Crime Exposure and Educational Outcomes in Mexico

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Abstract

Driven by drug-trade related crimes, homicide levels in Mexico have dramatically increased since 2007. This study examines the effect of students' exposure to crime on educational outcomes. Using school level data, a panel of Mexico's primary and secondary schools from 2006 to 2012 is constructed to analyse the effect of exposure to local homicides on standardised test scores and grade failure rates. The results show that an increase of one unit in the number of homicides per 10,000 inhabitants reduces average standardised test scores between 0.0035 and 0.0142 standard deviations. This effect is larger in secondary schools, grows stronger if the homicide occurs closer to the examination date, and is relatively stable when using either total homicides or drug-trade related homicides to measure crime exposure. Higher homicides rates are also associated with an increase in the grade failure rate. It is proposed that the negative effects of crime exposure are partly due to a reduction in the number of contact hours, where students do not compensate for this by studying more outside of the school. By having a negative impact on educational outcomes, early exposure to homicides has potential long term consequences since it may affect educational attainment levels and future income streams.

JEL Classification: I25, O12, O54, H49

Keywords: Crime; Academic performance; Grade failure; Homicide; Mexico

1 Introduction

Driven by drug-trade related crimes, homicide levels in Mexico have dramatically increased in recent years. Between 2007 and 2012, approximately 121,613 homicides and 66,217 drug-trade related homicides were committed in the country.[1] The rise in crime and insecurity has proved extremely costly, totalling 1.4% of Mexico's gross domestic product (GDP) in 2012 (INEGI, 2012). Since violence affects not only those directly involved in illegal activities but also reaches a much broader segment of society, it is likely to have important welfare effects. In the short run, these include negatively affecting school enrolment rates, the number of contact hours, academic performance and grade failure rates, among others. In the long run, it may influence educational attainment levels and income streams. This study examines the effect of students' exposure to local homicides on educational outcomes in Mexico. The effects of crime exposure are investigated for both standardised test scores and grade failure rates.[2]

The mechanisms linking violent crime exposure and educational outcomes operate across different channels. At the individual level, it may affect educational attainment due to changes in behaviours or mental health. Children and adolescents exposed to different types of violence frequently display a number of symptoms related to acute or post-traumatic stress disorder (PTSD) (Martinez and Richters, 1993; Berman et al., 1996; Osofsky et al., 2004). These characteristics, which include intensified levels of stress, anxiety, interrupted sleep, a lack of awareness, aggressive behaviour and difficulty concentrating, have been shown to affect educational outcomes (Margolin and Gordis, 2000; Ding et al., 2009).

Within the household, parents exposed to high levels of crime may shift their focus to ensure the basic safety of their children, dedicating less time and energy towards improving their education (Harding, 2010). Parents may resort to bounding techniques, which limit children to the home setting while restraining access to neighbourhood relations and influences (Jarret, 1997). This may reduce social ties between households, teachers and the community, all of which help monitor children and are generally associated with better educational outcomes (Bryk et al., 2010). Furthermore, parents that have previously undergone a traumatic experience are more likely to have children with PTSD symptoms, since they may transmit the effects of their experiences to them (Linares et al., 2004).

Extreme crime related events can also affect the school routine by causing closings and temporarily interrupting classes. The theory of compensating differentials predicts that teachers would request higher wages in order to accept working in schools that face a greater risk of violence. Since in Mexico teachers' salaries are fixed, violence may lead to high levels

[1] Author's calculation based on the *Sistema Estatal y Municipal de Bases de Datos* (SIMBAD, State and Municipal Database System) and the *Comisión Nacional de Seguridad* (CNS, National Security Commission).

[2] In Mexico, basic education is divided into primary school (first to sixth grade) and secondary school (seventh to ninth grade). Since 1993, education has been compulsory until ninth grade. This was modified in 2013 becoming compulsory until twelfth grade. In 2009, Mexico ranked in the 48th position among 65 countries that undertook the Programme for International Student Assessment (PISA) test (OECD, 2010). In 2010, public expenditure in education as percentage of the country's GDP stood at 5.2% (World Bank, 2014).

of attrition and absenteeism. Staff turnover may also increase given that managing a school in a locality with high levels of crime can be difficult as well as risky (Monteiro and Rocha, 2013, p. 15). If exposure to violent crimes leads to short term interruptions of classes, an implication is that children and adolescents exposed to these incidents are likely to function at a consistently lower level over the entire school year (Sharkey et al., 2014, p. 203).

Students may also attempt to side-step attending school due to safety concerns. Based on the *Encuesta Nacional de Victimización y Percepción sobre Seguridad Pública* (ENVIPE, National Victimization and Perception of Public Safety Survey), Table 1 shows that in 2011 approximately 7.2% of Mexico's students self-reported that they stopped going to school due to fear of being a crime victim. Furthermore, it can be seen in Table 2 that this figure is positively related to the homicide level in the municipality of residence.

This study contributes to the literature on crime and educational outcomes in Mexico in several ways. First, the period of investigation is updated and extended as it focuses on the years covering from 2006 to 2012. Second, the econometric analysis controls for different school and household level programs implemented by the federal government which have been shown to strongly affect educational outcomes in Mexico, and which surprisingly have been mostly ignored in the literature. Third, with respect to standardised test scores, different subsamples of the population are examined. Among secondary schools, heterogeneous effects depending on when the homicide occurred with respect to examination date are investigated and potential spillover effects originating from homicides registered in nearby municipalities are analysed. Fourth, regarding grade repetition, the study includes secondary schools, distinguishes between homicides and drug-trade related homicides, examines different population groups and investigates spillover effects. Fifth, the potential endogeneity of the homicide rate is addressed by using the instrument first proposed by Castillo et al. (2014), based on the closeness of Mexico's municipalities to the U.S. border interacted with information on cocaine seizures in Colombia. Sixth, evidence is provided on the mechanisms driving the negative relationship between crime exposure and educational outcomes. This is done by focusing on the effects of violence on the number of contact hours and the amount of time spent performing school related activities in the household. Lastly, from a public policy standpoint the study provides evidence regarding the fact that non-educational policies, such as those concerning the country's security, affect educational outcomes.

The results show that an increase of one unit in the number of homicides per 10,000 inhabitants reduces average standardised test scores between 0.0035 and 0.0142 standard deviations. This effect is larger in secondary schools, grows stronger if the homicide occurs closer to the examination date, and is relatively stable when using either total homicides or drug-trade related homicides to measure crime exposure. Higher homicides rates are also associated with an increase in the grade failure rate.

The study proceeds as follows. Section 2 reviews the related literature. Section 3 discusses the main motives behind recent increases in homicides and drug-trade related crimes in Mexico. Section 4 describes the data and presents summary statistics. Section 5 outlines the econometric methodology. Section 6 discusses the results. Section 7 tests the robustness of the results and examines some of the potential mechanisms. Section 8 concludes.

2 Literature Review

Within the international literature that examines the impact of crime exposure on educational outcomes, a series of studies have focused on the effects of school level violence (see, e.g. Grogger, 1997; Poutvaara and Ropponen, 2010; Abouk and Adams, 2013; Beland and Kim, 2014). These investigations tend to observe that bringing weapons to school, fights between students and school shootings are associated with lower enrolment rates, a reduction in attendance and graduation rates and lower scores in national standardised tests. Another strand of the literature has centred on the effects of widespread conflict. Armed conflict has been shown to have strong long term effects on primary school completion rates in Timor-Leste (Justino et al., 2014), to affect human capital accumulation in Guatemala (Chamarbagwala and Morán, 2011) and Peru (León, 2012), and to decrease women's enrolment rates and mandatory schooling completion rates in Tajikistan (Shemyakina, 2011), among others. Furthermore, a series of studies have examined the effects of violent crimes and illegal activities. Focusing on Colombia, Gerardino (2014) observes that teenage males are less likely to be enrolled at secondary school relative to girls when male-biased violence is high. Monteiro and Rocha (2013) analyse the impact of armed struggles between drug gangs in Rio de Janeiro on student achievement, and show that the negative effects of violence increase with its intensity, duration, and proximity to the examination dates. Finally, Sharkey et al. (2014) study the impact of exposure to violent crime on students' standardised test scores in New York City, where the authors observe that violence reduces performance on English assessments but has no effect on Mathematics scores.

A number of recent studies have examined the relationship between violence and educational outcomes in Mexico. Caudillo and Torche (2014) investigate the effect of crime exposure on grade failure among primary school students. Based on school level data covering the period from 1990 to 2010, the authors observe that a rise by one unit in the homicide rate per 10,000 inhabitants increases the failure rate by 0.027 percentage points. Michaelsen and Salardi (2015) quantify the effects of the rise in violent crime on standardised test scores in primary schools. Focusing on the years 2007 to 2011, the scholars observe that the increase in crime negatively affected standardised test scores in both Spanish and Mathematics. Finally, Márquez-Padilla et al. (2015) covering the period from 2009 to 2011 do not find an effect of the rise in violence on standardised test scores among primary or secondary school students. Nevertheless, the authors do observe that higher crime exposure leads to a small reduction in enrolment rates among high school-age individuals.[3]

[3]Among the studies that have examined the effects of the rise in crime in Mexico, Dell (2015) finds that municipalities that elected a mayor from the *Partido Acción Nacional* (PAN, National Action Party), the party of President Felipe Calderón (2006-2012), encountered an upsurge in crime rates in the months following the election relative to those municipalities where PAN lost by a small margin. The authors also observes that the rise in violence led to a reduction in female force participation rates and a contraction in wages among men employed in the formal sector. Enamorado et al. (2014) exploit cross-municipal income and crime data and observe that from 2005 to 2010 drug-trade related crimes deterred economic growth. Focusing on the 2006-2010 same period, Robles et al. (2014) assess the economic costs of drug-trade related violence. Using electricity consumption as an indicator of the level of economic activity, the study finds that marginal increases in homicide rates negatively affected labour force participation rates and increased the

3 Violence in Mexico

The increase in violent crime observed in Mexico in recent years is a result of a long-term political and economic process. Characterised by being a chaotic decade long episode, the Mexican revolution scarred the country and resulted in the creation of strong state led by the *Partido Revolucionario Institucional* (PRI, Institutional Revolutionary Party). The PRI suppressed political opposition by integrating different groups of society including labourers, peasants, businessmen, academics, and the armed forces into its organisation. It granted concessions and monopolies to private-sector supporters, paid off labour leaders, and assigned numerous well remunerated public-sector jobs to proponents. Backed by a strong repressive capacity, the PRI used its patronage machine to subdue rebellious voices and control Mexico for decades (O'Neil, 2009, p. 65).

