The Short-Term Impact of Crime on School Enrollment and School Choice: Evidence from El Salvador[1]

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Abstract

This paper employs variations in crime rates attributed to an unprecedented countrywide truce between gangs in El Salvador in 2012, and evaluates the short-term impact of homicides and extortions on educative choices of Salvadoran households. Results reveal that reductions in homicide rates due to the truce were associated with a migration within the educative system, from public to private institutions among boys 15-22 years old. Such fluctuations in homicide rates were also associated with a lower school attendance for girls 7-14 years old, especially due to a lower public school enrollment. No significant association between fluctuations in extortion rates and educative choices could be observed.

JEL Codes: D13, I24, I25

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1. INTRODUCTION

El Salvador is one of the most violent countries not at war in the world. With a homicide rate of close to 100 per 100,000 inhabitants in 2014, its capital city, San Salvador, was the 13th most violent city in the world (Mexico's Citizens Council for Public Security and Penal Justice, 2014). With more than 6,000 homicides reported during 2015, El Salvador has experienced levels of violence that haven't been seen since the end of its civil war, more than twenty years ago. Opinion surveys by Corporación Latinobarómetro (2011) and Observatorio de Seguridad Ciudadana (2013) show that over 50% of the Salvadoran population considered violence and crime as the most important policy issues, while the cost of living and unemployment are the next most mentioned problems, both combined representing only 25% of the responses. The Central Bank of El Salvador estimates that the total cost associated with violence and crime, including additional expenditures on the provision of public services, and private sector losses during 2015 was 2,800 million USD, which is equivalent to roughly 11% of the country's GDP (FUSADES, 2016). Soares (2006) shows that the accumulated welfare impact of violence through its effect on survival probabilities can be as large as 73% of El Salvador's GDP.

Conflicts between street gangs in El Salvador produce considerable volatility in criminal activity, thus making it an interesting case study. It is estimated that roughly 54,000 official members of the three major gangs in Central America populate Guatemala, Honduras and El Salvador, among which roughly 20,000 are based in El Salvador, for a rate of 323 gangsters per 100,000 persons in 2012

(UNODC, 2012). Gang members are mostly found in the 12-24 age bracket (Seelke, 2014). This demographic composition turns school-aged children, especially in poor urban areas, into a group at significant risk of recruitment and aggression, which raises concerns about whether violence and crime have a significant impact on the academic performance of students and the incentives of households to invest in education, whether through a higher victimization risk, the impact of crime on the budget of households or its effect on expectations about the future returns to education. The literature on education and crime has mostly concentrated on the impact of academic outcomes on future criminal behavior, while the body of literature that explores the relationship in the opposite direction is rather scarce. In El Salvador, research on the impact of crime on the education of children remains scarce, despite its relevance.

This research contributes to the previous literature in several dimensions. First, it employs household survey microdata along with data on homicides and extortions, and investigates the impact of these types of crime on the probability of enrollment and on the likelihood of being enrolled in a public or private school for male and female Salvadorans 7 to 22 years old. It employs variations in crime rates due to a countrywide truce between gangs in 2012 for identification. The results show that the 2012 truce induced a significant reduction in homicide rates during that same year, although no significant change in extortion rates could be observed. Drops in homicide rates are associated with lower attendance to public schools for girls under 15, and to

migration from public to private schools for boys 15 to 22 years old.

The content of this paper is organized as follows: Section 2 introduces background information on crime and education in El Salvador and discusses the relevance of this research in the context of previous literature. Section 3 presents the data and introduces the empirical strategy. Section 4 shows the estimation results. Finally, Section 5 evaluates the robustness of the results to changes in the methodology, and concludes.

2. BACKGROUND INFORMATION AND LITERATURE REVIEW

2.1 CRIME AND GANGS IN EL SALVADOR

Figure 1 shows the yearly number of cases of extortions reported by the National Civil Police of El Salvador (hereafter PNC), as well as the yearly real GDP growth rate from 2007 to 2014. Extortion of small businesses and transportation firms is a common activity of gangs and other criminal groups, through which they obtain resources for their operations. The number of extortions increased by 65% during 2009 compared to the previous year, passing from 2,729 cases to 4,528. After this peak, a decreasing trend can be observed as the economy recovers. Figure 2 shows the recent evolution of the total monthly property crimes (thefts and robberies[3]), compared with the evolution of the yearly growth rate of the unadjusted Index of Volume of

[3] Although extortions are typically considered property crimes, their strong association with the activities of gangs in El Salvador makes it necessary to isolate their effect. For the purposes of this research, only thefts and robberies are considered as property crimes.

Economic Activity (IVAE[4], represented by the dashed line and measured on the right axis).

Regarding homicides, it is important to stress their association with the activities of gangs, since roughly 88% of the total number of gang-related homicides during 2011 were attributed to the 18th Street gang[5] and the MS-13 gang. Both gangs originated in the United States, among young Latin American immigrants (Ward, 2013), and have held hostile relationships since 1989 until today (Sala Negra, 2012). Gangsters were brought to Central America during the beginning of the 1990s due to massive deportations and to the enactment of the Illegal Immigrant Reform and Immigrant Responsibility Act (IIRIRA) of 1996 (Seelke, 2014). The response of Salvadoran institutions to the rising number of gang-related crimes led in the past decade to an increase in the number of convictions, doubling the share of gangsters in jails from 16.2% to 31.2% of the total of inmates between 2002 and 2006 (Savenije, 2009). These policies, along with the practice of separating members of conflicting gangs into different jails, increased their coordination capabilities.

Capitalizing on these conditions, a group of civilians coordinated a negotiation with the imprisoned leaders of the major gangs and consolidated a no-aggression agreement between gangs, which became effective from late February 2012.

[4] The IVAE is a short-term indicator of economic activity calculated by the Central Bank of El Salvador.

[5] Recently divided into two factions due to internal conflicts, effectively becoming two different gangs.

In exchange, gangs would obtain better conditions in jails and the possibility of further negotiations. No agreements were made regarding extortions, crimes against civilians, or the termination of gangs. Figure 3 presents the total monthly homicides (solid line) and the number of homicides attributed to gangs (dashed line) during the last decade. The monthly number of homicides during the period Jan-2006 to Feb-2012 stayed typically just under 400. However, by March of 2012, it dropped to under 260 until March 2014. This drop in total homicides is not reflected in the number of gang-related homicides reported by the PNC, which raises concerns about the accuracy of institutional statistics regarding offences by gangs. The truce was terminated in 2014 after the presidential elections of that same year due to the lack of support to the truce by the newly elected president.

