Firms and Labor in Times of Violence: Evidence from the Mexican Drug War

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Violence in Mexico has reached unprecedented levels in recent times. After the government began a crackdown on drug cartels, nation-wide homicides almost tripled between 2006 and 2010. Using rich longitudinal plant-level data, this paper studies the impact of violent conflict on firms, exploiting this period of heightened violence in Mexico commonly referred to as the Mexican Drug War. The empirical strategy uses spatiotemporal variation in violence across Mexican cities and an instrumental variable strategy that relies on the triggers of the Drug War against potential endogeneity of the violence surge. It controls for observable and unobservable differences across cities and firms as well as for product-specific business cycles. The results show significant negative impact of the surge in violence on plants' output, product scope, employment and capacity utilization. Violence acts as a negative blue-collar labor supply shock, leading to significant increase in skill-intensity within firms. It also deters domestic, but not international, trade. The effect of the violence shock on firms is very heterogeneous, the output effect of violence increases with reliance on local demand, local sourcing and the employment effect of violence is stronger on plants with higher share of female and lower-wage workers. The results reveal significant distortive effects of the Mexican Drug War on domestic industrial development in Mexico and suggest that the Drug War accounted for the majority of the aggregate decline in manufacturing employment over 2007-2010.

Keywords: Drug War, Mexico, Firms, Violence, Organized Crime, Trade, Technology, Labor, Productivity, Reallocation

JEL Classifications: L25; L60; O12; O14; O54; R11; F14

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1 Introduction

Income disparities both within and between countries are large and they do not go away even when we take observed differences in the production factors into account (Caselli 2005, Acemoğlu and Dell 2010). It matters not only what production factors are employed and how much, but also the environment in which production takes place. In Ciudad Juárez, Mexico, for example, 283 homicides were reported per 100,000 inhabitants in 2010, while the rate in El Paso, in Texas, was just 0.8 per 100,000. The distance between the two cities is just a few miles, but the levels of violence are orders of magnitude apart. Apart from the direct consequences of violence on people involved, does a violent and conflict afflicted environment matter for firms, workers, and the way the business is conducted?

Economic distortions that slow down or prevent efficient reallocation of resources between heterogeneous firms are important barriers to economic development.[1] A potential economic distortion, violence, is a common condition - one in four people on the planet, more than 1.5 billion, live in conflict affected areas with very high levels of criminal violence (World Development Report 2011). Yet it is under-studied mostly because the large scale micro data needed to study its impact is hard to obtain from conflict affected areas. When combined with weaker institutions, common in developing countries, organized crime and violence can be detrimental to economic development and convergence between high and low-income countries. This paper studies the impacts of violent conflict on firms, utilizing the recent period of escalation of violence in Mexico commonly referred to as the Mexican Drug War in a natural experimental set-up.

Many developing countries suffer from urban violence with drug trafficking often playing a central role. Since 2007 there has been a drastic increase in drug-related violence in Mexico. The number of intentional homicides increased almost 200% from 2007 to 2010 (see Figure 1), an increase attributed to unexpected and unintended consequences of a change in the government's drug enforcement policy

[1]For example, Hsieh and Klenow (2009) report that removing distortive barriers would result in a 30-60 % gain in TFP in manufacturing in China and India, leading to a 60-120 % increase in output. While Hsieh and Klenow (2009) remain agnostic about particular types of frictions or specific distortive factors that drive wedges between marginal products across plants, studies mostly focus on adjustment costs on inputs (e.g. severance payments, borrowing constraints), imperfect competition, macroeconomic uncertainty, government-business ties (e.g. state-owned enterprises, corruption) and the like.

and further fueled by a plausibly exogenous increase in cocaine prices during the period (Dell (2015), Lindo and Padillo-Romo (2015), Castillo, Mejia and Restrepo (2016)).[2] In numbers of violent deaths Mexico had more than three times as many killings as Iraq and Afghanistan combined in 2010.[3], [4]

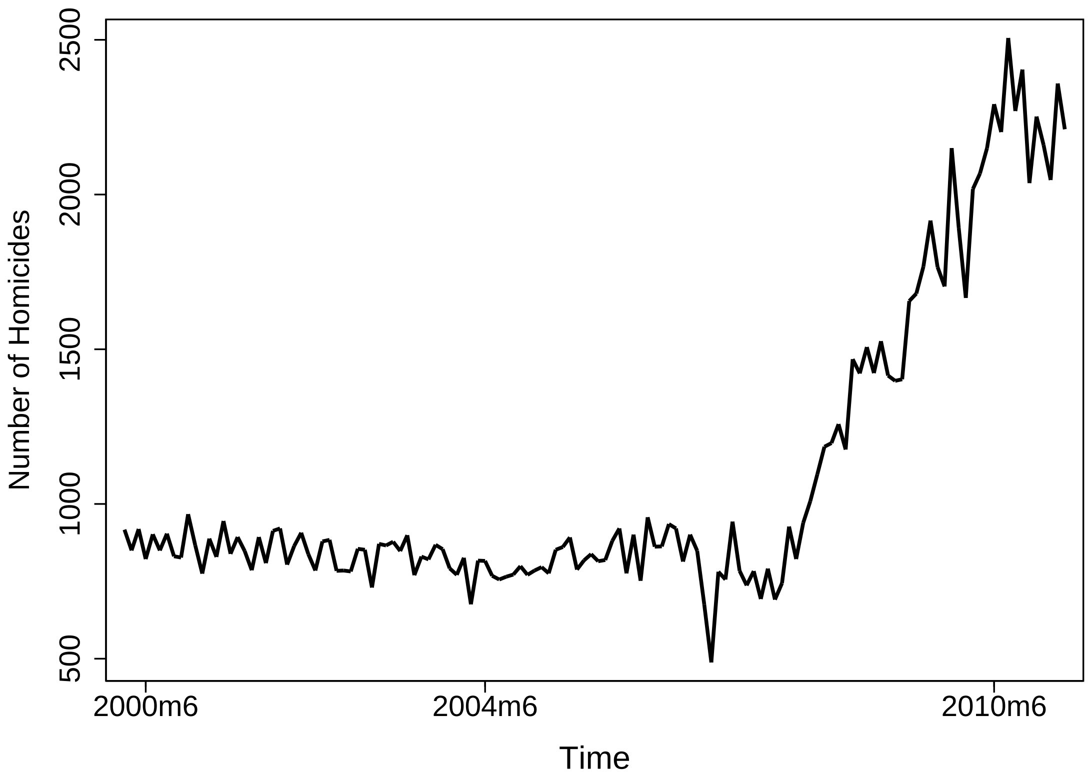

Figure 1: Surge in Violence in Mexico
Monthly number of homicides (INEGI).

I employ longitudinal plant-level data covering all of Mexico for the period 2005-2010 and utilize the outbreak of violence due to the Mexican Drug War to derive causal implications of a violent and conflict afflicted environment on industrial development and employment. As a developing country, long suffering from organized crime and drug trafficking, but also long benefiting from the international fragmentation of production, Mexico provides a suitable setting to study the impact of heightened vi-

[2]Angrist and Kugler (2008) emphasize the importance of demand channels in causing violence and show that plausibly exogenous increase in cocaine prices trigger violence in Colombia.

[3]There were 26,000 homicides in Mexico in 2010; Iraq Body Counts reports 4,167 civilian deaths from violence, Williams (2012) reports violent deaths of 2,777 civilians and 711 soldiers in Afghanistan in the same year.

[4]Drug trafficking is one of the central factors driving increases in violence in Latin America. Drug trafficking regions in these countries had homicide rates twice as high as in locales with low drug trafficking (World Bank, 2011).

olence on manufacturing firms. The period of analysis is marked by substantial variation in violence over time and among geographical markets across the country (Figure 2-3).

Mexican cities that are prone to increased violence may well have special characteristics, as the location of drug trafficking organizations (DTOs) are not random (Dell, 2015). And these locations may be attracting particular types of firms, perhaps firms with technology more resilient to outbreaks of violence. Longitudinal data allow me to control for observable and unobservable such differences between firms and cities that may confound the estimates using plant-fixed effects and to control for industry-specific aggregate shocks using industry by year fixed effects.

Violence as measured by the homicide rate may still be influenced by other factors than the plausibly exogenous outbreak of criminal violence and convolute the results.[5],[6] To address these concerns, I develop an instrumental variable strategy utilizing the widely agreed triggers of the Drug War, namely the policy change of the government in regard to the use of military deployment against the cartels and the increase in cocaine prices based on developments in Colombia. The results show that rising violence in a metropolitan area leads to significant decline in plant-level output, employment and capacity utilization. More specifically, doubling the homicide rate in a metropolitan area causes an 8% decline in plant-level output. The impact is not short-run or temporary, and outbreak of violence due to the Drug War has dynamic implications such that firms' product-scope also decreases significantly as well as plant growth and likelihood of survival. The estimates show that a marginal change in the homicide rate from the average in a metropolitan area increases the likelihood of plant exit 2.2 percentage points.

[5]In a Beckerian model of rational utility, changes in labor market opportunities affect the participation rate in crime, especially property crime. In a recent review article, Draca and Machin (2015) conclude that relative labour market opportunities are less likely to be a significant determinant of violent crime, or intentional homicide. On the other hand, in recent work, Dix-Carneiro, Soares, and Ulyssea (2018) and Dell, Feigenberg, and Teshima (2018) show trade-induced labor market conditions also affect violence. The results in this paper are robust to explicitly controlling for trade exposure of local markets.

[6]Dube and Vargas (2013) examines the impact of income shocks on armed conflict in Colombia and show that increased rent opportunities due to a positive oil price shock leads to an increased likelihood of conflict in oil extraction areas, and an increase in local income due to an increase in coffee prices leads to a decline in conflict in areas where coffee production concentrates. Such income shocks may lead to correlated plant-level outcomes and conflict intensity, and bias the impact of violence, downward or upward, depending on the source of income shocks. The empirical strategy in this paper focuses on the plausibly exogenous increase in violence due to the Mexican Drug War and controls for size of crop production, precious metal extraction as well as the size of oil production at the local labor market level.

The literature that relates conflict and crime to economic outcomes largely focuses on aggregate outcomes such as regional income or stock market returns (Abadie and Gardeazabal, 2003, Guidolin and La Ferrara, 2007, Pinotti, 2015). Abadie and Gardeazabal (2003) show that economic outcomes and stock market returns in the Basque Country were negatively affected by the outbreak of terrorist events. Similarly, Pinotti (2015), using synthetic control methods, finds lower GDP per capita in southern Italian regions exposed to organized crime. On the other hand, Guidolin and La Ferrara (2007) emphasize that violence is not necessarily perceived as negative by investors by showing that Angolan diamond firm returns were hurt due to the end of civil war in Angola. To understand under what conditions an economy reacts to violence and organized crime in a certain way and how permanent the effect will be requires identifying channels through which organized crime and violence impact an economy. Micro-level studies can zoom in on the way firms' and workers' behaviours interact with violence and potentially shed light into these channels.

Micro-level empirical studies are yet rare, but emerging. Ksoll, Macchiavello, and Morjaria (2016) use the increased ethnic violence following the disputed 2007 presidential election in Kenya, and study the effect on about 100 flower firms. They quantify significant negative effect on weekly export volumes of these firms. Their analysis points to worker absence as a main channel through which violence affects firms. Rozo (2017) uses micro data and shows that reduction in violence in Colombia following President Uribe's election leads to market expansion, and Klapper, Richmond, and Tran (2013) focus on civil unrest in Cote d'Ivoire following the coup d'etat in 1999, and find that the conflict leads to a drop in firm productivity.[7] Amodio and Di Maio (2017) study Palestinian firms during the Second Intifada and show that firms were affected by the conflict indirectly via border closure and their use of imported materials decrease as a result. This literature provides valuable insights and tells us that firms' operations are likely to be significantly affected by the violent environment, but since it either employs specific data (flower exporters) or focus on a specific channel (border closure) or otherwise does not focus on heterogenous impact, it falls short of providing a thorough insight on

[7]Focusing on firm productivity as an only outcome without documenting the associated changes within firms in detail may limit our understanding of the channels and sources of productivity effects as emphasized in Utar (2014).

how violence would affect the evolution of industries.

By studying large scale firm-level data from an emerging country, and focusing on a plausibly exogenous outbreak of violence I advance this literature in a number of ways. First, I show that a violent environment has very heterogeneous effects on firms, and therefore it significantly distorts the resource reallocation patterns between firms, and it affects the long-run development of industrial capability. To my knowledge this is the first paper that reveals strongly heterogeneous effects of violence. Then, unpacking these heterogeneous effects, I identify different channels through which the violent environment affects firms. I find that firms are affected by the Drug War: 1) via the labor market and 2) via its effect on domestic trade, which in turn affects firms' demand and supply chain.

Growing literature investigates the economic consequences of weak local state institutions, lawlessness and more recently some work on the role of organized crime (Acemoglu, De Feo, and De Luca (2017), Alesina, Piccolo, Pinotti (2018)). Throughout the world, organized crime is centered on illegal drug trade, and goes hand in hand with violence. How does a violent environment due to organized crime affect manufacturing activities? I advance this literature by showing the channels through which a violent environment due to organized crime affects firms and distorts the development of domestic industrial capability.

I show that blue-collar, unskilled, production workers are more vulnerable to increased violence than more skilled, non-production employees, and that violence works as a negative labor supply shock on unskilled workers. As a result, average wages of blue-collar workers increase and average wages of white-collar workers decrease at the firm-level and firms start to use non-production employees more intensively. This labor market channel is particularly strong in plants with a female-intensive workforce, suggesting that unskilled women living in poorer neighborhoods drop out of the labor force, as the risk of life outweighs the benefit of working. The labor market effect is also strong for lower wage plants, and plants with lower unionization rate among production workers.

The Mexican Drug War doesn't only operate through the labor market but also, by causing disruptions in domestic, local transactions, favors international trade over internal trade, leading to reallocation from domestically oriented establishments towards export and import intensive establishments.

By focusing on the firm-level impact of the violence due to the Drug War, this study complements Dell (2015) who examines the impact of change in the drug enforcement policy of the Mexican government on violence and drug trafficking. She establishes a causal relationship between the drug crackdowns and increased violence and finds that drug crackdowns were not effective in decreasing the drug trafficking activities. Although Dell (2015) does not focus on the economic impact of the Drug War, in her brief analysis that uses the labor force survey and drug trafficking routes, she shows that female labor force participation, but not male, was affected negatively by the Drug War. My results at the firm level corroborate and further these findings.

Recent studies also show negative association of the Mexican Drug War with service FDI (Ashby and Ramos, 2013), regional growth (Enamorado, et al ., 2014), income inequality (Enamorado, et al. 2016) and percentage of working people (Robles et al, 2013). I contribute to this literature by providing micro-foundations of regional aggregate affects. I find that the Mexican Drug War leads to reallocation from more manual labor intensive plants towards less, from less unionized plants towards more and from plants selling locally towards more geographically diversified firms. My estimates suggest that the Mexican Drug War accounted for the majority of the aggregate employment decline in manufacturing between 2007 and 2010.

The next section lays out the framework of the empirical analyses with background information on the history of organized crime in Mexico and the Drug War, describes the data, and presents a number of facts on the Drug War locations and firms located in these areas. The empirical strategy is described in Section 3. I present and discuss my results on the impact of the violence shock on firms. This section documents a substantial decline in firms' output, capacity utilization, employment, and product scope and shows violence-induced compositional changes within firms. The following section delves into channels through which drug violence affects firms and documents strong heterogeneous response both at the intensive and at the extensive margin. A number of robustness analysis are discussed in Section 6 followed by concluding remarks.

2 Violent Conflict and Firms: Sources of Variation and Measurement

2.1 Organized Crime in Mexico–A brief history

Organized crime in Mexico is centered on the transit of illegal drugs into the United States. Due to Mexico's 1,969-mile-long border with the United States, Mexico has been an ideal location for drug trafficking. As the popularity of cocaine grew in the United States in the 1970s, criminal organizations began to gain more power and influence on a national level in Mexico. The US is the largest cocaine market in the world with an approximate value of 38 billion USD in 2008 (World Drug Report 2010).[8] Out of the two major trafficking routes to the US used in the 1970s, the US gained control over the Caribbean route in the 1980s.[9] This development accelerated the power of Mexican drug trafficking organization and since then Mexico has been the major cocaine transit route to the US.

Mexico is not a source country for cocaine. Coca cultivation largely happens in the Andean region and particularly Colombian cocaine trafficked through Mexico dominates the US cocaine market.[10] In essence, in addition to links to suppliers in Central America and consumers in the United States, the main competitive assets of Mexican organized crime groups are rapid and low-friction transit routes in Mexico.

[8] In 2008 it is estimated that 500 metric tons of pure cocaine was in the market, 480 metric tons were consumed that year. The US consumed 165 metric tons of pure cocaine that year, all together the North American market consumed 196 metric tons. The second largest market is the western European market (EU and EFTA) which together consumed 124 metric tons (World Drug Report 2010).

[9] According to the U.S State Department's 2013 International Narcotics Control Strategy Report (INCSR), more than 90% of the cocaine that is seized in the United States has transited the Central America/Mexico corridor.