Links between the PRI and drug trafficking organizations (DTOs) date back to the 1920s during the Prohibition era, a relationship that grew stronger and had been solidified by the 1950s. Through the Secretariat of the Interior, local governments and the federal police, the state created patron-client relationships with different sectors of society including the DTOs. This agreement minimised the number of violent acts committed against government officials, high-ranking drug-traffickers and the general population, while also defining the rules of operation for DTOs and guaranteeing that police investigations did not reach kingpins or other cartel leaders (O'Neil, 2009, p. 65). These conditions allowed organised crime groups to be virtually unchallenged by the government, permitting them to operate with relative liberty and grow into highly powerful consortiums (Astorga and Shirk, 2010, p. 8). While the PRI did not generally accept criminal activity, such behaviour was more likely to go unpunished when public officials were more easily accessible for bribes and corruption. This association remained true even in the 1970s and 1980s when drug trafficking and production intensified throughout the country (O'Neil, 2009; Astorga and Shirk, 2010).

The equilibrium in the relationship between government authorities, including law enforcement, and DTOs began to change during Mexico's decentralization and democratization process in the late 1980s and 1990s. By losing a number of state governorships and subsequently failing to obtain absolute majority in Congress in 1997, the PRI lost its political monopoly as well as control over the drug trade. Once different political parties started coming into power, it invalidated the previous understanding requiring DTOs to negotiate with the new political establishment and encouraging rival crime groups to bid for market opportunities. With the election of President Vicente Fox (2000-2006), candidate of the right wing PAN, the old model dependent on PRI control was shattered (O'Neil, 2009). In certain instances, the country's political transformation provided the necessary impulse to spur accountability, transparency, better governance and a head on approach towards DTOs. In other cases, it simply unsettled political connections to favour one DTO over another. Nevertheless, it is noteworthy to mention that none of Mexico's mayor political parties have been immune from acts of corruption, as this is a widespread occurrence in the country (Astorga and Shirk, 2010, p. 8).

proportion of unemployed workers in an area.

The political opening in Mexico allowed DTOs the opportunity to gain autonomy and put a halt to their subordination to government authorities. Instead of buying off the necessary public servants, organised crime groups implemented a strategy of intimidation to ensure the safe passage of their merchandise. The rise of democratic competition also affected the state's capacity to react forcefully. As the influence of Congress increased, legislative gridlock weakened the later years of President Ernesto Zedillo's term (1994-2000) as well as the administration of Vicente Fox, delaying the judicial and police reforms needed by the country. Moreover, since they often belonged to different parties, problems often emerged between federal and local governments due to a lack of information being shared and the absence of coordinated policies (O'Neil, 2009). Consequently, when the Mexican state was divided into many different units that had different objectives, criminal behaviour became more violent since the probability of being punished decreased (Rios, 2014b, p. 4).[4]

The relationship between government authorities and DTOs was radically altered in 2006. Following a closely contested election and just a few days after coming into power, President Felipe Calderón made the fight against organised crime groups, commonly referred to as the "war against drugs", the centrepiece of his administration by sending troops to state of Michoacán in December 2006.[5] While initially 6,500 troops were deployed to fight the DTOs, by the end of Calderón's administration this figure had risen to 45,000. The crackdown was largely unanticipated as the election made narrow mention of security issues in Mexico (Dell, 2015).

The "war against drugs" was largely based on the non-selective arrest of criminal leaders, which in turn led to the fragmentation of DTOs and the emergence of violent conflicts between crime organisations. Without their heads, a power vacuum emerged in many DTOs. Oftentimes, aspiring leaders who worked as part of the enforcement arms of the illegal drug trafficking organisations resorted to the use of high levels of violence to try to gain control of the fragmented markets, which resulted in a significant increase in the number of homicides. The neutralisation of kingpins and leaders was especially high between 2008 and 2010, while actions related to drug seizures and crop eradication remained stagnant (O'Neil, 2009; Guerrero-Gutiérrez, 2011).

Figure 1 shows that in 2000, the homicide rate in Mexico per 100,000 inhabitants stood at 11.0 Beginning in 2008, the homicide rate grew significantly, reaching a maximum of 24.3 in 2011. The increase in the homicide rate was largely driven by an escalation in the number of drug-trade related homicides. It can be seen that the trend in the homicide rate is very similar to the one observed for drug-trade related homicides.[6]

[4]Simultaneously, as U.S. interdiction efforts in the Gulf of Mexico region increased, the Colombian DTOs gradually relied more and more on Mexican smuggling networks to access the United States. Furthermore, following the disintegration of Colombia's major cartels, Mexican DTOs began to play a larger role in controlling smuggling routes, where more products started going through Mexico and into the U.S. (Astorga and Shirk, 2010).

[5]Between 2006 and 2012 troops were also deployed to the states of Baja California, Chihuahua, Coahuila, Durango, Guerrero, Morelos, Nuevo León, Sinaloa, Tamaulipas, and Veracruz. In 2009, the Mexican government spent 9 billion U.S. dollars to fight drug trafficking (Keefer and Loayza, 2010).

[6]A large part of the violence among DTOs consist of drug traffickers killing each other, where this represents over 85.0% of all drug-trade related homicides. Furthermore, approximately 95.0% of the victims

Since the approach taken by President Calderón was to go after all DTOs, irrespective of their scope or whereabouts of the area under their control, this strategy resulted in amplified and geographically dispersed conflict (Guerrero-Gutiérrez, 2011). Figure 2 shows the geographic distribution and intensity of the homicide rate per 100,000 inhabitants by municipality from 2006 to 2012. While initially concentrated in a few states, homicides became more spatially diverse over time. Nonetheless, homicides were specifically high in the states of Chihuahua, Durango, Guerrero, Michoacán, Nuevo León, Sinaloa and Tamaulipas. Furthermore, a large part of drug-trade related homicides occur in areas close to drug trafficking routes and in border cities such as Ciudad Juárez or Tijuana, since the most lucrative part of the drug trafficking business chain takes place at U.S.-Mexico international border crossing points (Rios, 2014a, p. 201).[7] Between 2006 and 2012, the Mexican states bordering the U.S. accounted for 33.7% of the country's homicides despite being home to just 17.7% of its population. This figure is more pronounced when focusing on drug-trade related homicides, where the border states accounted for 44.8% of all drug homicides registered in Mexico between 2006 and 2012. Dell (2015) reports that in 2008 in approximately 68.0% of the country's municipalities there was either a major DTO or a local drug gang operating within its territory.

In addition to the increase in the homicide rate, a rise in the number of illegal activities targeting the general population was also observed. When the leaders of the DTOs were neutralised, crime organisations often lost the ability to operate their international drug trafficking routes in an effective and economic manner. Thus, remaining members commonly turned against civilians to extract economic resources through exploitative criminal acts (Robles et al., 2014, p. 3). These included kidnappings, extortions, assault and car-thefts, among others.[8]

Other major changes also occurred around the same time President Calderón took office, both of which affected the illegal drug market and homicide rates in Mexico. As explained by Castillo et al. (2014), in 2006 the Colombian government redefined its anti-drug strategy changing from a policy that emphasised attacking coca crops, which produce lower value added, to one that focused on the confiscation of drug shipments and well as the destruction of cocaine processing labs. This resulted in an increase in the amount of cocaine seized in Colombia, Mexico's main cocaine supplier. This created scarcity of cocaine and increased drug-trade related violence in Mexico. Another factor that also contributed to the increase in violent crime was the expiration of the U.S. Federal Assault Weapons Ban in 2004. Dube et al. (2013) observe that this made semi-automatic weapons more accessible to DTOs in Mexican states along the U.S. border, except for Baja California. Thus, the Mexican mu-

are male and 45.0% are under 30 years of age (Dell, 2015).

[7] Figure A.1 in the Appendix presents the geographic distribution of drug related homicides in Mexico.

[8] Extortion is likely the most common of the new criminal activities. At a first stage, the DTOs used extortion to target illegal businesses since they were unlikely to be denounced to the police. These include prostitution rings and casinos, among others. Subsequently, acts of extortion were extended to legal enterprises offering DTOs a quick way of acquiring income and substantially affecting economic activity. Thus, a large number of businesses were forced to close due to fear for their safety or the unsustainability of paying the high protection fees (Rios, 2014a).

nicipalities located near the non-California border states encountered differential increases in homicides and gun-related homicides after 2004.

While on the campaign trail, President Enrique Peña Nieto (2012-2018) had promised to cut down on the government's dependence on the counter-drug tactics used by the previous administration. Nonetheless, Peña Nieto has continued to heavily rely on the military while targeting the arrest of major DTO figures (Heinle et al., 2014).

4 Data and Descriptive Statistics

4.1 Data

Academic performance is measured using the scores obtained in the yearly national standardised test *Evaluación Nacional de Logros Académicos en Centros Escolares* (ENLACE, National Evaluation of Academic Achievement in Schools). First implemented in 2006, the test is taken by primary school students from third to sixth grade, and by secondary school students from seventh to ninth grade.[9] ENLACE evaluates students' knowledge and abilities in the subjects of Spanish and Mathematics. Since 2008, it also includes a third subject which changes on a rotating basis.[10] The test was initially implemented with the purpose of providing information on how to better structure and improve course outlines, and to help identify the skills-training needed by teachers.[11] ENLACE is measured on a scale ranging from 200 to 800. An advantage of the test is that it allows for a single and direct comparison between all evaluated students and schools. School level figures on ENLACE scores were obtained from the *Secretaría de Educación Pública* (SEP, Ministry of Public Education).[12]

Information on grade repetition rates were taken from the *Estadística de Educación Primaria y Secundaria* database, commonly referred to as *Estadísticas 911* (i.e. Statistics 911). The dataset includes information on students, teachers, school characteristics and other elements of the educational system from all the schools in Mexico.

