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How the Mexican drug war affects kids and schools? Evidence on effects and mechanisms

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ABSTRACT

We investigate the impact of drug-related violence in Mexico on academic achievement. We use panel of elementary and lower secondary schools and locality-level firearm homicides from 2006 to 2011. We rely on school fixed-effects models to estimate the impact on math test scores of turf war exposure and turf war persistence (e.g. months of exposure) during the academic year. According to the results, both exposure and persistence of criminal violence reduces math test scores. The analysis of heterogeneous effects shows that schools located in poor urban settings experience the largest negative effects. Further, we find stronger negative effects of drug-related violence exposure in lower secondary schools with street gang presence nearby. Finally, we further examine potential mechanisms driving the effects of criminal violence on test scores. Our findings indicate that turf war exposure and persistence are associated with a loss of instructional time due to higher teacher absenteeism and turnover, as well as student absenteeism, tardiness, and propensity to leave school days early.

1. Introduction

Violence is a critical development challenge that affects the lives of millions around the world. Much attention has been concentrated on the devastating impact of civil wars. But battle deaths pale in comparison to the number of people who die as a result of homicides in non-conflict settings. Criminal violence imposes serious human costs in terms of lives lost and human suffering, and it also hinders economic development (e.g., Londoño et al., 2000; Lora and Powell, 2011; Dell, 2015; Robles et al., 2013; Pshisva and Suarez, 2014). Concentrating around 30% of the world's murders and 8% of its population, Latin America is the most violent region of the world. The region is home to 43 of the world's 50 most dangerous cities. This paper focuses on one of the consequences of violent crime, focusing on how it affects one of the most vulnerable groups, children and adolescents. The study examines the consequences of criminal violence on education. In particular, it focuses on estimating the impact of the sharp escalation of drug-related violence observed in Mexico in recent years on educational quality, as measured by academic achievement test scores. Drug-related violence disproportionately affects the poor, further marginalizing socially and economically deprived population groups (Berkman, 2007). Failed development places poor communities at a greater risk of being caught in a violence trap (Collier et al., 2003). Since high-quality learning is a key contributor to individual earnings and to national economic growth (Hanushek and Kimko, 2000; Hanusheck and Woessmann, 2010) understanding how violence affects education outcomes is fundamental to design effective interventions targeted to schools and communities affected by violent crime.

The purpose of this paper is twofold. First, drawing from a unique panel of nationwide academic assessments of elementary and low-secondary schools, we estimate the impact of drug-related violence on school-level achievement test scores and empirically explore transmission mechanisms explaining this effect. The interest in the impact of violence on education caused either by armed conflict, post-conflict settings or chronic criminality has spurred a large body of literature. While the effects of violence on school enrollment, school attendance and educational attainment is well established (Barrera and Ibáñez, 2004; Shemyakina, 2011a,b; Akresh and De Walque, 2008; Yuksel-Akbulut, 2009; Leon, 2012; Rodríguez and Sanchez, 2009); we know less about the consequences of violent crime on educational quality (Bruck et al., 2014).

Recent research in developing countries show negative effects of violent conflict on educational quality, as measured by academic achievement. By exploiting within-school variation in the number

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of conflict-related fatalities, Bruck et al. (2014) and Monteiro and Rocha (2013) provide reliable evidence of small but significant negative impacts of armed conflicts on student-level academic test scores. Bruck et al. (2014) find that the Israeli–Palestinian conflict during the Second Intifada (2000–2006) reduces in 1% the probability to pass the final high school exam for Palestinian students from West Bank. In a sample of 5th graders attending school in favelas of Rio de Janeiro, Monteiro and Rocha (2013) found a significant reduction of 0.05 of a standard deviation in math test scores due to persistence of violent crime (measured as cumulative days of drug battles throughout the academic year). On the other hand, based on state-fixed effects models, Ortiz-Correa (2014) found a small impact of armed-conflict indicators – such as extortion, kidnapping and terrorist attacks – on academic outcomes in 5th and 9th graders in Colombia. One threat for identification in the Ortiz-Correa (2014) study is that crime is not distributed randomly within states. Empirical results could be biased if unobservable characteristics within state entities are correlated with both violence and educational outcomes. For the case of Mexico, there is less robust evidence regarding the effects of violence on academic achievement. Using school grades, Caudillo and Torche (2014) estimate an increased probability of grade failure in Mexico due to drug-related violence. These results are suggestive of the negative consequences of violence on academic performance in Mexico but preliminary. School grades have long been recognized as an inaccurate measure of student academic performance, since they reflect differing grading practices across academic subjects, teachers and schools. To overcome the main limitation in the Caudillo and Torche (2014), our analysis relies on a unique nationwide panel of school-level math test scores in Mexican elementary and lower secondary schools.

Further, while the vast majority of studies discuss potential mechanisms that might connect violent conflict and educational outcomes, very few identify the links empirically. The channels through which violent conflict affects academic achievement are manifold. From an ecological perspective (Bronfenbrenner, 1979; Garbarino and Abramowitz, 1992), environmental stressors such as exposure to violence negatively impact academic outcomes by directly threatening physical and emotional safety and, indirectly, by reducing the availability, access, and quality of learning opportunities at home, school and community (Bowen and Bowen, 1999). Prior studies have demonstrated that psychological distress due to exposure to criminal violence hampers student academic performance (Burdick-Will Ludwig et al., 2011; Bruck et al., 2014). Further, criminal violence erodes economic activity (Robles et al., 2013). Loss of earning capacity among families caused by community's economic deprivation may change families' and students' investment decisions in schooling due to higher opportunity costs and lower returns to education (Justino et al., 2013; Valente, 2013; Gerardino, 2013).

Alternatively, there is some evidence suggesting that changes in school supply is another relevant channel explaining the impact of violence on student academic achievement. Bruck et al. (2014) find that Israeli–Palestinian conflict worsened the quality of the learning environment in high schools by increasing average class overcrowding. Monteiro and Rocha (2013) find that gang-related violence in Rio de Janeiro's favelas is positively associated with higher teacher absenteeism, principal turnover, and number of school closing days in elementary schools. Prior studies suggest that various measures of instructional time loss such as teacher turnover (Ronfeldt, 2012), teacher absenteeism (Glewwe et al., 2011; Suryadarma et al., 2006) and student absenteeism seriously harm academic test scores (Abadzi, 2007). We contribute to the strand of literature by analyzing whether teacher and student absenteeism, teacher turnover, and students frequently leaving school early are significant mechanisms underlying the relation between drug-related violence and academic achievement in Mexican schools.

A second objective of the present study is to investigate how both locality characteristics (poverty level and degree of urbanization) and school characteristics (education level and principal-reported gang presence nearby schools) may mediate the impact of criminal violence. During the past decade, criminal violence in Mexico has become more urban and spatially clustered with other indicators of socio-economic disadvantage. Residents of violent communities also experience multiple forms of economic hardship, proliferation of street gangs, social exclusion, weak rule of law, and lack of safety. Hence, we expect larger effects of criminal violence among poor urban schools.