[10] In 2000 73% of the net coca cultivation was made in Colombia (National Drug Control Agency 2015). Other source countries are Bolivia and Peru.

2.2 Change in the Drug Enforcement Policy and Surge of Violence – Identifying variation

Until the mid 2000s anti-drug operations in Mexico focused mainly on destroying marijuana and opium crops in mountainous regions, both of which are very minor markets compared to cocaine. After the election of president Calderón in December 2006 the Mexican government, aiming to decrease the organized crime in the country, changed the focus of their battle against the powerful drug cartels, from ineffective crop eradication programs to actively seeking to capture cartel leadership in an approach also known as the Kingpin strategy. The Kingpin strategy was developed by the US Drug Enforcement Administration (DEA) in 1992 to target and eliminate, by death or by capture, commanders, controllers and key leaders of major drug trafficking organizations.[11],[12] Deploying large scale military forces, the Calderón administration was successful in removing key leaders from major criminal organizations through arrests or by death in arrest efforts.[13]

Paradoxically, despite the success of the new strategy in weakening the major cartels, it had the unfortunate and unanticipated consequence of increased violence. Killing and capturing leaders of DTOs triggered fights for powerful and profitable leadership positions within the same organizations among different factions. As mentioned before rapid and low-friction transit routes are the major assets of the drug trafficking organizations. As the organized crime groups fragmented and the distribution of power changed among the cartels, they fight each other to gain territorial controls over their now-weaker competitors' drug routes.[14] Table A-3 in the appendix shows the fragmentation of major DTOs over the sample period. In just about a few years, the number of major DTOs increased substantially in number as fragments of some of the DTOs formed new criminal organizations.

Studies also point out an additional factor potentially fueling the heightened violence after 2008 which

[11] See also Cockburn (2015).

[12] Despite DTOs are not cartels in the sense that they do not control prices by colluding, the term "drug cartel" is used colloquially to refer to DTOs. Drug cartels and DTOs are used interchangeably in this paper.

[13] The average annual number of troops assigned for battling drug trafficking increased 133% to 45,000 during the Calderón administration compared to the preceding Fox adminstration (Grayson, 2013).

[14] Lindo and Padilla-Romo (2005) show that the Kingpin strategy led to increase in the homicide rate by about 60%.

is the decline in the supply of cocaine in the market. Castillo, Mejía, and Restrepo (2016) argue that increased intensity of government seizures of drugs in Mexico's major cocaine supplier, Colombia, played an important role in the decline in cocaine supply. The resulting decline in the cocaine supply lead to increased cocaine prices in the US and intensified drug related violence especially in areas around the strategic drug trafficking routes to the US market.[15] Thus, after decades of stable rates of violent crime, homicide rates almost tripled from 2007 to 2010 (Figure 1). However, not every location was affected by the sudden surge of violence.

My spatial unit of analysis is a metropolitan area, which consists of an employment core and the surrounding areas that have strong commuting ties to the core.[16] This allows me to focus on well-defined local labor markets rather than administrative units. Focusing on metropolitan areas also prevents the differences in urban and rural areas to confound the results. Figure 2 and Figure 3 show the homicide rates in selected local labor markets (metropolitan areas)). The spatial variation is mainly due to the presence of the drug trafficking organizations (DTOs) and the selective federal army operations that triggered the war. This plausibly exogenous outbreak of violent conflict allows me to study causal relationships between an increase in violence in the local environment and detailed establishment-level outcomes.

[15]Cocaine production in Colombia decreased 43 percent from a potential 510 pure metric tons in 2006 to 290 pure metric tons in 2009 according to a Justice Department report published in 2011 (National Drug Assessment Report).

[16]Mexican Statistical Institute, *INEGI*, constructed fifty-nine such local labor markets in collaboration with the National Population Council, *CONAPA*, and the Ministry of Social Development, *SEDESOL*.

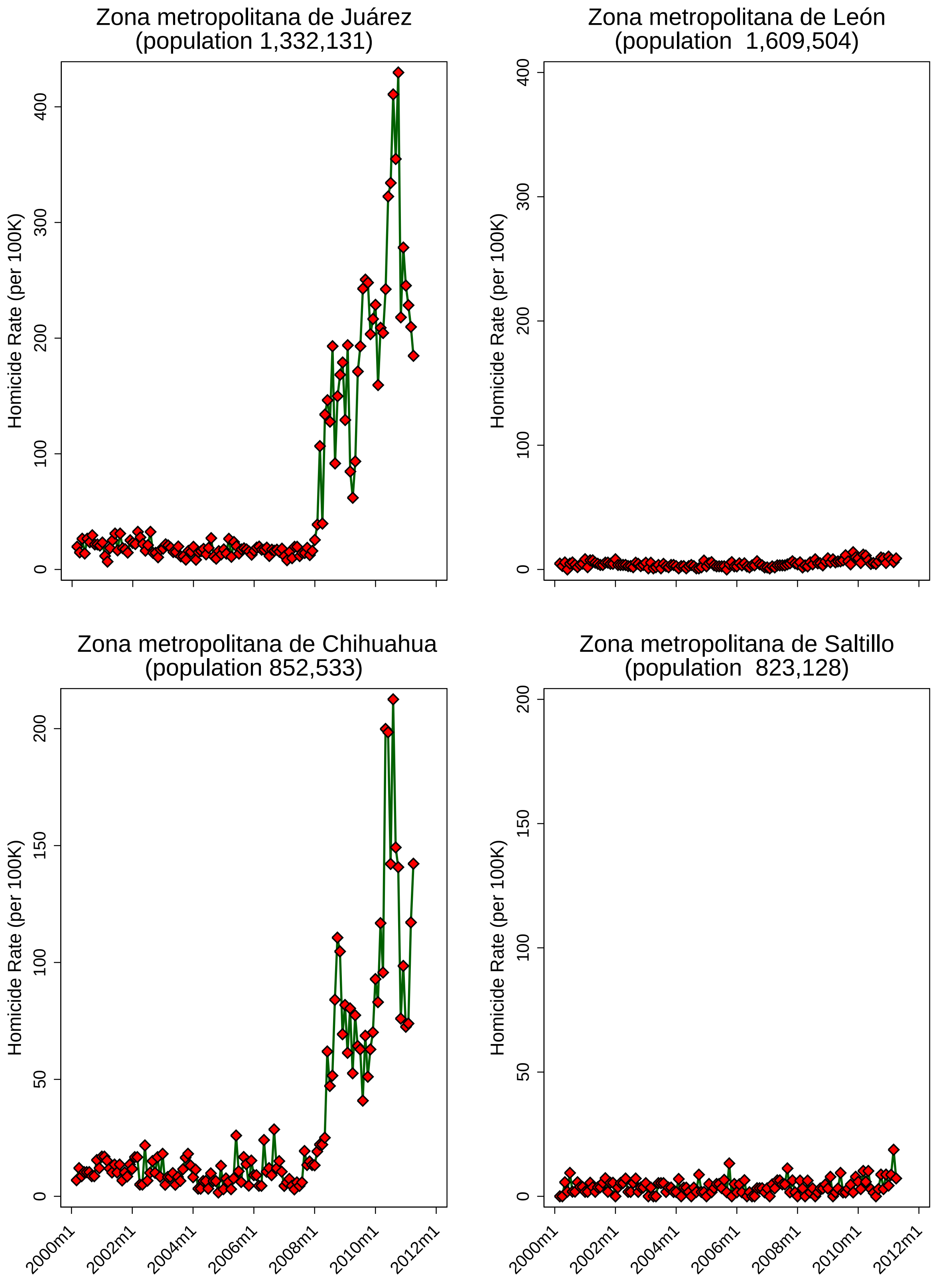

Figure 2: Homicide rates across selected metropolitan areas I

The number of homicide occurrences and population information is from INEGI. Population numbers in the figure titles are from the year 2010. Homicide rates are calculated using the annual population figures, they are annualized monthly rate of homicides.

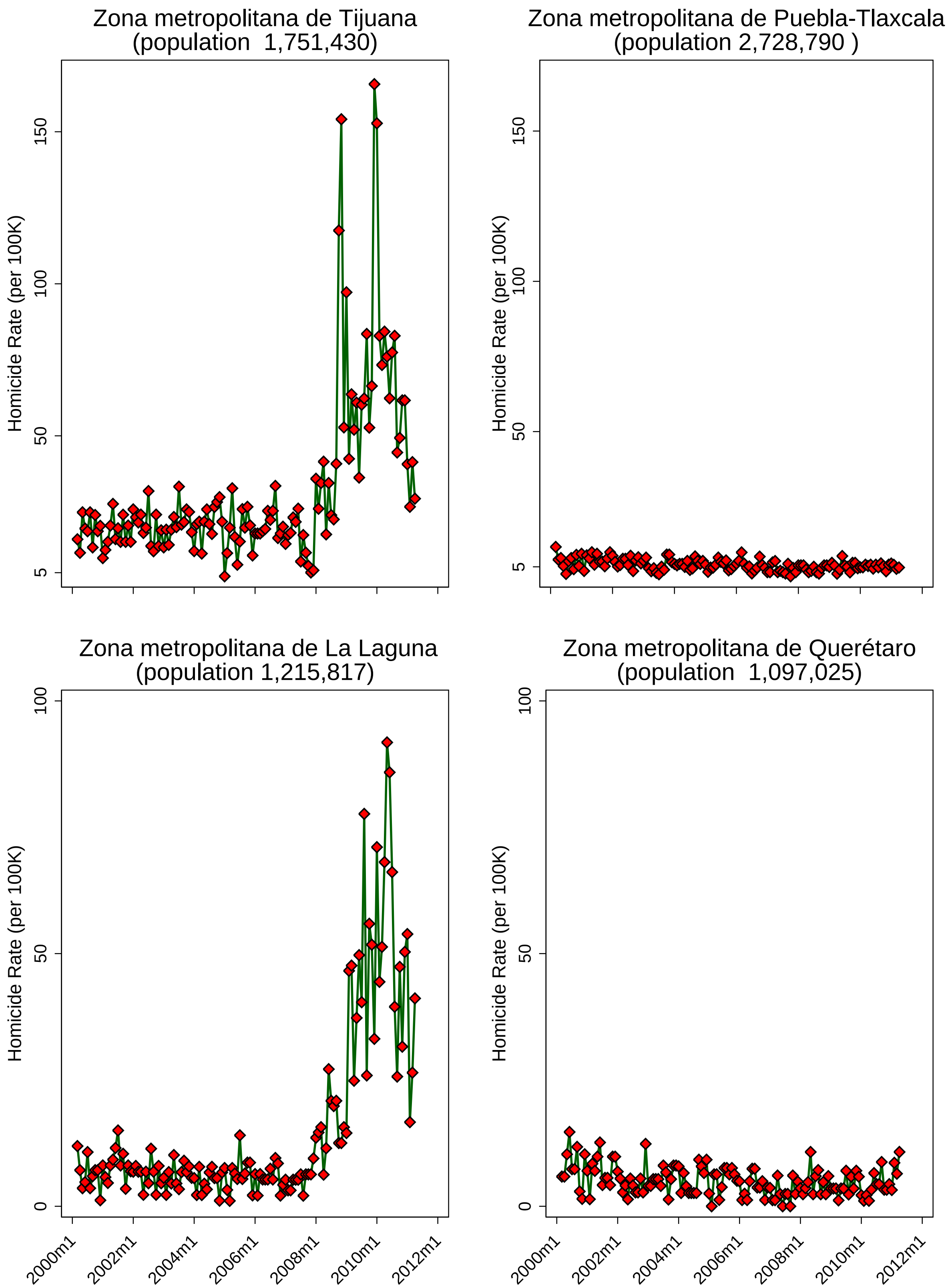

Figure 3: Homicide rates across selected metropolitan areas II

The number of homicide occurrences and population information is from INEGI. Population numbers in the figure titles are from the year 2010. Homicide rates are calculated using the annual population figures, they are annualized monthly rate of homicides.

2.2.1 Violence as a local disamenity shock

Much of the urban violence has been due to fights between drug cartels, so that many of the victims were involved in the drug cartels. However, the urban violence also led to wide-spread random violence especially in poorer neighborhoods of affected metropolitan areas. This may be so because drug cartels use violence to terrorize the public in order to force the government to back down. In October 2010 in Juárez a group of gunmen looking for a specific person stormed into a party. The person they were looking for was not among the party, but that did not prevent them killing 13 people aged 13 to 32 including 6 women and girls and wounding others including a nine-year-old boy (Williams, 2012). The following month in the same city another group of armed men attacked three buses belonging to a auto parts manufacturer, as the buses took third-shift workers home in the early morning, killing and wounding many. The gang members were apparently looking for one worker, whom they took away from the scene (La Botz, 2011). In August of 2010 in San Fernando the army found the bodies of 72 South American migrants, men and women, killed and buried in a mass grave. It later appeared that they were killed when resisting recruitment by the Zeta cartel.

From the news report we can identify at least two different ways that workers may be affected by the war. 1) Direct assaults or being directly involved by drug businesses. The annual profit estimates of the drug cartels in the US ranges from 18 to 39 billion USD (Mexico Drug War Fast Facts–CNN Library). With the amount of money involved, involvement of poor workers in logistics, transportation and other drug-related businesses may not be that surprising. 2) Being an indirect target by either DTOs or military/police forces. News reports document especially workers living in poor neighborhoods being victims of either drug gangs or the government forces by being in the wrong place at the wrong time. See e.g. Cardona (2010).

Figure 4 shows the evolution of intentional homicides victims and probability of being killed across a selected set of occupations. Production workers are especially susceptible to violence; the number of homicide victims who are production workers increased 160% between 2007 to 2010. Since there will be more unskilled production workers than, say professionals and technicians or machine operators, a difference in the level of homicide between these groups is expected. But the rate of increase in the

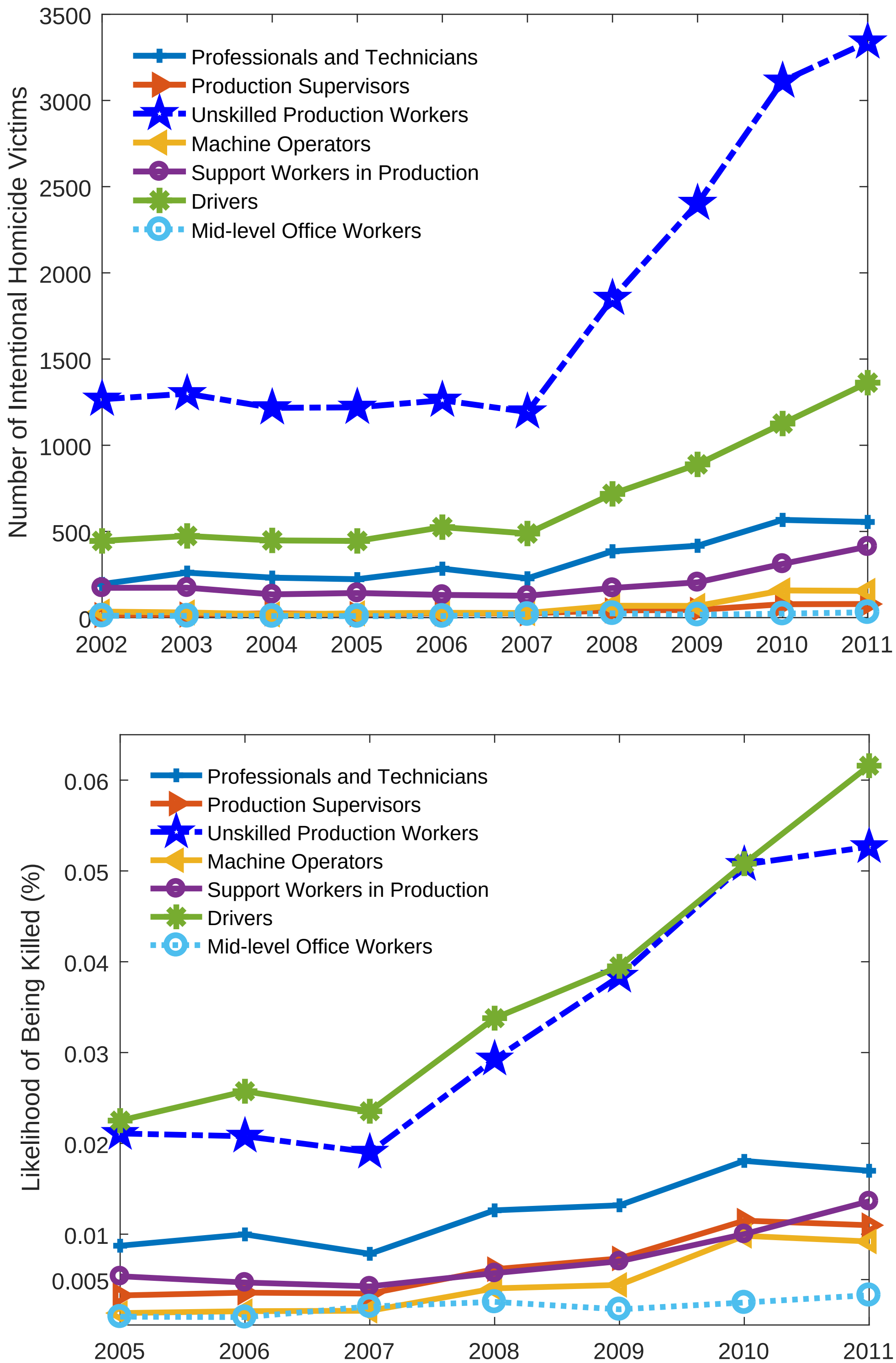

Figure 4: Occupations and Risk to Life

This figure shows the annual number of nation-wide homicides depending on victims' occupations (top) and the number of homicides over the total number of people employed in that occupation (bottom). Shown here are the selected set of occupations. Data Source: INEGI. Estadísticas de mortalidad and Encuesta Nacional de Ocupación y Empleo.

homicide for production workers is striking. The bottom part of the figure shows the likelihood of being a homicide victim, taking the number of workers in these occupations into account. It is also clear that risk to life increases substantially for production workers, almost to the level of drivers, who are more likely to be direct targets of the drug gangs, as they may also be involved in drug trafficking. The figure makes it clear that unskilled production floor workers are far more likely to be victimized during the Drug War compared to other manufacturing workers.

