Exposure to Violence and Youth Employment
Evidence from Mexico's Wars on Drugs

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Extended Abstract

When President Calderon declared the War on Drugs in December 2006, Mexico's society was stormed by a striking increase in criminal violence related to drug cartel activities. Up to that moment, in many regions of the country, cartels operated with impunity and the complicity of state and local government authorities; but when the *pax narca* was over, the Drug Trafficking Organizations got cornered in an all-out battle with the army and the federal police that quickly devolved into an in-fight between cartels for the distribution and territorial control of the main transit routes of drugs to the United States. As the conflict unfolded, the level of cruelty and bloodiness displayed by the criminal organizations deeply upset the social fabric of entire communities. More than ten years after Calderon's declaration, the epicenters, actors and even the war's dynamics changed, but the social decomposition steamed by the conflict still imposes long-lasting effects on family decisions.

In recent years, there has been a growing interest in the channels and effects of violence in Mexico, especially in how the exposure to homicides in low-intensity conflicts shifts people's behaviour. Many high quality papers have analyzed violence's main drivers (Rios, 2013; Osorio, 2015; Dell, 2015; Duran-Martinez, 2015; Sobrino, 2019), or have focused on household decisions like labor market choices (Robles et al., 2015), migration (Rios, 2014; Dell et al., 2019) or saving patterns (Torres-Garcia et al., 2019). However, although human capital accumulation in the long-run is a matter of interest (Murphy & Rossi, 2020), a comprehensive understanding of childhood and youth development under violent conditions remains a fertile field.

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Authors like Akresh & de Walque (2008), Shemyakina (2011), Rodríguez & Sánchez (2012), León (2012), and Di Maio & Nandi (2013) have found a substantial detrimental effect of the increase in violence on school attendance as well as on learning outcomes. Some possible channels discussed are related to students' environment like the destruction of infrastructure, others include changes in households' behavior, for example how much they value their children's education or how they react to a reduction in households' income. As a special case of a low-intensity conflict with a high homicide rate, the Mexican War on Drugs can offer more insight into this question. First, it differs from other conflicts as the surge in violence was not followed by a destruction of infrastructure. Second, there is a heated debate on the effect in some segments of the population, the impacts of cartel presence on poor households' income is still disputed, some papers argue that there are adverse results on labor market participation and unemployment (Robles, Calderón, & Magaloni, 2015), while others have found a decreasing marginalization rate in high-homicide municipalities (Murphy & Rossi, 2020). Third, as an enduring conflict, the cartel dynamic has evolved significantly. Robles, Calderón, & Magaloni (2015) have analyzed how the split of the Zetas, one of the most brutal and ruthless cartels in the country, from the Gulf Cartel in 2010, lead to a new surge in the violence as they contest the dominance and control of territories from other cartels. In our paper, we explore how long-term exposure to violence influences household decisions on minor's employment and education. As the incentives for children to stay in school and/or join the labor market change, high crime can have a strong and lasting effect.

The literature focusing on school-level outcomes has found an adverse effect of homicides on educational performance. Caudillo & Torche (2014) construct a panel of elementary schools between 1990 and 2010 to look at the effect of violence on grade failure. They use year-school-level analysis with fixed effects and find that in most of their specifications, higher homicide levels cause more grade repetition. In a complementary analysis, using a school-level panel between 2006 and 2012, Orraca Romano (2018) shows that although higher exposure to homicide has no effect on school attendance, it leads to higher grade repetition and worse outcomes for children. In a similar research paper, Jarillo et al. (2016) find a detrimental effect of high homicide rates on test scores in maths tests using school-level data between 2006 and 2011. A different approach is taken by Márquez-Padilla, Pérez-Arce, & Rodríguez-Castelán (2015) who use a municipality panel to look at the direct effect of exposure to homicides on educational enrollment, who find little to no effect of homicides on school attendance.

As the findings suggest an absence of effect on educational attendance, but a significant decrease in educational performance, at least at the beginning of the period, we believe that there is room for more research in the field. The new approach taken by this paper contributes to the literature in several aspects. First of all, to our knowledge, previous research has not been able to look at the longer term consequences of the War on Drugs in Mexico. As our period of interest is between 2011-2018, this allows us to analyze more deeply the time dynamics of the impact of violence. Second, although research in economics generally acknowledges the interrelated nature of household decisions about school attendance and labor market participation of young people, none of the papers focusing on the effects of high exposure to homicide extended their focus to look at employment and working hours of young people. Our dataset allows us to estimate these effects in a simultaneous way.

Data and Methodology

For data about school attendance, labor force participation and our main sociodemographic controls, we use a quarterly labor force survey, the ENOE (Encuesta Nacional de Ocupacion y Empleo). The ENOE is a nationally representative survey that includes around 120,000 households from all states and larger cities of Mexico. The dataset is organized as a rotating panel, households are included in the sample for 5 consecutive quarters. All household members who are at least 12 years old are asked a detailed set of questions about their labor market participation. In addition, sociodemographic information including school attendance is available on all household members.

The National Statistical institute (INEGI) provides monthly crime data by type of crime and location of crime. We use quarterly homicide rates by municipality as an indicator of exposure to violent crime. Additionally, we extract data from UNODC (United Nations Office on Drugs and Crime) about drug seizures in Colombia and Ecuador.