Statistics on the number of homicides at the municipality level were obtained from SIMBAD. Total homicides per 10,000 inhabitants were constructed using population figures

[9]Beginning in 2008, twelfth grade students also started taking the ENLACE test. Nevertheless, given that we were unable to obtain data for these schools, they were not included in the study.

[10]Specifically, in 2008 the third subject was Natural Sciences, in 2009 was Civics and Ethics, in 2010 was History, in 2011 was Geography, and in 2012 was once again Natural Sciences.

[11]ENLACE has undergone important changes since its inception. In 2006, the test was conceived solely as a tool that would allow to detect deficiencies among students, where its results could be used by teachers and parents to modify study habits and course outlines. Since ENLACE was not a "high impact instrument", the test was supervised by teachers and parents who did so on a voluntary basis. This was modified for the 2008-2009 school year, where the personnel conducting the test was no longer linked to the school being evaluated. Moreover, ENLACE scores were also linked to teacher compensation and school accountability, the latter by making its results public and creating school rankings (Backhoff, 2014).

[12]Although the ENLACE test does not determine if a student passes onto the next grade, Campos and Urbina (2011) show that its scores are closely related with bimonthly test results at the classroom level. Thus, the authors conclude that what is taught and learned in the classroom is reflected in the scores obtained in ENLACE.

derived from the 2005 Population Count and the 2010 Census of Population and Housing, both conducted by the *Instituto Nacional de Geografía y Estadística* (INEGI, National Geography and Statistics Institute). For years for which there are no population figures, the data was extrapolated assuming a constant yearly population growth-rate. Furthermore, the same yearly growth-rate observed between 2005 and 2010 was taken for 2010 to 2012.

To properly identify the effect of crime exposure on educational outcomes, a series of school, municipality and state level controls are introduced. Information on narcotics sentences at the municipality level and the unemployment rate and GDP per capita at the state level were taken from SIMBAD. Data on school level characteristics such as the number of students, groups, and the student-teacher ratio, among others, were obtained from Statistics 911. Information on whether the school participates in the *Programa Escuela de Calidad* (PEC, Quality School Program), *Programa Escuela Tiempo Completo* (PETC, Full-Time School Program) or the *Programa Escuela Segura* (PES, Safe School Program) was taken from SEP.[13] Cabrera-Hernandez (2015) observes that the implementation of the PEC and PETC had positive effects on ENLACE scores among primary school students. Data on the *Seguro Popular* coverage rate was obtained from the *Comisión Nacional de Protección Social en Salud* (CNPSS, National Commission of Social Protection in Health). Alcaraz et al. (2013) show that the expansion of *Seguro Popular* positively affected ENLACE scores. Finally, information regarding the *Prospera* coverage rate was taken from the *Coordinación Nacional de Prospera Programa de Inclusión Social* (CNPPIS, National Coordination of Prospera Social Inclusion Program). A number of studies have noted that *Prospera* has had a strong positive effect on educational outcomes in Mexico (see, e.g. Behrman et al., 2005; Attanasio et al., 2011).[14]

The period examined covers from 2006 to 2012. The analysis is limited to primary and secondary schools in which the ENLACE test was applied in all of the years included in the study. In total, there are 59,673 and 22,932 primary and secondary schools, respectively, in the sample, each observed for six periods.[15]

4.2 Descriptive Statistics

Table 3 displays the means and standard deviations of selected variables included in the econometric analysis. Regarding the outcomes of interest, for all years ENLACE scores in Mathematics are slightly larger than those in Spanish. Additionally, between 2006 and 2012

[13]The PETC extends the school day from four or five hours to between six and eight hours per day. The PEC allows each school to design an education improvement plan which includes teacher training and additional course materials, among others. The PES grants economic and technical resources to schools which may be used on training, course materials or equipment related to school safety.

[14]*Seguro Popular* is a free-of-charge publicly provided health insurance program for otherwise uninsured households. *Prospera*, previously called *Progresa* and *Oportunidades*, is a poverty reduction cash-transfer program with education and health components, where households receive transfers conditional on sending their children to school and visiting health clinics.

[15]Data for 2008 was not included since at the time of writing we were not able to obtain for this year ENLACE scores separated by subject. Furthermore, the state of Oaxaca is excluded from the analysis since the ENLACE test was not applied in the state in some of the years included in the study.

ENLACE scores steadily increased each year for both subjects. The opposite relationship is observed with respect to the grade failure rate, which gradually decreased during the period analysed.

Among school level controls, it is observed that the total number of students per school encountered a modest decrease between 2006 and 2012, dropping from 192.9 to 188.1, respectively. On the other hand, the number of groups per school remained relatively constant at around 7.9. The fact that the number of groups is highly correlated with the number of classrooms used signals that classrooms are generally not shared among different groups. Moreover, since there are between 4.0 and 4.1 teachers per every 100 students, this implies that on average there are close to 25 students per every teacher. Focusing on the different school level programs, Table 3 shows that the coverage rate of both the PETC and PES increased each year between 2006 and 2012. Specifically, while the coverage of the PETC was 0.0% in 2006, by 2012 this figure had increased to 2.2%. Furthermore, the PES which started in 2007 increased its coverage rate from 1.1% in its initial year to 35.0% in 2012. The PEC followed a less predictable pattern, where its coverage rate varied between 22.4% and 30.5% during the period of study.

Turning our attention to municipality and state level characteristics, it is observed that the total number of homicides per 10,000 inhabitants more than doubled during the period of analysis. While this figure stood at 0.9 in 2006, it escalated to 2.1 in 2011 and 2012. Moreover, the increase in the total homicide rate was largely driven by a rise in the number of drug-trade related homicides, which stood at 0.2 in 2007 and reached a maximum of 1.5 in 2011. While not as pronounced, there was also an increase in the number of narcotics sentences per 10,000 inhabitants, which rose from 1.2 in 2006 to 1.7 in 2011. Regarding different social assistance programs, it can be seen that the expansion of *Seguro Popular* coincided with the period analysed. In 2006, 21.6% of the population was enrolled in *Seguro Popular*. By 2012, this figure had more than doubled and stood at 55.9%. On the other hand, the coverage rate of *Prospera* remained fairly stable between 30.9% and 33.4%, as its main expansion occurred before 2006.

Finally, the state unemployment rate fluctuated between 3.6% in 2006 and 5.6% in 2010. With respect to GDP per capita, it reached its lowest point in 2009, when it dropped to approximately 102,100 pesos per year. The reduction in GDP per capita was largely driven by the global economic crisis where in 2009 Mexico's GDP contracted by 4.7% (World Bank, 2014).

5 Methodology

To estimate the effect of crime exposure on standardised test scores and grade repetition rates, the variation in homicide rates across municipalities and time is exploited. This is done by estimating a fixed effects (FE) model specified in the following manner:

$$y_{imt} = \gamma Crime_{mt} + X_{imt}\beta + W_{mt}\delta + Z_{st}\lambda + \alpha_i + \mu_t + \epsilon_{imt} \tag{1}$$

where y_{imt} denotes either the average ENLACE score obtained in Spanish or Mathematics

or the grade repetition rate observed in school i in municipality m in year t; $Crime_{mt}$ represents the homicide rate per 10,000 inhabitants in municipality m in year t; X_{imt} denotes a vector of school level characteristics that may affect ENLACE scores or grade repetition rates; Z_{st} represents a vector of state level variables; μ_t denotes a time period dummy which helps control for national trends in homicide rates; α_i represents school fixed effects that capture time-invariant characteristics which may affect the educational outcomes of interest; and ϵ_{imt} is a random error term assumed to be uncorrelated with $Crime_{mt}$, X_{imt}, and Z_{st}.[16]

In addition to the homicide rate at the municipality level, the model includes as covariates school level characteristics such as total number of students, number of groups, number of teachers per 100 students, number of classrooms used, and dummy variables denoting whether the principal is also a teacher and whether the school participates in the PEC, PETC and PES. Municipality and state level covariates include the number of narcotics sentences per 10,000 inhabitants, the *Seguro Popular* and *Prospera* coverage rates at the municipality level, and the unemployment rate and GDP per capita at the state level. Eq. (1) is estimated separately for primary and secondary schools, and for ENLACE scores in Spanish and Mathematics and grade repetition rates. Standard errors are clustered by municipality to account for possible correlation among schools in some unknown way.

6 Results

6.1 Homicides and Academic Performance

Table 4 presents the effects of homicides on ENLACE scores in Spanish and Mathematics for primary and secondary school students.[17] Columns (1) and (2) show that among primary school students, an increase of one unit in the number of homicides per 10,000 inhabitants reduces average standardised test scores in Spanish and Mathematics by 0.0035 and 0.0039 standard deviations, respectively. Regarding secondary school students, columns (3) and (4) show that the effect of homicides is again negative and statistically significant. Specifically, an increase of one unit in the number of homicides per 10,000 inhabitants reduces ENLACE scores in Spanish and Mathematics by 0.0089 and 0.0142 standard deviations, respectively.

Focusing on other controls, it is observed that in all cases the number of students at the school and the number of classrooms used are positively associated with standardised test scores. On the other hand, the number of groups at the school is negatively related with ENLACE scores in primary schools, but is not significant for secondary schools. The number of teachers per 100 students is positively associated with standardised test scores,

[16] When focusing on grade repetition rates, y_{imt} represents a continuous variable between 0 and 100 that captures the proportion of students from 3rd to 6th grade in primary schools and from 7th to 9th grade in secondary schools that failed the grade during the current academic year.

[17] The homicide rates presented in Tables 4, 5, 7, 8 and 9 were calculated based on the total number of homicides registered in the municipality where the school is located in the 12 months prior to the ENLACE test being taken. In 2006 ENLACE was applied from June 5 to 9, in 2007 from April 23 to 27, in 2008 from April 14 to 18, in 2009 from April 23 to 29, in 2010 from April 19 to 23, in 2011 from May 23 to 27, and in 2012 from June 4 to 8.

where this variable is highly significant and is especially strong for primary schools. This finding implies that students have better academic performance when the student-teacher ratio is lower. With respect to the school's Principal also being teacher, under this scenario secondary school students tend to perform worse in both Spanish and Mathematics, whereas for primary schools there is no effect. The fact that the Principal is also a teacher may be signalling that there exists a shortage of teachers in the school. Turning our attention to the different federal programs that were in effect during the period of study, it can be seen in all four columns that the PEC and PETC are positively associated with ENLACE scores. These results are in line with those reported by Cabrera-Hernandez (2015), who shows that students benefit from spending more hours at school. Finally, the PES is negatively related with standardised test scores, although this variable is generally not significant.