2.2 ON THE RELATIONSHIP BETWEEN CRIME AND SCHOOL ENROLLMENT IN EL SALVADOR

Basic education in El Salvador is compulsory and consists of nine years grouped in three three-year cycles. Secondary education offers the choice of a General Track and a Technical Track, with a length of two and three years respectively. Both, basic and secondary education are free when provided by the State. The public sector accommodates roughly 87% of basic education students and close to 74% of secondary education students[6]. Figure 4 shows the prevalence of the

[6] Educative Census 2014, MINED.

most important reasons for dropping out of school according to data by the Ministry of Education of El Salvador (MINED, 2010). For Basic Education students, moving to a different neighborhood and changing schools are the major reasons for abandoning school. However, for Secondary Education students, the share of crime is roughly 10% positioning it as one of the major reasons to abandon school. For persons in adult education programs, the share of crime is as large as 21%. One explanation for this pattern is differences in victimization risk across age groups: The Institute of Legal Medicine of El Salvador (IML) shows that 37.2% of the homicide victims during 2010 were in the 15-24 years age bracket and only 2.1% of the victims are younger than 15 years[7]. Close to 85% of the homicide victims are males[8]. This pattern is commonly observed in Latin American countries (Soares, 2006).

2.3 LITERATURE REVIEW

Studies on the causal impact of crime on educative outcomes are rather scarce, especially for Latin American countries, although many papers have evaluated the cases of Mexico and Colombia. One study that is closely related to this research is the one by Orraca (2015), which employs panel data from Mexican schools, showing that increases of one homicide per 10,000 inhabitants can reduce average test scores by as much as 0.35% of a standard deviation, being

[7] 15 is an important turning point, as it is the age at which children become legally able to work in El Salvador, and marks the end of the third cycle of basic education.
[8] Institute of Legal Medicine of El Salvador, 2010.

the effect larger for secondary school students and for crimes that occur closer to examination dates, which is attributed to lower contact hours. In contrast, Márquez-Padilla (2015) employs heterogeneous increases in crime rates due to Mexico's *War on Drugs* in a fixed-effects model with municipality-level data and shows that fluctuations in total and drug-related homicide rates have only very small effects on aggregate enrollment. Studies outside Latin America show that crime can exert a negative impact on educative outcomes through the effect of peers (Kristoffersen et al., 2015) and the involvement of parents in criminal activities (Rud et al., 2014).

Given that victimization risk tends to be strongly biased towards boys, it is important to question whether the response of households to fluctuations in crime rates lead to higher intra-household inequality in educational investment. The theoretical model in Becker and Tomes (1976) shows that parents can invest in their children in such a way that reinforces the original differences in children's endowments when the cost of investment is inversely proportional to the endowment of the kid. In the context of crime, this mechanism can arise if the risk of victimization is perceived by parents as a reduction in the endowment of the child, and if such risk increases the cost of investments in education. Consistent with this intuition, Gerardino (2014) shows for Colombia that an increase of one standard deviation in the male versus female homicide rate differential causes an increase of 1.1% in the secondary school enrollment gap in favor of girls. Such a trend can be caused by the increase of the opportunity cost of attending school and to reductions in the returns to education.

Crime-induced income shocks can also impact educational gaps. Previous literature has shown that, in the presence of increasing rates of return to schooling and liquidity restrictions, lower income households tend to exhibit higher educational inequality among siblings in many Latin American countries (Dahan and Gaviria, 2002). Additionally, intra-household inequality can also arise from the desire of parents to protect the mating value of their children (Perilloux et al., 2008) which can be determined by the relative scarcity of members of one gender (Abramitzky et. al., 2011), all of which can be affected by the victimization risk.

In contrast to previous studies, this research is, to the knowledge of the author, the first one to explore in detail the case of El Salvador employing micro-data, focusing on both homicide rates and extortion rates and on several demographic segments, and considering migration within the educative system.

3. DATA AND METHODOLOGY

This research employs data from the Salvadoran *Encuesta de Hogares de Propósitos Múltiples* (EHPM) 2013, a household survey collected and provided by the Bureau of Statistics of El Salvador (DIGESTYC), which includes information regarding demographic variables, school enrollment and educative attainment, health, labor force participation, income and consumption of Salvadoran individuals and their households. It consists of a stratified sample of over 20 thousand households, for a total sample size of over 85 thousand individuals. For this analysis, the sample is restricted to individuals 7 to 22 years

old who reported being the sons or daughters of the head of household. The data on municipal-level homicides and extortions was provided by the PNC.

Evaluating the impact of gang crime on educative choices is of especial importance for this research; however, its measurement is a difficult task, since it is doubtful whether official statistics provide an accurate measure of the prevalence of gang crime. Furthermore, due to the lack of periodic data on the characteristics of Salvadoran municipalities, the incidence of gangs is likely to be associated with unobserved variables, making it especially difficult to avoid endogeneity in estimates of the impact of crime on education. The 2012 truce presents a unique opportunity for identifying the magnitude of gang crime and its impact on educative choices, due to its large impact on homicide rates and its unexpected implementation, which makes it unlikely that citizens shaped their decisions in anticipation to the truce. The impact of the truce in gang crimes is likely not randomly allocated across municipalities due to the highly decentralized structure of gangs (Ward, 2013). However, the variation in fluctuations of crime rates attributed to the truce are more likely to be associated with the difficulty of enforcing the truce, rather than with the traditional determinants of crime. Therefore, by controlling for the difficulty to enforce the truce it is possible to avoid the sources of bias mentioned above.

Easier cooperation with and between gangs is likely to be found in the so-called *Sanctuary Cities*, also named *Cities Free of Violence*. These are municipalities in which gangs agreed to go beyond the content of the original truce and reduce their participation in of all sorts of crimes. Municipal authorities and private

enterprises would provide opportunities for facilitating the access to the labor market for gangsters who decide to abandon their criminal organizations (Valencia, R. 2012 and 2015). The conditions that would be required for a municipality to become a *Sanctuary City* were presented in a letter by the coordinators of the truce in November 2012, and the first municipalities adopting this model initiated its implementation in January 2013. Some conditions, such as voluntarily handing over weapons and allowing free movement of citizens and rival gangsters, required a high level of commitment and strong leadership inside gangs that is not easily attainable.