2.3 Data and Preliminary Evidence

The main data set used in this study is *Encuesta Industrial Mensual Ampliada* (EIMA) 2005-2010 which is a monthly survey of plants collected by the Statistical Institute of Mexico, INEGI. Its main purpose is to monitor short-term trends in employment and output, therefore the information collected especially focuses on employment and output changes of manufacturing plants. It surveys 7,238 establishments covering 86% of the nation-wide manufacturing value-added. EIMA 2005-2010 covers plants for each of the 32 states and the level of coverage in 28 of the 32 states is higher than 70%. All plants that are more than 300 employees are included in the survey. Smaller plants are included according to the following criteria: For each detailed manufacturing activity, *clase*, plants are ranked according to their production capacity as of Economic Census 2004 and they are surveyed from the top until at least 80% of all production within each detailed product category is covered. Because of this survey design there is a bias in favor of bigger plants. I will show later that violence especially affects smaller plants, therefore the estimates presented here can be seen as a lower bound of the real impact. Particularly important to the analysis is that plants at EIMA report for each variety they produce quantity and values separately, therefore it is possible to construct plant-level unit prices.

For the purpose of this study I focus on plants located in metropolitan areas. Table A-1 presents summary statistics for this sample. The average plant employs 236 workers and produces 3 varieties. Figure A-1 shows the distribution of plants in year 2005 across the three-digit industries, the sample covers a wide variety of plants and the distribution of plants across industries reflect the overall pattern of Mexican manufacturing with relatively higher share of food manufacturing as well as plastics, chemicals, non-metallic mineral products and the automotive (transportation equipment) sectors.

I match EIMA with the annual survey of manufacturing plants, *Encuesta Industrial Anual* (EIA), which provides detailed balance sheet information of the same manufacturing plants before the Drug War period of 2003-2007.[17] As both EIA and EIMA are based on the same survey design and run in parallel, 90 % of the plants surveyed in EIMA can be matched with EIA.[18] *Maquiladoras*, which are export-processing plants mainly owned by foreign companies and supplying into the US market, are not surveyed by either EIMA or EIA.[19] Exit is observed in the data as the exiting plants drop from the sample, however the survey design is fixed so that possible entries of new plants are not observed.

For more detailed technological and employee compositional pre-shock characteristics I also utilize *Encuesta Nacional de Empleo, Salarios, Tecnología y Capacitación en el Sector Manufacturero* (ENESTyC) 2005, which is a representative establishment level survey on technological and organizational capabilities of plants. Detailed technological and employee characteristics obtained from this nationally representative survey is mapped to EIMA which is the main data-set used in the analysis at four-digit industry-level.[20]Particularly important to the analysis is that plants report geographic distribution of their annual sales as well as their use of imports across the world. I use this information to construct entropy measures of sales and input diversification and study heterogeneity of the output elasticity of violence with respect to firm diversification.

2.4 Preliminary Evidence

I begin by documenting the broad patterns of the data to gain an aggregate level insight into the relationship between heightened violence and plant-level outcomes.

As a first step I compute the mean values of homicide rates and homicide numbers before and after

[17]These data-sets have been used for different time periods by for example Javorcik and Iacovone (2010).

[18]Unfortunately EIA was replaced with a new survey based on a new sampling in 2008, therefore I only rely on EIA for initial, pre-Drug War, characteristics of the plants.

[19]Due to the different legal framework that *maquiladoras* were subject to, *INEGI* has carried out a different survey for them (see Utar and Ruiz (2013)) for more details.

[20]In principle plants surveyed within ENESTyC can also be matched with the plants in EIMA. However, the resulting data-set is too small and significantly biased toward big plants, hence the choice of utilizing this data-set at the industry level.

the Drug War for each metropolitan area, that is across the 2005-2006 and 2008-2010 periods. I define metropolitan areas as High Intensity Drug War zones if the differences between pre- and post-period rate and number of homicides are larger than the mean differences. Doing that identifies six metropolitan areas as 'high intensity drug war zones: Acapulco, Chihuahua, Juárez, La Laguna, Monterrey, and Tijuana. Notice that in my empirical application I will rely on a continuous measure of exposure to the Drug War, namely the homicide rate. However this discrete scheme will help to understand the potential systematic differences between plants located in the drug-violence exposed areas versus others. I first focus on the pre-Drug War characteristics.

Table 1 shows the plant-level characteristics across the two areas as of year 2005. The average size of plants across the two areas are very similar whether measured by value of output or employment. Plants also have no significant difference in labor productivity or the number of varieties produced per plant. Drug war affected areas are on average closer to the US border, and as a result significantly more plants export in areas that will be exposed to heightened violence after president Calderón's launch of the war on drug cartels. On the other hand, there is no difference across plants located in the war affected and war un-affected areas in terms of importing behaviour.[21] Table 1 also shows that plants in the drug war areas are more capital-intensive than plants in other metropolitan areas, which is possibly associated with a higher share of exporters in the former areas.

[21] One should note that the sample does not include any maquiladora plants (export-processing plants), as such plants are surveyed separately by INEGI. See Utar and Ruiz (2013) for further details.

Table 1: Pre-Shock (2005) Plant Characteristics

	High Intensity Drug War Zones		Other Metropolitan Areas			
Plant-level variables	**Mean**	**SD**	**Mean**	**SD**	**Diff.**	**t-stat**
Log Value of Production	11.34	1.94	11.23	1.94	0.10	1.42
Log Capital per Worker	5.01	1.40	4.85	1.42	0.17*	2.99
Log N of Employees	4.59	1.31	4.57	1.31	0.02	-0.43
Log Labor Productivity	-1.06	1.12	-1.12	1.17	0.06	1.35
N of Varieties	3.07	2.87	3.22	3.13	-0.15	-1.31
Export Dummy	0.41	0.49	0.34	0.47	0.08*	-4.37
Import Dummy	0.48	0.50	0.48	0.50	0.00	0.12
Homicide Rate	12.12	6.58	7.78	6.74	4.34	1.50

Note: Values are measured in 2010 thousand Mexican Peso. Labor productivity is measured as the value of production over an hour unit of labor. The number of plants in the six metropolitan areas defined as 'High Intensity Drug War Zones' is 894 and the number in 'Other Locations' is 4,538. Import and Capital per worker data are from EIA, other data are from EIM. * indicates significance at the 5% level or below.

While the plant-level analysis only covers the areas where the manufacturing activities take place, in order to see broad correlation patterns of violence with the geographic, economic and socio-economic characteristics of local areas, I use municipality-level data covering the whole of Mexico. Table A-2 presents the pairwise correlation coefficient of the average post-war homicide rates with various pre-war municipality characteristics. In general, violence outbreak is not negatively correlated with economic activities, indeed, if anything, it is positively associated with the output per capita. This may be driven by the fact that areas closer to the US were important locations for the DTO activities. The overall pattern in Table A-2 shows that Drug War related violence was largely exogenous to local economic and socio-economic factors.

3 Empirical Strategy

This section describes the empirical strategy used to identify the effect of increased violence on plant-level outcomes. Drawing from a longitudinal plant-level survey allows me to focus on within-plant variation and eliminates the possibility that unobservable characteristics of plants and their locations affect the results. I start with the following estimation equation:

$$lnY_{ijkt} = \alpha_0 + \alpha_1 Violence_{jt} + X_{tj} + \tau_{kt} + \eta_i + \varepsilon_{ikjt} \quad (1)$$

Y_{ijkt} is plant i's outcome in industry k located in metropolitan area j and time period t. $Violence_{jt}$ is the logarithm of the number of intentional homicides that occurred between June $t-1$ and June t per thousand people in the area.[22] X_{tj} is a vector of time-varying metropolitan area characteristics. τ_{kt} denotes three-digit industry by time fixed effects and η_i denotes plant fixed effects that can be correlated with plant or metropolitan area characteristics. By making comparisons within a plant over time, observable and unobservable time-invariant characteristics (e.g. productivity or technology differences across firms), metropolitan area characteristics that make the local area less or more attractive to drug cartels or businesses such as infrastructure, ports, and economic development are controlled for. Further, as I focus on plants in metropolitan areas in the analysis, potential correlation between rural versus urban characteristics of locations with the homicide rate would not affect the results. I leave out the metropolitan area that was affected by the Tabasco flood, so there are 58 metropolitan areas in the sample out of the 59 designated metropolitan areas of Mexico.[23]

Inclusion of industry by time fixed effects account for not only macroeconomic changes but also industry-specific time trends that may affect certain regions maybe due to potential geographic concentration of industries. It is especially important to control for industry-specific business trends due

[22] Throughout the estimation analysis, the homicide rate will refer to the number of homicides per thousand inhabitants instead of the convention per hundred thousand inhabitants.

[23] In late 2007 there was a major flood in the sate of Tabasco affecting over one million residents. The state capital went bankrupt as a result and thousands of businesses were affected. Since this event is likely to affect the opportunity cost of conflict and crime, I do not include plants in the flood area in the analysis.

to the potential differential impact of the Great Recession.[24] Moreover, standard errors are allowed to have arbitrary patterns of correlation within each metropolitan area, and also separately within each 4-digit industry and two-way clustered for each metropolitan area and industry.

Dube and Vargas (2013) study how different types of commodity shocks affect civil war outcomes and show that a sharp fall in coffee prices during the 1990s in Colombia leads to increase in violence differentially in municipalities cultivating more coffee. This is the opportunity cost effect of conflict and the presence of such shocks may lead to overestimation of the violence effect. Dube and Vargas (2013) also find that a positive income shock due to a rise in oil price intensifies attacks in oil producing regions. The increase in oil price increases the contestable income, thereby increasing the conflict intensity. Such shocks are likely to lead to an underestimation of the violence effect on plant-level outcomes. In order to prevent a possible convolution of the results, the vector X_{tj} includes metropolitan-level employment shares of crop production, metal mining including gold, silver, copper, and uranium as well as oil and natural gas extraction.

Additionally the vector, X_{tj}, includes the pre-trends in homicide rate per metropolitan areas. To control for pre-trends, the year dummies are interacted with the year 2002 level of homicide rates of the metropolitan areas. α_1 will measure the variation in within-plant outcomes specific to local markets that experience heightened homicide rate during the Drug War.

3.1 Instrumental Variable Strategy

Although the spatio-temporal variation in the homicide rate during the sample period is mainly driven by the Drug War, the variation in homicide rates especially in non-conflict areas may be influenced by other factors that may be correlated with plant-level performance. For example, increased productive capacity in an area may attract unskilled migrants, potentially driving socioeconomic inequality that, in turn, contributes to an increase in local crime. Or maybe a positive oil price shock will boost the local economy in an oil extraction area and increase the contestable income for criminal organizations,

[24]However, studies tend to find that the geographic heterogeneity of crime rate in Mexico does not correspond to the differential regional magnitude of the Great Recession (e.g. Ajzenman et al., 2015).

leading to increased homicide rate as suggested by Dube and Vargas (2013). Such mechanisms will likely cause under-estimation of the impact of the Drug War as proxied by the homicide rate in an ordinary least square estimation. In order to rule out the possibility that the homicide rate is correlated with the error term and make sure that the results are driven by the plausibly exogenous escalation of violent conflict due to the unexpected consequences of a policy turn in Mexico, I conduct an instrumental variable strategy.

When the Calderon government decided to use federal army power on the drug cartels in 2007, Mexican states were offered to engage in joint military operations with the federal forces against the criminal organizations (*Operativos Conjuntos Militares*). Some states decided to opt in with the federal military operations and others opted out.[25] I utilize the federal army entrance in states as a measure of the implementation of the kingpin strategy, and thus of the unintended violence shock as the military is the main actor in implementing the kingpin strategy. Let FA_{st} be an indicator for state s whether it takes the government's offer. That is,

$FA_{st} = 1$ if state s agrees to participate in the joint military operations since 2007.

$FA_{st} = 0$ otherwise.

Note that $FA_{st} = 0$ before 2007. Federal army operations resulted in captures or killings of drug cartels leaders and that in turn triggered fights between cartels. I use the information on municipality-level locations of the Mexican drug cartels as documented by Coscia and Rios (2012). Let DTO_j be an indicator for metropolitan area j if there is an active criminal organization before the Drug War period of 2000-2006.[26] Interacting DTO_j with FA_{st} gives us the locations that are vulnerable to escalation in violence due to the unexpected consequence of the policy change.

Scholars also point out that the decline in cocaine supply from Colombia and the resulting change in cocaine prices intensified the war by increasing the rent opportunities (Castillo et al. 2016 and Angrist and Kugler, 2008). To capture the effect of Colombian drug-enforcement developments on cocaine prices, I regress the logarithm of cocaine prices in the US over the log of coca cultivated land

[25]Michoacán, Guerrero, and Baja California participated in 2007. Nuevo León, Tamaulipas, Chihuahua, Sinaloa and Durango participated in 2008. Other states were not involved.

[26]More specifically $DTO_j = 1$ if in any year over 2000-2006, a DTO is active in area j. The annual information on areas of operations of Mexican DTOs by municipality is from Coscia and Rios (2012).

(in hectar) in Columbia ($lnHectar^{CC}$) with three year lag and the annual log number of DTO ships ($lnShips^{CC}$) seized by the Colombian government with one year lag (equation 2).

$$lnP_t^{coke} = \beta_0 + \beta_1 lnHectar_{t-3}^{CC} + \beta_2 lnShips_{t-1}^{CC} + \varepsilon_t \tag{2}$$

Although with a limited number of observations, estimation of equation 2 results in statistically significant β_1 and β_2 coefficients with expected signs: namely, $\widehat{\beta_1} = -0.847$ with t-value -3.15 and $\widehat{\beta_2} = 0.347$ with t-value 11.43. I then use the predicted cocaine prices over the sample period by the Colombian supply developments and interact with the susceptible locations to the policy intervention, namely $DTO_j * FA_{st}$. In this way, I only use the time-variation in cocaine prices that is associated with the plausibly exogenous changes in Colombia.[27] Therefore :

$$I_{jt} \equiv FA_{st} * DTO_j * \widehat{lnP_t^{coke}} \tag{3}$$

where $\widehat{lnP_t^{coke}}$ denotes the predicted values of inflation and purity adjusted retail cocaine prices in the US (in logarithm). Assuming a strong correlation between the homicide rate and the instrument, the exclusion restriction is valid if $E[\varepsilon_{ijkt} I_{jt} | X_{tj}, \tau_{kt}, \eta_i] = 0$.

4 Decline in Manufacturing and Violent Conflict

This section shows that manufacturing activities decline significantly in the face of rising violence in a metropolitan area. Manufacturing plants' rate of utilization, output, employment and labor productivity drop significantly.

[27] Since 2000 Colombia implemented policies aimed at reducing the cultivation of coca together with policies that aimed at preventing drug shipments out of the country (Mejia and Restrepo, 2015).

4.1 Decline in manufacturing employment due to violence

Table 2 presents the results from estimation of equation 1 using OLS when the outcome variable is the logarithm of employment. Violent conflict is measured using the number of homicides per thousand inhabitants in panel A. Initially only plant fixed effects are included to account for observable or unobservable differences between plants and between metropolitan areas (column 1). The estimate of -0.206 means that an increase from zero to one homicide per thousand people is associated with a 21% decline in the number of employees. But obviously there are concurrent aggregate changes in the environment, importantly the great recession has to be taken into account. The specification in column 2 of Table 2 includes three-digit industry by year fixed effects and the new estimate is now substantially lower in magnitude, but it is still highly significant. The coefficient estimate in Panel A of column 2 means that an increase from zero homicides to one homicide per thousand people is associated with a 7.8% decline in plant-level employment. In column 3 pre-trends in violence is controlled for, and the effect is somewhat lower at 7.1% and statistically significant. Dube and Vargas (2013) study how shocks to certain sectors such as crop production or oil extraction can affect the conflict intensity. In column 4 metropolitan-level employment of crop production, precious metal mining (gold, silver, copper, and uranium) as well as oil and natural gas extraction are controlled for, and the estimate does not react much. This is reassuring. It indicates that identifying variation in the homicide rate over 2005-2010 is largely driven by the outbreak of the Drug War. The specification has three-digit industry by year fixed effects to control for potentially disproportionate impact of the Great Recession across local labor markets in Mexico, but what if there are finer industry-specific shocks that are felt differently across local markets? I add five-digit industry by year fixed effects, and the coefficient estimate in Panel A of column 5 shows that violence, independent from any type of shocks, whether common across industries or specific to very narrow industries, leads to a significant decline in plant-level employment. Panel B of Table 2 repeats the exercise when the violence is measured with the logarithm of the homicide rate, and shows that controlling for the local pre-trends is especially important for the employment elasticity estimate but otherwise the elasticity estimate is robust to outside factors.

