222*****	**MXIPI (-3)** **-0.442842*****	**IGAE (-3)**	**-0.500356*****
	(0.187894)	(0.189085)	(0.188919)	(0.172729)		(0.196893)
Juárez Homicides (-1)		**-0.00747**	**-0.007267**	**-0.007521**	**Homicide**	**-0.001488**
		(0.007878)	(-0.923114)	(0.007865)		(0.008247)
Juárez Homicides (-4)			**0.008701**	**0.007638**	**Homi .(-1)**	**-0.008499**
			(0.008169)	(0.008155)		(0.008262)
					Homi. (-2)	**-0.002393**
						(0.008537)
					Homi. (-3)	**0.005414**
						(0.008654)
					Homi. (-4)	**0.009907**
						(0.008641)
Number of Observation:	68	68	68	68		68.000000
R-squared:	0.278164	0.288481	0.301472	0.304283		0.307974
Adjusted R-squared:	0.232333	0.231101	0.232764	0.235852		0.200591
S.E. of Regression:	0.02663	0.026651	0.026623	0.026569		0.027175
Sum squared resid:	0.044677	0.044039	0.043235	0.043061		0.042832
Log Likelihood:	152.6573	153.1468	153.7733	153.9104		154.091300
F-statistic:	6.069351	5.027515	4.387745	4.446565		2.867989

Prob(F-stat):	0.000339	0.000625	0.000952	0.000856		0.007208
Durbin-Watson Stat:	1.919882	1.925633	1.955463	1.976430		1.942143
Breusch- Godfrey Serial Correlation LM Test						
F-statistic	0.013349	0.015898	0.045192	0.091318		0.036179
Obs*R-squared	0.029749	0.036016	0.104012	0.209847		0.087751
Prob. F()	0.9867	0.9842	0.9558	0.9129		0.964500
Prob. Chi-Square(2)	0.9852	0.9822	0.9493	0.9004		0.957100
Ho: NO SERIAL CORRELATION	Fail to Reject	Fail to Reject	Fail to Reject	Fail to Reject		Fail to Reject

Note: The data are regressed in First Difference-Logs. *** indicates 99 percent statistical significance, **indicates 95 percent statistical significance, and * indicates 90 percent statistical significance. A total of three regressions are estimated. Each subsequent regression is meant to illustrate the evolution of the initial specification as additional parameters are added as well as a robustness-check. Regression 4 is added as a robustness check where the IGAE is substituted with the Mexico Industrial Production Index from (INEGI). Regression 5 is also a robustness check where all lags for Homicides, up to one year back, are added. The Breusch- Godfrey Serial Correlation LM tests are reported as the Durbin-Watson statistic may prove limited if there are lagged dependent variables on the right had side of the regression.

Table 12: Ciudad Juárez Homicide rate

Year	Juárez Population	Homicides	Homicide rate per 100,000
2007	1,359,787	136	10.0
2008	1,384,102	1,332	96.2
2009	1,377,849	2,230	161.8
2010	1,321,004	2,738	207.3

Notes: The homicide rate per 100,000 inhabitants was calculated by first dividing the annual population by 100,000. Then, I divided the resulting number by the number of homicides for that year.
Source: Homicide data from La Presidencia de la Republica: México and Population data from The Border Region Modeling Project (UTEP).

Table 13: Mexico's Foreign Direct Investment

Year	FDI (billions, $)	% Change
1999	13.929	
2000	18.110	30.0%
2001	29.926	65.2%
2002	23.883	-20.2%
2003	18.655	-21.9%
2004	24.827	33.1%
2005	24.407	-1.7%
2006	20.119	-17.6%
2007	31.492	56.5%
2008	27.140	-13.9%
2009	16.119	-40.6%
2010	20.709	28.5%
2011	19.554	-5.6%

Source: Instituto Nacional de Estadística y Geografía (INEGI).