If this ease of commitment was also required to enforce the truce during 2012, one would expect to see higher reductions in crimes between 2011 and 2012 in *Sanctuary Cities*. Table 1 compares the changes in crime rates from 2011 to 2012 by *Sanctuary City* status. The 11 cities that adopted this model [9] experienced in 2011 a mean homicide rate of 94 cases per 100,000 persons, which was reduced to 47.8 cases during 2012 (a reduction of 49%). In comparison, *non-sanctuary* cities were experiencing a considerably lower mean homicide rate of 43.7 in 2011, which was reduced to 33.7 during 2012 (for a reduction of 22.9%). Other crimes experienced smaller drops in Sanctuary Cities than in other municipalities, except for the robberies rate. The *Sanctuary City* regimen began to be enforced from 2013, and therefore these differences in the evolution of homicides are associated with pre-existing characteristics of

[9] Apopa, Ciudad Delgado, Ilopango, La Libertad, Nueva Concepción, Puerto El Triunfo, Quezaltepeque, San Vicente, Santa Tecla, Sonsonate and Zacatecoluca.

the municipalities, and are not an effect of the *Sanctuary City* status itself.

Two types of crimes are especially linked to gangs' activities: homicides and extortions. To obtain a measure of the variation in homicides attributed to the truce, a panel of the 262 municipalities of El Salvador from 2005 to 2011 is employed to estimate the following model:

$$H_{i,t} = \rho_0^H + \sum_{k=1}^{4} \rho_k^H H_{i,t-k} + \rho_5^H R_{i,t-1} + \rho_6^H T_{i,t-1} + \rho_7^H E_{i,t-1} + \rho_8^H G_{i,t} + \rho_9^H Pop_{i,t} + \rho_{10}^H Rec_t + \varepsilon_{i,t}^H \quad (1)$$

Where, $H_{i,t}$ represents the homicide rate for the municipality *i* in year *t*, R is the rate of robberies, T is the thefts rate, E is the rate of extortions and G is the rate of gang murders. All the rates are measured per 100,000 inhabitants in the corresponding municipality. Pop represents the population of the municipality, and Rec is a binary variable that takes the value of 1 for the year 2009, capturing the effect of the economic recession. ρ are regression coefficients. Similarly, for extortions the following model is estimated:

$$E_{i,t} = \rho_0^E + \sum_{k=1}^{4} \rho_k^E E_{i,t-k} + \rho_5^E R_{i,t-1} + \rho_6^E T_{i,t-1} + \rho_7^E H_{i,t-1} + \rho_8^E G_{i,t} + \rho_9^E Pop_{i,t} + + \varepsilon_{i,t}^E \quad (2)$$

Results for both equations are presented in Table 2A. Estimates can be employed to obtain the forecast $\hat{C}_{i,2012}$ of the homicide or extortion rate for the year 2012, which represents a rough measure of the level of homicides that was expected in the absence of the truce. An estimate of the effect of the truce on the crime measure $\mathrm{C} \in (\mathrm{H}, \mathrm{E})$ is obtained in the following way:

$$\hat{C}_{i,2012} - C_{i,2012} = -\hat{\varepsilon}_{i,2012}^{c}$$

$$truce\ effect_i^C = \frac{-\hat{\varepsilon}_{i,t}^C}{\sigma_{\hat{\varepsilon}^C}}$$

For ease of interpretation, this variable is defined so that its sign is *positive* when the observed crime rate is **below** the predicted value. Table 2B shows the means for both *truce effects* by *Sanctuary City* status. The *truce effect on homicides* is significantly different from zero in both types of municipalities, and the mean for *Sanctuary Cities* is significantly larger at a 1% level. The mean *truce effect on extortions* is not significantly different from zero at conventional levels in both types of municipalities. This is consistent with the perception that the truce did not have an effect on crimes other than homicides (Dudley, 2013). The distributions of both *truce effects* on the EHPM sample are shown in Figure 5.

Having obtained these measures of crime, the next step is to evaluate their impact on educative choices. Assume that individuals are presented on a given school year with three alternatives: not enrolling in school at all, enrolling in a public school or enrolling in a private school. The utility of choosing a given option is determined by $\mathrm{y}_{i,j}^* = \mathrm{U}_{i,j} + \omega_{i,j}$, where $\mathrm{U}_{i,j}$ represents the utility for the individual *i* of choosing the alternative *j*, which can be represented by the linear combination $C_i'\alpha_j^c + X_i'\beta_j$. Here, C_i represents a measure of the crime level experienced by individual *i*, and X_i represents a set of characteristics of the individual, her household and her environment. One can only observe the discrete variable y_i representing the discrete choice of the individual, where

$$\mathrm{p}(\mathrm{y}_i = \mathrm{k}|X_i) = \mathrm{p}(\mathrm{y}_{i,k}^* = \mathrm{Max}(\mathrm{y}_{i,1}^*, \mathrm{y}_{i,2}^*, \mathrm{y}_{i,3}^*))$$

Assuming that $\omega_{i,j}$ follows a multivariate normal distribution, the set of

coefficients β_j can be estimated employing a multinomial probit model. Note that this model does not rely on the Independence from Irrelevant Alternatives assumption, and therefore is robust to the correlation of errors across choices. The estimation is performed separately employing as measures of crime: the *truce effect on homicides,* the *truce effect on extortions*, the homicide rate and the extortion rate in the municipality of residence during 2012. X_i includes a set of individual and family level controls including: age, dummy variables for female, married, and urban residence, as well as a continuous variable for the maximum years of schooling of the head of household and the spouse. It also includes dummy variables indicating whether the household is classified as relatively poor or extremely poor[10]. Additionally, X_i contains a dummy variable identifying *Sanctuary Cities*, controls for the homicide rates for the years 2009, 2010 and 2011 and the population of the city of residence of the individual during 2012. Summary statistics of the main covariates are shown in Table 3 for two age groups. The enrollment rate up to age 14 is over 90% for both genders, and drops to roughly 50% for the older group. 99% of the children who enrolled in school in both age groups reported attending school during the time of the survey. Among those enrolled in school, 91% of the individuals in the youngest group is in the public education sector, and no difference between