Despite the fact that street gangs have propagated in many violent cities of Latin America, we know very little about the influence of street gang presence in high-crime neighbors on schools and students outcomes. The presence of gang members inside and outside the school can deteriorate schools' social environment with negative consequences on student academic performance. Jarillo et al. (2016) show that in Mexican high schools, students who reside in violent localities and self-reported to be part of a gang display more violent behaviors at school. In a nationally representative sample of middle and high school students in the United States, Bowen et al. (2002) find that school attendance and grades are negatively correlated with exposure to negative neighborhood peer culture – measured as respondents' perceptions that youth in their neighborhood were likely to join a gang and engage in other risky behaviors.

Finally, we also estimate heterogeneous effects of criminal violence by education level. Because peer relationships and a broader local culture at the community level might have a stronger influence in adolescents compared to younger children (Brooks-Gunn et al., 1997), we expect that of street gangs presence in poor and violent localities has a stronger impact on lower secondary schools compared to elementary schools (Brooks-Gunn et al., 1997).

Another important contribution of our paper is the use of novel measures of exposure and persistence of drug-related violence at the locality level. Rather than using a continuous measure of violence intensity, we follow Justino et al. (2013) to implement an event approach to model high-intensity violent events or turf wars. We claim that a turf war approach is a more accurate way to model the sudden and dramatic waves of shootouts and executions associated to drug-related violence in Mexico (Robles et al., 2013). We assume that people respond differently to ordinary crime compared to high-intensity violent events. Scholars analyzing behavioral changes triggered by exposure to violent conflicts agree that the reaction to crime is defined by the risk or fear to become a victim of crime (Justino, 2010). Fear of crime is not static and might be influenced by prior levels of violence experienced in the community. We expect that the spike of intra or inter-cartel conflict induces behavioral changes, such as parents refusing to send their children to school or principals shutting down schools temporarily.

Based on school-fixed effects models, we find that drug-related turf war exposure and persistence have a negative effect on academic achievement. Further, prior studies have shown that student displacement or migration are common reactions to violent crime (Velásquez, 2014; (Brown, 2014)). We show that our empirical findings are robust to the presence of selective migration. Our results also suggest that teacher turnover and tardiness, student and teacher absenteeism, and students frequently leaving school days early are channels linking the negative effects of drug-related turf war persistence on academic achievement. The analysis of heterogeneous effects shows that schools located in poor urban settings experience the largest negative effects of drug-related wars on academic achievement. Finally, we found a stronger effect of drug-related violence on academic achievement for lower secondary schools with increased presence of street gangs nearby.

The paper is structured as follows. The next section of this paper reviews the literature on the effect of crime on educational outcomes. Section 2 provides a background on the Mexican experience of violent drug-related turf wars. Section 3 describes the data used in the empirical work and presents descriptive statistics of the analytical sample. Section 4 provides a description of the statistical models and the identification strategy. Section 5 presents the results. Section 6 discusses robustness checks. Section 7 concludes.

2. Background

Violence in Mexico has exploded in recent years as a result of structural changes in the drug trafficking business and government strategies to combat Drug Trafficking Organizations (DTOs) (Robles et al., 2013). More than 60,000 murders took place between 2007 and 2012, when violence increased almost threefold, and thousands have disappeared or being displaced. Most of these deaths, according to the government's classification of homicides during the Felipe Calderon administration (2006–2012), resulted from confrontations between DTOs (denoted as executions in Fig. 1).

With the escalation of murders related to drug trafficking over the past seven years, crime-related violence has become a rising threat to schools, teachers and students. Schools temporally close because of gun shootings (Malkin, 2011). After receiving several extortion demands from drug trafficking organizations, teachers in the state of Guerrero went on strike demanding federal and state governments to provide additional security efforts at school level (México, 2011). Even if students and educators do not experience crime on first-hand, the fear of crime is an increasing concern across the country. According to the National Survey on Victimization and Public Security Perception, 28% of the population reported feeling unsafe in the surroundings of schools in 2012.

Three main factors explain the escalation of drug-related violence in Mexico. First, the successful strategies from the United States and Colombia governments to cut down cocaine production and distribution in the Caribbean. The Colombian government succeeded in destabilizing cocaine distribution by switching from a strategy that emphasized drug eradication and aerial spraying to one that focused on seizures of drug exports. Castillo, Mejia and Restrepo (2012) argue that this major change in Colombian anti-drug strategy raised cocaine prices and consequently increased the incentives for Mexican drug cartels to fight each other. The Colombian drug-trafficking organizations turned to Mexican allies for the cocaine business. The drug business in Mexico became more profitable as Mexican cartels inherited a monopoly of trafficking routes to the United States.

Second, a debilitated Mexican judicial system combined with networks of corruption among cartels, local police forces, government officials, and military personnel, facilitate the operation of drug-business enterprises, while simultaneously draining any efforts to punish organized crime (Morris, 2012). Third, and probably the most influential explanation of the spike of killings after 2006, relates to the efforts of President's Calderón administration to hunt drug cartels' top leadership by relying on the army and the navy to fight a war against organized crime. Felipe Calderon's major security strategy was to send military security forces to many parts of the country to disrupt cartel leadership structures, which contributed to fragment criminal organizations (Calderón et al., 2015). With the fractionalization of organized crime groups, smaller, less structured, and more aggressive criminal cells resulted in much more chaotic and unpredictable patterns of violence (Shirk, 2010).

Young men have been by large the primary victims and perpetrators of Mexico's recent violence epidemic. Importantly, adolescent boys face a sharp increase in the probability of being murdered after they turn 15, and the risks increase until they reach 34 years, the peak of victimization age for men. Homicide in Mexico has become the second leading cause of death for males aged 15–24. In areas with few job opportunities and where the distribution and consumption of drugs have grown fast, minors are at higher risk to be involved with either street gangs or DTOs. Street gangs engage in less profitable criminal activities than DTOs, since the former are larger, more powerful and more sophisticated criminal groups (Jones, 2013). In some states, DTOs control local street gangs. Minors living in poor and socially excluded communities (many who also belong to street gangs) are at risk of becoming cheap labor for DTOs. They are generally recruited to work as lookouts, drug dealers, sicarios (hitmen), and mules (Mosso and Torres, 2013). The number of minors involved in the drug-related business spiked significantly in recent years. According to the U.S. Immigration and Customs Enforcement, just along the Tijuana-San Diego border, the number of youths aged 14–18 arrested trying to cross the border to sell drugs grew from 19 in 2008, to 165, 190 and 190 in 2009, 2010 and 2011, respectively (Cossio, 2012).

As mentioned before, we distinguish drug-related conflicts or turf wars in Mexico from ordinary homicides. Drug-related violence is characterized by sporadic spikes of bloody events. The onset, intensity and persistence of outbreaks are quite unforeseeable by regular citizens. Violence is mainly targeted to criminal groups, and triggered by motives such as cartel fights for the control of drug trafficking routes and markets, conflicts with authorities, competition for leadership and betrayals within criminal organizations. Although most of drug-related violence is concentrated in certain states of Mexico, it has spread to several regions of the country. Fig. 2 shows the share of the population affected by a turf war by municipality in 2007 and 2011. The darker red areas reflect the highest proportion of population in a municipality affected by turf wars.

