



Deportations and the transnational roots of gang violence in Central America [☆]

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ARTICLE INFO

Article history:

Accepted 18 December 2020

Available online 8 January 2021

Keywords:

Deportations
Gang Violence
Central America

ABSTRACT

It has often been claimed that the violent gangs that haunt Central America today are rooted in urban metropolises of the United States and have been exported to Central America through the deportation of convicted gang members. This case study on El Salvador provides econometric evidence that the deportation of convicts led to the spread of gangs along migration corridors. Cross-sectional analysis at the sub-national level reveals that migrants' municipalities of origin have a higher probability of gang presence today when migrant corridors developed around US destinations with high incidences of violent crime before migrants arrived. The cross-sectional evidence is backed by panel data analysis that allows testing the underlying mechanism. The inflow of convicted felons translated into rising homicide rates along migration corridors, whereas the inflow of non-convicts did not increase violence. In sum, the inflow of deported convicts constituted an exogenous spark of violence that had large and lasting consequences in countries that lacked the social, institutional and economic capacities to control the spread of gangs.

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"We sent them children fleeing war and they returned gangs to a country that needed to build peace" (Carlos Dada, Salvadoran journalist and writer)¹

1. Introduction

Gang-related violence has become a major concern in Central America since the late 1990s. Guatemala, Honduras and El Salvador are consistently ranked among the most violent countries of the world, with average annual homicide rates above 40 per 100,000 in Guatemala and above 60 per 100,000 persons in Honduras and El Salvador over the last ten years, compared to a global average of around 5 (World Bank, 2017). The murder rate in El Salvador was 109 per 100,000 habitants at its height in 2015, turning El Salvador into the most violent country of the world during that year.

[☆] I am indebted to Jesse Acevedo for sharing data on migration corridors and for very helpful comments, Carlos Carcach for sharing data on historical rates of violence, and Roberto Valencia for sharing data on local level homicide rates. The paper also benefitted from comments by Covadonga Meseguer, Sabine Kurtenbach, as well as participants at conferences and seminars in Göttingen, Mexico-City and Berlin. Errors and omissions are mine, of course.

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¹ New York Times (Spanish edition), "El Salvador sacudido por un terremoto llamado Trump", January 12th 2018, translated by author.

In 2017, more than 57% of Salvadoran citizens ranked delinquency and gangs as their most important concerns, above poverty, unemployment or the economy (Latinobarómetro 2017, 60). Social and economic costs to affected societies are huge. The migrant caravans from Central America that crossed Mexico on their way to the US in the autumn of 2018 have been attributed to violence at places of origin. Clemens (2017) reports that many of the 180 thousand unaccompanied minors from Guatemala, Honduras and El Salvador that have been apprehended at the US border between 2011 and 2016 fled violence in Central America.

El Salvador provides a unique laboratory for studying the effects of international migration on the spread of violence at origin. Civil war in the 1980s and subsequent out-migration rapidly transformed Salvadoran economy and society. By 2008, 1.2 million Salvadoran-born - roughly a fifth of El Salvador's population of 6 million - resided in the US, compared to only 2% of its population stock in 1981 (see Fig. 1). Remittances sent by migrants to their families at home contributed to 17% of Salvadoran GDP in 2016 (World Bank, 2017) and have been an important factor in reducing poverty, improving education outcomes, providing liquidity to the financial sector, and financing the current account deficit, among others (Cox Edwards & Ureta, 2003; Anzoategui, Demirgüç-Kunt, & Martínez Pería, 2014; Gammage, 2006).

On the dark side of international migration lies the spread of gang-related violence across Central America. Large part of the increase in homicide rates since the 1990s in El Salvador and other

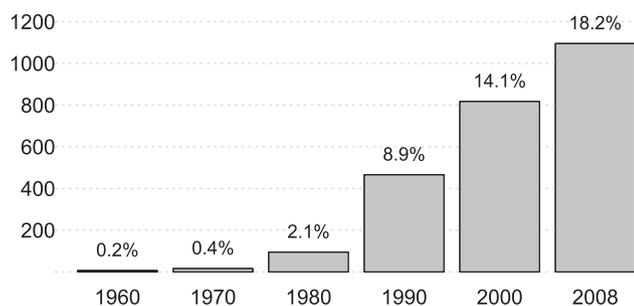


Fig. 1. Foreign born Salvadorans in the US (in thousands), and their share of home country population, 1960–2008. Source: [Pew Research Center \(2015\)](#).

Central American countries is related to the activities of two rivaling gangs: The “Mara Salvatrucha” (MS-13) and the 18th street gang (M-18 or Barrio 18), the latter having split into two separate fractions, the “Revolucionarios” (Revolutionaries) and the “Sureños” (Southerners) ([Cruz et al., 2017](#)). Both originated on the streets of Los Angeles, home to a large Salvadoran diaspora, nourishing the suspicion that violence in El Salvador and other Central American countries today is rooted in countries’ migration histories. Qualitative research and journalistic investigations have emphasized the role that mass deportations of migrants with a criminal record in the US have played for the propagation of gang violence in El Salvador and ultimately in other Central American countries (see for example [Arana, 2005](#); [Cruz, 2013](#); [Lineberger, 2011](#); [Rodgers, Muggah, & Stevenson, 2009](#); [Zuñiga Nuñez, 2016](#)).