[10] Under the definition by DIGESTYC, households in extreme poverty are those where the income per capita is not enough to cover the basic food basket. Households in relative poverty are those for which the per-capita income is larger than the basic food basket, but not larger than twice its value. This ranking is expected to be less prone to under-reporting bias than the monetary amount of income.

genders is observed. For the oldest group, the share of students who attend a public institution declines to 80% for male students and 76% for female students. Monthly expenditure in education per child among those spending a positive amount has a sample mean of $18.61 for the younger group and over $56 for the older one. Individuals in the sample were exposed on average to a drop of homicide rates due to the 2012 truce of roughly 0.73 standard deviations with respect to the previous trend. The mean homicide rate and extortion rate are both roughly 40 cases per 100,000 persons, while the mean property crime rate (thefts and robberies) is slightly over 220 cases. The EHPM 2013 is obtained from a stratified sample, where the strata are chosen attending to socio-economic and industrial conditions of the sampling units. The survey was designed to be representative to the country-level, urban and rural areas, the 14 main administrative divisions of the country, the metropolitan area of San Salvador and the 50 largest municipalities, but not for each municipality. This design is likely to bias the estimates if the response of households to crime levels is heterogeneous across cities (Solon, Haider and Wooldridge, 2013). To account for sample design, the estimations are performed employing sampling weights provided by DYGESTIC.

Finally, the standard errors employed for inference must account for two characteristics of the data: first, residuals are likely to be correlated across individuals inhabiting in the same municipality due to being subject to the same security and educational policies of their local government, and due to the

territorial nature of gangs. Second, the complex sample design makes the assumption of fixed covariates unlikely to hold, and therefore a conditional estimate of the standard errors is not appropriate. This paper employs unconditional standard errors clustered to the Municipality level calculated through linearization with a method based on Korn and Graubard (1999)[11] and employing sample weights.

4. RESULTS

Table 4 shows the average marginal effects for the main controls in the model and for each of the three choices, estimated employing the full sample of individuals between 7 and 22 years old who are the children of the head of household. For the sake of brevity, only results obtained employing the *truce effect on homicides* as a measure of crime are shown. Living in an urban area and having highly educated parents is associated with a higher probability of enrollment into a private school, while being poor is associated with higher probabilities of public school attendance or not enrolling at all. The signs of these marginal effects are consistent with the normality of education as a consumption good.

Results also show that older students are more likely to be in private institutions or outside the educative system than in public institutions. This pattern clearly

[11] Standard errors were obtained by employing the *vce(unconditional)* option of Stata's *margins* command. The conclusions drawn from the results in this paper are robust to whether the Delta Method or the linearized method mentioned above are employed.

responds to two facts: first, older students face a higher opportunity cost (the value of their marginal productivity in the labor market). Second, the provision of public education at higher levels in El Salvador tends to shrink considerably, especially at the beginning of the third cycle of basic education and secondary education. It is therefore reasonable to expect that some older students who would have attended a public school might be left outside of the educative system for lack of supply at an affordable cost.

Being married increases the probability of not being enrolled at all. The Sanctuary City status is not significantly associated with differences in educative status.

The truce effect on homicides is associated with a significance level of 10% with a lower probability of public school attendance, although it is not possible to tell whether this goes in favor of a higher private school participation. Such a weak association is likely to be observed if heterogeneity of the relationship between crime and educative choices exists across demographic groups. To verify this assumption, Table 5 shows the average marginal effects of several measures of crime for different sample segments according to gender and age. All regressions include the same set of controls employed for the estimates in Table 4. Results in Panel A employing the *truce effect on homicides* as the measure of crime suggest heterogeneity in the way different demographic groups respond to drops in homicide rates. For older males, marginal effects suggest migration within the educative system, with lower homicide levels associated with a higher private school attendance. In contrast, lower homicide

levels are associated with a lower public school attendance and a higher chance of being out of the educative system for young girls, while no significant evidence of higher private school attendance could be observed.

A plausible interpretation for these differences can come from the way households respond to perceived risk and its heterogeneity with respect to the gender of the child. When risk is high, households can decide to spend more on reducing the risk of the child's commute (paying for private transportation services, buying a car, etc.) at the expense of a reduced income available for school fees. Lower perceived risk would therefore allow parents to enroll their children in higher quality more expensive schools. In the case of older students, if parents are more protective with respect to girls, it can be expected that their decision to disinvest in such measures is more inelastic to drops in risk levels, while a higher elasticity would be expected in the case of boys. A lower victimization risk is also likely to increase the expected relative return to the education of older boys, leading parents to invest in higher quality education for them (Becker and Tomes, 1976).

In the case of younger girls, drops in homicide rates can lead to a lower value of schools as safe havens, allowing some girls to stay at home helping their parents with the family business. Note however that further study is required on whether the 2012 truce was really perceived by households as a long-term drop in victimization risk, and whether this perception led to changes in household consumption patterns. Finally, although regressions include income controls, controlling for the impact of the truce on the level of income (a measure of the

magnitude of crime-induced income shocks) would require panel data. For this reason, the effect of income shocks on intra-household educational gender inequality through a mechanism as the one presented in Dahan and Gaviria (2002) cannot be discarded.

Marginal effects when employing homicide rates as the measure of crime are presented for reference in Panel B. Homicides are associated with a higher public school attendance among young females, and lower private school attendance for older males, which is consistent with the results shown in Panel A, and with the conclusions in Gerardino (2014).

Average marginal effects for the *truce effect on extortions* are shown in Panel C. Although the pattern in the signs of average marginal effects is the same as the one observed for the *truce effect on homicides*, they are not accurately estimated, mainly because no significant deviation in extortions could be observed during the period of the truce. Finally, average marginal effects for the extortion rate are also presented for reference in Panel D. Higher extortion rates during 2012 are associated with a lower probability of attending a private school with a significance level of 5% in almost all segments of the sample. The fact that the pattern of coefficients is so different compared to Panel C could indicate that measurement error is larger for extortions than for homicides. The following section addresses the robustness of these results to changes in the specification of the model, and their causal interpretation.