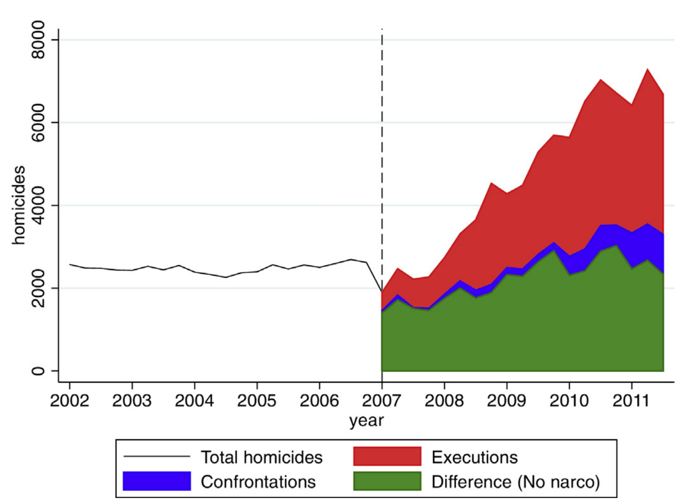

Fig. 1. Total homicides in Mexico, 2003–2010
Robles et al. (2013).

3. Data

Information on firearm-related murders by locality and year are gathered from death certificates available from the National Health

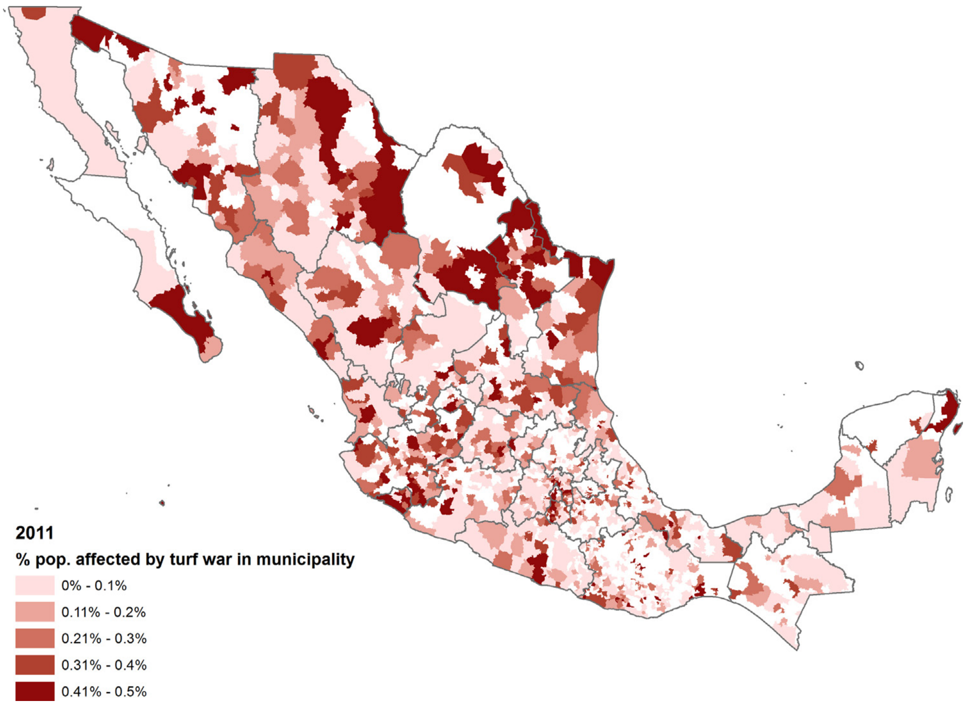

Fig. 2. Local turf wars in terms of the proportion of the population affected by municipality.
Authors calculation with INEGI data, several years.

Information System (SINAIS, by its Spanish acronym). We define drug-related turf war exposure when in at least one month during the academic year, the monthly number of firearm-related homicides in a locality surpasses a threshold of two standard deviations above its moving average of the previous four years. In addition to exposure, we explore turf war persistence, a continuous variable measuring the cumulative number of months within an academic year in which the number of homicides in the locality exceeded the threshold of two standard deviations above its moving average of the previous four years.

Fig. 3 describes the variations of drug-related turf war exposure observed between 2006 and 2011 in selected urban localities. We plot the trend of monthly firearm homicides over the period of 2006 and 2011 (black dashed line), the historic mean or moving average of the previous four years (black line) and the moving average plus two standard deviations (grey area).

According to our definition of turf war exposure, the locality of Acapulco experienced turf wars in 2006, 2008, 2009, 2010 and 2011. Turf wars erupted in 2008 in Cuernavaca, Guadalajara, and Ciudad Juárez. Turf wars in Reynosa and Tijuana started by 2009. By 2011, Juarez, Reynosa, Tijuana, Cuernavaca and Guadalajara no longer were suffering turf wars.

Further, in Fig. 4 we observe that trends of drug-related turf war exposure also vary by locality's size. Between 2006 and 2011, the period of analysis, a higher proportion of urban localities (dot-dash line) were affected by drug-related turf war exposure compared to semi-urban (dash line) and rural localities (dot line).

To measure school outcomes we use the National Assessment of Academic Achievement in Schools test (ENLACE, by its Spanish acronym). ENLACE tests for mathematics and literacy are collected by the Ministry of Education in Mexico at the end of the academic year. ENLACE test scores are publicly available and reported as the

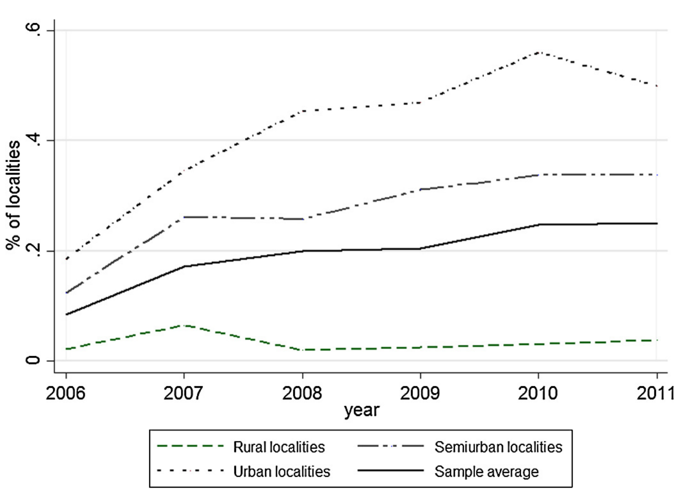

Fig. 3. Firearm homicides in several urban localities, 2006–2011.
Authors calculation with INEGI data, several years.