Table 5 shows how homicides affect the distribution of ENLACE scores within each school. For primary schools, an increment of one unit in the number of homicides per 10,000 inhabitants increases the proportion of students obtaining a score in the "Insufficient" category by 0.078 percentage points for Spanish and 0.089 percentage points for Mathematics. Thus, for primary schools violent crime seems to mostly affect the performance of students located in the lower part of the ENLACE score distribution. Concerning secondary schools, increasing the number of homicides per 10,000 inhabitants by one unit generates a rise in the percentage of students obtaining an "Insufficient" score by 0.153 percentage points for Spanish and 0.251 percentage points for Mathematics. Homicides also affect the upper part of the score distribution, by reducing the proportion of students in the "Good" and "Excellent" categories. Consequently, for secondary schools an increase in violent crime levels produces a strong shift to the left of the ENLACE score distribution.

Table 6 presents how the effects of homicides vary depending on their timing and how close they occur to the date the ENLACE test was taken. In general, it can be seen that the effects of homicides grow stronger if they occur closer to the examination date. For primary schools, whereas homicides registered during the entire academic year reduce Spanish test scores by 0.0043 standard deviations, homicides committed in the week prior to the test being taken decrease average scores by 0.0214 standard deviations. A similar relationship is observed for ENLACE scores in Mathematics, where homicides committed the week before the exam reduce average scores by 0.0325 standard deviations compared to 0.0048 for homicides committed during the entire academic year. Among secondary schools, the relationship between Spanish scores and the timing of the homicides remains fairly stable over the different time periods. On the other hand, the effect of homicides on Mathematics scores stands at 0.0155 standard deviations for homicides committed during the entire academic year and gradually rises to 0.0203 for homicides registered during the 3 months prior to the ENLACE test.

To examine if there are heterogeneous effects, Table 7 focuses on different subsamples of schools. It can be seen it columns (1) and (2) that for both primary and secondary schools, the effect of violent crime is stronger when schools are based in a locality with high marginality levels or in highly deprived areas. Moreover, the negative effects of homicides are larger in schools located in rural areas compared to those registered in urban localities, where

for the latter there is generally no significant effect. Additionally, the effects of homicides tend to be larger for schools teaching in the morning session compared to those that teach in the afternoon session. Not surprisingly, for primary schools the negative effect of homicides is larger among public schools relative to private schools. Nonetheless, academic performance in indigenous schools appears to be greatly affected by increases in violent crime levels, where an increase of one unit in the homicide rate per 10,000 inhabitants reduces ENLACE scores in Spanish and Mathematics by 0.0264 and 0.0236 standard deviations, respectively. Among secondary schools, the estimated coefficients of the effect of homicides on test scores are actually positive for public and private schools, but are negative for *telesecundarias* or distance education secondary schools. The lagged effects of homicides are small for primary schools and completely disappear after two years. On the other hand, lagged effects are strong for secondary schools, where these only become non-significant after three years.

Finally, spillover effects generated by homicides committed outside of the municipality where the school is located are explored. Table 8 shows the effects of homicides registered away from the municipality but within a 20, 30 or 40 km radius. In general, it can be seen that there are negative spillover effects brought about by homicides committed outside of the municipality, where the estimated coefficients are generally statistically significant. Nevertheless, relative to homicides registered within the municipality, these effects are quite small. Furthermore, as would be expected, the spillover effects grow smaller as a larger area away from the municipality is considered.

6.2 Homicides and Grade Repetition

Attention now turns to effect of homicides on grade repetition. According to the results presented in Table 9, an increase of one unit in the homicide rate per 10,000 inhabitants is associated with a rise in the grade failure rate of 0.028 percentage points for primary schools and 0.027 percentage points for secondary schools.

Column (1) shows that for primary schools, the effect of homicides is only significant for schools located in areas with low marginality levels. Nevertheless, although not significant, the estimated coefficient is largest for schools situated in high marginality areas. Concerning the locality size, the effect of violent crime is significant in schools located in both urban and rural localities, where the effect of homicides is stronger among schools located in rural settings. With respect to whether classes are taught in the morning or afternoon session, the effect of homicides is slightly larger for schools that teach in the afternoon. Regarding the school type, the effect of crime exposure is stronger in public schools compared to private schools. In indigenous schools the results show than an increase in the homicide rate is negatively associated with the grade failure rate. On the other hand, the lagged homicide rate is positively related with grade repetition rates for up to two periods. Turning our attention to secondary schools, it can be seen in column (2) that the effect of homicides on grade repetition rates is larger in schools based in localities with high marginality levels. Once again, the negative effect of violent crime is stronger in rural areas compared to urban settings. Further, the effect of homicides on grade repetition rates is stronger for secondary schools that teach in the afternoon session. Moreover, while there is no significant effect for

private schools, crime exposure does increase the grade repetition rate for public schools and *telesecundarias* or distance education secondary schools. Finally, one- and two-year lagged values of the homicide rate significantly affect current grade repetition rates.[18]

7 Robustness Checks and Mechanisms

7.1 Drug-trade Homicides and Instrumental Variable Estimations

Since the increase in homicide levels observed from 2007 onwards was largely driven by a rise in drug-trade related homicides, this section examines their effect on educational outcomes. Provided by the CNS, data on drug homicides is available on an annual basis starting in December 2006. Unlike the homicide level information obtained from the SIMBAD, this dataset does not provide information on the date when the homicide occurred or when it was registered. Instead, only information regarding the total number of drug homicides at the municipality level during the calendar year is available.

This section also addresses the different challenges to identification that arise when attempting to estimate the effect of crime exposure on educational outcomes. First, regardless of the inclusion of a wide range of school, municipal and state level controls, unobserved variables may jointly determine educational outcomes and variations in the homicide rate. Factors such as institutions may generate a downward bias on the coefficient if municipalities with weak institutions offer lower quality schooling and have poorer educational outcomes, while also being exposed to larger increases in crimes levels due to less effective police and judicial services (Basu and Pearlman, 2014, p. 18). Second, the potential reverse causality between educational outcomes and violent crime levels cannot be disregarded. Whereas an increase in the homicide rate is likely to negatively affect academic performance and grade repetition rates, it is plausible to assume that violent crime levels are higher where educational outcomes are worse. This is likely to arise because DTOs may more easily employ adolescents who study at badly-performing schools (Michaelsen and Salardi, 2015). Lastly, while measurement error in homicide variables is not generally considered a serious problem compared to other types of crime, evidence suggests that this could be a problematic issue for the case of Mexico. According to official government data, between 2006 and 2013 an estimated 1,273 bodies, of which only 142 were identified, were found in different clandestine graveyards throughout the country (PGR, 2014). Moreover, it is highly probable that there many other illegal graveyards that have not yet been discovered and never will be. Measurement error in the homicide rate biases the coefficient towards zero. That is, it leads to attenuation bias by overestimating, or estimating as more positive, a negative coefficient. Considering all the factors mentioned above, the potential direction of the bias is uncertain.

To address the potential endogeneity issues, this study follows the strategy first put forward by Castillo et al. (2014). Specifically, an instrumental variable (IV) model is estimated using as a source of exogenous variation the interaction of a municipality's closeness to the

[18]The effects of homicide rates on grade repetition separated by different time periods and the analysis of spillover effects are also examined. See Tables A.1 and A.2 in the Appendix, respectively.

U.S. border with the percentage of cocaine seized in Colombia. Castillo et al. (2014) state that when the Colombia government seizes large quantities of cocaine, its price rises due to a reduction in supply. This increases the market value of cocaine, even more so in localities close to the U.S. border. Mexican municipalities that are close to the border have a comparative advantage due to their strategic geographic location since the U.S. is the final market. It is assumed that it will be these municipalities that see the highest increase in homicide levels because their control is more valuable to the DTOs (Robles et al., 2014).[19]

Table 10 presents the first stage results of the instrumental variable estimations. In all cases, the interaction of the municipality's closeness to the U.S. border and the percentage of cocaine seized in Colombia is positive. This relationship is of the expected sign, since it is assumed that if a municipality is closer to the U.S. its homicide rate will be higher. It is also expected that if the percentage of cocaine seized increases, more homicides will occur. Furthermore, the interaction term is a strong predictor of the homicide rate at the municipality level, where the coefficient is in all models significant at the 1% level. Finally, the value of the F statistic is comfortably above the rule of thumb of 10 commonly used in the literature and the Stock-Yogo critical values at the 10% significance level (Silwal and McKay, 2014).

Fixed effects and instrumental variable estimations of the effects of drug-trade related homicides on educational outcomes are presented in Table 11. Results for the effects of total homicides during the last calendar year are also presented in order to have a directly comparable measure of the two violent crime variables.

Table 11 shows in columns (1) and (3) that among primary school students, concerning ENLACE scores in Spanish and Mathematics, the negative effect of total homicides is larger than that of drug-trade related homicides. For grade repetition the same pattern is observed, where the effect of drug homicides is smaller relative to that of total homicides. Among secondary schools students, although negative, the fixed effects results suggest that ENLACE scores are not affected by drug homicides. Nonetheless, grade repetition rates increase with the drug homicide level, where this coefficient is significant at the 1% level. With respect to the instrumental variable estimations presented in columns (2) and (4), it is observed that when instrumenting for the homicide variables using the interaction of a municipality's closeness to the U.S. border with the percentage of cocaine seized in Colombia, the effect is again negative and highly significant. Additionally, for secondary school students the relationship between drug homicides and ENLACE scores in Spanish and Mathematics is now significant at the 1% level. The larger size of the total homicides and drug-trade related homicides coefficients when using instrumental variable models suggest that the fixed effect estimations may be downwardly biased.

[19]Information on cocaine seizures in Colombia was obtained from UNODC (2014). Figure A.2 in the Appendix presents the relationship between homicide levels in Mexico and the proportion of cocaine seized in Colombia. On the other hand, the exclusion restriction is upheld if the change in the proportion of total cocaine production seized in Colombia jointly with the municipality's closeness to the U.S. border only affect homicide levels.