In addition to being driven by plausibly exogenous policy intervention in Mexico, the homicide rate, especially in locations that are not affected by the Drug War may be responding to inter-temporarily changing characteristics of the local economy, or local labor markets, so we may not be able to claim causality in the negative relationship identified in Table 2.[28] Addressing this, Table 3 presents the instrumental variable estimates of elasticity of employment with respect to violence. Column 1 first shows the OLS estimates on employment. In column 2 the logarithm of the homicide rate is instrumented with $FA_{st} * DTO_j * \widehat{lnP_t^{coke}}$. The coefficient of interest is larger in magnitude and more precisely estimated; that shows that potential convoluting factors, such as a positive oil price shock (boosting the local economy with oil production, and causing increased criminal activities by increasing the contestable income), leads to underestimation of the impact of violent conflict in OLS. First stage results show that the instrument is indeed strongly correlated with the homicide rate. Instrumentation is strong, as indicated by the first-stage F statistics (Kleibergen-Paap F statistic) at the bottom of the table. The coefficient estimate in columns 2 tells us that doubling the homicide rate leads to a 3.5% decline in plant-level employment. Once the homicide rate is instrumented, inclusion of time-varying local market characteristics, namely controls for crop production, precious metal mining (gold, silver, copper, and uranium), oil and natural gas extraction, does not affect the impact of violence on plant-level employment.[29] Next, I include four-digit, instead of three-digit, industry by year fixed effects. The estimate moves only slightly. In column 5, I shut off all variation across very detailed five-digit industry by time. The impact of violence is more precisely estimated and it gets larger in magnitude. And to remove any suspicion regarding convoluting factors such as trade competition or the Great Recession, I include product by year fixed effects in addition to plant fixed effects and pre-trends in the homicide rate. The two-stage least square estimate shows that drug violence causes significant decline in plant-level employment. More specifically, doubling

[28]Exposure to trade shocks can also influence, in general, crime via changes in labor market conditions or provision of public goods (Feler and Senses (2016)). Recently Dell, Feigenberg and Teshima (2018) show that trade-induced decline in male employment may fuel violence. Dix-Carneiro, Soares and Ulyssea (2018) find that trade-induced labor market changes in Brazil increase crime.

[29]Since including time-varying metropolitan controls on crop, oil, gas and metal mining may add into endogeneity concerns, and the IV strategy focuses on the triggers of the Drug War, the default specification with the two stage least squares does not include them. They are only included when OLS is used. However, including them does not change the results, as it is also clear from Table 3.

the homicide rate in the local market leads to a 4% decline in plant-level employment (column 6). Since the nation-wide homicide rate tripled between 2007 and 2010, and the aggregate manufacturing employment declined 8% over the same period, this estimate implies a substantial impact of the Drug War on the aggregate employment decline. Figure A-3 in the appendix also shows the evolution of the manufacturing employment across selected exposed and non-exposed metropolitan areas (see also Figures 2-2). The aggregate manufacturing employment either declined or stayed constant between 2005 and 2010 in all of the exposed metropolitan areas, whereas all four of the similarly sized non-exposed metropolitan areas experienced net increase in the manufacturing employment over the same period.

The decline in employment may be due to decline in demand, or due to labor market effects of violence or some combination of both. Next, I focus on plant-level price, output and other within-plant changes in response violence.

4.2 Violence and Plants' Utilization, Output and Productivity

In response to violence, the average employment level of plants drops significantly. What are other changes happening within firms due to drug violence? I start with examining the rate of capacity utilization of plants. This variable shows the percentage of the fixed assets that are being utilized in the plant. The results presented in column 1 of Table 4 shows that violence significantly reduces capacity utilization. The coefficient -3.3 implies an average 10 percentage point drop between 2005 and 2010 in the utilization rate of plants in Juarez.[30] The reductions in employment and plant utilization due to violence is accompanied with a significant drop in the value of output (column 2 of Table 4). The estimate -0.08 indicates that doubling the homicide rate decreases output by close to 6%. Output demand may decline due to business closures, emigration or decrease in conspicuous consumption (Mejia and Restrepo, 2016). The negative demand shocks may lead to decline in prices (assuming some market power). Violence-induced labor supply changes and other factors such as increased security expenses tend to increase marginal costs of operating (or to reduce productivity) and to increase firms' price.

[30]The homicide rate, lagged in six months, increases from 15 to 228 between 2005 and 2010 in Juarez.

In situations where violence both leads to a negative labor supply shock and also a decrease in output demand, the impact on prices will be biased towards zero. In column 3 of Table 4 I present the impact of violence on plant-level price. The estimate of elasticity of plant-level price with respect to violent conflict is positive and statistically significant. Doubling the homicide rate increases the prices on average by 2%. This must be an indication of increased cost or lower productivity.[31] Column 4 of Table 4 presents the effect on the product portfolio of plants. The results show not only a significant reduction in output but also in the number of varieties produced. This is an indication that demand channels are likely to be active as well and that the decline in production is not just temporary or short-run. The estimate in column 4 shows a drop in the number of varieties approximately by 3% in response to doubling the homicide rate. Violence also leads to decline in productivity as measured by the output per hour worked.

Foreign demand is not likely to be affected by the local violence shock, but possible disruptions in high-ways and other international routes may deter international trade activities of Mexican firms. Martin, Mayer, and Thoenig (2010) shows that international trade may act as an insurance if international trade provides a substitute to internal trade during civil wars. In column 7 of Table 4 the outcome variable is an indicator variable for exporting. The results show that firms exporting likelihood are not affected significantly by the Drug War. The impact on the share of foreign sales is also not found to be significant (column 8). Further results on exported products (not shown) also reveal that the decline in products is driven by the domestic market as well. These results show that violence leads to a decline in domestic, local demand.

The following section focuses on the compositional changes in plant-level workforce to shed more light on the sources of decline in employment.

[31] The change in average plant-level price would also be a result of product selection within firms if firms drop products that are at the lower end of the price distribution.

4.3 Violence as a Negative Blue-collar Labor Supply Shock

Table 5 presents the analysis of violence on different types of labor. Panel A shows the elasticity estimates for the total blue-collar, production, and total white-collar, non-production, workers. In Mexico, firms can employ workers in two ways: either by direct employment or by indirect employment via an external company. In case of direct employment, firms are required to pay social security contributions and pay severance payments at termination of a contract. In case of indirect employment, firms are not responsible for social security contributions and severance payments. The dependent variables in panel A include both directly and indirectly employed workers, where indirect workers are defined as employed, but not on the firm's payroll. In column 1 the outcome variable is the blue-collar or production workers. The two-stage ordinary least square estimate in column 1 is -0.083, larger than the estimate on total employment which is -0.05 in the corresponding specification (Table 3, column 3), and statistically significant at the 1% level. It shows that doubling the homicide rate in a metropolitan area causes a 6% decline in the number of blue-collar employees. Column 2 shows the impact on total white-collar workers and the estimate is positive, 0.043, though statistically insignificant. Focusing on hours worked in columns 3 and 4, the disproportionate impact of violence on white versus blue-collar workers is even getting stronger: The decline in blue-collar hours as a result of a 100% increase in the homicide rate is around (-0.092x70/100=) 6.4%, but interestingly, white collar hours increases in response to it (5%). Although the increase in white collar hours is not precisely estimated, it is definitely true that white collar employees do not respond negatively to the heightened violence due to the Drug War.

In the presence of labor market frictions (such as severance payments), if the violence shock is felt purely as a demand shock, one expects: 1) a stronger decline in hours worked than in the number of employees for hourly paid workers and 2) a stronger response in indirect employment than in payroll employment. This is so, because it is cheaper to decrease workers' hours worked than laying them off, and it is cheaper to start cutting labor among indirect employees first, as firms have no or imperfect knowledge of how severe or permanent the shock will be (Bloom, 2009). In panel B of Table 5 the focus is on blue- and white-collar employees that are on payroll. The results in Panel B show that firms experience stronger decline among blue-collar workers that are on payroll than the total number of blue-collar workers (column 1 of panel A vs panel B). That is, the violence shock does not cause stronger reduction in temporary blue-collar workers (not on payroll), just the opposite, reduction in blue-collar employees is concentrated among the permanent, payroll employees. This is a good indication that the main driver of decline in blue-collar workers is not violence induced reduction in local demand. Then the results in Panel B also show that the extent of reduction in blue-collar hours worked and the number of blue-collar employees is almost the same (columns 1 and 3 of panel B). The coefficients imply that doubling the homicide rate in a metropolitan area leads to around 6.4% decline in both blue-collar payroll employees and blue-collar payroll hours worked. Together with the fact that white collar employees are not negatively affected and that there is an indication that temporary white collar employees (not on payroll) increases as a result (columns 2 and 4 of panels A and B), these results show that the decline in employment cannot entirely be driven by violence induced decline in local demand and that the drug war's effect on the blue-collar labor force plays a larger role than the drug war's effect on local demand.

Why, then, are blue-collar workers more affected by the war than skilled and higher paid white collar employees? If kidnapping risk and risk to life due to being in the wrong place at the wrong time increases (for all workers), this would lead to increased reservation wage for workers, a wage below which these risks outweigh the benefit of working. As blue collar workers are the lowest paid workers, the increase in reservation wage will be binding for lowest paid, blue-collar workers. Additionally, production workers are more likely to be prone to risk to life (see Figure 4) as they travel during nights and early mornings according to production shifts. Further, Ajzenman et al. (2015), as well as news reports as discussed above, emphasize that especially poorer workers and poor neighborhoods are being impacted by the drug war within metropolitan areas, making lower-paid workers more susceptible to brutality. If this is the case then one also expects the impact to be stronger on unskilled female workers, as they are less likely to be primary bread-winners, hence they will have more elastic labor supply participation compared to male workers. Alternatively or additionally, expansion of the illegal sector, and increased demand for brutal male force may lead especially male workers to leave the legal sector for the illegal one. In both cases, we expect blue collar workers' wages must increase. Panel C of Table 5 shows the two-stage least squares estimates of elasticity of plant-level wages with respect to local conflict. Average wages are not affected (columns 1 and 2), but this is due to significant increase in blue-collar wages and corresponding decline in white collar wages in response to heightened violence. If it is the lower-wage individuals among blue-collar workers who leave the workforce, the increase in blue-collar workers' wages may be driven by selection. But given that the violence also causes decline in white collar wages, this shows that violence indisputably increases the relative wages of unskilled, manual workers, i.e. it decreases the skill-premium. Panel D of column 1 shows that the intensity of white-collar or skilled employees increases as a result. That is, increased violence due to the drug war works as a negative labor supply shock on blue collar workers. As blue-collar workers become relatively scarce in the local labor supply, this leads to decline in the use of blue-collar workers and a significant reduction in skill premium.

The impact is not short-run or temporary as evidenced by the significant decline in employment growth, entirely driven by the reduction of blue-collar workers (columns 2-4 of Panel D). These results show that the Drug War has an *ability* to influence the technology of firms–the way production is organized. Firms use production technologies that are more intensive in the use of the relatively more abundant labor type, white collar workers, in response to violence induced local labor supply shocks.[32]

5 An Anatomy of Mis(Re)-allocation Induced by Drug Violence

The results so far point to two important channels through which firms are affected by the Drug War: 1) via violence induced local labor supply shocks and 2) via violence induced reduction in local demand. Some firms are likely to be more or less prone to the demand effect of violence or the labor supply effect of violence. For example, exporters' output demand are less likely to be affected by

[32]Note that all adjustment to a local labor supply shock could also take place between firms or between industries by inducing a decrease in scale of those production units that are intensive in the use of the now relatively scarce labor input (Rybczynski Theorem). Dustmann and Glitz (2015) emphasize the importance of within firm adjustment in response to changes in local labor supply.

local violence and high-wage plants are less likely to be affected by local labor supply shocks. This section studies potentially heterogenous impact of violence to help pinpoint the channels through which firms are affected and to document the extent of reallocation induced by violence. For this, I utilize the rich information on characteristics of plants provided by the annual survey (EIA) and the technology survey (ENESTyC). My approach for studying the heterogenous response of plants is to partition the sample depending on plants' initial characteristics and conduct the analysis separately for the resulting sub-samples.

5.1 Labor Market Channel

Compositional changes within firms confirm that the violence shock is felt as a negative labor supply shock on blue-collar workers. Descriptive analysis point to higher risk of life especially for production workers, who are also the ones with the lower incomes. As a local disamenity especially affecting poorer neighborhoods, violence is likely to increase the reservation wages of workers below which the discomfort and the risks outweighs the benefit of working. Despite women not being the immediate target of violence, this mechanism is expected to be stronger for women, simply because they tend to have more elastic labor supply, as they are less likely than men to be the primary bread-winner of their family and their labor is less well paid. In the light of a low rate of migration out of exposed regions (see Table A-4 in the appendix), which should decrease the labor supply for both men and women, the decline in labor force participation of women due to violence is expected to affect more strongly manufacturing plants that are intensive in female labor.[33] It is also possible that the drug war expands the illegal sector and pushes up blue-collar wages in the legal sector. Such a mechanism would also act stronger on lower wage plants, but on male-intensive rather than female intensive ones.

To distinguish among alternative explanations of labor supply changes Table 6 present the sensitivity of the employment response to drug violence across plants with different susceptibility to violence

[33] Table A-4 in the appendix shows that people more likely to emigrate to other countries in exposed states in comparison to people in non-exposed states. However, in general there is a strong overall declining trend in the number of international emigrants (namely emigrants to the US) over the sample period, which is likely to be due to stricter policies in the US with regard to illegal immigration.

induced labor supply shocks. The first panel of Table 6 presents the impact of violent conflict on employment separately among low- and high- female intensive plants. For these regressions, the sample is divided depending on the median value of the female employee share of plants as of the initial year 2005 and equation 1 is estimated for each sample using 2SLS where the logarithm of the homicide rate is instrumented with the instrument described in equation 3. As the sample is partitioned according to various plant characteristics, I control for five-digit industry by year effects instead of the default three-digit industry by year fixed effects in these regressions to avoid any convoluting factors. The results show that plants with a female-intensive workforce experience three times stronger decline in employment. Doubling the homicide rate causes 9% decline in total employment for plants with female-intensive workforce as opposed to 3% for plants with non female-intensive workforce.[34] This is in line with the idea that by increasing the risk to life, a violent environment decreases the value of work and increases the reservation wages of workers. Female workers are more likely to be affected by this, since they are easier and more exposed targets of random violence and since they tend to have more elastic labor supply. At the municipality-level, an analysis presented in the online appendix of Dell (2015), for example, shows significant negative effect of the Drug War on female labor force participation, and no effect on male labor force participation.

If firms are affected not only through the labor market channel but also by decline in local demand, one expects a smaller difference between plants with female intensive workforce and other plants when it comes to output. Table 8 presents the elasticity estimates for low- and high- share of female workforce plants across wide range outcomes, and it confirms that the decline in outputs across these plants are more similar in comparison to the stark differences in labor outcomes. While the employment effect of violence on male-intensive plants is only one third of the effect on female-intensive plants, the output effect of violence on male-intensive plants is two thirds of the effect on female-intensive plants. This is because firms are affected by the Drug War both through its effect on local labor markets but also through its effect on local demand.

Next, I focus on low- versus high-wage plants. Low-wage plants must be more exposed to the labor

[34] The median level of female share of workforce in 2005 is 0.195. Therefore female-intensive plants are plants with at least 20% female employment.

market channel because the new reservation wage will be more binding for lower-wage plants. The results in Panel B of Table 6 show that doubling the homicide rate causes a 7% decline in the total employment among the low-wage plants, while the employment decline is not significant among high-wage plants.

Unionization would also be an important factor influencing workers' bargaining power, and hence their compensation level and amenities such as more secure worker transportation, and safer and better protected work environment. Such amenities could help to reduce the impact of violence on workers. Panel C of Table 6 shows that plants with higher than median level of unionization rate among their production employees do not experience significant decline in total employment, while plants with low degree of unionization experience significant reduction in total employment. For plants with low degree of unionization, doubling the homicide rate means a 6% reduction in total employment.