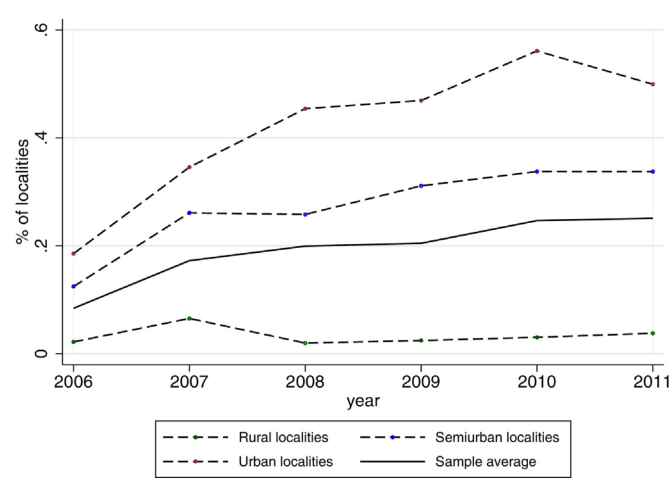

Fig. 4. Percentage of localities exposed at least one turf war during the school year, 2006–2011.
Authors calculation with INEGI data, several years.

Table 1
Student, teacher and schools characteristics, by drug war exposure in 2011.

Variable	Schools in localities exposed to drug wars			Schools in localities not exposed to drug wars			*P*-value
	Obs.	Mean	SD	Obs.	Mean	SD	
School-level outcomes							
Student math scores	20,457	542.5	64.9	79,724	520.3	75.4	0.00
Student absenteeism (%)	20,928	44.0	49.6	85,683	33.3	47.1	0.00
Students arrive at school late (%)	20,941	52.9	49.9	85,253	11.9	32.4	0.00
Teacher arrive at school late, (%)	20,925	41.2	49.2	85,419	29.1	45.4	0.00
Teacher absenteeism (%)	20,923	20.8	40.6	85,357	13.2	33.9	0.00
Shorter class time (%)	20,941	52.9	49.9	85,676	41.8	49.3	0.00
School-level characteristics							
Public school (%)	21,731	79.8	40.1	90,364	94.1	23.6	0.00
Primary schools (%)	27,998	73.1	45	89,799	75.9	40.0	0.00
Lower secondary schools (%)	21,625	26.9	44.4	89,799	24.1	42.8	
School size	19,187	269.5	197.1	82,377	139.1	160.7	0.00
Student teacher ratio	24,545	26.8	10.4	67,494	25.6	11.9	0.00
Youth gangs near schools (%)	27,067	51.6	50.0	79,358	23.5	42.4	0.00
Locality-level characteristics							
Locality size (%)							
Rural (<= 2,500 pop.)	16,929	10.7	30.9	70,638	69.6	46.0	0.00
Semi-urban (2,500 - 100,000 pop.)	16,929	27.8	44.8	70,638	18.7	39.0	
Urban (>100,000 pop.)	16,929	61.5	48.7	70,638	11.7	32.1	
Poverty Index (quartiles)							
1st quartile	27,012	57.1	49.0	73,430	13.7	34.3	0.00
2nd quartile	27,012	34.1	47.0	73,430	22.3	22.2	
3rd quartile	27,012	5.6	23.0	73,430	32.6	32.6	
4th quartile (very poor)	27,012	2.57	15.0	73,430	31.4	31.4	

standardized average mean score at the school level. Since 2006, ENLACE is administered to all students in third through sixth grades (elementary education level), and in seventh through ninth grade (lower secondary education level) at the end of the school year.

We also analyze school-principal reported teacher and student behavior, all gathered from survey questionnaires when ENLACE assessments were implemented in school sites. We linked ENLACE data to the Ministry of Education's nationwide school administrative records (named formato 911) to obtain annual information on school size (the total number of students enrolled by school), and number of teachers and employees working at each school every year.

Table 1 shows school-level averages on math test scores and percentage of schools where principals reported student and teacher absenteeism and tardiness, and students' frequent propensity to leave school early as frequent and very frequent issues within the school academic year. We compare schools in localities exposed to drug-related turf wars and those that did not experienced drug-related turf wars. Our data suggests that exposure to local drug-related turf wars within the school year is associated with more frequent absenteeism, tardiness and students' frequently leaving school early. For instance, in localities exposed to at least one drug-related turf war during the 2011 academic year, 44% and 52.9% of school principals reported more frequent student absenteeism and student tardiness, respectively, compared to 33.3% and 32.4% in localities not exposed to drug-related turf wars.

Further, both teacher absenteeism and tardiness are more common in schools exposed to drug-related turf wars, 20.8% and 41.2% respectively, in comparison with schools not exposed to drug-related turf wars, 3.2% and 29.1% correspondingly. Finally, students' frequently leaving school early happen more often in schools exposed to local drug-related turf wars, 52.9% of school principals mentioned this is a frequent situation, compared to 41.8% of schools not exposed to local drug-related turf wars in 2011.

The relationship between drug-related turf wars and math scores is less clear. School-average math scores is higher in localities exposed to drug-related turf wars. Nevertheless this positive relationship is contaminated by confounding factors, such as degree of urbanization. Table 1 also shows that a larger proportion of schools exposed to drug-related turf wars are located in urban areas (61.5%) in comparison to semi-urban localities (27.8%) and rural areas (10.7%). Finally, in localities that observed turf wars in the period of study, a higher percentage of school principals reported the presence of youth gangs in the vicinity of schools (51.6% vs. 23.5%).

4. Empirical strategy

Confounding and non-random selection of students and school personnel across violent and non-violent geographic locations limits the ability to uncover the causal effect of drug-related turf wars on education outcomes. High concentrations of criminal violence are more likely to happen in under-resourced localities. Further, low-achieving schools are also, on average, more likely to be located in communities with weak political institutions and low-quality social and economic resources. Since both locality of residence and student academic achievement are strongly correlated with community-level and family-level social and economic resources, it is possible that the observed test score difference between schools in violent and non-violent localities is influenced by unobserved characteristics.

Our panel data provides multiple observations for each school over time. Thus, we rely on school fixed-effects models to estimate the impact of drug-related turf wars on math test scores. Under this approach, since schools are essentially compared to themselves over the period of 2006 and 2011, we eliminate selection bias from any time-invariant observed or unobserved differences across schools. The empirical model is the following:

$$Y_{ilt} = \beta_1 W_{lt} + \beta_2 X_{ilt} + \delta_i + \pi_t + \epsilon_{ilt} \quad (1)$$

In Eq. (1), Y_{ilt} represents the average math test score at school level for school i situated in locality l during the academic year t. W_{lt} indicates one of the two measures of drug-related war indicators used in the analysis. The first is an indicator of drug-related turf war exposure, equal one if the school is situated in a locality where at least one drug-related turf war occurred during the academic year. We also test drug-related turf war persistence, defined as the cumulative number of months of drug-related turf war during the academic year. Xit is the vector of control variables at school level and locality level, including school size (in terms of the number of students), student–teacher ratio, and locality's population size. Finally, δ_i and π_t are the school fixed effects and academic-year fixed effects, respectively.