7.2 Mechanisms

Attention now turns to the mechanisms by which crime exposure affects educational outcomes. It is hypothesised that exposure to violent crime affects academic performance and grade repetition rates partly because it leads to a reduction in contact hours. To examine this, data from the *Encuesta Nacional de Uso del Tiempo* (ENUT, National Time-Use Survey) is used.[20] Table 12 explores the relationship between attending school, the number of contact hours, engaging in school related work at home, the number of hours doing schoolwork at home, and homicide rates. Column (1) shows that among individuals between 8 and 16 years of age, homicide rates are not associated with the decision to attend school. Nonetheless, it can be seen in column (2) that higher homicide rates are indeed related with a reduction in the number of hours spent at school. As a result of the decrease in contact hours, families could compensate by increasing the amount of school related activities performed at home. Column (3) shows that the homicide rate is not associated with whether or not children and adolescents perform schoolwork at home. However, it can be seen in column (4) that higher homicide rates are negatively associated with the number of hours students spend performing school related activities in the household. Thus, families do not compensate for the reduction in the number of contact hours by making their children study more outside of the school. On the contrary, these two mechanisms appear to reinforce one another, further accentuating the negative effects of crime exposure on educational outcomes.[21]

High levels of violent crime in a municipality are also likely to affect the characteristics of the schools located within their limits. Table 13 explores the relationship between homicides, teacher and student mobility, and teachers' education levels. It can be seen in column (1) that an increase in the homicide rate is negatively related with the number of teachers per school. Moreover, column (2) shows that a rise in homicide levels is also negatively associated with the number of students enrolled per school. These statistically significant results suggest that crime exposure affects both teacher and student composition. Nevertheless, Márquez-Padilla et al. (2015) show that for the 2000-2010, 2005-2010 and 2007-2010 periods the rise in homicide levels did not affect the enrolment rates of primary and secondary school students. Column (3) presents the effects of the homicide rate on the student-teacher ratio, where higher incidences of violent crime are associated with a reduction in the number of students per teacher. This finding may be partially a result of the higher mobility that students have to change schools relative to teachers. Column (4) shows that the relationship between homicides and the percentage of teachers with graduate studies, interpreted here as a very broad measure of teacher quality, is not statistically significant.

Finally, previous evidence suggests that the rise in violent crime influenced the migration behaviour and mental health status of different segments of the population. Rios (2014a) observes that a one point increase in the drug-related homicide rate per 100,000 inhabitants

[20] While the ENLACE dataset includes information on how many of the enrolled students did not take the test, neither it nor Statistics 911 include information on school assistance rates or contact hours.

[21] The effect of crime on the number of hours a primary or secondary school teacher works was also examined. It was observed that a one unit increase in the homicide rate per 10,000 inhabitants is associated with a reduction of 0.58 in the number of hours teachers work per week.

is associated with 6.34 Mexicans fleeing their municipality of residency. To minimise the effects of this phenomenon, Eq. (1) was estimated for schools where the difference in the total number of students in any two periods was never larger than five, ten or twenty. The results obtained from these subsamples were similar to those reported in Table 4. The findings are also robust to the elimination of schools located in states bordering the United States. Arceo-Gómez (2012) presents evidence on how the escalation of violence led some Mexicans living close to the U.S. to migrate north of the border. On the other hand, Michaelsen (2012) shows than the high crime rates in Mexico affected the depression and anxiety levels of both men and women. The fact that the rise in homicide rates is associated with some individuals being displaced from their municipality of residence and with an increase in PTSD levels implies that, besides the reduction in contact hours, these two factors are also likely to be explaining why being exposed to violent crimes is negatively associated with educational outcomes.

8 Conclusions

This study examined the effects of crime exposure on the educational outcomes of primary and secondary school students in Mexico. To measure crime, homicides rates at the municipality level were constructed. Educational outcomes were analysed based on the scores obtained in the ENLACE test in Spanish and Mathematics and on grade repetition rates. The econometric analysis was performed using fixed effects and instrumental variable models. The results show that an increase in the number of homicides per 10,000 inhabitants by one unit reduces average ENLACE scores between 0.0035 and 0.0142 standard deviations. This effect is larger in secondary schools, grows stronger if the homicide occurs closer to the examination date, and is relatively stable when using either total homicides or drug-trade related homicides to measure crime exposure. Higher homicides rates are also associated with an increase in the grade failure rate. It is hypothesised that the negative effects of crime exposure on educational outcomes are partly due to a reduction in the number of contact hours, where students do not compensate for this by studying more outside of the school.

The negative and wide-ranging effects of the "war against drugs" and the increase in homicide levels in Mexico from 2007 onwards have been well documented. This study has provided evidence on the fact that non-educational policies affect educational outcomes. In addition to the short-term effects observed, it can be inferred that the increase in violence will have medium and long-term effects since, by affecting current educational outcomes, early exposure to homicides is likely to impact subsequent educational attainment levels and thus the future income streams of the country's youth. Moreover, since the effects of crime exposure are stronger in public schools and in higher marginalized areas, these negative consequences are potentially amplified among students residing in households located at the bottom-part of the income distribution. Given that educational attainment plays a central role in explaining differences in earnings and general economic well-being, this may generate higher inequality in the future by widening the gap in human capital attainment levels

between the rich and the poor.

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Table 1: Due to fear of being a crime victim, did you stop...?

Action	Yes	No	Observations
Going out at night	54.5%	45.5%	61,177
Let under-age kids go out	59.9%	40.1%	35,950
Visit family or friends	33.1%	66.9%	64,220
Take a taxi	27.6%	72.4%	40,833
Use public transportation	16.5%	83.5%	51,838
Carry money in wallet	44.5%	55.5%	64,238
Go to school	7.2%	92.8%	7,237
Go to the cinema or theatre	30.8%	69.2%	31,561
Go for a walk	31.6%	68.4%	55,864
Wear jewellery	59.6%	40.4%	36,709
Go out for dinner	26.9%	73.1%	52,381
Carry credit or debit card	36.5%	63.5%	34,496

Source: Author's elaboration based on ENVIPE 2011.

Table 2: Due to fear of being of crime victim, did you stop going to school?

Violence level by municipality	Yes	No	Observations
Total homicides			
High	8.9%	91.1%	1,006
Medium	5.8%	94.2%	2,173
Low	3.6%	96.4%	4,058
Drug-trade related homicides			
High	10.4%	89.6%	3,301
Medium	5.2%	94.8%	3,025
Low	2.5%	97.5%	911

Source: Author's elaboration based on ENVIPE 2011. Municipalities with high, medium and low violence levels refer to those located in the upper, medium and lower tercile, respectively, of the homicide distribution.

Table 3: Descriptive statistics

Variable	2006	2007	2009	2010	2011	2012
School characteristics						
ENLACE test scores: Spanish	487.4	492.7	502.7	508.4	515.4	522.8
	(57.8)	(61.3)	(57.7)	(61.2)	(65.5)	(70.4)
ENLACE test scores: Mathematics	491.6	497.6	506.4	516.4	529.6	554.4
	(57.5)	(61.4)	(61.9)	(65.6)	(70.2)	(77.4)
Grade failure rate (%)	3.2	3.0	2.8	2.5	2.3	1.8
	(4.3)	(4.2)	(4.1)	(4.0)	(3.9)	(3.5)
Number of students	192.9	193.2	192.2	190.8	189.3	188.1
	(195.0)	(195.3)	(194.4)	(193.1)	(192.0)	(191.3)
Number of groups	7.9	7.9	8.0	8.0	7.9	7.9
	(4.4)	(4.4)	(4.4)	(4.4)	(4.4)	(4.4)
Teachers per 100 students	4.0	4.0	4.0	4.1	4.1	4.1
	(3.0)	(3.0)	(3.2)	(3.4)	(3.4)	(3.3)
Number of classrooms used	7.9	7.9	8.0	8.0	8.0	8.0
	(6.1)	(6.0)	(6.4)	(5.8)	(5.9)	(5.7)
Principal is also a teacher (%)	41.6	41.6	41.2	40.7	40.4	40.6
	(49.3)	(49.3)	(49.2)	(49.1)	(49.1)	(49.1)
PEC (%)	24.7	25.1	22.4	24.3	30.5	26.7
	(43.1)	(43.4)	(41.7)	(42.9)	(46.0)	(44.2)
PETC (%)	0.0	0.0	0.4	0.8	0.9	2.2
	(0.0)	(0.0)	(6.6)	(8.9)	(9.3)	(14.6)
PES (%)	0.0	1.1	14.9	25.8	31.1	35.0
	(0.0)	(10.3)	(35.6)	(43.8)	(46.3)	(47.7)
Municipality and State characteristics						
Homicides per 10,000 inhabitants	0.9	0.8	1.6	2.0	2.1	2.1
	(1.1)	(1.0)	(3.0)	(3.8)	(3.4)	(3.4)
Drug homicides per 10,000 inhabitants	0.0	0.2	0.8	1.3	1.5	1.3
	(0.0)	(1.0)	(2.4)	(4.0)	(3.6)	(2.8)
Narcotics sentences per 10,000 inhabitants	1.2	1.2	1.0	1.6	1.7	1.5
	(2.1)	(1.8)	(1.7)	(2.7)	(3.2)	(2.9)
Seguro Popular coverage (%)	21.6	28.2	36.8	48.3	55.2	55.9
	(19.8)	(21.1)	(21.3)	(22.9)	(22.8)	(22.5)
Prospera coverage (%)	33.4	32.3	30.9	32.5	32.1	31.8
	(28.5)	(27.6)	(25.5)	(25.8)	(25.6)	(25.6)
State unemployment rate (%)	3.6	4.0	5.3	5.6	5.5	5.2
	(1.1)	(1.5)	(1.8)	(1.8)	(1.5)	(1.6)
GDP per capita/1000	108.1	109.2	102.1	105.5	107.7	110.1
	(111.0)	(103.1)	(86.3)	(82.3)	(79.6)	(78.5)
Observations	82,619	82,619	82,619	82,619	82,619	82,619

Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD. PEC denotes the Programa de Escuelas de Calidad (Quality Schools Program). PETC denotes the Programa Escuelas Tiempo Completo (Full-time School Program). PES denotes the Programa Escuela Segura (Safe School Program). GDP per capita is in 2010 pesos. Standard errors are in parenthesis.