Partly as a response to the involvement of immigrant population in drug trafficking and other illegal gang activities, large-scale deportations of Central Americans began in the mid-1990s. With passage of the Illegal Immigrant Reform and Immigrant Responsibility Act (IIRIRA) in 1996, any “alien” who served a longer-than-a-year sentence became subject to deportation from the US after completion of their prison term ([Cruz, 5, 2013](#); [Seelke, 2011](#)). Overall deportation rates increased further in the 2000s, including non-legal residents both with and without prior criminal records. Over the entire 17-year period for which data is shown in [Fig. 2](#) (1997–2015), El Salvador received a total of 244 thousand deportees. More than 90 thousand or roughly a third – the equivalent of 1.5% of the population stock of El Salvador – had previously been convicted for a crime².

[Rodgers et al. \(2009, 20\)](#) suspect that Nicaragua remained spared from the same level of gang violence despite a large diaspora in the US because its migrant communities were less exposed to US gang culture and therefore experienced much lower deportation rates from the United States³. Econometric evidence for such assertions is rare, though. In a cross-country panel, [Blake \(2014\)](#) studies the effect of deportations on crime and finds that deportations are correlated with homicide rates in countries of origin. [Ambrosius and Leblang \(2020\)](#) extend this analysis to later periods

² Public responses to the spread of gangs in El Salvador were complicated by the fact that Salvadoran authorities received no information on the legal background of returnees. Only in 2014, the State Department and the Department of Homeland Security signed an agreement to expand a Criminal History Information Sharing (CHIS) program with Central American countries ([Seelke 2011, 9](#); [Cruz 2013](#)). Hence, the Salvadoran state not only lacked the financial resources but was also deprived of the legal means for tracking deportees once they entered Salvadoran territory.

³ Although migration patterns in Central America followed country-specific patterns and dynamics, all three of the gang-ridden countries of the Northern Central American triangle (Guatemala, Honduras and El Salvador) received strong inflows of deported convicts since the 1990s (see [Obinna 2019](#) for a comparison of their migration contexts and settlement patterns across the US; and [Ambrosius and Leblang 2020](#) for cross-country patterns in deportations from the US).

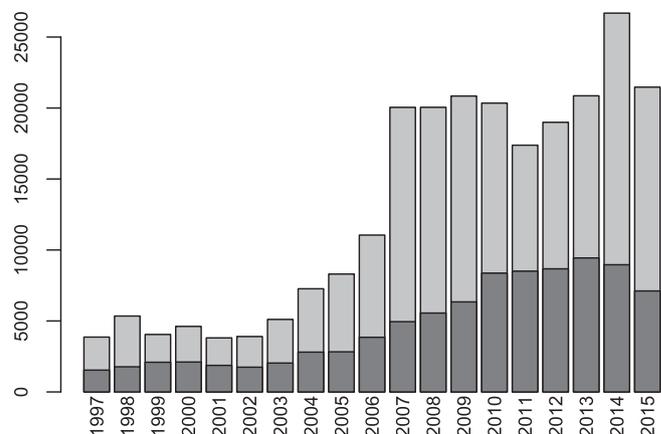


Fig. 2. Annual deportations of Salvadorans, 1997–2015. The figure shows total annual deportations of Salvadorans from the US (grey bars) and, as a subset, those who had been convicted (dark grey bars). Source: US Department of Homeland Security, Yearbooks of Immigration Statistics, Various Years.

and a broader set of countries and address endogeneity using migrants’ exposure to immigration policies at the level of US states as an instrumental variable. At the country level, [Kalsi \(2018\)](#) studies the effect of gangs in El Salvador on education outcomes, using the exposure of different age cohorts to the annual inflow of convicts as an instrument ([Kalsi, 2018, 585–87](#)), an approach that has been pursued similarly by [Sviatschi \(2019\)](#). While joined in the argument that the deportation of convicts facilitated the spread of gangs in El Salvador, this paper differs from and extends their research in several important ways. First, Kalsi’s geographic measure of gangs builds on the assumption that the inflow of convicts led to the spread of gangs in places where the possibilities to gain revenue from extortion – i.e. in densely settled areas with more businesses – was high. In contrast, this paper traces the contagion of violence along migration corridors while controlling for these and a large number of other social, economic and demographic pre-treatment differences that are potentially correlated with the posterior spread of gangs. This paper also extends previous research by addressing both cross-sectional and panel dynamics, by providing alternative measures of gang-related violence and by validating results using placebo regressions (i.e. estimation of the effect of non-criminal deportations and the effect of future deportations on current violence). This permits drawing a more nuanced picture of the transnational roots of gang-related violence in Central America and to emphasize the causal mechanisms through which migration to the US and US deportation policies shaped the subsequent rise of gangs.

Several main messages emerge from the empirical analysis. First, gangs spread along migration corridors. In Salvadoran municipalities whose migrant communities were exposed to large pre-existing rates of violence in their host communities upon arrival, destination country violence was transmitted back to migrants’ communities of origin. Second, the contagion of violence is driven by the deportation of Salvadorans with a previous conviction for crime in the US: The inflow of convicts translated into higher homicide rates in those municipalities whose migrant communities were exposed to high pre-existing levels of violent crime at destination. At the same time, the inflow of non-convicts did not add to violence. In sum, although the role of local conditions in facilitating the spread of gangs is not denied, this research singles out an exogenous spark that existed in the form of young immigrants’ exposure to pre-existing rates of violent crime in the US. Destination violence spilled over to municipalities of origin where gangs flourished after deportees returned to their places of birth and recruited new members from among the local population and in prisons.

The remainder of the paper is organized as follows: The following section II situates the paper within existing literature on the transnational roots of gang violence and derives testable hypotheses. Section III describes the data and methods applied. Section IV presents estimation results on the contagion of gang-related violence along migration corridors for a cross-section of 255 Salvadoran municipalities. Panel data regressions in section V allow testing deportations as the underlying mechanism of violence contagion, using data at the municipal level from 1999 to 2015. Chapter VI concludes with remarks on the policy implications of these findings and the potentially huge follow-up costs of deportation policies.