To explore potential mechanisms driving the impact of violence on test scores we estimate the following equation:

$$Z_{ilt} = \beta_1 Y_{ilt-1} + \beta_2 W_{lt} + \beta_3 X_{ilt} + \delta_i + \pi_t + \epsilon_{ilt} \quad (2)$$

where Z_{ilt} is a variable indicating a specific mechanism for school i in a given locality l, during the school year t, which varies at school-level and across time. Other control variables are the same as those included in Eq. (1). Additionally, we control for lagged school-level achievement test scores. In both regression models errors are clustered at locality-level.

5. Regression results

5.1. The impact of drug-related turf wars on math test scores

We find consistent evidence that criminal violence has a negative impact on math test scores (see Table 2). This finding is robust to the addition of school-fixed effects, time-fixed effects, and time-variant covariates at locality and school levels. For comparison purposes, we compare our approach with a more standard way to model criminal violence using murder rates. Column 1 illustrates the linear effect of local homicide rates is significantly different from zero but very small. Suggesting that the marginal effect of violence is significantly smaller than the effect of drug-related turf war exposure. Column 2 indicates that drug-related turf war exposure reduces math test scores by −2.32 points of a standard deviation. Further, intensity of drug-related violence is associated with a reduction of −1.3 points of a standard deviation in school-average math test scores (column 3).

To understand the magnitude of the estimates of turf war, we make a comparison of the drug-related war effect with the impact of poverty on school-level achievement test scores. Using the same sample of schools, we run an OLS model to estimate the association between poverty and math test scores. We estimated that schools in poor localities have lower math test scores, −24 points of a standard deviation, compared to school in non-poor localities (results are provided upon request). On the other hand, the effect of six months of violence is 12.84. Hence, the estimated impact of six months of violence is equivalent to a half of the drop in test scores associated with poverty. On average, localities where turf wars occurred experienced six months of violence during 2011, which was the most violence year in the period of analysis.

Table 2
The impact of drug-related turf wars on math test scores, 2006–2011.

	(1)	(2)	(3)
Firearm-related homicide rate	−0.0446** (0.021)		
Turf war exposure		−2.321** (0.717)	
Months of turf war exposure			−1.317*** (0.365)
Observations	326,583	326,583	326,583
Schools	59,465	59,465	59,465
School-fixed effects	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes
Adjusted R^2	0.109	0.101	0.109

Note: standard errors (clustered at the locality level) are reported in parentheses. We use panel data at school level from 2006 to 2011. The outcome variable is the school average of the national standardized test ENLACE for math, collected at the end of the school year. We explore three measures of drug-related violence: (1) continuous measure of firearm murder rates at the locality level; (2) turf war exposure when the annual change in the monthly number of homicides in the locality surpasses a threshold of two standard deviations above its moving average of the previous four years; (3) turf war persistence or duration as the number of months of turf war exposure, as previously defined. The time-variant controls are school size (as the number of students enrolled), student–teacher ratio, and population size at the locality level.

5.2. Evidence on mechanisms

Criminal violence also affects other student and school variables that influence academic achievement. The first three columns of Table 3 illustrate the impact of exposure to high-intensity violent crime on teacher turnover, absenteeism and tardiness. We report exponentiated coefficients. Column 1 shows that drug-related turf war exposure during the school year is related to an annual decrease of the teaching staff of 7.5%. Column 2 and 3 suggest that drug-related turf war exposure is not associated to teacher absenteeism, however, teacher tardiness is significantly affected by drug-related turf war exposure. Further, columns 4–6 show that drug-related turf war persistence is strongly associated with a reduction of 11.9% in the within-school annual growth of the teaching staff. We also found that one month of violent crime exposure increases the odds of frequent teachers absenteeism and frequent teacher tardiness. These estimates can

Table 3
Effects of turf war exposure and months of turf wars on teacher behavior outcomes, 2006–2011.

Empirical model	OLS	Logit	Logit
	Staff growth	Teacher absenteeism	Teacher tardiness
	(1)	(2)	(3)
Turf war exposure	−0.0750** (0.137)	1.019 (0.0222)	1.04*** (−0.0179)
Observations	351,516	78,710	134,827
Schools	74,992	26,054	15,625
School-fixed effects	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes
Adjusted R^2	0.0152	0.0060	0.0047
Months of turf war	−0.119* (−0.006)	1.0123* (0.008)	1.0145*** (0.005)
Observations	351,516	78,710	134,827
Schools	74,992	26,054	15,625
School-fixed effects	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes
Adjusted R^2	0.0152	0.0060	0.0048

Note: We report exponentiated coefficients. Standard errors (clustered at the locality level) are reported in parentheses. We use panel data at school level from 2006 to 2011. Staff growth refers to the annual percentage growth rates of teaching staff. We explore two measures of drug-related violence: (1) Turf war exposure when the annual change in the monthly number of homicides in the locality surpasses a threshold of two standard deviations above its moving average of the previous four years; (2) turf war persistence or duration as the number of months of turf war exposure, as previously defined. The time-variant controls are school size (as the number of students enrolled), student–teacher ratio, and population size at the locality level.

Table 4
Effects of turf war exposure and months of turf wars on student behavior outcomes, 2006–2011.

Empirical model	Logit Student absenteeism (1)	Logit Student tardiness (2)	Logit Leave school days early (3)
Turf war exposure	1.0369**	1.039**	1.018
	(0.0166)	(0.0166)	(0.0228)
Observations	202,794	191,723	85,236
Schools	74,992	38,579	15,625
School-fixed effects	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes
Adjusted R^2	0.0152	0.0039	0.0062
Months of turf war	1.004	1.001	1.0124*
	(0.0048)	(0.0046)	(0.0069)
Observations	202,794	191,723	85,236
Schools	74,992	38,579	15,625
School-fixed effects	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes
Adjusted R^2	0.0152	0.0039	0.0062

Note: We report exponentiated coefficients. Standard errors (clustered at the locality level) are reported in parentheses. We use panel data at school level from 2006 to 2011. Staff growth refers to the annual percentage growth rates of teaching staff. We explore two measures of drug-related violence: (1) turf war exposure when the annual change in the monthly number of homicides in the locality surpasses a threshold of two standard deviations above its moving average of the previous four years; (2) turf war persistence or duration as the number of months of turf war exposure, as previously defined. The time-variant controls are school size (as the number of students enrolled), student–teacher ratio, and population size at the locality level.

be seen as lower bounds effects since principals in Mexican schools tend to consistently under-report information on student and teacher issues.

With respect to demand-side mechanisms, results presented in Table 4 suggest that the impact of turf war exposure increases the odds of frequent student absenteeism (column 1) and frequent student tardiness to schools (column 2). Turf war persistence is not a significant predictor of student absenteeism and student tardiness (column 4 and 5, correspondingly). However, it is associated with students' frequently leaving school early. One month of turf war is associated with 1.24% higher odds of observing students leaving school early (column 6).

5.3. The heterogeneous effects of drug-related turf wars

Estimations of the impact of violence on academic achievement shown in Table 3 assume a constant average treatment effect across the distribution of our sample of schools. In this section we uncover heterogeneous effects of criminal violence on academic performance by degree of urbanization, poverty status, and education level. To examine heterogeneous treatment effects we include in our models interactions between the group and each drug-related turf war indicator and group dummies.