5. ROBUSTNESS TESTS AND CONCLUSIONS

Table 6 shows average marginal effects of the truce effect on homicides obtained under several changes in the specification of the model in order to evaluate the variability of the results. Panel A shows estimation results when the sample is segmented in age groups that respond to the risk of recruitment by gangs, rather than to labor market incentives. Children older than 11 are considered in high risk of recruitment, while younger children are a lower risk group (Seelke, 2014). Significant effects in the case of older males are no longer observed. Consistent with Figure 4, crime imposes a higher cost on the education of older males, since they are more valuable for the labor market. If the risk of recruitment is a less important factor affecting educative choices, the strength of the marginal effects for a sample segment that includes lower-risk children is likely to decrease. In the case of females, marginal effects are less consistent. The negative impact on the probability of attending a public school remains strong and significant, although a positive impact on private school attendance significant to the 10% level is now observed. This seems to indicate that homicide rates produces shifts in the public-private choice for the youngest girls. Dropout due to violence, probably among public school students, would be a characteristic of girls approaching puberty.

Another robustness test evaluates the performance of the truce effect on homicides as a measure of crime. This variable is defined as a deviation with respect to the trend in homicides previous to 2012. If this variable truly reflects variations in homicides attributed to the truce, one would expect to fail to

observe a significant *truce effect* in a year when a structural change in homicides did not happen. Furthermore, such a placebo control should not have a significant impact on educative choices. Panel B of Table 6 shows estimation results for a placebo truce effect on homicides. This effect is estimated by Equation (1) employing data from 2005-2010, and obtaining fitted values for the homicide rate of 2011. In other words, it represents deviations in 2011 with respect to the previous trend. The mean value for this effect in the panel of municipalities is of .005 standard deviations, and is not statistically significant from zero at a 10% level. This is consistent with the assumption that 2011 did not present significant deviations from the pre-existing trend, and supports the idea that the *truce effect on homicides* in 2012 effectively captures a structural break, likely attributed to the truce. As expected, the average marginal effects shown in Panel B are not significant for any of the sample segments. The pattern of signs in the marginal effects is also different from the one observed in Panel A of Table 5, suggesting that lack of significance in the marginal effects of the placebo control are not only attributed to the lack of statistical power due to the use of a noisier control.

Finally, Panel C of Table 6 evaluates the variability of results when sample weights are not employed. Although the conclusions remain the same for the 7-14 years old group, a positive impact on the probability of private school attendance for females older than 15 years is observed, in a pattern that resembles that for males in the same age group.

Results so far suggest that drops in homicide rates due to the truce had a

significant impact on educative choices, especially for girls under 15 and boys between 15 to 22 years old. Furthermore, it is shown that homicide rates induce migration within and outside of the educative system for young girls and working-age boys. One note of caution is necessary. These effects were obtained by employing variations attributed to the 2012 truce between gangs, for which a causal interpretation is not strictly guaranteed. The truce was not randomly distributed across municipalities, and therefore there is no control group for comparison. Controlling for the cooperation capabilities of gangs through the *Sanctuary City* status is not a perfect substitute of a propensity score. Furthermore, endogenous measurement error cannot be discarded in the case of both, extortions and homicides. Data on extortions is based on self-reporting, and therefore underreporting bias cannot be disregarded (Svensson, 2003). Furthermore, it cannot be guaranteed that measurement error on self-reported extortions itself was not affected by the truce. Homicides tend to be less prone to measurement bias because they can be verified with death certificates by the Institute of Legal Medicine of El Salvador. However, gangs can still influence the accounting of homicides by hiding the evidence.

The relationship between crime and educative choices has not been studied in detail in El Salvador. Did the 2012 truce affect households' long-term expectations of risk? Is this perception of risk the main driver of the effect of crime on educational inequality? Did households adjust their expenditure as a response to a lower perceived risk? These are important questions that remain unanswered. Finally, this author believes that open access to datasets, richer on

characteristics of municipalities can greatly improve the quality of research on crime and education in El Salvador. The Salvadoran Institute of Access to Public Information (IAIP) represents an important first step in that direction.

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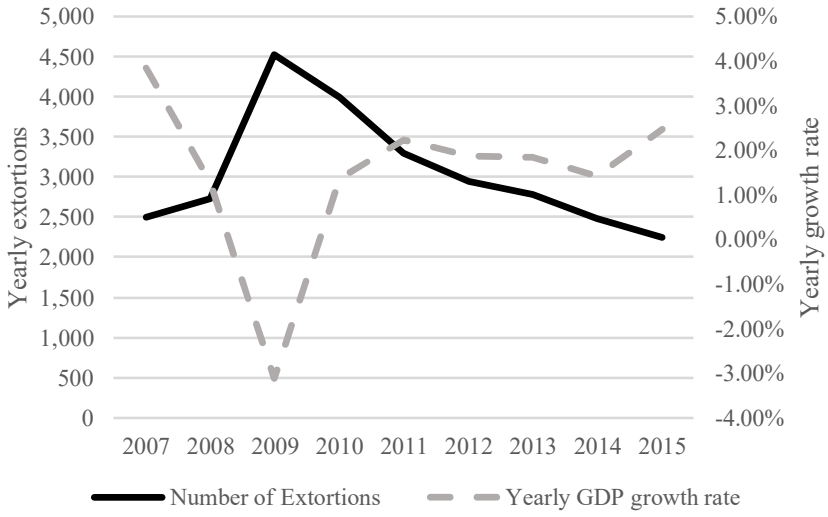
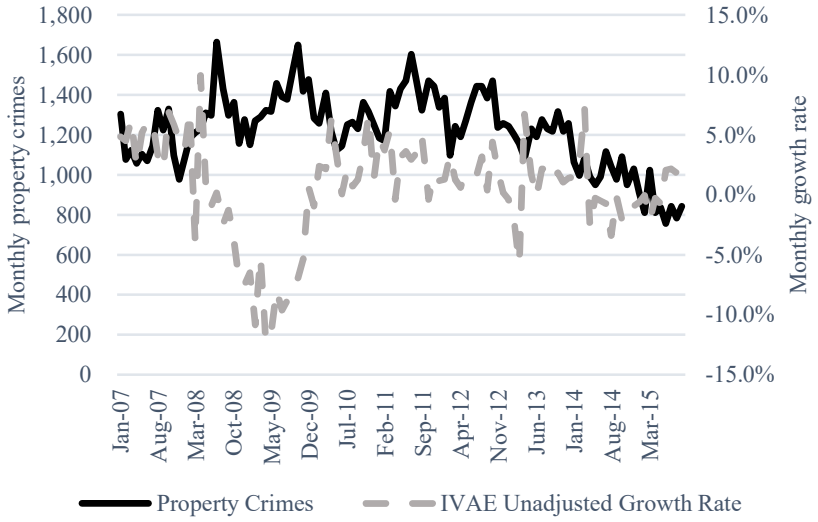
Figure 1: Evolution of yearly cases of extortion and economic growth