2. The transnational roots of Central American gangs: theory and hypotheses

While it is well known that the two dominant gangs that haunt Central America – the MS-13 and the 18th Street Gang – made their first appearances in the city of Los Angeles in the 1980s (Vigil, 2010), different views exist on their transnational dimensions. These fall into two main camps. One view has portrayed MS-13 as part of a larger transnational criminal network that reached out from the US to Central America. Arana (2005) claims in a much-cited journalistic article that “ultraviolent” gangs from Los Angeles “took over Central America”. According to Chabat (2008), the MS-13 constitutes a franchise of organized crime, and Papachristos (2005) and Fitzpatrick (2013) suggest that the expansion of gangs followed broader trends and opportunities provided by globalization.

In contrast, many scholars on the Central American gangs argue that the transnational dimension of the gang phenomenon has been overstated and lacks empirical substance. Although Central American gangs have transnational names, their activities are predominantly local (Hagedorn 2008b). For Savenije (2009) and Savenije and Andrade-Eekhoff (2003), the rise of Central American gangs responded most of all to internal conditions of marginality and social exclusion. Moreover, juvenile gangs have a tradition that can be traced back to the time before mass deportations (Smutt & Miranda, 1998). Rather than being an entirely new phenomenon, the Central American landscape of gangs has witnessed a “rebranding”: Marginalized groups borrowed and adopted the new lifestyles and attributes diffused by youth deported or returning from Los Angeles and other US metropolises (Hagedorn 2008b). From this perspective, MS-13 and M-18 have been described as a copycat phenomenon with little direct connection to US gangs (Wolf, 2012, 74). In support of this view, researchers have emphasized that only a minority of gang members has own migration experiences. Cruz (2013, 11) reports that in survey rounds undertaken by Cruz and Peña (1998) only 4% and 11% of interviewed gang members had actually been deported from the US. Among the imprisoned population interviewed by Cruz et al. (2017), less than 1% had grown up in the US (Cruz et al. 2017, 19)

Based on transnational migration studies and the literature on the “homeland spillovers” (Waldinger, 2013) or “diaspora externalities” (Rapoport, 2018) from migration, this research puts forward a view that differs from the above on two accounts.

First, whereas local conditions did certainly matter in posing fertile grounds for the spread of gangs across Central America, this investigation emphasizes that today’s presence of MS-13 and M-18 in El Salvador is more than a copycat phenomenon. Although the majority of gang members does not have own migration experiences, the arrival of deported convicts did play an important role for the contagion of violence across borders. Second, the contagion of gang-related violence did not occur as a deliberate branching out of gangs. In fact, empirical studies on gang violence in Central

America have rejected the portrayal of Central American gangs as part of transnational criminal networks. Corsetti (2006) and Johnson (2006) identify only limited cross-border command structures and a weak organization beyond local “clikas” or chapters of MS-13 (cp. Wolf, 2012, 67). Therefore, rather than a branching out of Los Angeles gangs, this research interprets gang proliferation as a process in which deportees “imported” and transmitted structures and behavioral patterns that interacted with local conditions (cp. Cruz, 2013).

An extensive literature has emphasized how “social remittances” (Levitt, 1998) – the flow of ideas, behaviors, identities and social capital across borders – affect migrants’ countries of origin. In general, this literature builds on the assumption that migration experiences lead to a status gain for migrants. As a result, migrants often function as role models and opinion leaders in their communities of origin where they multiply cultural norms and behavioral patterns from host countries. For instance, empirical studies have found evidence for the diffusion of fertility norms (Beine, Docquier, & Schiff 2013) and political preferences (Barsbai et al., 2017) along migration corridors. Such social, institutional or cultural spillovers from migration may occur across distance, i.e. via communication between sending and receiving communities. They may also be transmitted when migrants return. For example, researchers have found evidence that returning migrants diffuse political values (Chauvet & Mercier, 2014) and gender norms (Tuccio & Wahba, 2018) to their families and communities.

Convicts being returned to Central America face social stigma, exclusion and lack of employment perspectives in their countries of origin (Savenije, 2009; Savenije & Andrade-Eekhoff, 2003). At the same time, deported felons enjoy the social recognition they are denied in mainstream society among the marginalized young men that constitute the principal recruitment pool for gangs (Cruz et al., 2017). As Hagedorn (2008b, 43) writes, “In Guatemala, Honduras, and El Salvador, gang members returning from Los Angeles possessed powerful cultural symbols that appealed to alienated youth”. Based on their migration experiences and criminal skills, deported convicts were therefore able to occupy a position of high status among marginalized youth. Although returning migrants did not constitute the bulk of gang members, as leading figures within gangs they had a strong influence on their shape and character (Cruz, 2013). Attracting new gang members from the streets and in prisons (Demoscopia, 2007; Ranum, 2006), MS-13 and M-18 gradually supplanted, marginalized or absorbed older native gangs into the new dominant gang culture (Cruz, 2013; Rodgers, Muggah, & Stevenson, 19, 2009).

Building on the literature on transnational migration studies as well as previous research on gang development in Central America, this paper proposes three testable hypotheses. First, provided it is true that gangs originated in the US, pre-existing violence at migrants’ destination is expected to have a measurable effect on the posterior presence of gang-related violence at origin. Hence, under the assumption that gangs have transnational roots and that contagion occurred along migration corridors, the first hypothesis is stated as follows:

Hypothesis 1: Migrants’ exposure to violent crime at destination predicts the presence of gangs at origin.