The first column of Table 5 illustrates the interaction effects between our measure of turf war exposure and localities' degree of urbanization. We observe that the negative impact of drug-related turf war exposure on academic test scores is more pervasive in urban localities than in rural ones. Note that the magnitude in the interaction effect of drug-related turf war exposure and semi-urban locality is positive but not statistically significant, which indicates that there is no evidence that violent crime affects more semi-large localities compared to rural ones. Column two shows the triple interaction of turf war exposure, urbanization and poverty status. The negative effect of drug-related turf war exposure is larger in urban localities compared to rural localities. Further, the triple interaction term suggests that drug-related turf wars negatively affect school performance more sharply in urban localities than in poor localities.

For drug-related turf war persistence, both interaction terms in columns 3 and 4 are statistically significant. These results indicate that the negative effect of one month of drug-related turf war exposure is larger for semi-urban and urban localities compared to rural ones (column 3). The effect of an additional month of a turf war exposure is larger in poor and rural localities compared to non-poor rural localities. Finally, the negative estimate for the triple interaction between urban locality, poverty status, and persistence of drug-related turf war suggests that urban and poor localities are the most affected by drug-related turf wars.

Why violent conflict has a stronger negative impact on academic performance in poor urban compared to poor rural localities? Part of the explanations lies in fact that poverty in urban versus rural settings differs in fundamental ways (Fay, 2005). Violence-related problems such as exposure to organized crime, narco-traffic, and gang violence are more prevalent in poor urban areas. Evidence from Mexico suggests that, compared to rural localities, families in violent and poor urban neighborhoods are more likely to be subject of extortion by drug trafficking organizations (Díaz-Cayceros et al., 2014). Additionally, compared to poor rural areas, poor urban zones in Latin American cities are characterized by weaker family ties, a more diverse population, and higher population density (Fay, 2005). This which implies greater social risk in child-rearing strategies and other behaviors that affect their educational achievements (Fay et al., 2005). For example, Table 6 shows that exposure to crime in urban localities (compared to rural ones) is related to relative higher odds of student absenteeism and more students' frequent propensity to leave school days early.

A second possibility is that the urban–rural differential effect of violence is driven by school factors. If drug-related turf war effects are more pervasive in urban localities relative to rural ones, we would expect schools in urban settings (vs. rural ones) to experience a larger increase of teacher absenteeism or tardiness associated to drug-violence. Nevertheless, we did not find more frequent teacher absenteeism or tardiness associated to drug-violence in urban localities compared to rural ones.

Finally, heterogeneous effects of drug-related turf war exposure could be driven by differential migration patterns of students across rural and urban areas. If the students who migrate out of larger urban areas were among the wealthiest compared to those that migrate out of rural communities, then our estimated coefficients would be overestimating the effects of turf wars on academic achievement in urban areas. In the following section we explore whether migration poses a significant threat to the validity of our results.

Table 7 presents the estimated coefficients of models that include interaction terms of education level (elementary vs secondary school) with degree of urbanization, poverty status, and drug-related turf war exposure. Column 1 indicates that the effect of violence is more pronounced at lower secondary than elementary schools. Column 2 and 3 suggest that the differential effects between lower secondary schools and elementary schools is even greater in poor localities vs. non-poor localities and in urban localities versus rural ones. Similar effects are found when looking at the differences of turf war persistence by level of education. Column 4 indicates that the within-school effect of one month of turf war exposure is more negative in secondary schools compared to elementary schools, and column 5 and 6 show that this differential effect is even more pervasive in poor and urban localities, versus non-poor and rural ones, respectively.

Table 5
Differential effects of drug-related turf wars and drug-related turf war persistence by degree of urbanization and poverty level.

	(1)	(2)	(3)	(4)
Turf war exposure	0.238	1.597		
	(0.77)	(1.00)		
Turf war*semi-urban	−0.646	−0.287		
	(0.98)	(1.48)		
Turf war*urban	−3.433**	6.849***		
	(1.62)	(2.62)		
Turf war*poor		−4.552***		
		(1.46)		
Turf war*poor*semi-urban		2.431		
		(1.94)		
Turf war*poor*urban		−7.695**		
		(3.15)		
Months of turf war			0.571	1.904**
			(0.65)	(0.90)
Months of turf war*semi-urban			−1.347*	−1.355
			(0.72)	(1.07)
Months of turf war*urban			−1.895**	6.271**
			(0.75)	(2.48)
Months of turf war*poor				−3.764***
				(1.22)
Months of turf war*poor*semi-urban				2.233
				(1.40)
Months of turf war*poor*urban				−5.727**
				(2.57)
Observations	324,940	322,714	324,940	324,940
Schools	59,463	59,125	59,125	59,463
School-fixed effects	Yes	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes	Yes
Locality and school controls?	Yes	Yes	Yes	Yes
Adjusted R^2	0.110	0.111	0.110	0.112

Note: We report exponentiated coefficients. Standard errors (clustered at the locality level) are reported in parentheses. We use panel data at school level from 2006 to 2011. Staff growth refers to the annual percentage growth rates of teaching staff. We explore two measures of drug-related violence: (1) turf war exposure when the annual change in the monthly number of homicides in the locality surpasses a threshold of two standard deviations above its moving average of the previous four years; (2) turf war persistence or duration as the number of months of turf war exposure, as previously defined. The time-variant controls are school size (as the number of students enrolled), student–teacher ratio, and population size at the locality level. Poverty status is defined as localities above the median point of the poverty index's distribution. Rural localities are all localities with an aggregated population lower than 2500; semi-urban localities have between 2500 and 100,000 residents; and urban localities have more than 100,000 inhabitants.

Why lower secondary schools are more affected by violence than students in elementary schools, particularly in poor communities? Community-level factors, such as poverty and violence, may operate differently across developmental stages (Aber et al., 1997). Students attending lower secondary school are in their early adolescence period. The salience of risk-taking behaviors and increase of peer interactions define this period, making more vulnerable of crime victimization or risky interactions. Adolescents living in poor and violent communities, face multiple stressors that contribute to lower academic performance (Jensen, 2009). We proceed to analyze if street gang presence near schools is a significant moderator of impact of criminal violence on academic achievement, particularly for lower secondary schools.

In Table 8, we explore to what extend gang presence near schools exacerbates the negative effect of drug-war on math test scores and student absenteeism. In column 1, the estimated interaction term between gang presence and lower secondary education schools indicates that, compared to elementary schools, lower secondary schools with gang presence nearby have lower math test scores. In column 2, the triple interaction effects suggests a greater negative effect of turf war exposure among lower secondary schools (vs. elementary schools) when there is gang presence in school surroundings (−5.433 of a standard deviation).