Table 14: Ciudad Juárez/ El Paso Net Migration

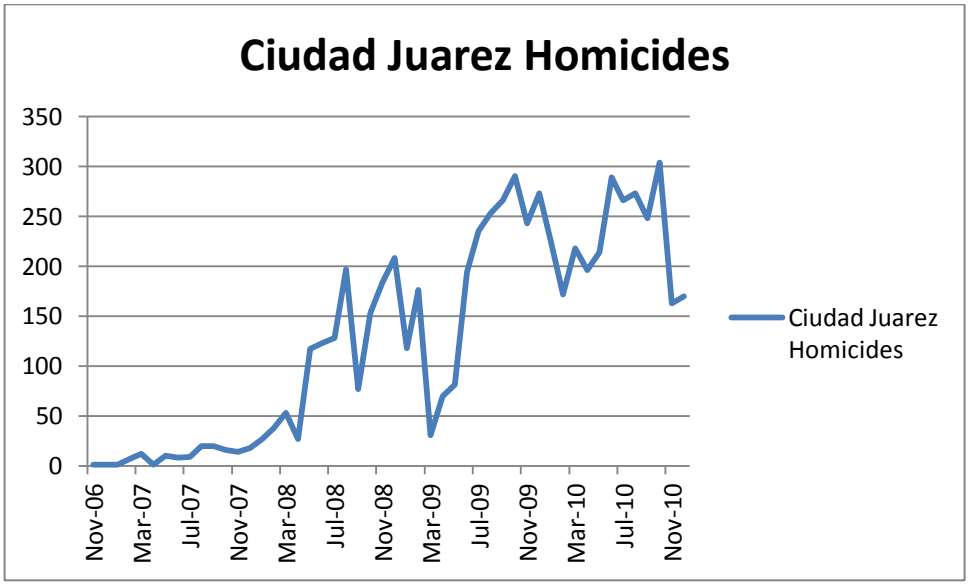
Year	Ciudad Juárez Net Migration	El Paso Net Migration
2000	-11,265	-4,793
2001	-25,935	-6,313
2002	-27,554	-5,828
2003	2,627	-3,936
2004	3,951	-2,506
2005	17,563	-3,904
2006	4,615	2,170
2007	4,026	-2,907
2008	373	1,061
2009	-26,969	3,397
2010	-73,990	2,045

Notes: Net migration is the calculated difference between Immigration and emigration. A positive value implies a higher number of individuals coming in while a negative implies a higher number going out.
Source: The Border Region Modeling Project (UTEP).

Table 15: Descriptive Statistics (Monthly)

Variable (Frequency: Monthly)	Mean	Median	Maximum	Minimum	Std. Dev.	# of obs.
Metro Business Cycle Index	152.131	158.35	201.5	98.2	32.922	372
El Paso Employment	248.304	253.95	280.3	207.8	20.548	252
U.S. Ind. Produc. Index	73.543	71.316	100.724	46.763	17.036	372
Peso/Dollar Exchange Rate	85.272	80.656	139.284	55.462	18.083	372
I.G.A.E.	98.1	99.231	124.132	73.234	14.038	216
MX. Ind. Prod. Index	98.026	99.989	116.605	70.466	12.957	216
Ciudad Juárez Homicides	18.172	1	304	1	57.43	372

Notes: Data for El Paso Employment corresponds to the period 1980:01 – 2010:12; for U.S. Industrial production Index corresponds to period 1980:01 – 2010:12; for the Real Peso/Dollar exchange rate corresponds to period 1980:01 – 2010:12; for Indicador Global De la Actividad Economica corresponds to period 1993:01 – 2010:12; for Mexico Industrial Production Index corresponds to period 1993:01 – 2010:12; for Ciudad Juárez Homicides corresponds to period 1980:01 – 2010:12 after adjustments.