Table 4: Homicides and academic performance

Variable	(1)	(2)	(3)	(4)
	ENLACE test scores: Primary		*ENLACE test scores: Secondary*	
	Spanish	*Math*	*Spanish*	*Math*
Homicides per 10,000 inhabitants	-0.0035**	-0.0039**	-0.0089***	-0.0142***
	(0.0018)	(0.0019)	(0.0029)	(0.0032)
Number of students/100	0.036***	0.043***	0.093***	0.058***
	(0.008)	(0.008)	(0.011)	(0.011)
Number of groups	-0.014***	-0.014***	-0.003	0.005
	(0.003)	(0.003)	(0.005)	(0.005)
Teachers per 100 students	1.570***	1.950***	0.580***	0.628***
	(0.202)	(0.224)	(0.133)	(0.138)
Number of classrooms used	0.017***	0.016***	0.005*	0.007***
	(0.002)	(0.003)	(0.003)	(0.003)
Principal is also a teacher	-0.009	0.003	-0.047***	-0.051***
	(0.007)	(0.008)	(0.013)	(0.014)
PEC	0.015***	0.015***	0.022***	0.024***
	(0.005)	(0.006)	(0.008)	(0.008)
PETC	0.126***	0.124***	0.233***	0.256**
	(0.025)	(0.025)	(0.081)	(0.101)
PES	-0.011	-0.012	-0.056***	-0.011
	(0.013)	(0.013)	(0.020)	(0.023)
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes
R-squared	0.218	0.270	0.082	0.169
Observations	358,038	358,038	137,592	137,592

*p<.1, **p<.05, ***p<.01

Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. PEC denotes the Programa de Escuelas de Calidad (Quality Schools Program). PETC denotes the Programa Escuelas Tiempo Completo (Full-time School Program). PES denotes the Programa Escuela Segura (Safe School Program). Standard errors are in parenthesis and are clustered at the municipality level.

Table 5: Homicides and the distribution of scores

Sample	**(1)**	**(2)**	**(3)**	**(4)**
	Insufficient	*Elemental*	*Good*	*Excellent*
	Dependent variable: Proportion of students in each score range			
Primary				
Spanish	0.0784***	-0.0298	-0.0433	-0.0047
	(0.0289)	(0.0290)	(0.0275)	(0.0209)
Math	0.0886***	-0.0364	-0.0582*	0.0008
	(0.0314)	(0.0296)	(0.0316)	(0.0241)
Secondary				
Spanish	0.1532**	0.0043	-0.1753***	-0.0194***
	(0.0666)	(0.0371)	(0.0377)	(0.0059)
Math	0.2514***	-0.0265	-0.1332***	-0.1281***
	(0.0690)	(0.0430)	(0.0302)	(0.0349)
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

*p<.1, **p<.05, ***p<.01

Source: Coefficients reported correspond to the total number of homicides per 10,000 inhabitants. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Table 6: Homicides and academic performance. Different effects by time

Dependent variable:	**(1)**	**(2)**	**(3)**	**(4)**
	Academic Year	6 months	3 months	Week
	Primary school			
ENLACE scores: Spanish	-0.0043**	-0.0049*	-0.0042	-0.0214*
	(0.0021)	(0.0028)	(0.0038)	(0.0119)
ENLACE scores: Mathematics	-0.0048**	-0.0057*	-0.0066	-0.0325***
	(0.0022)	(0.0032)	(0.0043)	(0.0125)
	Secondary school			
ENLACE scores: Spanish	-0.0098***	-0.0094**	-0.0121**	-0.0097
	(0.0033)	(0.0042)	(0.0054)	(0.0137)
ENLACE scores: Mathematics	-0.0155***	-0.0158***	-0.0203***	-0.0185
	(0.0037)	(0.0044)	(0.0061)	(0.0188)
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

*p<.1, **p<.05, ***p<.01

Source: Coefficients reported correspond to the total number of homicides per 10,000 inhabitants. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Table 7: Homicides and academic performance. Subsamples

Sample	**(1)**	**(2)**	**(3)**	**(4)**
	ENLACE test scores: Primary		*ENLACE test scores: Secondary*	
	Spanish	*Math*	*Spanish*	*Math*
A. Main	-0.0035**	-0.0039**	-0.0089***	-0.0142***
	(0.0018)	(0.0019)	(0.0029)	(0.0032)
B. Marginality Level				
High	-0.0087**	-0.0065	-0.0183***	-0.0196**
	(0.0041)	(0.0041)	(0.0059)	(0.0088)
Medium	-0.0037	-0.0027	0.0033	-0.0036
	(0.0037)	(0.0042)	(0.0052)	(0.0058)
Low	0.0004	0.0005	0.0072***	0.0018
	(0.0011)	(0.0012)	(0.0022)	(0.0017)
C. Locality Size				
Urban	-0.0015	-0.0019	0.0024	-0.0031*
	(0.0015)	(0.0016)	(0.0019)	(0.0017)
Rural	-0.0057**	-0.0041	-0.0161***	-0.0191***
	(0.0027)	(0.0029)	(0.0037)	(0.0049)
D. Session				
Morning	-0.0040**	-0.0043**	-0.0103***	-0.0151***
	(0.0019)	(0.0019)	(0.0029)	(0.0034)
Afternoon	-0.0013	-0.0017	0.0127***	0.0052
	(0.0017)	(0.0020)	(0.0041)	(0.0034)
E. School Type				
Public	-0.0032*	-0.0032*	0.0086***	0.0041**
	(0.0018)	(0.0019)	(0.0023)	(0.0021)
Private	0.0062**	0.0044	0.0143**	0.0130***
	(0.0028)	(0.0032)	(0.0060)	(0.0049)
Indigenous	-0.0264***	-0.0236***	—	—
	(0.0066)	(0.0071)		
Telesecundaria	—	—	-0.0178***	-0.0220***
			(0.0037)	(0.0048)
F. Lagged Homicide Rate				
t-1	-0.0034*	-0.0033	-0.0109***	-0.0177***
	(0.0019)	(0.0021)	(0.0031)	(0.0038)
t-2	-0.0013	-0.0004	-0.0063**	-0.0139***
	(0.0018)	(0.0019)	(0.0032)	(0.0048)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

*p<.1, **p<.05, ***p<.01

Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Table 8: Homicides and academic performance. Spillover effects

Homicides occurring:	**(1)**	**(2)**	**(3)**	**(4)**
	ENLACE test scores: Primary		*ENLACE test scores: Secondary*	
	Spanish	*Math*	*Spanish*	*Math*
In Municipality	-0.0035**	-0.0039**	-0.0089***	-0.0142***
	(0.0018)	(0.0019)	(0.0029)	(0.0032)
Outside Municipality, 20 km	-0.0002*	-0.0003*	-0.0006*	-0.0008*
	(0.0001)	(0.0002)	(0.0003)	(0.0004)
Outside Municipality, 30 km	-0.0002	-0.0003**	-0.0006***	-0.0007***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Outside Municipality, 40 km	-0.0002*	-0.0002**	-0.0002	-0.0002*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

*p<.1, **p<.05, ***p<.01

Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Table 9: Homicides and grade repetition

Sample	**(1)**	**(2)**
	Primary	*Secondary*
A. Main	0.0282***	0.0268***
	(0.0070)	(0.0082)
B. Marginality Level		
High	0.0151	0.0545***
	(0.0140)	(0.0209)
Medium	-0.0016	0.0041
	(0.0151)	(0.0252)
Low	0.0129**	0.0196**
	(0.0058)	(0.0093)
C. Locality Size		
Urban	0.0172***	0.0220**
	(0.0066)	(0.0104)
Rural	0.0276***	0.0403***
	(0.0086)	(0.0132)
D. Session		
Morning	0.0273***	0.0269***
	(0.0073)	(0.0085)
Afternoon	0.0309***	0.0258
	(0.0096)	(0.0164)
E. School Type		
Public	0.0293***	0.0168**
	(0.0073)	(0.0072)
Private	0.0137*	0.0279
	(0.0075)	(0.0246)
Indigenous	-0.0576	—
	(0.0522)	
Telesecundaria	—	0.0447***
		(0.0151)
F. Lagged Homicide Rate		
t-1	0.0357***	0.0277***
	(0.0074)	(0.0083)
t-2	0.0362***	0.0306***
	(0.0083)	(0.0075)
School level controls	Yes	Yes
School fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Municipality level controls	Yes	Yes
State level controls	Yes	Yes

*p<.1, **p<.05, ***p<.01

Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Grade failure rate is measured on a scale from 0 to 100. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Table 10: First stage results of IV-FE estimation

Variable	**(1)**	**(2)**	**(3)**	**(4)**
	Homicides		*Drug-trade homicides*	
	Primary	*Secondary*	*Primary*	*Secondary*
	Dependent variable: Homicides per 10,000 inhabitants			
(Closeness to U.S. border)*(% Colombian cocaine seized)	0.0091***	0.0074***	0.0089***	0.0070***
	(0.0019)	(0.0015)	(0.0015)	(0.0011)
Number of students/100	-0.326**	-0.022	-0.240***	-0.065
	(0.131)	(0.039)	(0.084)	(0.055)
Number of groups	-0.012	-0.047**	-0.004	-0.025
	(0.014)	(0.019)	(0.014)	(0.017)
All grades	-0.086	0.225**	-0.143**	-0.014
	(0.054)	(0.091)	(0.063)	(0.152)
Number of classrooms used	-0.010	-0.003	-0.004	0.008
	(0.013)	(0.011)	(0.012)	(0.008)
Principal is also a teacher	-0.031	-0.040	0.046*	0.027
	(0.027)	(0.032)	(0.027)	(0.038)
Student/Teacher ratio	0.147	0.371	0.268	0.831**
	(0.775)	(0.388)	(0.922)	(0.413)
PEC	0.072	0.044	0.066	0.070**
	(0.057)	(0.033)	(0.044)	(0.034)
PETC	-0.212**	-0.292*	-0.191	-0.335*
	(0.102)	(0.163)	(0.128)	(0.193)
PES	0.423**	0.262***	0.161	0.034
	(0.169)	(0.094)	(0.131)	(0.076)
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes
R-squared	0.185	0.157	0.133	0.103
F-test on instrument	21.74	25.47	37.37	38.50
Observations	358,038	137,592	358,038	137,592

*p<.1, **p<.05, ***p<.01

Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911), SIMBAD and CNS 2006, 2007, 2009, 2010, 2011 and 2012. PEC denotes the Programa de Escuelas de Calidad (Quality Schools Program). PETC denotes the Programa Escuelas Tiempo Completo (Full-time School Program). PES denotes the Programa Escuela Segura (Safe School Program). Standard errors are in parenthesis and are clustered at the municipality level. The reported F statistic is the Kleibergen-Paap rk Wald F statistic, which is robust to the presence of clustering in the data.