The results compellingly demonstrate that gang presence near schools exacerbate the negative impact of turf wars on student achievement; gang presence particularly affects kids in middle school. We can highlight various possible mechanisms explaining these results. First, Jarillo et al. (2016) demonstrate that school violence increases when students are members of gangs. Stress resulting from school violence might diminish attention spans, increase student absenteeism and tardiness and impair academic performance (Hoffman, 1996; Jensen, 2009). A violent environment inside the classroom likely hinders student learning due to factors such as fear, psychological stress, and physical harm. A hostile and violent environment among students might create ongoing feelings of concern about safety and incentives self-destruction and reckless behaviors among students. Second, more students will likely be drawn into negative peer networks when gangs are present near school. The pressure to join gangs might come from intimidation, coercion, dare, or the search for solidarity and friendship. Potential recruits more likely come from middle school boys who are more likely to be drawn to the gang lifestyle. This might explain why we find that turf wars have more negative effects on middle schools that have gangs nearby relative to elementary schools. Lastly, since drug cartels often try to recruit gangs to sell drugs or to serve as informants or as hitmen, drug-related violence is likely to be more intensely concentrated around poor urban neighborhoods with strong gang presence. Our results support prior research indicating students' worry over safety and their exposure to community violence contribute to lower academic performance (Pratt et al., 1997; Schwartz and Gorman, 2003).

6. Robustness checks

In this section, we present a series of robustness checks that address several possible threats to our assumptions and identification strategy. First, we use peaks in firearm homicides to model

Table 6
Effects of drug-related turf war exposure on student behavior by degree of urbanization, 2006–2011.

	(1) Student Absenteeism	(2) Student Tardiness	(3) Students Leave school early
Turf war exposure	0.963	1.052	0.895*
	(0.047)	(0.048)	(0.054)
Turf war *semi-urban	1.067	0.955	1.178**
	(0.061)	(0.053)	(0.087)
Drug war *urban	1.101*	1.0161	1.1859**
	(0.061)	(0.054)	(0.087)
Observations	143,597	159,014	81,245
School-fixed effects	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes
Time-variant controls?	Yes	Yes	Yes

Note: We report exponentiated coefficients. Standard errors (clustered at the locality level) are reported in parentheses. We use panel data at school level from 2006 to 2011. Staff growth refers to the annual percentage growth rates of teaching staff. We explore two measures of drug-related violence: (1) turf war exposure when the annual change in the monthly number of homicides in the locality surpasses a threshold of two standard deviations above its moving average of the previous four years; (2) turf war persistence or duration as the number of months of turf war exposure, as previously defined. The time-variant controls are school size (as the number of students enrolled), student–teacher ratio, and population size at the locality level. Poverty status is defined as localities above the median point of the poverty index's distribution. Rural localities are all localities with an aggregated population lower than 2500; semi-urban localities have between 2500 and 100,000 residents; and urban localities have more than 100,000 inhabitants.

drug-related turf wars. Our assumption is that firearm homicides are a reasonable proxy for homicides linked to organized crime. Nevertheless, it can be argued that such measure underestimates the effect of drug-related violence because it is not taking into account other murders allegedly linked to organized crime, such as homicides caused by torture. To test this claim we construct an alternative measure of drug-related turf wars using homicides of males in the 15–39 age group. The latter was found to be a good indicator of drug-related violence (Calderón et al., 2015). We found that our estimated coefficients retain their significance and magnitude, with the new estimates all lying in the 95% confidence intervals of our original results. Results are not shown here, but they are available upon request.

Second, potential selective migration could bias the estimated impact of violent crime on student achievement. Since our empirical strategy relies on school fixed effects models, it can be questioned when non-random sorting of students across localities is affected by violent crime exposure or if there is a high correlation between violent crime exposure and other time-variant unobservable variables influencing student academic achievement. For example, wealthier students are more likely to migrate as a result or anticipation of an escalation of crime. Systematic migration could lead to a non-random sample (Velásquez, 2014). In our case, the presence of systematic migration associated with local drug-related turf wars could bias the estimates of interest.

To explore whether systematic student migration could be associated with local drug-related turf war exposure, we model the school's average annual growth of student enrollment, our proxy for student migration, as a function of drug-related violence and

Table 7
Differential effects of drug-related turf wars by educational level. Outcome variable: math test scores.

	(1)	(2)	(3)	(4)
Turf war exposure	0.238	1.597		
	(0.77)	(1.00)		
Turf war*semi-urban	−0.646	−0.287		
	(0.98)	(1.48)		
Turf war*urban	−3.433**	6.849***		
	(1.62)	(2.62)		
Turf war*poor		−4.552***		
		(1.46)		
Turf war*poor*semi-urban		2.431		
		(1.94)		
Turf war*poor*urban		−7.695**		
		(3.15)		
Months of turf war			0.571	1.904**
			(0.65)	(0.90)
Months of turf war*semi-urban			−1.347*	−1.355
			(0.72)	(1.07)
Months of turf war*urban			−1.895**	6.271**
			(0.75)	(2.48)
Months of turf war*poor				−3.764***
				(1.22)
Months of turf war*poor*semi-urban				2.233
				(1.40)
Months of turf war*poor*urban				−5.727**
				(2.57)
Observations	324,940	322,714	324,940	324,940
Schools	59,463	59,125	59,125	59,463
School-fixed effects	Yes	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes	Yes
Locality and school controls?	Yes	Yes	Yes	Yes
Adj. R^2	0.110	0.111	0.110	0.112

Note: We report exponentiated coefficients. Standard errors (clustered at the locality level) are reported in parentheses. We use panel data at school level from 2006 to 2011. Staff growth refers to the annual percentage growth rates of teaching staff. We explore two measures of drug-related violence: (1) turf war exposure when the annual change in the monthly number of homicides in the locality surpasses a threshold of two standard deviations above its moving average of the previous four years; (2) turf war persistence or duration as the number of months of turf war exposure, as previously defined. The time-variant controls are school size (as the number of students enrolled), student–teacher ratio, and population size at the locality level. Poverty status is defined as localities above the median point of the poverty index's distribution. Rural localities are all localities with an aggregated population lower than 2500; semi-urban localities have between 2500 and 100,000 residents; and urban localities have more than 100,000 inhabitants.

Table 8
Differential effects of drug-related turf wars by gang presence and education level.

	(1) Math Test scores	(2) Math Test scores	(3) Student Absenteeism	(4) Student Absenteeism
Turf war exposure	−1.364*	−0.658	1.017	1.0338
	(0.821)	(0.680)	(0.024)	(0.028)
Gangs	−0.0514	−0.0534	1.602	1.60234***
	(0.433)	(0.430)	(0.030)	(0.030)
Turf war exposure*gangs	−1.534**	−0.255	1.021	0.996
	(0.771)	(0.688)	(0.032)	(0.035)
Turf war exposure*lower sec.		−2.711		.93308
		(1.805)		(.049327)
Turf war exposure*gangs*lower sec.		−6.485***		1.1288*
		(1.267)		(.07999)
School-fixed effects	Yes	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes	Yes
Time-variant controls?	Yes	Yes	Yes	Yes
Observations	199,470	199,470	148,061	148,061

Note: standard errors in parenthesis.

school-level math test scores from the prior school year. We also control for school fixed effects. This model allows us to analyze whether changing attendance patterns of student enrollment are associated with changes of violence dynamics at the locality level. To test the hypothesis that high performing students are more likely to migrate for crime related-reasons, we include in the model an interaction between drug-related violence and each quintile of school-level math test scores, as measured in 2006.