In principle, a transmission of violence along migration corridors could occur via two channels. Similar to the transfer of values, norms and behavior that have been observed in the literature on social remittances, a stronger presence of gangs could be the result of cross-border interactions between migrants and their communities. Thus, we might see a contagion of violence as a result of transnational communication and interactions rather than as the result of a direct involvement of deported migrants in gang-related activities. Although this could be true to some extent, deportations are expected to be the principal mechanism that

explains the spread of violence along migration corridors. The first hypothesis is therefore extended in a second testable hypothesis:

Hypothesis 2: Deportations lead to a rise of homicide rates along migration corridors.

The effect of deportations on violence at origin should be driven by migrants with a prior history of crime in the US. Former migrants with a prior conviction are more likely to take up leading roles in gangs upon return to their communities of birth and are more likely to bring criminal skills and practices with them. At the same time, we should not see an increase in violence as a result of the inflow of deportees without a previous criminal record in the US. These assumptions justify the third hypothesis:

Hypothesis 3: The rise in homicide rates is due to the inflow of convicts, whereas the inflow of non-convicts does not increase violence.

The first hypothesis is tested on a cross-sectional dataset of Salvadoran municipalities by estimating the effect of migrants' exposure to violence at destination on the posterior presence of gangs. The second and third hypotheses are tested on a panel of Salvadoran municipalities reaching back to 1999. Time-variation on the independent variables is obtained by interacting migrants' exposure to violence at destination with the stock and inflow of deportees as well as with the inflow of deported convicts and non-convicts. The following section III explains the empirical approach in more detail.

3. Data and methods

In order to demonstrate that migrants' exposure to pre-existing violent crime at US destinations contaminated migrants' places of origin, this paper relies on both cross-sectional and time-variation in homicide rates at the level of Salvadoran municipalities. This section explains first the cross-sectional model related to hypotheses 1 followed by an explanation of the panel data model related to hypotheses 2 and 3.

3.1. Exposure to violence at destination and gang-related killings at origin: cross-sectional model

The following cross-sectional model is estimated for 255 Salvadoran municipalities j for which data is available⁴:

$$\text{gangrelatedkillings}_j = \beta_0 + \beta_1 \text{exposureUSviolence}_j + \beta_2 \text{Xpre92}_j + u_j \quad (1)$$

In Eqn 1, *gangrelatedkillings* refers to an estimate of homicides attributed to gangs, whereas *exposureUSviolence* measures the average exposure of each municipality's diaspora to pre-existing crime rates at US destinations. *Xpre92* is a vector of pre-treatment control variables measured at the level of Salvadoran municipalities, β are the estimated coefficients and u is the usual error term.

In order to distinguish the phenomenon of gang-related violence from overall homicide rates that may have other causes, the dependent variable proxies gang-related killings in each Salvadoran municipality j by exploiting the quasi-experiment of a truce⁵ that was brokered between rivaling gang members in Salvadoran prisons in march 2012 (Martínez et al., 2012). Incarcerated gang leaders who still commanded the two dominant gangs from within prison were offered privileges against the promise to reduce

killings. The truce brought average homicide rates considerably down to around 35 per 100,000 people between march 2012 and march 2013⁶, halving the average rate of around 70 during the years before (see Fig. 3). After the truce broke up in mid-2013⁷, homicides jumped to 109 per 100 thousand in 2015 (World Bank, 2017), the highest rate ever registered in El Salvador, turning the country into the world's most violent country in peace-time. Although the truce was not successful in suppressing gang-related violence over the longer term (post-truce homicide rates were higher than before), the policy experiment provides an opportunity to approximate gang-related violence at the level of municipalities as the difference between homicide rates during the truce (march 2012–march 2013) and homicide rates before and after the truce. Fig. 4 illustrates the estimate of the geographical distribution of gang-related violence in El Salvador, where darker shades indicate a stronger drop in homicide rates during the truce. The figure highlights considerable variation in the effects of the truce at the subnational level, with the strongest drops registered in the Central Western Zone. Data on homicide rates at the level of municipalities for the years 2009 to 2015 is based on information collected by the National Police, the Institute of Legal Medicine and the public prosecutor's department (*fiscalía*) in El Salvador⁸. For the years 1999 to 2008, homicide data at the municipal level is taken from the statistical yearbooks of the Institute for Legal Medicine (*Instituto de Medicina Legal de El Salvador. Anuarios Estadísticos*). For robustness, regression results are also shown using 1074 police encounters between police forces and presumed gang members between January 2015 and August 2016 as an alternative dependent variable (Fig 5)⁹. Using this alternative dependent variable responds to two potential concerns. For one, the truce might have led to a stronger drop of violence in regions where rivaling gangs fight each other over territorial control. Since police encounters with gangs are not limited to areas where gangs fight each other, this alternative variable should be less prone to the same measurement bias. Second, territorial control by gangs could have shifted to new municipalities over the period under study. Extending data coverage to the post-truce period makes it less likely that results are driven by changing dynamics over time.

The rationale behind estimating an effect of migrants' exposure to US violence is that gangs in El Salvador developed when migrant communities settled in urban areas with large pre-existing gang structures and other criminal activities. When Salvadoran migrant communities developed in the poorer urban districts of Los Angeles, Washington, New York and Houston (PEW, 2015; MPI, 2010), migrants were exposed to high levels of violent crime and a gang culture that was already flourishing prior to their arrival (Vigil, 2010, 132f; cp. Cruz, 2013).¹⁰ Once being returned to their places

⁶ Own calculation based on homicide rates reported by the *mesa tripartida*.

⁷ Although the truce was officially abandoned only in January 2015, the truce was already severely weakened after June 2013 (Valencia 2015). Calculations for the reduction in homicide rates is based on the period 03/2012 to 03/2013 during which homicide rates most visibly fell.