The main challenge in identifying the effect of exposure to violent homicide on children is that ideally, we would like to separate the impact of high homicide rates on children's schooling and labor market outcomes from the impact of other factors such as for example a reduction in household income or a change in municipality labor markets. As the ENOE is a rotating panel, it cannot be directly used for panel estimations with individual fixed effects for a long enough period for us to observe changes in these long term outcomes. We propose two methods that help us separate the impact of homicides from time-invariant fixed effects: 1) a municipality-level panel, 2) a pseudo-panel approach.

First, we define a panel based on municipality-quarter averages. This municipality panel dataset has the advantage of being very balanced, most of the municipalities have observations for the majority of the periods. We estimate the effect of a change in municipality-level homicide rates on the share of children in school, share of youth working and their working hours, including a set of municipality level controls, and time and state level fixed effects to control for time-invariant state-specific effects.

Second, we carry out a cohort analysis on a pseudo-panel dataset, where cohorts are defined based on state and age, i.e. children born in the first quarter of 2000 living in Oaxaca are followed through time as one group, comparing their schooling and labor outcomes at a certain age to children born in other years living in other states with different exposure to violence. We include time and cohort fixed effects as well as a range of sociodemographic and economic controls in our estimations.

To tackle the endogeneity problem in both panel datasets due to the non-random assignment of children to municipalities, we take an instrumental variables approach. Following Castillo, Mejía, & Restrepo (2013), we use the interaction of the distance between the centre of the municipality and the closest border to the United States with cocaine seizures in Colombia and Ecuador to instrument homicide rates. As a significant part of drug-trafficking in Mexico is the transportation of drugs produced in Mexico or in other Latin American countries to the US market, municipalities closer to the US are plausibly more valuable for DTOs to control, and as a result we would expect more violent homicides in these locations (Dell, 2015). It has also been shown that the larger the competition between cartels in the area, the more likely it is that violence will occur (Sobrino, 2019). As a proxy for supply shocks, we use UNODC data about drug seizures in Colombia and Ecuador, two of the main supplier countries of the cocaine transported through Mexico. Since scarcity of supply due to external supply shocks increases competition, we expect that it is more likely that violence will erupt if the amount of cocaine seized in the previous

quarter is higher.

Results

Even though we would expect that a large increase in exposure to homicides would have some kind of impact on family decisions, *prima facie* evidence suggests that this is not the case. Pooling the observations from all individuals aged 12-17 and regressing school attendance, employment and hours worked on homicides, we find insignificant and very small coefficients.

We estimate the effect of high exposure to homicides in the municipality on the share of children between 12 and 17 of age in school, the share of children working and the hours they work. In the baseline unconditional OLS specification, none of them are highly significant, and the values are also very close to zero. As we gradually introduce municipality-level controls that plausibly affect schooling and working youth, as well as time and state fixed effects, results do not change, except for hours worked, where we find a decreasing effect of homicide rates. As these results suffer from endogeneity, we repeat our estimation using the instrumental variable strategy discussed above in detail. Our 1st stage results show significant correlations between our instrument, distance from the US border interacted with previous quarter cocaine seizures in Colombia and Ecuador and homicide rates, with a high F value of the overall 1st stage.

In the IV estimates, school attendance is significantly negatively associated with homicide rates, but this disappears as soon as we introduce time fixed effects. This seems to suggest that this association is more a product of a parallel trend than an actual causal effect: school attendance seems to increase in overall throughout our period, while homicide rates have a slightly decreasing trend. On the other hand, for both share of youth employed and working hours, we find a robust significant negative relationship. In municipalities where homicide rates increase by 10 homicides, the share of young people aged 12-17 who are employed decreased by around 10%. Similarly, if there are 10 more homicides in the area, young people work on average 7.2 hours less.

This is a large and significant effect, the reason for which we speculate to be either an income effect of the changing labor market, or a safety concern. As it is usually the parents of low educated and low income parents that first start working, a positive income effect of cartel presence on the parents might have a employment-reducing effect on the children which can manifest itself in either exiting the labor market (share of youth employed), or decreasing working hours (hours worked). It is important to note that in our case, those who exit the labor market would be counted as people whose working hours drop to zero, which partially explains the large effect on working hours.

As we know that in general, there is an increasing trend in children's school attendance rates, and a decreasing trend in their labor market participation, it is important to compare different cohorts to separate general trends from the impacts of differential exposure to violence. We estimate regressions on a pseudo-panel dataset that includes all cohorts that are no younger than 12 years old and no older than 17 years old at the time of the survey. Results are by and large similar to those of the municipality panel; while school attendance does not seem to be significantly affected by homicide rates, employment and working hours are both negatively associated with violence. However, interestingly, these effects disappear if we control for cohort-specific fixed effects.

Although our result about the absence of violence's impact on school attendance is similar to what other papers have previously found, this does not necessarily mean that there is no effect anywhere in the income distribution. It is possible that the lack of change in educational enrollment is a combination of a positive effect on poor students (income effect on parents) and a negative one on students from middle-class families (safety effect). We plan to extend our research in a direction to analyze this further for both schooling and employment decisions.

Moreover, we have not yet exploited our rich homicide data to analyze in more detail the time dynamics of the impact of increasing homicide rates. It is plausible that short term spikes in violence will influence households in a different way than long term changes. Differences in household responses based on the length of exposure to violence could offer us deeper insight into the main channels through which violence disrupts families and communities.

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