Columns 1 and 2 in Table 9 show the estimated effects of war exposure, before and after including the interaction terms with score quintiles. We find that exposure to drug-related turf wars during the academic year reduces the annual growth of student enrollment. Furthermore, the interaction terms between drug-related turf war exposure and quintiles of school-mean scores suggest that a decline in student population enrollment associated with violent crime war exposure is in fact significantly larger among schools at the highest level of math test scores.

A similar effect is shown in columns 3 and 4, when we use months of drug-related turf war exposure as a proxy of violence persistence. We found that one month of exposure to drug-related turf war during the academic year reduces the annual growth of student enrollment by 14%. Further, the decline in student population growth associated with one month of drug-related turf war exposure is higher in high-quality schools versus lower-quality schools. Hence, we conclude that violent crime triggers systematic non-random student migration that could bias the estimates of drug-related turf war exposure on academic achievement.

To test the robustness of our estimated effects of criminal violence on academic achievement accounting for migration due to drug-related turf war exposure, we rerun our estimations restricting the sample to schools that did not experienced student migration. In particular, we restricted our sample to those schools that did not observe an annual decrease of student enrollment. In Table 10, we compare the estimated effects of drug-related turf wars on the full sample (Panel A); on the subsample of schools that experience high student migration during 2007–2011 (Panel B); and on the subsample of schools that experience low student

Table 9
Effects of turf war exposure and months of turf war on school size growth. Outcome: annual change in student enrollment, 2006–2011.

	(1)	(2)	(3)	(4)
Turf war exposure	−0.264*	−0.0119		
	(0.160)	(0.163)		
Turf war exposure*2nd math q		−0.247		
		(0.250)		
Turf war exposure*3rd math q		−0.119		
		(0.203)		
Turf war exposure*4th math q		−0.199		
		(0.252)		
Turf war exposure*5th math q		−0.827***		
		(0.234)		
Months of turf war			−0.140**	−0.151**
			(0.060)	(0.060)
Months of turf war*2nd math q				−0.0838
				(0.125)
Months of turf war*3rd math q				−0.0465
				(0.092)
Months of turf war*4th math q				−0.0889
				(0.102)
Months of turf war*5th math q				−0.313***
				(0.075)
School fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
No. of obs.	270,852	270,852	270,852	270,852
No. of schools	59,119	59,119	59,119	59,119
Adj. R^2	0.0159	0.0160	0.0160	0.0161

Table 10
Effects of turf war on math test scores, sensitive analysis by subsamples defined according to low/high student migration.

	(1)	(2)
Panel A: Original estimates, full sample		
Drug war exposure	−2.321***	
	(0.717)	
Months of drug war exposure		−1.317***
		(0.365)
Observations	326,583	326,583
Adjusted R^2	0.109	0.109
Panel B: Sample of schools with high student migration		
Drug war exposure	−2.579 ***	
	(0.776)	
Months of drug war		−1.316***
		(0.309)
Observations	189,590	189,590
Adjusted R^2	0.107	0.101
Panel C: Sample of schools with low student migration		
Drug war exposure	−1.196***	
	(0.610)	
Months of drug war		−.853***
		(0.307)
Observations	261,531	261,531
Adjusted R^2	0.0908	0.1113
School-fixed effects	Yes	Yes
Time-fixed effects	Yes	Yes
Locality and school controls?	Yes	Yes

Note: standard errors in parenthesis.

migration (Panel C). We present estimated coefficients for both drug-related turf war exposure (column 1) and turf war persistence (column 2). We found stable and significant estimates in the subsample of schools that experience low student migration, suggesting that migration does not pose a significant threat to the validity of the results. The magnitude of the negative effect of drug-related turf war is slightly higher for the sub-sample of schools that did experience student migration, indicating that children who migrate out of violent localities have better educational opportunities.

7. Conclusions

Drug-related turf wars have escalated in Mexico in recent years, affecting the lives of thousands who suffer abuse as victims, witnesses, and perpetrators. Drug-related violence has been shown to have negative consequences for economic development, hindering investment, job creation, and economic performance (Robles et al., 2013; Dell, 2015). What has been less obvious is the even greater cost due to the long-term consequences of such experiences on school children. This paper contributes to the existing literature by systematically exploring how drug-related turf wars in Mexico have impacted achievement among elementary and lower secondary level school students.

Based on five annual waves of school-level data at elementary and lower secondary levels, we estimated the impact of drug-related turf war exposure and persistence on math test scores and principal-reported measures of students and teachers behavior. We find robust evidence that exposure to and persistence of drug-related turf wars in Mexico negatively impact academic achievement in a national sample of elementary and lower secondary schools. Exposure to bloody battles among drug trafficking cartels may substantially alter the context in which localities operate, affecting the behavior of both students and teachers, leading to diminished academic performance. Victimization and fear of crime hinders the supply of education. Our analysis suggests that violent crime persistence increases teacher turnover, teacher absenteeism, and teacher tardiness. On the other hand, crime might also change students' opportunity cost of education and its expected returns. Persistence of violence is also associated with increased student absenteeism and students' frequently leaving school early.

The analysis of heterogeneous effects demonstrates that schools located in large-urban settings experience the largest negative effects of drug-related turf wars on academic achievement. This is partially explained by higher teacher and student absenteeism associated with criminal violence in more urban places. Further, we also found that secondary schools are significantly more affected from drug-related turf wars compared to elementary schools. One potential explanation for these differential effects by education level relates to developmental differences between low-secondary students compare to younger ones. Adolescents become more vulnerable to crime victimization inside and outside schools.

Furthermore, we demonstrated greater negative effects of criminal violence in lower secondary schools with frequent street gang presence in their surroundings. We highlight various possible mechanisms explaining these results, including higher incidence of violence inside the classroom when students are associated with gangs, the fact that more students are likely drawn into the world of criminality when gangs are present, and probable higher incidence of student recruitment into drug cartels when gangs are present. A violent environment inside the classroom likely hinders student learning due to factors such as fear, psychological stress, and physical harm. Moreover, the presence of gangs likely changes the opportunity costs for students to invest in their education relative to a lifestyle of criminality.

These results provide evidence of the substantial impact of criminal violence on educational quality, as measured by academic achievement. It is therefore imperative a policy agenda aimed at attending these negative consequences of drug-related violence on schools. Government policy should include school or community-based strategies to insure the safety of school personnel and students. Moreover, school-based programs must contemplate additional days of instruction to compensate for instructional time lost during the academic year. Efforts should particularly target marginalized localities in urban areas. It is very important for school affected by street gangs to collaborate with government officials, civil society organizations and other members in the community to assess the extent of gang involvement in criminal activity so that interventions and resources can be directed toward efforts to prevent and attend youth violence and victimization. Finally, schools and communities must invest in programs to mitigate mental stress, fear, trauma and physical harm among children in school.

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