⁸ The National Police, the Institute of Legal Medicine and the public prosecutor's department form the "*mesa tripartida*" (a tripartite commission) that provides the most reliable information on homicide rates at the municipal level. Data from the *mesa tripartida* were shared by Roberto Valencia from the online newspaper www.elfaro.net

⁹ Data for encounters with presumed gangs comes from *Policía Nacional Civil* and has been provided by Roberto Valencia from the digital newspaper www.elfaro.net. See Valencia (2016).

¹⁰ After being initially attracted to existing Chicano and Latino gangs, children of Salvadoran migrants who had arrived in the 1980s and 1990s increasingly formed their own Salvadoran-based gangs, later joined by other Central Americans (cp. Cruz 2013). US prisons and Juvenile Detention Centers have been claimed to have played an important role in shaping a specific "Salvadoran" identity of gangs and their emancipation from older Latino gangs (see Howell and Moore 2010; Howell 2015; Dunn 2007; C. Martínez and Sanz 2012a; 2012b for the creation of Salvadoran gangs in the US).

⁴ The regression below uses 255 out of a total of 262 Salvadoran municipalities. Seven municipalities dropped from the regression. One municipality reported no data on migrants. Six Salvadoran municipalities have repeated names and could not be clearly assigned in the data.

⁵ This approach has been applied similarly by Kalsi (2018).

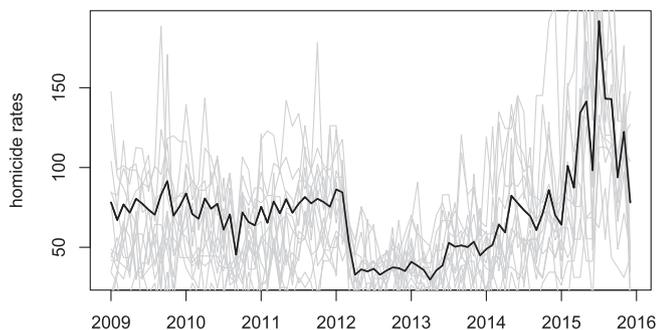


Fig. 3. Monthly homicide rates per 100 thousand persons, 2009–2016. The figure shows annualized homicide rates per 100 thousand persons at the level of Salvadoran municipalities (light grey lines) and as an average over all municipalities (black line). The truce between rivaling gang members was brokered in march 2013 and faded out in June 2013. See text for details and sources.

of birth, deportees brought gang practices, habits and criminal skills acquired abroad with them.

In order to create an indicator for diaspora's exposure to US crime at the level of Salvadoran municipalities, the exposure to crime at destination is weighted by the size of migrant populations in US destination counties. Data on migration corridors is based on documents issued by the Salvadoran consulates in the US who register place of birth and current residence for all Salvadorans requesting documents. The cross-sectional data has been assembled by the North American Integration and Development (NAID) Center at the University of California Los Angeles and permits identifying migration corridors between El Salvador and the United States up to the level of Salvadoran municipalities and US counties¹¹. For each Salvadoran municipality j , the share of its diaspora D in each destination county k is multiplied with crime rates C in destination county k in the year 1981, and summed up across all destinations K using the formula $exposureUSviolence_j = \sum_{k=1}^K C_k D_{kj}$. Hence, for every municipality j , the indicator calculates the average exposure of its migrant population to violent crime at destination counties k . Diaspora shares sum up to 100% for each Salvadoran municipality. This assures that it is not the size of the diaspora, but its distribution across the US that provides variation in crime exposure. Whereas data on gangs at a local level is not available for the 1980s, incidents of violent crime including murder and non-negligent manslaughter, legacy rape, revised rape, robbery, and aggravated assault are used as a proxy for the prevalence of gangs. Data for US crime statistics comes from the US Department of Justice-Federal Bureau of Investigation, via [US Census Bureau \(2017\)](#)¹². To mitigate the concern that crime rates at destination could themselves be affected by increasing immigration from Latin America since the 1990s, the earliest available year at the county-level will be used, which is 1981. Regressions below also evaluate the effect of different locations in the US, in particular Los Angeles, Washington D.C. and Long Island (New York). According to the sample on migration corridors, more than half of all emigrants were located in one of these three Metropolitan Areas¹³. With the excep-

¹¹ Data collection was completed in 2011 and used to be publicly available under <https://gis.ats.ucla.edu/naid/>. See [Hinojosa \(2011\)](#) for a description of the data and [Anzoategui et al. \(2014\)](#) for an application to the creation of instruments using migrants' population exposure to labor market shocks in the US. I am indebted to Jesse Acevedo for sharing the data.

¹² The average exposure of Salvadoran migrants to crime in the US was about 4–5 times larger than the average US crime rate (crime rates averaged over all US counties). This can be explained by the fact that Salvadoran migrants settled to a large degree in large cities.

¹³ Similar to the data reported here, the Migration Policy [Institute \(2010\)](#) states that nearly two-thirds of Salvadoran immigrants resided in only six metropolitan areas. In addition to those mentioned in the text, San Francisco, Dallas and Houston are other Metropolitan areas with considerable populations of Salvadoran immigrants.

tion of Long Island, all of them were characterized by intense gang activities in the 1980s and 1990s before Salvadoran emigrants arrived ([Hagedorn, 2008a](#); [Howell, 2015](#); [Dunn, 2007](#)). Especially Los Angeles is often considered to be the “gang capital of the world” ([Vigil, 2010](#)).