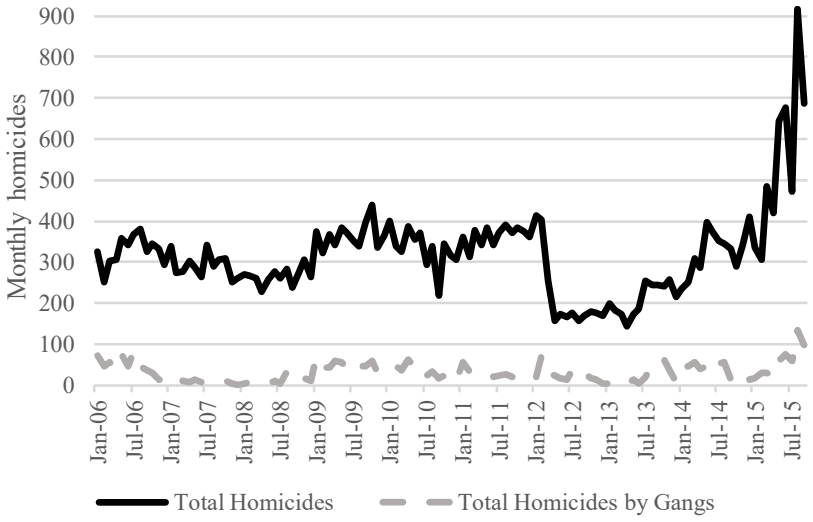
Source: Own elaboration based on data by the National Civil Police and the Central Bank of El Salvador

Figure 2: Evolution of monthly property crimes (thefts and robberies) and economic activity



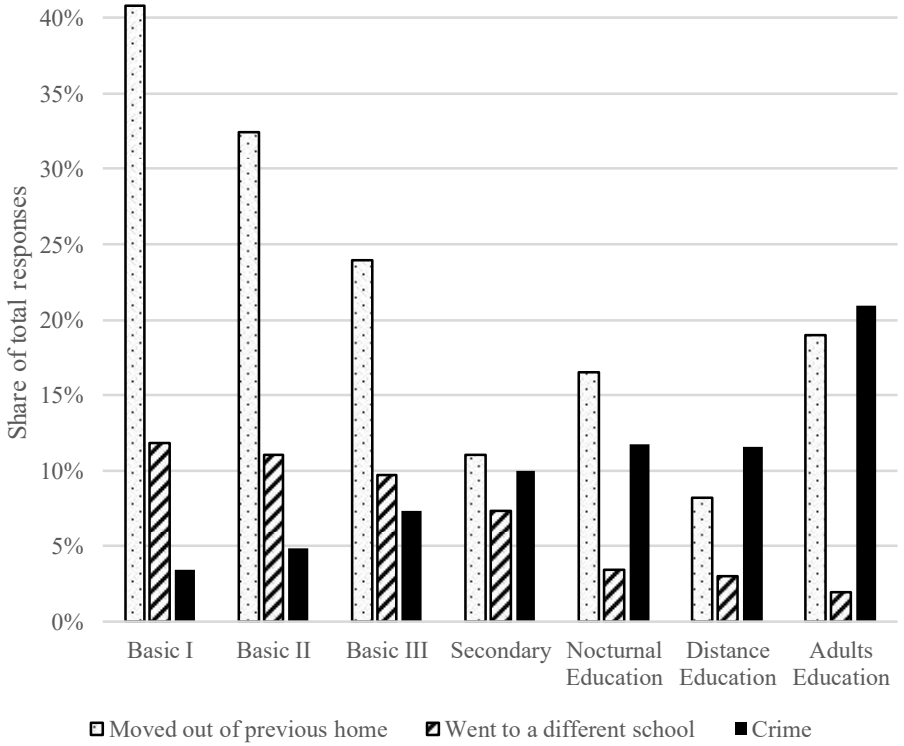
Source: Own elaboration based on data by the National Civil Police and the Central Bank of El Salvador

Figure 3: Evolution of monthly number of homicides



Source: Own elaboration based on data by the National Civil Police of El Salvador

Figure 4: Reasons to abandon school (2010)



Source: Own elaboration based on data by the Ministry of Education of El Salvador, 2010

Table 1: Changes in mean crime rates by Sanctuary City status

Non-sanctuary (N = 151)			
	2011	2012	Yearly increase (%)
Homicides rate	43.73	33.71	-22.9%
Extortions rate	33.62	29.34	-12.7%
Robberies rate	60.77	64.65	6.4%
Thefts rate	151.09	139.40	-7.7%
Gang homicides rate	2.78	2.50	-10.2%
Sanctuary (N = 11)			
	2011	2012	Yearly increase (%)
Homicides rate	94.03	47.83	-49.1%
Extortions rate	69.90	64.84	-7.2%
Robberies rate	112.53	99.36	-11.7%
Thefts rate	177.22	167.71	-5.4%
Gang homicides rate	7.71	7.31	-5.2%