Next I focus separately on women's and men's average wages across plants. Since the decline in labor supply is likely to be driven by lower wage female workers dropping from the labor force, we would expect to see larger difference in employment response between high- and low female wage plants compared to between high- and low male wage plants. Panels D and E of Table 6 present these results for wages of unskilled female production workers and unskilled male production workers. Since the detailed wage information for genders is not available at EIM or EIA, I utilize the representative plant-level survey ENESTyC and match the information to plants via their four-digit industry. Panel D shows that employment decline is concentrated among plants with lower average wage for unskilled females. In Panel E the results show that the employment effect of violence is more precisely estimated for plants with lower unskilled male wage but the magnitudes are similar whether plants on average have lower unskilled male wage or not. This is once again confirms that dropping of relatively lower paid female workers from the labor force is the main driver of the labor market effect of violence on firms.

The next section turns the focus to the demand channel of violence.

5.2 Internal versus International Trade

Violence is likely to reduce the size of the market and this effect is expected to be stronger for firms selling and sourcing locally. Since the first order effect of violence induced demand change is on output rather than employment, this section focuses on the value of output. The first panel of Table 7 presents the output elasticity of violence among domestic sales intensive versus export intensive plants. Export intensity is defined as the 75th percentile of the ratio of foreign sales over the total sales as of the initial year 2005. The output decline due to the Drug War is concentrated among domestic sales intensive plants. Doubling the homicide rate decreases the value of output by 11% for these plants. The reduction of output in response to local violence among export-intensive plants, on the other hand, is not significant. Panel B reports the output elasticity of violence among plants that do not export as of the initial year 2005. The results are similar: purely domestic consumer oriented plants experience a 9.4% reduction in output in response to increased violence, and the exporters' outputs do not significantly react to local violence. The results show that the Drug War decreases the final demand of the domestically selling firms. In panel C the sample is partitioned depending on the intensity of import in total material expenditure as of 2005. Plants that source mostly domestic inputs experience a 9.4% reduction in output due to heightened violence, while the average impact on plants that rely mostly on imported materials is 5.3% but statistically insignificant. These results show that local violence disrupts domestic trade, and as a result domestically selling and sourcing firms are disproportionately more affected by the escalation of violence due to the Drug War.[35]

Next, I use the information on plants' sales and material purchases across different regions in the representative ENESTyC data-set and construct the entropy measures of firm diversification across industries. The sales diversification measure, which is used in the IO literature (Palepu (1985), Rumelt (1982)), gets larger the more geographic segments a firm operates in, and the less the relative importance of each of the segments in the total sales. It takes zero for non-diversified firms. Similarly, I define materials diversification measures based on geographic distribution of firms' material pur-

[35]The results on the asymmetric impact of violence on domestic versus international trade may imply a limited role of international trade in acting as a deterrent to the Drug War and also speaks into a recent nascent literature studying the linkages between the globalization and civil war (McLaren (2008), Martin, Thoenig, and Mayer (2008)).

chase. ENEStyC provides sales and purchase of materials information of plants across eight mutually exclusive and exhaustive regions world-wide. Mexico as a whole is considered as one market, as there are no details regarding sales and purchases within the domestic market. The idea here is that, the more diversified a firm is world-wide, the more diversified it is likely to be domestically.

Panel D shows that the output elasticity of violence is larger the less the geographic diversification of sales. More precisely, doubling the homicide rate leads to 8.2% decline in value of production among plants with lower rate of sales diversification, while the effect is not statistically significant among diversified establishments. Similar results are obtained when focusing on geographic diversification of inputs. The decline in output due to the Drug War concentrates in locally selling and sourcing plants.

Altogether these results show that the Mexican Drug War affect manufacturing via : its effect on the local labor force and its effect on local market size or demand. These two channels at the end leads to strong reallocation within firms, and between continuing firms. Next, the focus will be on the extensive margin, or firms' likelihood of exit. Are the effects of the Drug War so strong that the same channels also operate at the extensive margin, leading to plant exit? This will be in focus next.

5.3 Drug Violence and Plant Closings

In the following I will examine the relationship between heightened conflict due to the Drug War and the likelihood of plant exit. I adopt a probit specification and study the relationship between the likelihood of exit and the number of homicides per thousand inhabitant in the metropolitan area where the plant is located.

As before, I include three-digit industry by year fixed effects to remove industry-specific business cycles. I then, one by one, control for detailed initial characteristics of plants (the logarithm of employment, the ratio of non-production workers over the total number of employees, the logarithm of capital per worker, the ratio of female workers over the total number of employees, the ratio of IT expenditure over the total expenses, the logarithm of labor productivity, the number of manufactured products, export indicator and import indicator), of local socio-economic structure (percentage of literates, percentage of female employment, percentage of car ownership, percentage of professionals, percentage of school enrollment, and percentage of economically active population), local economic structure (the logarithm of gross value-added per worker, the logarithm of the number of businesses, employment shares of crop production, precious metal mining, oil and natural gas extraction and manufacturing) and pre-trends in the homicide rate. Table 9 shows the summary of these results. The coefficient in column 1 implies that marginal change in the homicide rate from the average of 0.085 increases the likelihood of plant exit by 3.3 percentage points. Adding controls mostly strengthens the effect of the homicide rate on plant exit in columns (2)-(3). Once the pre-trends are controlled for, the coefficient in column (4) implies a 2.2 percentage point increase in the likelihood of plant exit.[36]

Are all plants equally affected by drug violence in terms of exit probability? The results in Table 10 reveals heterogenous impact. Column 1 shows that small plants (as defined by plants with up to 40 employees) are significantly more vulnerable to the Drug War, as they are likely not to be able to cover the increased cost of operating due to violence. Plants with higher ratio of female employees are also significantly more likely to exit showing that the labor market disruption channel of violence is also operative at the extensive margin. This indicates once again the importance of the labor market channel (column 2). Results in column 3 shows that intensity of foreign sales significantly decreases the impact of the Drug War on exit probability. This result confirms the importance of the demand channel. In column 4 the homicide rate is interacted with the intensity of import over total material expenditure. The results show that the intensity of foreign inputs strongly shields plants from exiting due to the Drug War. In sum, the Drug War leads to plant exits. Disruptions in local trade as well as disruptions in local labor markets are all important channels also at the extensive margin. Locally sourcing, locally selling and female worker intensive plants are especially badly affected by violence. 37

[36]When instrumenting the homicide rate, a null hypothesis of exogeneity of the homicide rate is not rejected by a Wald test of exogeneity, so I opted for the ordinary probit.

[37]I also study the impact across industries to see if violence leads to plant exit in particular industries. I find very similar negative impact across all three-digit NAICS industries with one exception. The survival likelihood of plants in the primary metal production (iron and steel) increases with the violence shock as probably the drug war benefits their demand. Appendix Table A-6 present these results for a selected set of industries.

6 Additional and Robustness Analysis

Recession or Trade-induced Labor Market Shocks

The empirical strategy in this paper allows for differential time trends across industries and the results are also robust to inclusion of product specific business cycles (Table 3). However, even within a detailed manufacturing activity not all plants export or sell domestically. If exporters are more likely to be affected by the Great Recession as their main market, the US, is heavily affected by the Recession, this can lead to heterogenous impact of the Great Recession within industries. To investigate if such a channel plays a role in the results, I additionally include differential time trends for exporters, namely the interaction of exporter dummy with year fixed effects and estimate equation 1 using the two-stage least squares. The results presented in Table A-8 are robust to inclusion of differential time trends for exporters and they confirm that the estimated effect of violence is not convoluted by the Great Recession.

Additionally, Table 13 and 14 present the estimation of equation 1 using the two stage least squares on the data from only two years, 2005 and 2010, removing the period of the recession, and the results are found to be very similar.

The other related issue is possible effect of trade competition during the sample period. If trade competition induces layoffs in a local market, it may increase the local violence by lowering the opportunity cost of crime. Several studies show that the rise of China in the global trade was an important shock to the US manufacturing sector (Pierce and Schott (2016); Autor, Dorn, Hanson (2013)), and Utar and Torres-Ruiz (2013) shows that increased competition in the US with China spilled over to Mexico in a substantial way via the US-Mexico production chain. And more recently Dell, Feigenberg, and Teshima (2018) shows that increased competition in the US with China increases drug violence in Mexico. Would my results then be affected by such a mechanism?

Since the results here are robust to controlling for product by year fixed effects, and my instrument focuses on the spatio-temporal variation in the plausibly exogenous outbreak of violence due to the Drug War (Dell, 2015), trade-induced labor market changes are not likely affecting my results. Additionally controlling for differential time trend for exporters also indicates that the results in this paper are free from such concerns. However, to directly address this concern, I construct the trade exposure measure of Dell, Feigenberg, and Teshima (2018) for all local markets in my sample and additionally control for local trade exposure of metropolitan areas (see Appendix C for details). The results shown in Table A-7 confirm one more time that the results presented in this paper are not influenced by trade-induced, or the recession-induced employment loss.

Firm Selection

I show that plants that are exposed to the violence shock are more likely to exit, and that the likelihood of exit is stronger if plants are more female-intensive, oriented towards the domestic market and smaller. I also show that such plants disproportionately downsize conditional on staying in the market. These results may imply that selection may cause underestimation of the true impact of the violence shock at the intensive margin. To gauge this, relying on the "identification-at infinity" idea (Chamberlain (1986) and Mulligan and Rubinstein (2008)) that the selection bias must be lower for plants with higher survival probability, I restrict the estimation sample to plants with higher survival probability and observe how the estimates change as one drops the plants most likely to exit step by step. The results, shown in Table A-9 in the Appendix, confirm that negative effect of violence on employment at the intensive margin is partly underestimated due to plant exit.

7 Concluding Remarks

In this paper I study microeconomic impacts of violent conflict. Exploiting the sudden, unanticipated, and geographically heterogeneous surge in organized crime and violence in Mexico during the late 2000s, and employing longitudinal plant-level data from all metropolitan areas of Mexico, I show that violence, apart from its direct impact on people's lives, causes significant decline in plant-level output, employment and the capacity utilization of Mexican manufacturing plants. The decline in output and employment has long term dynamic implications in the form of significant decline in product scope and plant growth.

A violent environment affects relatively unskilled, lower paid production workers more strongly and manifests as a negative unskilled labor supply shock, pulling down the relative wages of skilled workers and pushing up the skill-intensity of manufacturing establishments. That is, in response to the violence induced labor supply shock firms adjust by using the relatively abundant type of labor more intensively. Female-intensive, lower-wage, and less unionized establishments are more strongly affected by the labor market channel of the violence and experience stronger decline in employment. At the same time local violence hinders domestic trade but not international trade. As a result, plants selling and sourcing locally experience stronger decline in output.

At the extensive margin, the Mexican Drug War causes plant closings; the survival likelihood of plants decreases especially if they are smaller, female-intensive, domestically oriented plants. Overall the results show that both at the intensive and at the extensive margin, disruptions in the labor supply and internal trade are important channels in which local violence affects firms. These results show that the Mexican Drug War significantly hinders development of domestic industrial capability by taking resources away from locally sourcing, and selling plants, and plants with female-intensive workforce towards internationally oriented, diversified, and bigger plants.

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Table 2: OLS Results– Violent Conflict and Plant-level Employment

	(1)	(2)	(3)	(4)	(5)
Specification: OLS					
Dep. Var.: Log Employment					
Panel A.					
Homicide Rate	-0.206***	-0.078***	-0.071***	-0.070***	-0.062***
	(0.062)	(0.020)	(0.023)	(0.023)	(0.020)
Panel B.					
Log Homicide Rate	-0.074***	-0.014	-0.025*	-0.025**	-0.026***
	(0.010)	(0.013)	(0.011)	(0.013)	(0.009)
For both panels:					
Plant Fixed Effects	✓	✓	✓	✓	✓
3-dig Industry **x** Year Fixed Effects	No	✓	✓	✓	No
2002 Homicide Rate **x** Year FE	No	No	✓	✓	✓
Time-Varying Local Market Characs	No	No	No	✓	✓
5-dig Industry **x** Year Fixed Effects	No	No	No	No	✓
No of Observations	30,695	30,695	30,695	30,695	30,695
No of Plants	5,570	5,570	5,570	5,570	5,570
No of Local Markets (Clusters)	58	58	58	58	58

Note: The dependent variable is the logarithm of the number of employees. Violent Conflict is measured as the logarithm of the number of homicides per thousand inhabitant of each metropolitan area. Time-Varying Local Market Characteristics include metropolitan area-level employment shares of crop production, metal mining including gold, silver, copper, and uranium and the metropolitan area-level employment share of oil and natural gas extraction. Robust standard errors, reported in parentheses, are two-way clustered by local market (metropolitan area) and four-digit industry level. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 3: IV Results–Violent Conflict and Plant-level Employment

	(1)	(2)	(3)	(4)	(5)	(6)
Specification	OLS	IV	IV	IV	IV	IV
Dep. Var. Log Employment						
Log Homicide Rate	-0.025**	-0.050***	-0.050***	-0.047**	-0.052***	-0.055***
	(0.011)	(0.018)	(0.018)	(0.018)	(0.019)	(0.019)
Plant FEs	✓	✓	✓	✓	✓	✓
Time-Varying Local Market Characs	-	-	✓	-	-	-
2002 Homicide Rate **x** Year FEs	✓	✓	✓	✓	✓	✓
3-dig Industry **x** Year FEs	✓	✓	✓	-	-	-
4-dig Industry **x** Year FEs	-	-	-	✓	-	-
5-dig Industry **x** Year FEs	-	-	-	-	✓	-
Product **x** Year FEs	-	-	-	-	-	✓
No of Observations	30,695	30,695	30,695	30,695	30,694	30,682
No of Clusters (MZ)	58	58	58	58	58	58
First Stage						
Instrument ($FA_{st} * DTO_j * \widehat{lnP_t^{coke}}$)		0.118***	0.118***	0.120***	0.119***	0.119***
		(0.021)	(0.021)	(0.020)	(0.019)	(0.019)
Kleibergen-Paap F-excluded instrument		33.24	33.24	36.42	37.52	38.34

Note: The dependent variable is the logarithm of the number of employees. Violent Conflict is measured as the logarithm of the number of homicides per thousand inhabitant of each metropolitan area. Time-Varying Local Market Characteristics include metropolitan area-level employment shares of crop production, metal mining including gold, silver, copper, and uranium and the metropolitan area-level employment share of oil and natural gas extraction. Robust standard errors, reported in parentheses, are two-way clustered by local market (metropolitan area) and four-digit industry level. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 4: Mexican Drug War and Decline in Manufacturing Plants

Specification	(1) IV Capacity Utilization	(2) IV Value of Output	(3) IV Avg Output Price	(4) IV Varieties Produced	(5) IV Labor Productivity	(6) IV Export Indicator	(7) IV Export Intensity
Log Homicide Rate	-3.308***	-0.079***	0.031**	-0.039**	-0.053*	-0.020	-0.011
	(1.076)	(0.026)	(0.015)	(0.015)	(0.031)	(0.018)	(0.010)
Plant FEs	✓	✓	✓	✓	✓	✓	✓
Pre-Trends in Homicide Rate	✓	✓	✓	✓	✓	✓	✓
3-dig Industry **x** Year FEs	✓	✓	✓	✓	✓	✓	✓
No of Observations	30,148	30,817	28,812	30,817	30,035	30,817	30,813
No of clusters (LM)	58	58	58	58	58	58	58
Kleibergen-Paap F-excluded instrument	32.43	33.20	32.38	33.20	32.97	33.20	33.21

Note: Capacity utilization is the rate of utilization of the fixed assets of the plant. All dependent variables, except "Capacity Utilization", "Export Indicator" and "Export Intensity" are in logarithm. Labor productivity is the logarithm of the value of output per hour worked. Robust standard errors, reported in parentheses, are two-way clustered by local market (metropolitan area) and four-digit industry level. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 5: Violence as a Negative Supply Shock of Blue-Collar Workers

Specification: 2SLS	(1)	(2)	(3)	(4)
Panel A. Both Payroll and Indirect Employees				
Dependent Variable	BC Workers	WC Workers	BC Hours	WC Hours
Violent Conflict	-0.083***	0.043	-0.092***	0.066
	(0.024)	(0.036)	(0.025)	(0.045)
No of Observations	28,981	30,066	29,719	25,064
F-excluded instrument	33.81	33.25	32.41	34.14
Panel B. Employees on Payroll				
Dependent Variable	BC Workers	WC Workers	BC Hours	WC Hours
Violent Conflict	-0.092***	-0.016	-0.091***	0.014
	(0.026)	(0.033)	(0.023)	(0.033)
No of Observations	26,179	25,820	25,561	21,039
F-excluded instrument	33.19	33.41	32.32	34.27
Panel C. Monthly Wages				
Dependent Variable	Avg Wage	Avg Wage on Payroll	BC Avg Wage	WC Avg Wage
Violent Conflict	-0.026	0.002	0.099*	-0.084*
	(0.016)	(0.018)	(0.052)	(0.044)
No of Observations	30,073	26,084	24,682	24,676
F-excluded instrument	32.88	32.93	33.22	33.47
Panel D. Skill Intensity and Growth Rates				
Dependent Variable	Skill Intensity (WC/TotEmp)	Employment Growth	BC Growth	WC Growth
Violent Conflict	0.014*	-0.030*	-0.190**	0.059
	(0.007)	(0.017)	(0.082)	(0.116)
No of Observations	30,695	24,818	23,434	24,325
F-excluded instrument	33.24	27.17	26.46	27.48