Two additional destination variables are included in order to ensure that the contagion of US crime to municipalities of origin is not driven by other variables at destination. Average housing costs of new buildings at the level of US counties is a proxy for wealth and living costs at migrants' destinations. In addition, the share of Latin origin population at destination measures the previous existence of a Latin American diaspora. Both variables refer to the year 1980, prior to the arrival of Salvadorans (Construction Division of the US Census and the 1980 Population Census, via [US Census Bureau \(2017\)](#)), and both variables have been normalized to the range [0,1]. In addition, the vector of cross-sectional control variables X_{92} includes a large number of variables related to social and demographic characteristics of municipalities. On the one hand, municipalities with a higher incidence of poverty and social exclusion might be more vulnerable to the spread of gang-related violence ([Savenije & Andrade-Eckhoff, 2003](#); [Savenije, 2009](#)), either because few employment opportunities lower the opportunity costs of becoming a gang member, or because social composition and cohesion may matter for how resilient a society is to the spread of gangs. On the other hand, municipal level variables address eventual bias that may occur from self-selection into US destinations. For example, emigrants from urban areas may have a preference for urban destinations in the US, that also tend to be characterized by higher levels of violent crime.

Control variables for the cross-sectional model refer to the year 1992 when the national census was carried out, shortly after the end of the civil war. This ensures that control variables are not themselves affected by gang violence spreading the country from the late 1990s onwards. The list of control variables includes average household size, population size (logged in the regression), and population density as controls for differences in demographic conditions. A measure on the share of households with at least one member above the age of 15 who does not know how to read or write is included as a measure of levels of human capital. A composite indicator of average housing quality on a scale between 0 and 1 captures differences in poverty levels, where higher values indicate worse housing quality. The indicator on housing quality gives equal weights to four binary housing measures, following definitions used by the National Statistics Office [Digestyc \(2015\)](#). In addition, regressions control for the share of households in which children under the age of 15 were working. Two variables are related to levels of migration and remittances: The share of households in a municipality that reported emigrants, and the share of households who reported international remittances from migrants abroad. Levels of historical data on homicides at the municipal level are hard to get. [Carcach \(2008\)](#) made an effort of estimating municipal level homicide rates for earlier decades by evaluating homicides reported in the printing press. Although these estimates might be biased towards urban municipalities due to better press coverage, the data functions as a rough proxy for historical differences in violence across regions in El Salvador, controlling for longer historical trends and patterns. Logged historical homicide rates measure the average number of homicides per 100,000 as reported in the years 1965, 1975 and 1995.

The estimation of Eq. (1) faces several methodological challenges. First, coefficients could be biased if violence in municipality j is also affected by violence in adjacent territories. Second, the dependent variable of gang-related killings is left-truncated: 45 municipalities either reported no drop in violence or increases in violence during the truce. Third, the estimate of homicide rates is relatively imprecise for small municipalities, with populations as

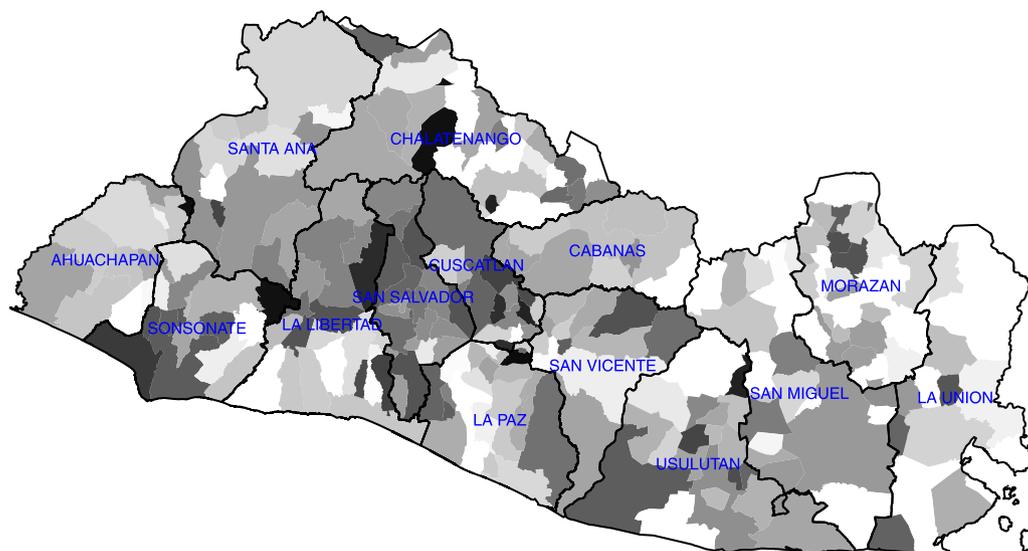


Fig. 4. Drop in homicides during truce, by municipalities. Darker shades indicate a higher drop in homicide rates during the truce between rivaling gangs (march 2012–march 2013). The drop in homicides rates is used as a proxy for the spatial distribution of gang-related homicides. See text for details.