Table 2A: Estimation of the trend in homicide rates from 2005 to 2011

	Homicides		**Extortions**
Homicide Rate per 100,000 persons (t-1)	0.31683***	Extortion Rate per 100,000 persons (t-1)	0.34284***
	(0.04113)		(0.05221)
Homicide Rate per 100,000 persons (t-2)	0.21198***	Extortion Rate per 100,000 persons (t-2)	0.13661***
	(0.04140)		(0.03304)
Homicide Rate per 100,000 persons (t-3)	0.19201***	Extortion Rate per 100,000 persons (t-3)	-0.10802
	(0.04845)		(0.07875)
Homicide Rate per 100,000 persons (t-4)	0.24883***	Extortion Rate per 100,000 persons (t-4)	0.35267***
	(0.04554)		(0.08377)
Robberies Rate per 100,000 persons (t-1)	0.01518	Robberies Rate per 100,000 persons (t-1)	0.07544*
	(0.02048)		(0.04025)
Thefts Rate per 100,000 persons (t-1)	0.00373	Thefts Rate per 100,000 persons (t-1)	0.02816
	(0.01333)		(0.02290)
Extortion Rate per 100,000 persons (t-1)	0.02377	Homicide Rate per 100,000 persons (t-1)	-0.03139
	(0.02594)		(0.04771)
Gang Homicide Rate per 100,000 persons (t-1)	0.07711	Gang Homicide Rate per 100,000 persons (t-1)	-0.18686
	(0.16590)		(0.25917)
Recession Dummy	9.42697***	Recession Dummy	
	(2.55180)		
Population (t)	-0.00002	Population (t)	0.00002
	(0.00003)		(0.00005)
Constant	4.56288*	Constant	2.07458
	(2.59922)		(3.81655)
Observations	786	Observations	262
R2	0.493	R2	0.494

Each observation corresponds to one of the 262 municipalities for each year on the period of analysis. * p<0.1, ** p<0.05, *** p<0.01. Standard errors in parenthesis.

Table 2B: Differences in truce effects by Sanctuary City status

	Non-sanctuary	Sanctuary	Difference	t-value of difference
Truce effect on homicides	0.404	1.214	-0.810	-2.598
Truce effect on extortions	0.007	-0.289	0.296	0.748

Figure 5: Distribution of the effects of the truce on homicides and extortions in the EHPM sample

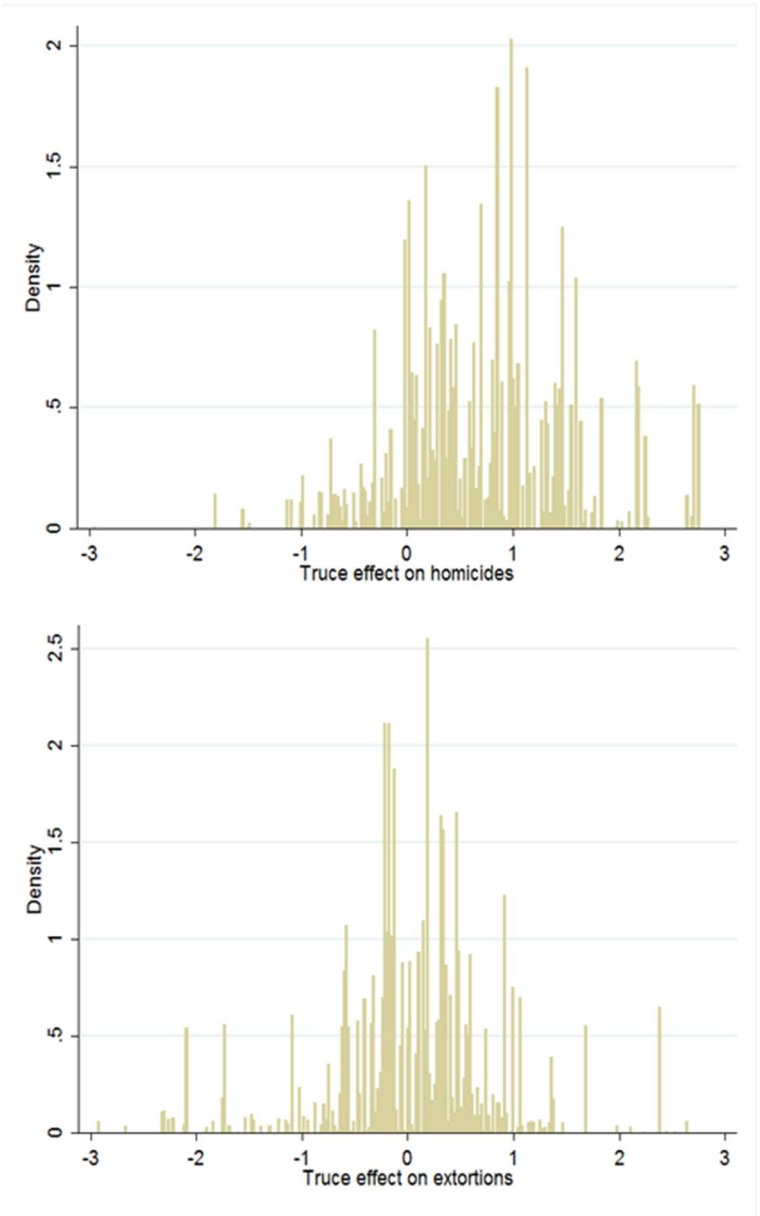


Table 3: Sample means of variables employed in the multinomial probit regression analysis

Variable	5-14 years	15-22 years
Enrollment rate (males)	94.7%	50.4%
Enrollment rate (females)	94.6%	55.1%
Attendance Given Enrollment (males)	99.2%	99.0%
Attendance Given Enrollment (females)	99.6%	98.9%
Enrolled in a Public Educative Institution (males)	91.1%	80.3%
Enrolled in a Public Educative Institution (females)	91.3%	75.9%
Total Expenditure in Education (USD per Month)※	$18.61	$55.66
Truce Effect on Homicides (standard deviations from the trend)	0.7	0.7
Homicide Rate 2012 in the City of Residence (per 100,000 inhabitants)	42.5	41.6
Extortion Rate 2012 in the City of Residence (per 100,000 inhabitants)	40.3	40.8
Age	10.8	18.1
Female	49.4%	45.7%
Urban	46.8%	50.0%
Married	0.0%	3.3%
Extremely Poor	15.2%	11.3%
Relatively Poor	34.5%	28.6%
Max Education of Head of Household and Spouse (years)	6.8	6.0

※Among those who spend a positive amount

Table 4: Average marginal effects on the probability of each educative status obtained from multinomial probit regression (full sample)