Note: Violent Conflict is measured as the logarithm of the number of homicides per thousand inhabitant of a metropolitan area. All dependent variables are in logarithmic form except "Skill Intensity" which is the ratio of total number of white-collar employees over the total employment. All regressions include plant fixed effects, 3-digit industry by year fixed effects, and the pre-trends in the homicide rate per metropolitan area. Robust standard errors, reported in parentheses, are clustered two-way by metropolitan area and industry. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 6: Heterogeneity in Employment Elasticity of Violence

Partition variable	Low	High
Panel A. Female Workforce Share (p50=0.195)	$<= p50$	$> p50$
Log Employment	-0.039**	-0.118**
	(0.019)	(0.048)
N	13,412	13,374
First-Stage F	39.18	30.90
Panel B. Log Monthly Wage (p50=9.133)	$<= p50$	$> p50$
Log Employment	-0.101**	-0.017
	(0.039)	(0.022)
N	14,277	14,320
First-Stage F	29.93	40.49
Panel C. Share of Unionized Production Workers (p50=0.354)	$<= p50$	$> p50$
Log Employment	-0.082***	-0.021
	(0.022)	(0.024)
N	15,523	15,171
First-Stage F	34.96	39.47
Panel D. Unskilled Female Production Wage (p50)	$<= p50$	$> p50$
Log Employment	-0.089***	0.005
	(0.020)	(0.024)
N	15,628	15,066
First-Stage F	40.20	30.76
Panel E. Unskilled Male Production Wage (p50)	$<= p50$	$> p50$
Log Employment	-0.054***	-0.052**
	(0.018)	(0.024)
N	16,783	13,911
First-Stage F	32.10	42.64

Note: Each cell shows the 2SLS estimation of the log homicide rate on the logarithm of the total number of employees when the sample is partitioned according to the value of the variable on the left in the respective row. Each regression includes plant fixed effects, five digit industry by year fixed effects, and the pre-trends. Robust standard errors, reported in parentheses, are clustered two-way by metropolitan area and industry. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 7: Heterogeneity in Output Elasticity of Violence

Partition variable	Low	High
Panel A. Export Intensity (p75)	$<= p75$	$> p75$
Log Value of Output	-0.146***	-0.030
	(0.043)	(0.056)
Panel B. Export Indicator	Non-exporters	Exporters
Log Value of Output	-0.130***	-0.010
	(0.041)	(0.037)
Panel C. Import Intensity (p75)	$<= p75$	$> p75$
Log Value of Output	-0.130***	-0.075
	(0.046)	(0.052)
Panel D. Geog. Diversity of Sales	$<= p50$	$> p50$
Log Value of Output	-0.114***	-0.052
	(0.036)	(0.052)
Panel E. Geog. Diversity of Materials	$<= p50$	$> p50$
Log Value of Output	-0.088**	-0.082
	(0.038)	(0.060)

Note: Each cell shows the 2SLS estimation of the log homicide rate on the logarithm of the value of production when the sample is partitioned according to the value of the variable on the left in the respective row. Each regression includes plant fixed effects, five digit industry by year fixed effects, and the pre-trends. Robust standard errors, reported in parentheses, are clustered two-way by metropolitan area and industry. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 8: Sensitivity to Drug Violence across low- and high- female intensity plants

	Low Female Share Plants	High Female Share Plants
Employment	-0.039**	-0.118**
	(0.019)	(0.048)
BC Employment	-0.074***	-0.171***
	(0.025)	(0.052)
BC Hours	-0.082***	-0.165***
	(0.027)	(0.058)
WC Employment	0.030	0.056
	(0.034)	(0.070)
WC Hours	0.073	0.056
	(0.045)	(0.059)
BC Wage	0.029	0.188**
	(0.029)	(0.082)
WC Wage	-0.026	-0.165*
	(0.036)	(0.097)
Skill Intensity	0.011**	0.031*
	(0.005)	(0.017)
Skill Premium	-0.068	-0.414*
	(0.045)	(0.233)
Value of Output	-0.102***	-0.152**
	(0.016)	(0.067)
Number of Varieties	-0.052**	-0.049
	(0.021)	(0.035)
Export	-0.039	-0.034
	(0.024)	(0.031)

Note: Each cell shows the 2SLS estimation of the log homicide rate on the logarithm of the variable listed on the left hand side when the sample is partitioned according to the median value of the female workforce share. Each regression includes plant fixed effects, five digit industry by year fixed effects, and the pre-trends. Robust standard errors, reported in parentheses, are clustered two-way by metropolitan area and industry. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 9: Drug War leads to plant closings

Specification: Probit	(1)	(2)	(3)	(4)
Violence	0.435***	0.486***	0.515***	0.359**
	(0.148)	(0.109)	(0.141)	(0.145)
3-dig. Industry **x** Year FE	✓	✓	✓	✓
Plant Characteristics	no	✓	✓	✓
Local Economic Characs.	no	no	✓	✓
Local Socio-Economic Characs.	no	no	✓	✓
Pre-Trends in Homicide Rate	no	no	no	✓
Pseudo R^2	0.067	0.071	0.074	0.075
No of Observations	26,288	22,572	22,415	22,415
No of Clusters	58	57	55	55

Note: Violence is measured as the the number of homicides per thousand inhabitant in a metropolitan area. Plant Characteristics include year 2005 values of plant size (employment), log capital per worker, IT-intensity, non-production intensity, labor productivity, female worker intensity, exporter dummy, importer dummy, and the number of manufactured products. Local Economic Characteristics (metropolitan area-level) include the 2004 or 2005 values of log output per worker, log number of businesses, employment shares of crop, metal mining, oil extraction, and manufacturing. Local Socio-Economic Characteristics include year 2000 values of percentages of professionals, literate residents, school enrollment, people with own car, economically active population and female employees over female population. Robust standard errors, reported in parentheses, are clustered by metropolitan area. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 10: Drug Violence and Plant Exit–Heterogenous Impact

Specification: Probit	(1)	(2)	(3)	(4)
Violence	0.167	0.018	0.474***	0.568***
	(0.173)	(0.149)	(0.145)	(0.142)
Violence **x** Small	0.417***			
	(0.146)			
Violence **x** Female Intensity		2.416**		
		(1.126)		
Violence **x** Export Intensity			-0.839*	
			(0.479)	
Violence **x** Import Intensity				-1.909**
				(0.940)
Pre-Trends in Homicide Rate	✓	✓	✓	✓
Plant Characteristics	✓	✓	✓	✓
Local Economic Characs.	✓	✓	✓	✓
Local Socio-Economic Characs.	✓	✓	✓	✓
3-dig. Industry **x** Year FE	✓	✓	✓	✓
Pseudo R^2	0.072	0.073	0.074	0.073
No of Clusters	55	55	55	55
No of Observations	22,415	22,415	22,333	22,415

Note: Violence is measured as the number of homicides per thousand inhabitant in a metropolitan area. Plant Characteristics include year 2005 values of plant size (employment), log capital per worker, IT-intensity, non-production intensity, labor productivity, and female worker intensity. Local Economic Characteristics (metropolitan area-level) include the 2004 or 2005 values of log output per worker, log number of businesses, employment shares of crop, metal mining, oil extraction, and manufacturing. Local Socio-Economic Characteristics include year 2000 values of percentages of professionals, literate residents, school enrollment, people with own car, economically active population and female employees over female population. All interacted plant characteristics are the 2005 values, when interacted, linear effects are also controlled for, if they are not already among the plant-level controls. Robust standard errors, reported in parentheses, are clustered by metropolitan area. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

8 Robustness and Additional Analysis

Alternative Specifications

In section 2.4 I define high intensity drug war areas based on the change in the number and the rate of homicide. Using this definition, I also conduct difference-in-difference specification and estimate the following:

$$lnY_{ijkt} = \alpha_0 + \alpha_1 DW(j) * D2008(t) + X_{tj} + \tau_{kt} + \eta_i + \varepsilon_{ikjt} \tag{4}$$

As before, Y_{ijkt} is plant i's outcome in industry k located in metropolitan area j and time period t. X_{tj} is a vector of time-varying metropolitan area characteristics, and include pre-trends in the homicide rate, employment shares of crop production, metal mining including gold, silver, copper, and uranium and the metropolitan area-level employment share of oil and natural gas extraction. τ_{kt} denotes three-digit industry by time fixed effects and η_i denotes plant fixed effects that can be correlated with plant or metropolitan area characteristics. $DW(j)$ is an indicator variable that takes 1 if the metropolitan area is defined a high intensity drug war zone. The definition of High Intensity Drug War Zones follows the text (section 2.4) and $D2008(t)$ is an indicator variable that takes 1 on and after 2008.

Results presented in Tables 11-12 show qualitatively similar results: Plants that are located in metropolitan areas highly exposed to drug violence experience 6.3% disproportionate decline in output and experience 4% disproportionate decline in the total number of employees.

Table 11: The Impact of Violence on Plant-level Production–Main Effects using Discrete Exposure

Specification: OLS						
Violent Conflict ≡ Drug War Zones(j) * D2008(t)						
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Output Value	Varieties Produced	Export Intensity	Export Indicator	Avg Output Price	Domestic Price
Violent Conflict	-0.063***	-0.030***	-0.007	0.004	0.019	0.030**
	(0.016)	(0.010)	(0.006)	(0.011)	(0.013)	(0.013)
Plant Fixed Effects	✓	✓	✓	✓	✓	✓
Industry **x** Year Fixed Effects	✓	✓	✓	✓	✓	✓
Time-Varying LM Controls	✓	✓	✓	✓	✓	✓
Pre-Trends in Homicide Rate	✓	✓	✓	✓	✓	✓
No of Observations	30,817	30,817	30,831	30,858	28,812	28,469
No of LMs (clusters)	58	58	58	58	58	58

Note: Violent Conflict is measured as the interaction variable of the Drug War Zones as defined in the text and the dummy variable that takes 1 on and after 2008. All dependent variables, except Export Intensity and Export Indicator are in logarithmic form. Time-Varying LM Controls include employment shares of crop production, metal mining including gold, silver, copper, and uranium and the metropolitan area-level employment share of oil and natural gas extraction. Robust standard errors, reported in parentheses, are two-way clustered by metropolitan area (58) and by four-digit industry level (84). *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 12: Robustness Analysis with Discrete Exposure– Capacity, Productivity and Composition of Workforce

Specification: OLS				
Violent Conflict ≡ Drug War Zones(j) * D2008(t)				
Panel A.				
Dependent Variable	Total Employment	Rate of Utilization	Labor Productivity	Skill Intensity
Violent Conflict	-0.039**	-0.041**	-0.036**	0.008*
	(0.016)	(0.019)	(0.016)	(0.004)
No of Observations	30,695	29,819	30,035	30,695
Panel B. All Employees (on payroll and indirect)				
Dependent Variable	BC Workers	WC Workers	BC Hours	WC Hours
Violent Conflict	-0.058***	0.021	-0.054***	0.044
	(0.012)	(0.029)	(0.016)	(0.031)
No of Observations	28,981	30,066	29,719	25,064
Panel C. Employees on payroll				
Dependent Variable	BC Workers	WC Workers	BC Hours	WC Hours
Violent Conflict	-0.063***	-0.015	-0.058***	0.017
	(0.013)	(0.021)	(0.015)	(0.021)
No of Observations	26,179	25,820	25,561	21,039
Panel D.				
Dependent Variable	Average Wage	Avg. Payroll Wage	BC Average Wage	WC Average Wage
Violent Conflict	0.001	0.017*	0.052**	-0.040*
	(0.007)	(0.010)	(0.026)	(0.021)
No of Observations	30,073	26,084	24,676	24,682
Indicators for all panels				
Plant Fixed Effects	✓	✓	✓	✓
Industry **x** Year Fixed Effects	✓	✓	✓	✓
Time-Varying LM Controls	✓	✓	✓	✓
Pre-Trends in Homicide Rate	✓	✓	✓	✓
No of LMs (clusters)	58	58	58	58

Note: Violent Conflict is measured as the interaction variable of the Drug War Zones as defined in the text and the dummy variable that takes 1 on and after 2008. All dependent variables are in logarithmic form except "Rate of Utilization" which is a percentage of capacity utilization and "Skill Intensity" which is the ratio white-collar employees over the total number of employees. Time-Varying LM Controls include employment shares of crop production, metal mining including gold, silver, copper, and uranium and the metropolitan area-level employment share of oil and natural gas extraction. Robust standard errors, reported in parentheses, are clustered by metropolitan area level (58) and by four-digit industry level (84). *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 13: Robustness w/ 2005 and 2010 data–Decline in Output

	(1)	(2)	(3)	(4)	(5)
Specification	IV	IV	IV	IV	IV
	Avg Output Price	Value of Output	Varieties Produced	Export Indicator	Export Intensity
Log Homicide Rate	0.036***	-0.072***	-0.042***	-0.010	-0.006
	(0.013)	(0.019)	(0.013)	(0.016)	(0.007)
Plant FEs	✓	✓	✓	✓	✓
Pre-Trends in Homicide Rate	✓	✓	✓	✓	✓
3-dig Industry **x** Year FEs	✓	✓	✓	✓	✓
No of Observations	8,456	9,078	9,078	9,078	9,074
No of clusters (LM)	58	58	58	58	58
Kleibergen-Paap F-excluded instrument	39.08	39.75	39.75	39.75	39.78

Note: All dependent variables, except "Capacity Utilization", "Export Indicator" and "Export Intensity" are in logarithm. Labor productivity is the logarithm of the value of output per hour worked. Log Homicide Rate is the logarithm of the number of homicides per thousand inhabitant in a metropolitan area. Robust standard errors, reported in parentheses, are two-way clustered by local market (metropolitan area) and four-digit industry level. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table 14: Violence as a Negative Supply Shock of Blue-Collar Workers –w/ 2005 and 2010 data

Specification: 2SLS	(1)	(2)	(3)	(4)
Panel A. Capacity, Productivity				
Dependent Variable	Total Employment	Capacity Utilization	Labor Productivity	Skill Intensity
Log Homicide Rate	-0.044***	-2.932***	-0.030**	0.014**
	(0.016)	(0.874)	(0.014)	(0.006)
No of Observations	9,062	8,450	8,518	9,062
F-excluded instrument	39.89	39.78	39.16	39.89
Panel B. Both Payroll and Indirect Employees				
Dependent Variable	BC Workers	WC Workers	BC Hours	WC Hours
Log Homicide Rate	-0.076***	0.026	-0.088***	0.061**
	(0.024)	(0.019)	(0.023)	(0.028)
No of Observations	8,064	8,770	8,448	6,448
F-excluded instrument	41.18	39.33	39.36	39.75
Panel C. Employees on Payroll				
Dependent Variable	BC Workers	WC Workers	BC Hours	WC Hours
Log Homicide Rate	-0.070***	-0.006	-0.079***	0.009
	(0.026)	(0.023)	(0.024)	(0.030)
No of Observations	7,376	7,210	6,928	5,076
F-excluded instrument	39.16	38.49	38.82	38.36
Panel D. Monthly Wages				
Dependent Variable	Avg Wage	Avg Wage on Payroll	BC Avg Wage	WC Avg Wage
Log Homicide Rate	-0.008	-0.002	0.077**	-0.062
	(0.016)	(0.016)	(0.038)	(0.040)
No of Observations	8,592	7,110	6,646	6,634
F-excluded instrument	39.92	38.86	38.91	38.27

Note: og Homicide Rate is the logarithm of the number of homicides per thousand inhabitant in a metropolitan area. All dependent variables are in logarithmic form except "Skill Intensity" which is the ratio of total number of white-collar employees over the total employment and "Capacity Utilization" which is the percentage showing the rate of utilization of the fixed assets of the plant. All regressions include plant fixed effects, 3-digit industry by year fixed effects, and the pre-trends in the homicide rate per metropolitan area. Robust standard errors, reported in parentheses, are clustered two-way by metropolitan area (58) and by four-digit industry (84). *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

A Summary Statistics and Descriptive Analysis

Table A-1: Summary Statistics

	Mean	Median	StDev	N
Number of Employees	235.875	99.6	485.662	30695
Number of Blue-Collar Employees	155.196	62.3	316.656	30695
Number of White-Collar Employees	70.325	22.3	225.261	30695
Number of Varieties	3.125	2.0	3.021	30695
Log Value of Output	11.260	11.3	2.047	30817
Log Value of Domestic Sales	11.037	11.1	2.031	30631
Log Value of Foreign Sales	10.231	10.4	2.559	10887

Note: All values are expressed in 2010 thousand peso. Table shows the summary statistics of main variables in the estimation sample (metropolitan areas). Source: EIMA, INEGI.