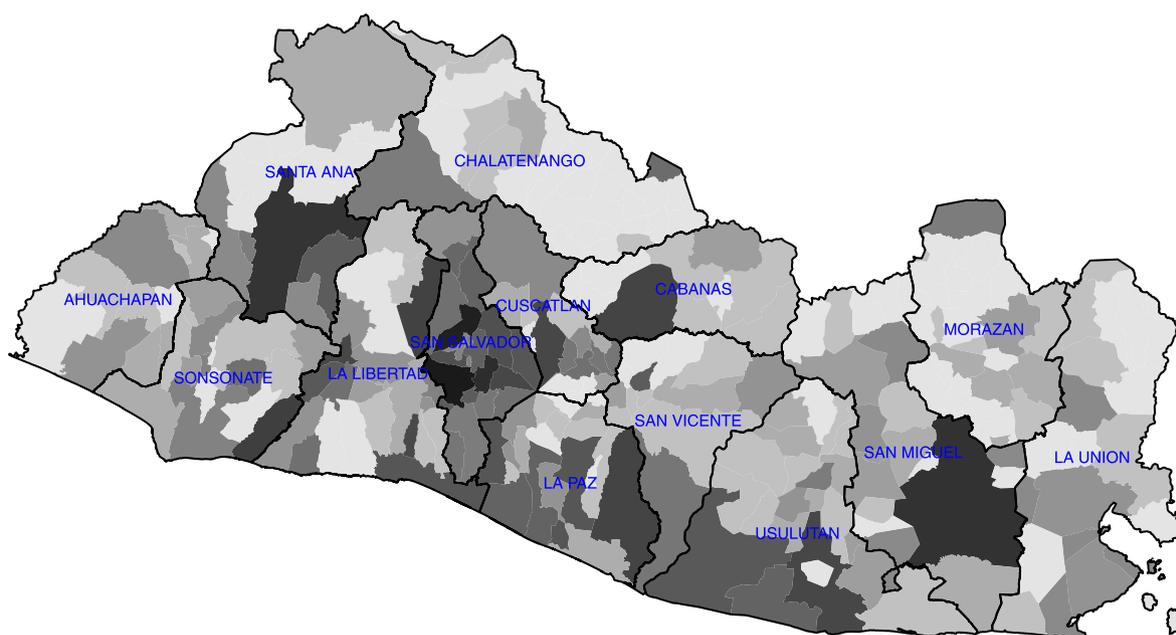


Fig. 5. Encounters between police forces and gangs (Jan. 2015–Aug. 2016). Darker shades indicate more encounters between police forces and presumed gang members between January 2015 and August 2016.

small as several thousand inhabitants in some cases. Indicators on the proxy of gang-related violence should be read with the caveat that this indicator is estimated with a larger error term in small municipalities.

The paper addresses these issues in the following ways. First, regressions include precision weights (inverse variance matrix weights), that give a lower weight to municipalities with small population sizes, taking into account a higher volatility in measuring homicide rates in smaller units. Alternatively, results will be shown for subsets excluding municipalities below a critical population threshold. Second, as an alternative to ordinary least squares regression, the paper applies tobit maximum likelihood estimation in order to correctly model the left-censoring of the dependent variable. Third, in order to address the possibility of spatial correlation, the paper follows common practice in the literature on

determinants of crime (e.g. Anselin, Cohen, Cook, Gorr, & Tita, 2000; Baller, Anselin, Messner, Deane, & Hawkins, 2001) and evaluates the inclusion of a spatial lag parameter, that takes into account possible correlation of violence between k municipalities sharing a common border. Then, a binary weighting matrix is applied to the list of neighbors in order to identify spatial lags for each municipality j .

3.2. The inflow of deportees and homicide rates: modelling time dynamics

Results from the cross-sectional study are backed by an analysis of time-variation in homicide rates at the municipal level, covering the sixteen-years period ranging from 1999 to 2015 that was marked by an overall increase in homicide rates. The analysis of time

dynamics has three goals. First, panel data analysis permits testing for the underlying mechanisms of cross-sectional correlations: Did the rise in violence over a longer period respond to the inflow of deportees? Second, the inclusion of municipality fixed effects in panel data regressions minimizes concerns of selection bias by controlling for all unobserved time-constant characteristics of municipalities. Third, if the hypothesis on the export of gangs through deported convicts is true, the rise in homicides should be driven by the inflow of deported convicts, whereas the inflow of non-convicts should have a much smaller or no effect on violence.

Unfortunately, detailed data on deportees including their municipalities of birth is not available. However, interacting aggregate numbers of the annual inflow of deportees with characteristics of different migration corridors provides annual variation at the level of municipalities that permits examining several implications and the channel of transmission: According to hypothesis H2, the stock and inflow of deportees is expected to have a strong effect on homicide rates in municipalities whose diaspora settled in high-crime environments in the US, and low effects in municipalities whose diaspora settled in low-crime environments. At the same time, as postulated in hypothesis H3, the effect should be driven by the inflow of convicts. Also, in line with eq. (1), we should observe a positive effect of an interaction of the inflow of convicts with high-crime exposure of migrants up the truce in march 2012, and a drop in homicide rates during the years of the truce (2012 and 2013).

These hypotheses will be tested using the following linear panel model:

$$\text{homicides}_{j,t} = \beta_1 \text{inflowdeportees}_t * \text{exposureUSviolence}_j + \beta_2 X_{j,t} + \tau_t + \nu_j + u_{j,t} \quad (2)$$

where homicides refer to logged homicides per 100 thousand persons at time t in municipality j . β_1 is the main coefficient of interest, estimated from an interaction between the inflow of deportees at the national level and the average exposure of migrants from each municipality j to pre-existing violent crime at US destinations. In addition, regressions include an interaction of migrants' exposure to violent crime at destination with the years of the truce.

The inflow of deportees is measured alternatively as cumulated stock of deportees or as new inflows at time t . The rationale for using the cumulated stock of deportees is that deported convicts constitute a pool of individuals that may eventually recur to violent behavior at some time, although not necessarily immediately after return. Alternatively, the recent inflow of deportees allows to assess whether the return of migrants affects rates of violence relatively shortly after being returned. New inflows are shown separately for deported felons and for the inflow of people without a previous record of crime¹⁴. Data on annual US deportations to El Salvador are available from the US Department of Homeland Security, Yearbooks of Immigration Statistics (see Fig. 2). Flows of deported migrants are available since the 1970s. Cumulated stocks as well as new inflows of deportees are calculated per 100 thousand persons¹⁵.