Table 11: Homicides, drug-trade related homicides and educational outcomes

Dependent variable	**(1)**	**(2)**	**(3)**	**(4)**
	Homicides		*Drug-trade homicides*	
	FE	*IV*	*FE*	*IV*
	Primary			
ENLACE: Spanish	-0.0035**	-0.0470***	-0.0021**	-0.0483***
	(0.0016)	(0.0164)	(0.0010)	(0.0143)
ENLACE: Math	-0.0039**	-0.0584***	-0.0021*	-0.0601***
	(0.0018)	(0.0186)	(0.0011)	(0.0159)
Grade Repetition	0.0239***	0.3612***	0.0190***	0.3711***
	(0.0068)	(0.0888)	(0.0053)	(0.0779)
	Secondary			
ENLACE: Spanish	-0.0059**	-0.1552***	-0.0005	-0.1631***
	(0.0026)	(0.0420)	(0.0015)	(0.0401)
ENLACE: Math	-0.0099***	-0.1471***	-0.0017	-0.1540***
	(0.0027)	(0.0409)	(0.0019)	(0.0383)
Grade Repetition	0.0288***	0.1782***	0.0199***	0.1883***
	(0.0073)	(0.0477)	(0.0055)	(0.0446)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

*p<.1, **p<.05, ***p<.01

Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Table 12: Homicides, school attendance, contact hours and schoolwork

Dependent variable	**(1)**	**(2)**	**(3)**	**(4)**
	Attending school (Yes = 1, 0 = No)	*Hours at school*	*Schoolwork at home (Yes = 1, 0 = No)*	*Hours doing schoolwork at home*
Homicides per 10,000 inhabitants	0.0037	-0.1414*	0.0026	-0.1823***
	(0.0028)	(0.0765)	(0.0027)	(0.0522)
Observations	10,242	6,697	10,242	6,429
R-squared	0.264	0.010	0.242	0.030

*p<.1, **p<.05, ***p<.01

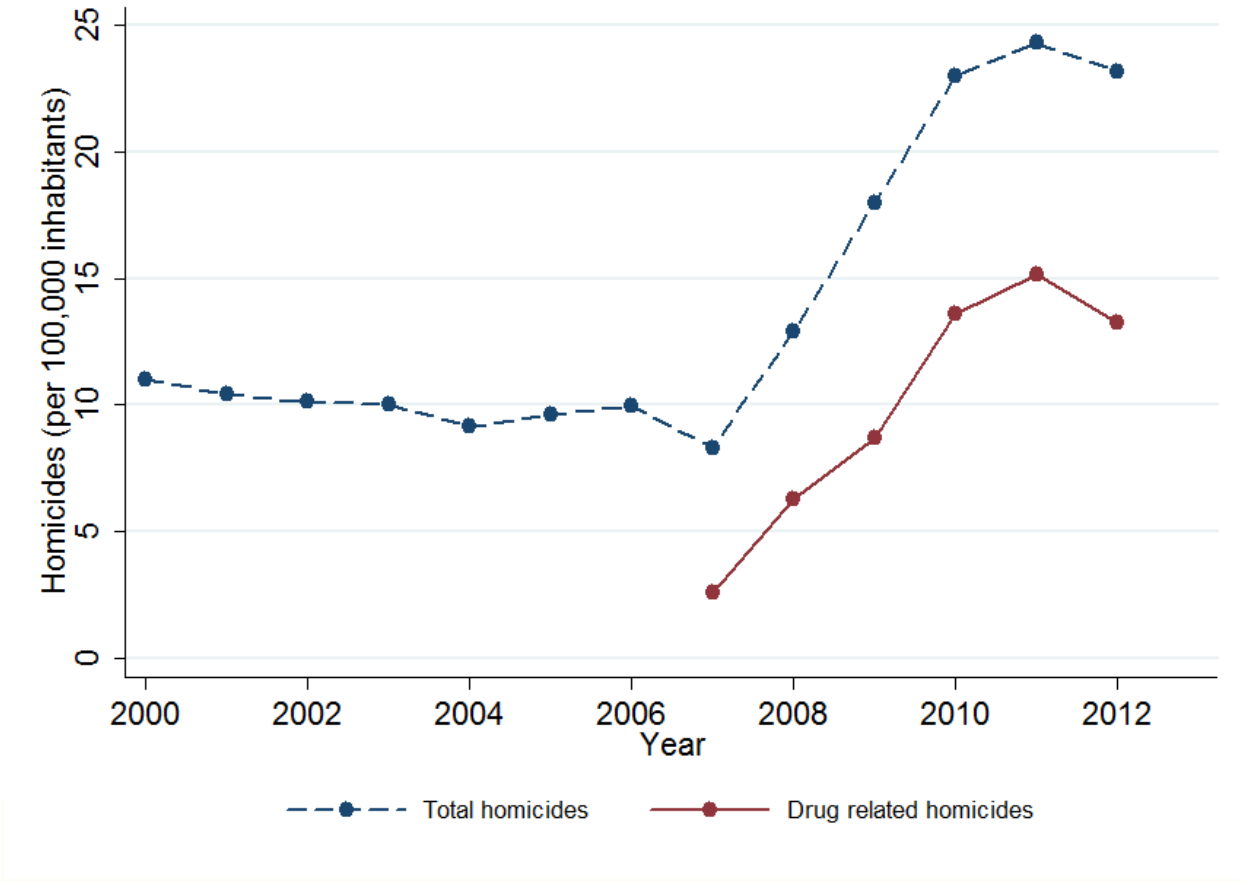
Source: Author's elaboration based on ENUT 2002 and 2009. Estimations based on individuals between 8 and 16 years of age. Coefficients correspond to the total number of homicides per 10,000 inhabitants at the state level. All regressions include as additional controls age and gender of the respondent, number of persons in the household, indicators of quality of the roof, wall and floor in the household, size of locality dummies, a time dummy and a constant. Standard errors are in parenthesis and are clustered at the state level.

Table 13: Homicides, mobility and school characteristics

Dependent variable	**(1)**	**(2)**	**(3)**	**(4)**
	No. of teachers at school	*No. of students at school*	*Student-teacher ratio*	*Percentage of teachers with graduate studies*
Homicides per 10,000 inhabitants	-0.0127***	-0.6410***	-0.0183*	-0.0245
	(0.0033)	(0.1601)	(0.0106)	(0.0152)
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes
Observations	495,660	495,693	452,424	495,714
R-squared	0.043	0.019	0.053	0.017

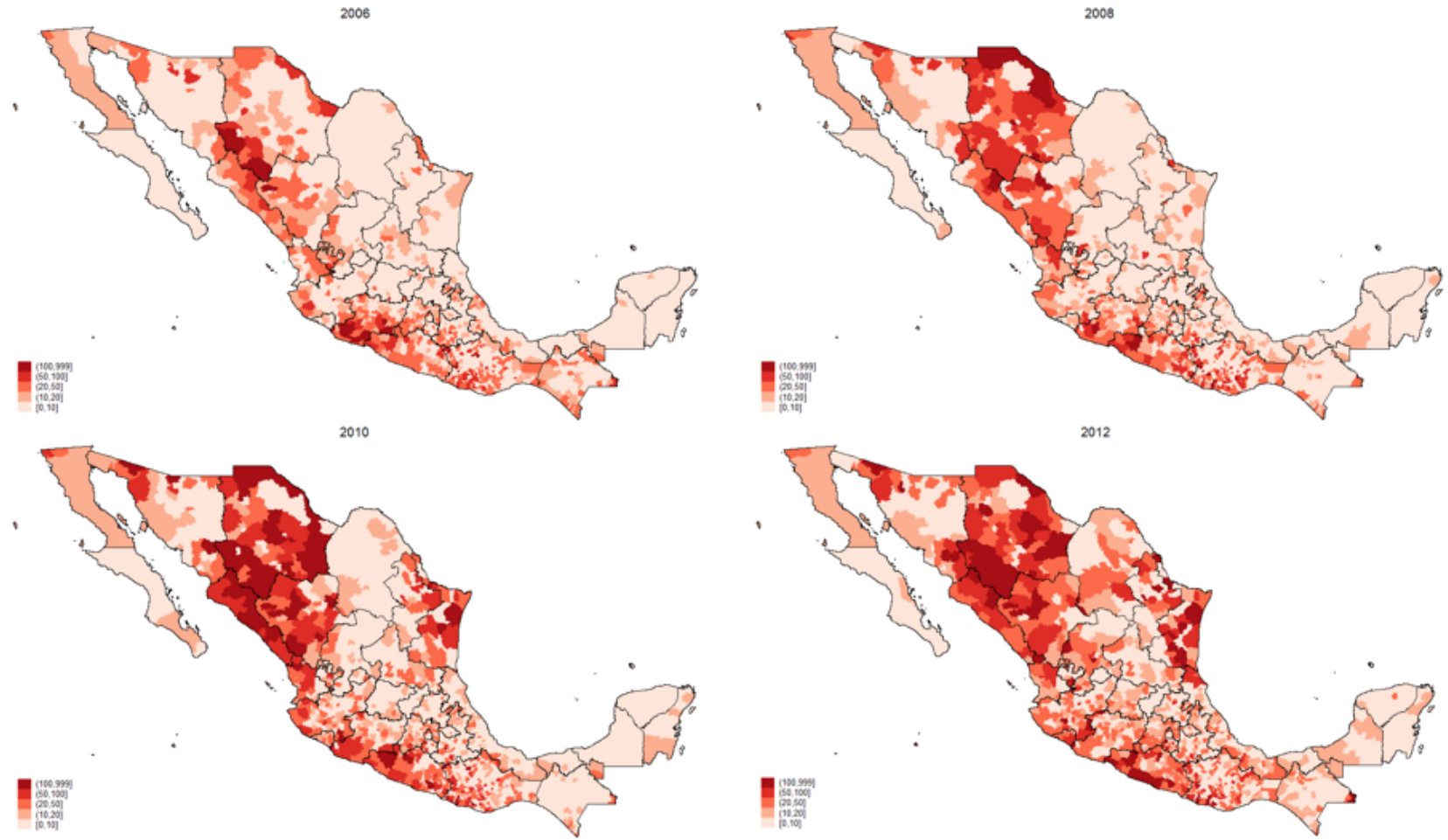
*p<.1, **p<.05, ***p<.01
Source: Author's elaboration based on Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Figure 1: Homicides per 100,000 inhabitants in Mexico, 2002-2012



Source: Author's elaboration based on SIMBAD and CNS.