Table A-2: Pairwise Correlation of Pre-War Municipality Characteristics and Post-War Violence

Municipality Characteristics	Correlation Coefficient	Nobs
Manufacturing Share in overall economy	0.034	2,222
Log Output per Worker	0.081*	2,366
Log Gross Value Added	0.010	2,348
Average Establishment Size	0.036	2,357
Log Public Expenditure	0.015	2,113
Log Distance to the US	-0.341*	2,367
Socio-economic characteristics		
% of Economically Active Population (age 20-49)	-0.038	2,367
% of Households with Own Car	0.330*	2,367
% of Professionals among Employed	-0.007	2,367

Note: Each cell shows the pairwise correlation coefficient of the municipality characteristics given in the respective row at first column and the average homicide rate over 2008-2012 (Post-War period) * indicates statistical significance at 5% level or better. The socio-economic characteristics are from the 2000 Census, Log output per worker, log gross value-added, average establishment size are from the 2004 census, manufacturing share in overall economy (measured in employment) is obtained from the IMSS (Social Security) 2005, Public expenditure data is from year 2005 and the distance to the US border is the author's own calculation.

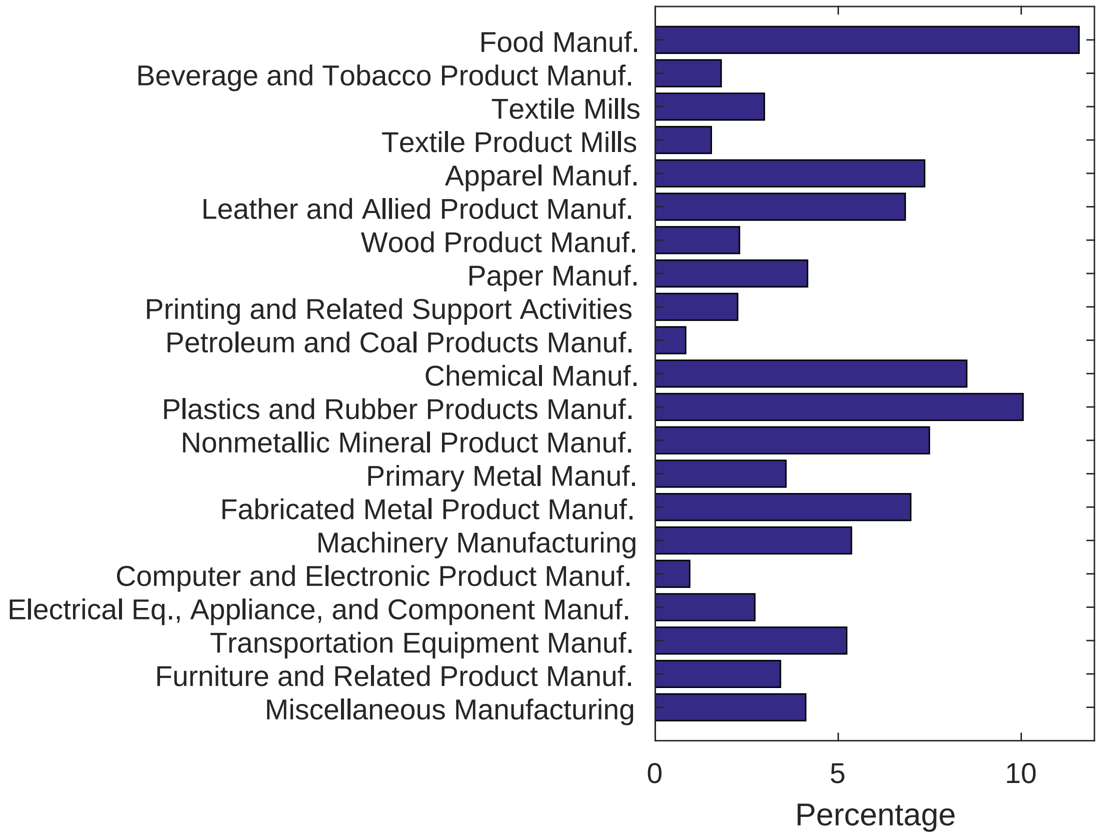


Figure A-1: Distribution of Number Plants across Three-Digit Industries
Figure shows the year 2005 distribution of plants in the estimation sample across the three-digit NAICS industries.

A.1 Drug War in Mexico

Table A-3 shows the evolution in the number of major cartels in Mexico over the period of 2006-2010. In about four years the number of major cartels increased more than 70% (from 7 to 12).

Table A-3: Fragmentation of Major Drug Cartels in Mexico

2006	2007-2009	2010
Pacifico cartel (Sinaloa)	Pacifico cartel Beltrán-Levya cartel	Pacifico cartel Pacifico Sur cartel Acapulco Independent cartel “La Barbie” cartel
Juárez cartel Tijuana cartel	Juárez cartel Tijuana cartel “El Teo” faction	Juárez cartel Tijuana cartel “El Teo” faction
Golfo cartel	Golfo-Zetas cartel	Golfo cartel Zetas cartel
La Familia Michoacana	La Familia Michoacana	La Familia Michoacana La Resistencia
Milenio cartel	Milenio cartel	Jalisco cartel-Nueva Generación

Source: Bagley and Rosen (2015).

Figure A-2 shows the evolution of homicide rate in metropolitan areas in Mexico since 2007.

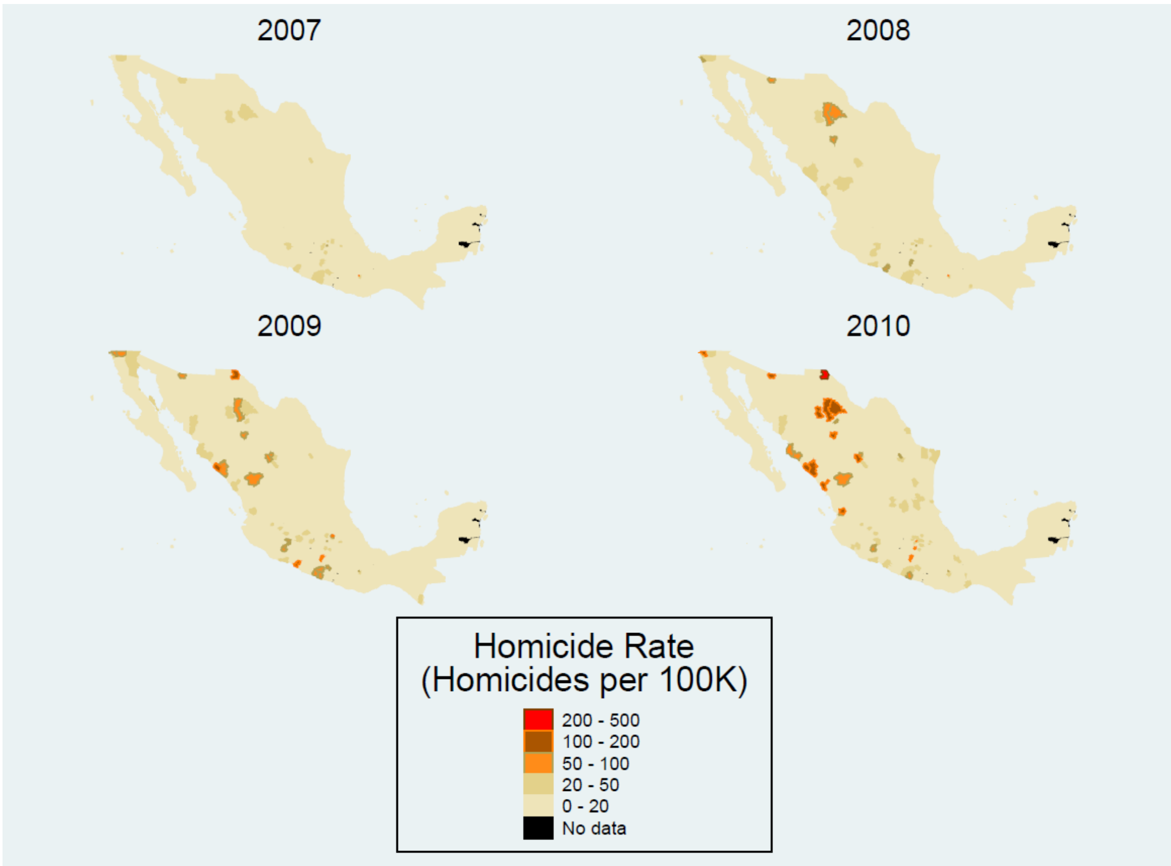


Figure A-2: Expansion of Urban Violence in Mexico

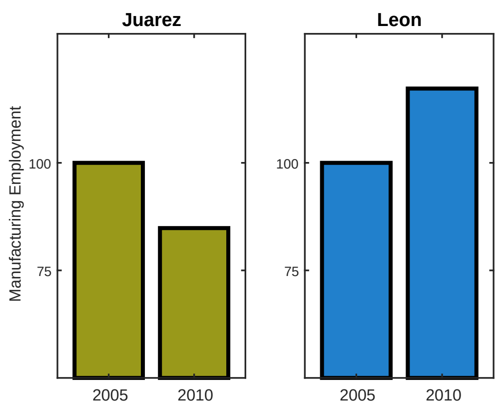
The number of homicides per 100,000 inhabitants across municipalities with at least 100,000 inhabitants or otherwise belonging to a metropolitan area.

Using the estimated state-level migration flows provided by Consejo Nacional de Población (CONAPO), Table A-4 presents the change in the pattern of migration in exposed versus not exposed states. For the purpose of this descriptive analysis, the state-level organized crime rate is used to describe exposed versus non-exposed states. Exposed states are states with average organized crime rate during 2008-2010 above the 75th percentile. These are: Baja California, Chihuahua, Durango, Guerrero, Michoacán, Nayarit, Sinaloa, Sonara. Non-exposed states are states with average organized crime rate during 2008-2010 below the 25th percentile. These are: Baja California Sur, Campeche, Chiapas, Puebla, Querétaro, Tlaxcala, Veracruz, and Yucatán. Table A-4 shows a significant drop in the inflow of domestic immigrants into the exposed states between 2005 and 2010. Exposed states also have significantly less inflow of international immigrants in comparison to non-exposed states. Although there is an overall strong declining trend in international emigrants during the sample period, exposed states have significantly less drop in the number of people moving out of the country in comparison to non-exposed states.

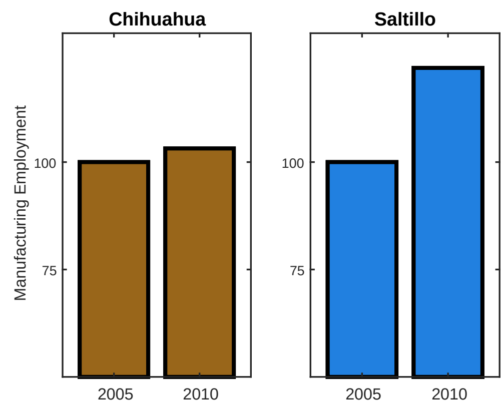
Table A-4: Migration Pattern and Drug War

2005-2010 Growth	Exposed States Post-drug war org. crime(>=p75) Mean	Not exposed States Post-drug war org. crime(>=p25) Mean	Difference	t-stat
Inter State Emigrants	0.6%	-1.5%	2.1%	-0.37
International Emigrants	-42.1%	-45.5%	3.4%	-4.70
Inter State Immigrants	-6.5%	7.4%	-13.9%	1.97
International Immigrants	13.6%	27.2%	-13.6%	2.34

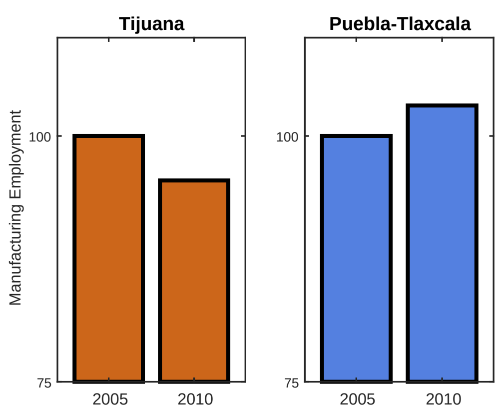
Table shows the 2005-2010 change in the state level migration patterns across exposed versus non-exposed states. States with average organized crime rate during 2008-2010 above the 75the percentile are defined as exposed states. These are: Baja California, Chihuahua, Durango, Guerrero, Michoacán, Nayarit, Sinaloa, Sonara. States with average organized crime rate during 2008-2010 below the 25the percentile are defined as non-exposed states. These are: Baja California Sur, Campeche, Chiapas, Puebla, Querétaro, Tlaxcala, Veracruz, and Yucatán. Source for the migration data: Consejo Nacional de Población (CONAPO)



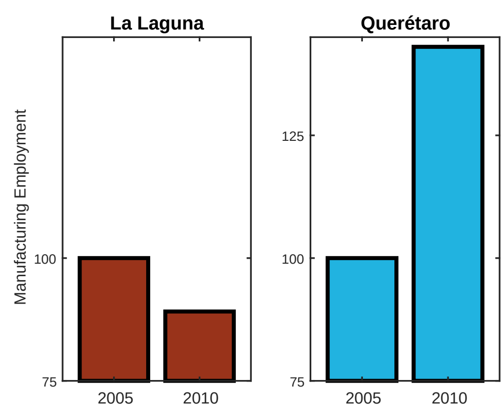
(a) Juarez versus Leon



(b) Chihuahua versus Saltillo



(c) Tijuana versus Puebla-Tlaxcala



(d) La Laguna versus Queretaro

Figure A-3: Manufacturing employment across selected metropolitan areas

B Additional Analysis

Table A-5: The Impact of Urban Violence: OLS Results

Specification: OLS Violence ≡Homicides per '000 inhabitant	(1)	(2)	(3)	(4)
Panel A: Sales				
Dep. Var.	Value of Production	Avg Output Price	Foreign Sales	Export Indicator
Violence	-0.105***	0.005	0.154	-0.006
	(0.034)	(0.053)	(0.099)	(0.018)
Plant Fixed Effects	✓	✓	✓	✓
Industry by Year Fixed Effects	✓	✓	✓	✓
Time-Varying LM Characs.	✓	✓	✓	
Pre-trends in Homicide Rate	✓	✓	✓	
No of Observations	30,817	28,812	10,555	30,817
No of LMs (clusters)	58	58	50	58
Panel B: Products and Capacity				
Dep. Var.	Varieties Produced	Exported Varieties	Rate of Utilization	Total Employment
Violence	-0.054**	-0.007	-5.826***	-0.070***
	(0.023)	(0.034)	(1.572)	(0.023)
Plant Fixed Effects	✓	✓	✓	✓
Industry by Year Fixed Effects	✓	✓	✓	✓
Time-Varying LM Characs.	✓	✓	✓	
Pre-trends in Homicide Rate	✓	✓	✓	
No of Observations	30,817	10,553	30,148	30,695
No of LMs (clusters)	58	58	50	58
Panel C: Composition of Employment				
Dep. Var.	Payroll Employees	Payroll Hours	Blue-Collar Hours	White-Collar Hours
Violence	-0.063**	-0.058**	-0.092***	0.038
	(0.027)	(0.029)	(0.021)	(0.029)
Plant Fixed Effects	✓	✓	✓	✓
Industry by Year Fixed Effects	✓	✓	✓	✓
Time-Varying LM Characs.	✓	✓	✓	
Pre-trends in Homicide Rate	✓	✓	✓	
No of Observations	26,717	26,078	29,719	25,064
No of LMs (clusters)	58	58	50	58

Note: Violence is measured as the number of homicides in thousand people in each metropolitan area. All dependent variables are in logarithmic form. Time-Varying Local Market (Metropolitan area) Characteristics include employment shares of crop production, metal mining including gold, silver, copper, and uranium and the local market-level employment share of oil and natural gas extraction. Robust standard errors, reported in parentheses, are two-way clustered by metropolitan area (58) and 4-digit industry (84) level. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table A-6: Drug Violence and Plant Exit across Selected Industries

Spec: Probit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Violence	0.341**	0.380**	0.330**	0.338**	0.448***	0.370**	0.375**	0.363**	0.381**	0.379***	0.364**	0.371**
	(0.152)	(0.150)	(0.152)	(0.153)	(0.134)	(0.151)	(0.160)	(0.159)	(0.180)	(0.143)	(0.150)	(0.149)
Violence **x** Food	0.171											
	(0.311)											
Violence **x** Textile		-4.123										
		(3.958)										
Violence **x** Apparel			0.245									
			(1.861)									
Violence **x** Leather				-0.890								
				(1.056)								
Violence **x** Wood					-0.669							
					(0.489)							
Violence **x** Paper						-0.036						
						(0.695)						
Violence **x** Petroleum							-0.206					
							(0.603)					
Violence **x** Chemical								0.216				
								(1.229)				
Violence **x** Plastic									-0.123			
									(0.568)			
Violence **x** Primary Metal										-6.649***		
										(1.706)		
Violence **x** Computer											0.272	
											(1.448)	
Violence **x** Electrical												-3.595
												(3.459)
Pseudo R^2	0.073	0.073	0.075	0.074	0.072	0.072	0.072	0.072	0.072	0.073	0.072	0.072
No of Observations	22,415	22,415	22,415	22,415	22,415	22,415	22,415	22,415	22,415	22,415	22,415	22,415
No of Clusters	55	55	55	55	55	55	55	55	55	55	55	55

Note: Violence is measured as the the number of homicides per thousand inhabitant of a metropolitan area. All regressions include three-digit industry by years fixed effects, pre-trends in the homicide rate, plant, local economic, and local socio-economic characteristics. Plant Characteristics include year 2005 values of plant size (employment), log capital per worker, IT-intensity, non-production intensity, labor productivity, and female worker intensity. Local Economic Characteristics (metropolitan area-level) include the 2004 or 2005 values of log output per worker, log number of businesses, employment shares of crop, metal mining, oil extraction, and manufacturing. Local Socio-Economic Characteristics include year 2000 values of percentages of professionals, literate residents, school enrollment, people with own car, economically active population and female employees over female population. Homicide rate is interacted with selected three-digit NAICS industries, when interacted, linear effects are also controlled for if they are not already among the controls. Robust standard errors, reported in parentheses, are clustered by metropolitan area. *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

C Violence Outbreak and Trade Shocks

In this section I address the concern that other local market shocks may be confounding the results. In particular, Utar and Ruiz (2013) show that rising import competition in the US has a substantial impact in Mexico via maquiladoras, export processing plants in Mexico that are tied to the US market. Recently Dell, Feigenberg, and Teshima (2018) find that areas that encounter decline in employment due to the Chinese import competition shock in the US market also suffer from heightened drug violence. Since the results here are robust to eliminating all potential changes happening at product by year level it is very unlikely that such effects play a role here. However, I conduct a further robustness check by constructing metropolitan area level import competition shock due to China's rise in the US market.