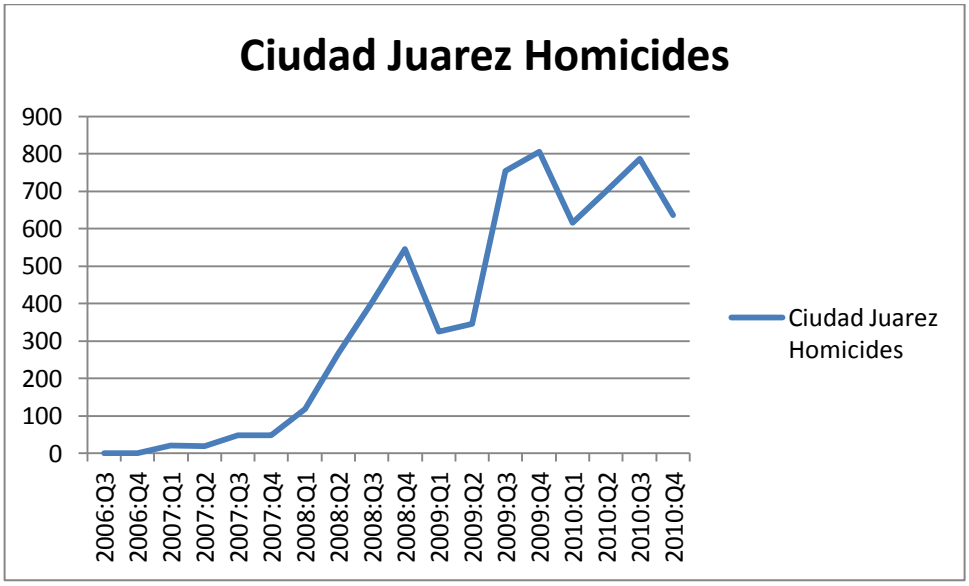


Source: Presidencia de la Republica: México.

Table 16: Descriptive Statistics (Quarterly)

Variable (Frequency: Quarterly)	Mean	Median	Maximum	Minimum	Std. Dev.	# of obs.
El Paso Unemployment Rate	9.206	9.283	12.633	5.633	2.051	84
U.S. Ind. Produc. Index	73.676	71.712	100.507	47.148	17.086	124
Peso/Dollar Exchange Rate	85.272	81.438	138.569	57.301	17.965	124
I.G.A.E.	98.1	99.191	120.55	74.132	14.064	72
MX. Ind. Prod. Index	98.026	99.999	116.466	72.068	12.992	72
El Paso Retail Sales	824.845	796.475	1181.06	551.03	166.7905	124
Ciudad Juárez Homicides	52.774	1	806	1	169.62	124

Notes: Data for El Paso Employment corresponds to the period 1980:Q1 – 2010:Q4; for U.S. Industrial production Index corresponds to period 1980:Q1 – 2010:Q4; for the Real Peso/Dollar exchange rate corresponds to period 1980:Q1 – 2010:Q4; for Indicador Global De la Actividad Economica corresponds to period 1993:Q1 – 2010:Q4; for Mexico Industrial Production Index corresponds to period 1993:Q1 – 2010:Q4; for El Paso Real Retail Sales correspond to period 1980:01 – 2010:12; for Ciudad Juárez Homicides corresponds to period 1980:Q1 – 2010:Q4 after adjustments.



Source: Presidencia de la Republica: México

Table 17: Ciudad Juárez Employment and Retail Sales Index

Year	Ciudad Juárez Employment	% Change	Retail Sales Index	% Change2
2004	333.366		104.80	
2005	357.338	7.191%	112.60	7.443%
2006	369.258	3.336%	119.30	5.950%

2007	372.438	0.861%	127.77	7.100%
2008	322.737	-13.345%	126.06	-1.338%
2009	302.365	-6.312%	119.40	-5.283%
2010	312.920	3.491%	121.03	1.365%

Curriculum Vita

Pedro Niño, Jr. was born in El Paso, Texas, to Pedro and Guadalupe Niño. He graduated from Montwood High school in El Paso, Texas, in 2005. In 2010, he received a Bachelor of Business Administration degree with a major in Economics from the University of Texas at El Paso. He has worked as a licensed Texas real estate agent and as a graduate teaching and research assistant at the department of Economics and Finance at the University of Texas at El Paso. He is currently employed by a private college in El Paso, Texas, where he teaches courses in economics.