Figure 2: Homicides per 100,000 inhabitants by Municipality



Source: Author's elaboration based on SIMBAD.

Appendix

Table A.1: Homicides and grade repetition. Different effects by time

Dependent variable:	**(1)**	**(2)**	**(3)**	**(4)**
	Academic Year	6 months	3 months	Week
		Primary		
Grade repetition	0.0357***	0.0406***	0.0591***	0.1433***
	(0.0082)	(0.0112)	(0.0165)	(0.0529)
		Secondary		
Grade repetition	0.0326***	0.0464***	0.0715***	0.1852***
	(0.0099)	(0.0137)	(0.0212)	(0.0462)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

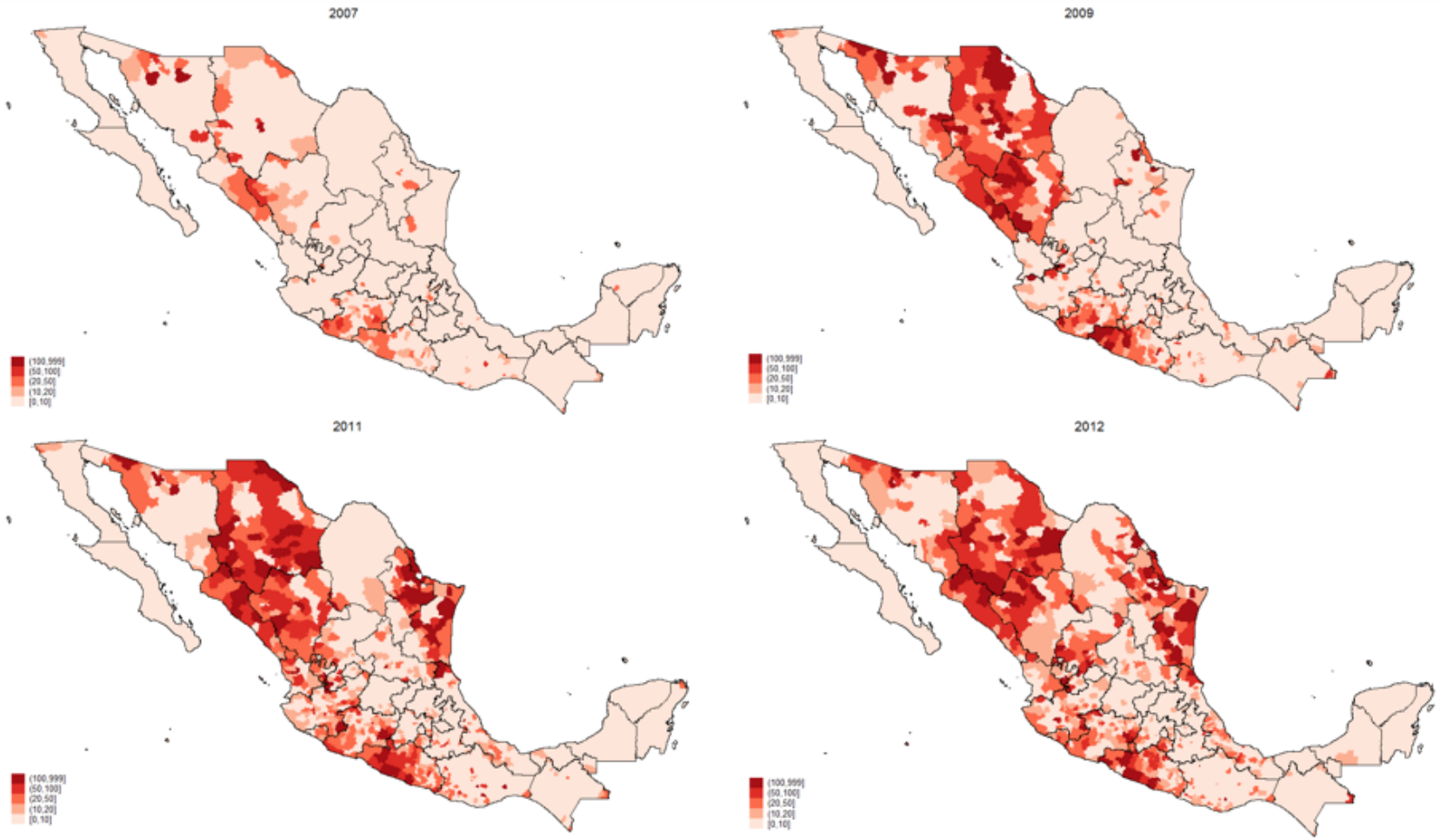
*p<.1, **p<.05, ***p<.01
Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Grade failure rate is measured on a scale from 0 to 100. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Table A.2: Homicides and grade repetition. Spillover effects

Homicides ocurring:	**(1)**	**(2)**
	Primary	*Secondary*
In Municipality	0.0282***	0.0268***
	(0.0070)	(0.0082)
Outside Municipality, 20 km radius	0.0005	0.0019***
	(0.0005)	(0.0007)
Outside Municipality, 30 km radius	0.0003	0.0012***
	(0.0005)	(0.0004)
Outside Municipality, 40 km radius	0.0006*	0.0007**
	(0.0003)	(0.0004)
School level controls	Yes	Yes
School fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Municipality level controls	Yes	Yes
State level controls	Yes	Yes

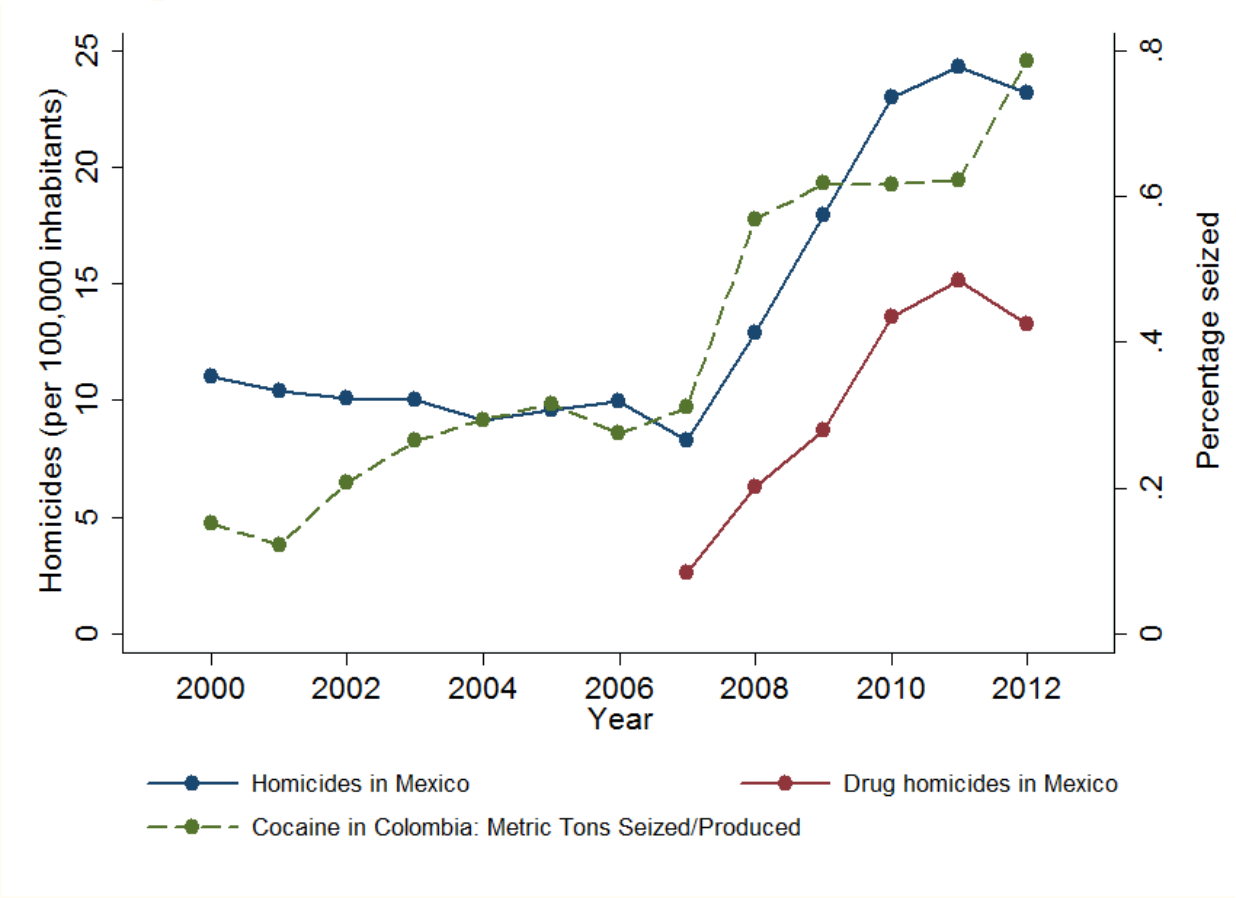
*p<.1, **p<.05, ***p<.01
Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Grade failure rate is measured on a scale from 0 to 100. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Figure A.1: Drug-trade related homicides per 100,000 inhabitants by Municipality



Source: Author's elaboration based on data obtained from the CNS.

Figure A.2: Homicides in Mexico and cocaine seizures in Colombia, 2002-2012



Source: Author's elaboration based on data obtained from SIMBAD, CNS and UNODC.