Let $\Delta TradeComp_j$ be the per worker measure of change in trade competition between 2005 and 2010. Following Utar and Ruiz (2013) and Dell, Feigenberg, and Teshima (2018), I use the following measure of trade competition:

$$\Delta TradeComp_j = \sum_k \frac{L_{jk,ini}}{L_{k,ini}} \frac{\Delta^{05-10} MCH^{US}}{L_{j,ini}}$$

$$\Delta^{05-10} MCH^{US} = \frac{MCH_{j,2005}}{TotMCH_{2005}} * [TotMCH_{2010} - TotMCH_{2010}]$$

where $L_{jk,ini}$ is employment of industry k in metropolitan area j at the initial year, $L_{k,ini}$ is total initial employment of industry k in Mexico and $L_{j,ini}$ is total non-agricultural employment in metropolitan area j. $\Delta^{05-10} USM_C H$ is the predicted change in Chinese imports in the US in industry k between 2005 and 2010.[38] Higher value of $\Delta TradeComp_j$ means a metropolitan area has a larger share of employment in industries based on their initial share where Chinese imports in the US are predicted to grow.

I, then interact $\Delta TradeComp_j$ with year fixed effects and include in equation 3 and re-estimate the impact of violence shock as proxied by the logarithm of the homicide rate. Results that are presented

[38] Industry k denotes four-digit NAICS industry. Initial employment shares are calculated using Census 2004.

in A-7 re-confirm that the results are robust. Table A-8 shows the results when differential time trends for exporters are additionally controlled for. Here, for each exporter as of the initial year 2005, I allow for differential time trends by interacting its exporting status in 2005 with year fixed effects. The results are robust.

D Plant Exit and the Impact at the Intensive Margin

I show that plants that are exposed to the violence shock are more likely to exit, and that the likelihood of exit is stronger if the plants are more female-intensive, oriented towards the domestic market rather than exporting and importing and smaller. I also show that such plants disproportionately downsize conditional on staying in the market. These results may imply that selection may be leading to under-estimation of the true effect at the intensive margin. To gauge this, I use the "identification-at infinity" idea (Chamberlain (1986) and Mulligan and Rubinstein (2008)) that the selection bias must be lower for plants with higher survival probability and restrict the estimation sample to plants with higher survival probability and observe how the estimates change as one drops the plants that most likely exit step by step. Table A-9 presents the results when plants are allocated in sub-samples depending on their average probability of exit across the sample years. The results suggest that, to a some extent, the endogenous exit is likely to lead to understating the true impact at the intensive margin as the coefficient estimates get larger for employment and output impact of violence. So one can interpret the findings in the paper as the lower bound of the real impact.

Table A-7: Robustness Analysis with Additional Differential Time Trends for China-Shock Exposed Areas

Specification: 2SLS	(1)	(2)	(3)	(4)	(5)	(6)
Panel A.	Avg Output Price	Value of Output	Varieties Produced	Capacity Utilization	Export Indicator	Export Intensity
Log Homicide Rate	0.022***	-0.098***	-0.040**	-3.129**	-0.028	-0.015
	(0.005)	(0.032)	(0.017)	(1.216)	(0.021)	(0.010)
No of Observations	28,812	30,817	30,817	30,148	30,817	30,813
First-Stage F	36.63	38.23	38.23	37.95	38.23	38.24
Panel B.	Total Employment	Blue-Collar Employment	White-Collar Employment	Blue-Collar Wage	White-Collar Wage	Skill Intensity
Log Homicide Rate	-0.058**	-0.097***	0.041	0.114*	-0.065	0.017**
	(0.023)	(0.028)	(0.046)	(0.061)	(0.054)	(0.008)
No of Observations	30,695	28,981	30,066	24,682	24,676	30,695
First-Stage F	38.24	38.58	38.27	40.36	40.27	38.24
Indicators for both panels:						
Plant Fixed Effects	✓	✓	✓	✓	✓	✓
Industry **x** Year FEs	✓	✓	✓	✓	✓	✓
Pre-Trends in Homicide Rate	✓	✓	✓	✓	✓	✓
$\Delta TradeComp_j$ **x** Year FEs	✓	✓	✓	✓	✓	✓
No of LMs (clusters)	58	58	58	58	58	58

Note: All dependent variables, except Capacity Utilization, Export Intensity and Export Indicator are in logarithmic form. Robust standard errors, reported in parentheses, are two-way clustered by metropolitan area (58) and by four-digit industry level (84). *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table A-8: Robustness Analysis with Additional Differential Time Trends for Exporters

Specification: 2SLS	(1)	(2)	(3)	(4)	(5)	(6)
Panel A.	Avg Output Price	Value of Output	Varieties Produced	Capacity Utilization	Export Indicator	Export Intensity
Log Homicide Rate	0.030*	-0.081***	-0.041**	-3.232***	0.003	-0.009
	(0.015)	(0.026)	(0.016)	(1.060)	(0.016)	(0.010)
No of Observations	28,812	30,817	30,817	30,148	30,817	30,813
First-Stage F	32.40	33.21	33.21	32.45	33.21	33.22
Panel B.	Total Employment	Blue-Collar Employment	White-Collar Employment	Blue-Collar Wage	White-Collar Wage	Skill Intensity
Log Homicide Rate	-0.048**	-0.082***	0.046	0.098*	-0.086**	0.014*
	(0.018)	(0.024)	(0.036)	(0.052)	(0.043)	(0.007)
No of Observations	30,695	28,981	30,066	24,682	24,676	30,695
First-Stage F	33.25	33.82	33.25	33.21	33.45	33.25
Indicators for both panels:						
Plant Fixed Effects	✓	✓	✓	✓	✓	✓
Industry **x** Year FEs	✓	✓	✓	✓	✓	✓
Pre-Trends in Homicide Rate	✓	✓	✓	✓	✓	✓
Exporter **x** Year FEs	✓	✓	✓	✓	✓	✓
No of LMs (clusters)	58	58	58	58	58	58

Note: All dependent variables, except Capacity Utilization, Export Intensity and Export Indicator are in logarithmic form. Robust standard errors, reported in parentheses, are two-way clustered by metropolitan area (58) and by four-digit industry level (84). *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

Table A-9: Exit Likelihood and the Impact at the Intensive Margin

Specification: 2SLS					
	(1)	(2)	(3)	(4)	(5)
Exit Prob	All	except top 1%	except top 5%	except top 10%	except top 20%
Panel A.	Dep. Var. Value of Output				
Log Homicide Rate	-0.079***	-0.091***	-0.095***	-0.101***	-0.106***
	(0.026)	(0.027)	(0.027)	(0.029)	(0.036)
First-Stage F	33.20	34.17	36.59	36.22	36.37
N	30817	26798	25615	24191	21648
Panel B.	Dep. Var. Employment				
Log Homicide Rate	-0.050***	-0.053**	-0.058**	-0.059***	-0.068***
	(0.018)	(0.020)	(0.022)	(0.022)	(0.025)
First-Stage F	33.24	34.09	36.45	36.08	36.12
N	30695	26770	25609	24191	21650
Panel C.	Dep. Var. Blue-Collar Employment				
Log Homicide Rate	-0.050***	-0.053**	-0.058**	-0.059***	-0.068***
	(0.018)	(0.020)	(0.022)	(0.022)	(0.025)
First-Stage F	33.24	34.09	36.45	36.08	36.12
N	28981	25284	24224	22871	20480
Panel D.	Dep. Var. Blue-Collar Wages (on payroll)				
Log Homicide Rate	0.099*	0.091*	0.086*	0.084**	0.091*
	(0.052)	(0.046)	(0.047)	(0.041)	(0.050)
First-Stage F	33.22	33.52	36.92	36.65	36.45
N	24682	21557	20611	19368	17240

Note: All dependent variables are in logarithmic form. Robust standard errors, reported in parentheses, are two-way clustered by metropolitan area (58) and by four-digit industry level (84). *, ** and *** indicate significance at the 10 %, 5% and 1% levels respectively.

E Data Appendix

EIMA 2005-2010: *La Encuesta Industrial Mensual Ampliada* (*EIMA*) is a monthly survey of manufacturing plants carried out by *INEGI*. It constitutes the basis of Gross Domestic Product and Economic Indicators on employment, production, and productivity among others. It includes 230 economic classes of activity (clases de actividad) and covers 7328 establishments. Industry classification is SCIAN 2002. *EIMA* provides information on the number of white collar and blue collar workers, wages, hours and days worked, plant capacity utilization, quantity and value of production, sales, and export for each product.

In recent years there have been important changes in the way companies are organized. One of the most important is related to outsourcing of personnel. The *EIMA* captures information both of the personnel dependent on the corporate name, as well as that provided by a personnel service provider, so that now these two components of the personnel employed in the manufacturing sector are published.

EIA 2003-2007: *La Encuesta Industrial Anual* (*EIA*) is an annual survey of manufacturing plants carried out by *INEGI*. It provides detailed balance sheet information of the manufacturing plants including information on employment, fixed assets, wages, itemized expenses, itemized income, value of production, and inventories. The industry classification of plants is based on the North American Industry Classification System (NAICS), 2002.

Encuesta Nacional de Empleo, Salarios, Tecnología y Capacitación en el Sector Manufacturero (ENESTyC) 2005:

The *ENESTyC* is a representative establishment-level survey of manufacturing firms conducted in 1995, 1999, 2001, and 2005. This study employs ENESTyC 2005 which is representative based on 2004 Economic census information and covers 9920 manufacturing establishments as well as 685 maquiladoras.

Distance to the US border: I select more than 130 points along the US border with latitude and longitude information and obtain the position of each locality (village) in Mexico (degrees/minutes/seconds (DMS)) from INEGI. After converting the DMS measure to decimal degrees, I use the Haversine formula to calculate the great circle distance from each urban Mexican village (locality) to around 130 US border points.[39] I then take the distance between each municipality's position and the closest border point.

Homicide Rates: Information on the number of homocides by municipality and month is obtained from INEGI. Homicide rates used in the descriptive analysis throughout the paper are calculated as

[39] I also use the Pythagorean theorem to calculate the km distance, obtaining very similar results.

the number of homicides in 100,000 people. Homicide rates used in the regressions are re-scaled and they are the number of homicides in 1,000 people. Municipality-level annual population numbers are calculated using the census data for years 1990, 1995, 2000, 2005, and the annual state-level population estimates of INEGI.

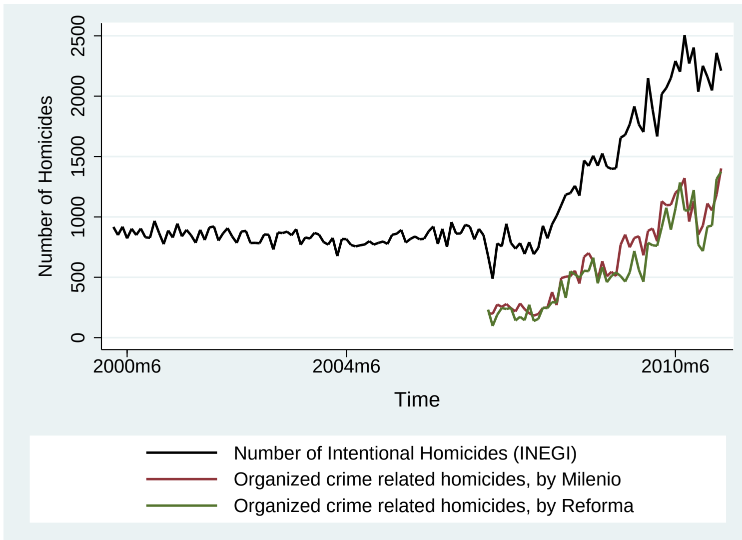


Figure A-4: Organized Crime Related Violence in Mexico

Cocaine Prices: Cocaine prices are purity-adjusted prices of a gram of cocaine in the US. The quarterly data is obtained from the annual reports of the National Drug Intelligence Center. The annual data source is the US Office of National Drug Control Policy, the data obtained from the United Nations Office on Drugs and Crime (UNODC, 2014).

Drug Trafficking Organizations: Yearly information on the municipalities in which Mexico's drug trafficking organizations operate comes from 'Knowing Where and How Criminal Organizations Operate Using Web Content' by Michele Coscia and Viridiana Rios published at the Association for Computing Machinery (ACM)'s International Conference on Information and Knowledge Management (CIKM) in 2012. Using computer science and big data techniques Coscia and Rios develop a framework that uses Web content to identify the areas of operation and modus operandi of Mexican drug trafficking organizations over 1990-2010.

Metropolitan area-level data: The analysis makes use of a set of time varying metropolitan area-level variables. These are the annual information on the metro-level employment shares of crop production, metal mining including gold, silver, copper, and uranium as well as oil and natural gas extraction. The sources of annual data on municipality level employment across industries are the records of contributions to the Mexican Institute of Social Security (IMSS). The industry classification used in this data is the Mexican version of the North American Industrial Classification System (SCIAN) in its 2007 revision. INEGI is the source of the additional municipality-level variables, which include the number of strikes, the number of registered vehicles, the number of traffic accidents, the number of traffic accidents due to bad road conditions, and high-school success rate. Whenever used in the firm-level analysis these data are aggregated at the metropolitan level using the key provided by INEGI matching municipalities with metropolitan areas.

Construction of Entropy Measures of Diversification: The nation-wide representative survey ENESTyC 2005 reports for each plant the percentage of sales as well as material use for each geographic region in the world. These regions are 1) domestic, 2) US, 3) Canada, 4) Caribbean and Central America, 5) South America, 6) Europe, 7) Middle East and Asia and 8) Africa, Australia, New Zealand. The entropy measure of diversification *DivSales* is defined as follows. Let P_i be the share of the ith geographic segment in the total sales of the firm. Then $DivSales_i = \sum_1^N P_i In(\frac{1}{P_i})$ This is a weighted average of the shares of the segments, the weight for each segment being the logarithm of the inverse of its share. The measure, which is used in the IO literature (Palepu (1985), Rumelt (1982)), gets larger the more segments a firm operates in, and the less the relative importance of each of the segments in the total sales. It takes zero for non-diversified firms. Similarly, a diversification measure of materials, $DivMats_i$, is calculated for each firm i. I then map these information with the plants in my sample using the four-digit industry classification.

Construction of Trade Exposure Variable: In constructing trade exposure variables at the metropolitan level I use employment information from the Mexican Census 2004 (*Censos Economicos 2004*) and international trade data from the US. *Censos Economicos 2004* provides employment information at municipality and industry level. Industry classification in 2004 Census is the Mexican version of NAICS (SCIAN). US and Mexican versions of NAICS are identical at the first four digits. Import information for the US is obtained from the US Census (usatrade). The data includes all goods that physically arrive into the United States, whether they are consumed domestically or are used further in production. The import value excludes transportation, insurance, freight and other related charges incurred above the price paid. The data employ the North American Industry Classification System (NAICS) definitions for industries. To calculate the trade competition exposure variable for each metropolitan area I first calculate the predicted change in Chinese imports in the US in industry k between year 2005 and year 2010 for each four-digit NAICS industry. I divide this measure with the total non-agricultural number of employees in metropolitan area j to obtain the per-worker measure of the predicted change in Chinese imports in the US. A la Bartik 1991, I then use the ratio of employment of industry k in metropolitan area j in the census year 2004, E_{kj0} to the total initial Mexican employment for industry j, $E_{jo} = \sum_k E_{kj0}$ to map the change in the Chinese imports in the US with the Mexican metropolitan areas.