	Not Enrolled	Public School	Private School
Truce	0.00280	-0.01905*	0.01624
	(0.00812)	(0.01025)	(0.01003)
Age	0.04585***	-0.04948***	0.00362***
	(0.00139)	(0.00168)	(0.00086)
Urban	-0.06687***	-0.03194**	0.09881***
	(0.00909)	(0.01420)	(0.01396)
Married	0.25603***	-0.18085**	-0.07518
	(0.03653)	(0.07560)	(0.08162)
Extremely Poor	0.06215***	0.04642**	-0.10857***
	(0.01293)	(0.02188)	(0.02513)
Relatively Poor	0.01326	0.06742***	-0.08068***
	(0.00979)	(0.01483)	(0.01149)
Max. Educ. Of Parents	-0.01540***	-0.00223	0.01763***
	(0.00098)	(0.00296)	(0.00241)
Sanctuary City Dummy	-0.00564	-0.00852	0.01416
	(0.01211)	(0.02723)	(0.02040)

Obs	20,733

Multinomial probit average marginal effects. The sample is restricted to children aged 7 to 22 years old of both genders who reported being children of the head of household. Other controls include the homicide rate for the years 2009, 2010 and 2011, and the 2012 population of the city. All models include a constant term.

* p<0.1, ** p<0.05, *** p<0.01. Unconditional Standard Errors clustered to the municipal level in parentheses. Coefficients and Standard Errors are obtained by applying sampling weights.

Table 5: Average marginal effects of several measures of crime on the probability of each educative status by gender and age group

Panel A: Truce effect on homicides				
	7 to 14 years old		15 to 22 years old	
	Male	Female	Male	Female
Not Enrolled	-0.00730	0.01600**	0.00079	-0.00188
	(0.00738)	(0.00729)	(0.01423)	(0.01553)
Public School	-0.00470	-0.03390*	-0.02757*	-0.00879
	(0.01461)	(0.01790)	(0.01622)	(0.01676)
Private School	0.01200	0.01790	0.02678**	0.01067
	(0.01535)	(0.01748)	(0.01330)	(0.01580)
Panel B: Homicides				
	7 to 14 years old		15 to 22 years old	
	Male	Female	Male	Female
Not Enrolled	0.00025	-0.00051**	0.00031	0.00034
	(0.00025)	(0.00024)	(0.00050)	(0.00052)
Public School	0.00023	0.00130**	0.00086	-0.00034
	(0.00046)	(0.00058)	(0.00053)	(0.00058)
Private School	-0.00048	-0.00079	-0.00118**	-0.00000
	(0.00046)	(0.00056)	(0.00051)	(0.00052)
Panel C: Truce effect on extortions				
	7 to 14 years old		15 to 22 years old	
	Male	Female	Male	Female
Not Enrolled	-0.00427	0.00625	0.00427	-0.00389
	(0.00410)	(0.00389)	(0.00945)	(0.00868)
Public School	-0.00363	-0.01223	-0.00943	-0.00643
	(0.00683)	(0.00895)	(0.00832)	(0.01247)
Private School	0.00790	0.00598	0.00517	0.01031
	(0.00694)	(0.00775)	(0.00768)	(0.00996)
Panel D: Extortions				
	7 to 14 years old		15 to 22 years old	
	Male	Female	Male	Female
Not Enrolled	0.00020**	-0.00008	0.00035	0.00016
	(0.00010)	(0.00009)	(0.00027)	(0.00023)
Public School	0.00021	0.00051***	0.00021	-0.00040
	(0.00018)	(0.00014)	(0.00023)	(0.00028)
Private School	-0.00041**	-0.00043***	-0.00056***	0.00025
	(0.00017)	(0.00013)	(0.00021)	(0.00017)
Observations	5,366	5,241	5,500	4,626

Multinomial probit average marginal effects for multinomial probit regressions including the full set of controls in the base model. * p<0.1, ** p<0.05, *** p<0.01. Unconditional Standard Errors clustered to the municipal level in parentheses. Coefficients and Standard Errors are obtained by applying sampling weights.

Table 6: Robustness test results for the average marginal effect of the Truce effect on homicides, on the probability of each educational status by age group and gender.

Panel A: Age groups defined by risk of gang recruitment				
	7 to 11 years old		12 to 22 years old	
	Male	Female	Male	Female
Not Enrolled	-0.00724	0.00871	-0.00156	0.01095
	(0.00871)	(0.00586)	(0.01211)	(0.01258)
Public School	-0.01803	-0.04042**	-0.01673	-0.01953
	(0.01683)	(0.01739)	(0.01375)	(0.01471)
Private School	0.02527	0.03171*	0.01829	0.00858
	(0.01679)	(0.01656)	(0.01215)	(0.01306)
Panel B: Placebo truce effect on homicides				
	7 to 14 years old		15 to 22 years old	
	Male	Female	Male	Female
Not Enrolled	-0.01534	0.00781	0.04230	0.02649
	(0.01706)	(0.01764)	(0.03150)	(0.03801)
Public School	0.00749	-0.00487	-0.03874	-0.05329
	(0.04172)	(0.03711)	(0.03370)	(0.04558)
Private School	0.00785	-0.00294	-0.00356	0.02680
	(0.04024)	(0.03166)	(0.02789)	(0.03405)
Panel C: Truce effect on homicides without employing sample weights				
	7 to 14 years old		15 to 22 years old	
	Male	Female	Male	Female
Not Enrolled	-0.00574	0.01295*	-0.00126	-0.00296
	(0.00667)	(0.00748)	(0.01490)	(0.01383)
Public School	-0.00347	-0.02638**	-0.01826	-0.01825
	(0.01105)	(0.01183)	(0.01536)	(0.01377)
Private School	0.00922	0.01344	0.01953**	0.02122**
	(0.01144)	(0.01032)	(0.00890)	(0.01031)

Multinomial probit average marginal effects for the truce effect on homicides. Panel A shows estimation results by segmenting the sample in groups according to their risk of recruitment from gangs. Panel B shows the average marginal effect of a placebo truce effect on homicides in 2011. Panel C estimates the base model with the original definition of the truce effect on homicides without employing sample weights. All models include the full set of controls in the base model. * p<0.1 ** p<0.05 *** p<0.01. * p<0.1, ** p<0.05, *** p<0.01. Unconditional Standard Errors clustered to the municipal level in parentheses. Except for Panel C, coefficients and Standard Errors are obtained by applying sampling weights.