¹⁴ A challenge in strictly separating the effect of deported convicts and deported non-convicts is that both are strongly correlated (the correlation coefficient over the years 1997 to 2015 is 0.82). As can be seen in Figure 2, the deportation of convicts and non-convicts respond to similar trends. Even so, some variation in the inflow of deported convicts relative to non-convicts can be exploited, ranging between 25% of all deportees in 2007 to 52% of all deportees in 1999.

¹⁵ Deportation rates per 100 thousand over the period 1997 to 2015 ranged between 30 and 150 for convicts, and between 30 and 280 for non-convicts. The stock of deported convicts in 2015 was around 1.5% of the population of El Salvador, and the stock of deported non-convicts was around 3% in 2015. However, the registry of convictions in US deportation data was unsystematic before the 1990s, making the estimate of a stock of deportees with prior convictions unreliable. When referring to stocks, regressions therefore use the total stock of deportees only and not separate stocks for convicts and non-convicts.

Regressions are run on biannual periods, taking means over two-year periods for homicide rates and the inflow of deportees. This is done for two reasons. On the one hand, longer periods capture effects beyond annual observations. Deportations may translate into homicide rates with a lag. On the other hand, mean values over two-year periods for both the dependent variable (logged homicide rates) and the independent variable (inflow of new deportees) smooth outliers for single years.

The year fixed effects τ_t capture common time trends. Municipality fixed effects ν_j control for all time-constant factors at the municipality level, including geographical variables and institutional and other historical legacies. This reduces the potential threat to identification that may arise if unobserved variables explain both the self-selection into US destinations and the prevalence of gang-related killings today.

In addition to municipality fixed effects, the vector X is comprised of two time-varying controls at the level of municipalities. Population size is included as a measure of demographic factors that could be related to migratory movements, among others. In addition, the annual value added tax per capita generated at the level of municipalities controls for economic conditions. Annual data on per capita value added tax has been obtained from the Secretary of Finance (Ministerio de Hacienda de El Salvador, Dirección de Impuestos Internos). The National Statistics Office provides annual data on population size at the municipality level (Digestyc, 1996; Digestyc/UNFPA/CEPAL, 2014).

Like in the cross-sectional model, the panel model in Eq. (2) is estimated using precision weights, taking account of the fact that homicide rates have a higher volatility in small municipalities. As usual, u is the error term.

See Annex 1 for a description of all variables and sources.

4. Cross-sectional evidence: migrants' exposure to violent crime at destination and gang-related killings in El Salvador

Table 1 summarizes regression output for the effect of migrants' exposure to US crime rates on gang-related killings from ordinary least squares. Output based on tobit maximum likelihood estimation for left-censored variables and results from a spatial lag models are provided in the appendix. Since left-censoring and spatial lags hardly altered the results, results shown below mainly focus on linear regression results due to its simplicity and easy interpretation¹⁶.

Results in Table 1 are shown for eight different specifications. The first column shows effects of migrants' exposure to crime at destination on gang-related killings, without any additional controls. Column 2 adds social and demographic controls from the 1992 household census, a control for historical homicide rates, as well as controls for other destination characteristics (housing costs and the share of Latin population). Column 3 shows the effect of migrants' exposure to crime at destination together with department fixed effects and precision weights, addressing the lower reliability of estimates in small populations. Column 4 adds social and demographic controls plus a control for historical homicide rates. Column 5 additionally controls for destination characteristics (i.e. housing costs and share of Latin population). Column 6 excludes all municipalities that belong to the capital and largest city San Salvador. Columns 7 and 8 show results using encounters between police forces and presumed gang members between January 2015 and August 2016 has an alternative dependent variable.

¹⁶ For technical reasons, the three methodological challenges mentioned above – left truncation, spatial correlation, and imprecise estimates for small municipalities – are addressed separately. The reason for focusing on the linear regression output with precision weights is that bias resulting from small sample bias turned out to be more relevant compared to truncation and spatial correlation.

Table 1
Exposure to US violence and the presence of gangs (OLS).

	gang-related homicides						gang encounters	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	5.2 [9.2]	61 [53]	-40 [34]	310*** [110]	270** [110]	270** [110]	-4.6*** [1.2]	-4.7*** [1.3]
exposure US violence	74*** [26]	54* [32]	160** [80]	130** [52]	120** [53]	120** [53]	0.91** [0.38]	0.84** [0.38]
exposure housing costs		9 [16]			27 [33]	27 [33]		-0.14 [0.35]
exposure Latin		22 [15]			17 [27]	17 [27]		0.34 [0.32]
hist. homicide rates		-0.42 [1.3]		-6.2** [2.5]	-6.5*** [2.5]	-6.8*** [2.5]	-0.0054 [0.031]	-0.0034 [0.031]
analphabetism		-21 [37]		91 [83]	110 [84]	110 [87]	-0.77 [0.83]	-0.66 [0.81]
child work		21 [62]		150 [130]	160 [130]	160 [140]	0.51 [0.99]	0.55 [1]
population size		-3.9 [3.1]		-25*** [7.6]	-24*** [7.3]	-24*** [7.2]	-0.44*** [0.066]	-0.44*** [0.068]
population density		2.1 [1.6]		4.4 [5.8]	4.6 [5.9]	8.9 [20]	-0.15 [0.1]	-0.15 [0.1]
housing quality		35 [45]		-110 [69]	-110 [66]	-100 [67]	-0.16 [0.7]	-0.17 [0.7]
household size		-4.4 [5.8]		-19 [15]	-19 [14]	-19 [15]	0.0023 [0.21]	0.0019 [0.21]
emigration		-110 [71]		-210 [130]	-220* [120]	-220* [120]	-0.91 [1.1]	-0.96 [1.1]
remittances		90 [67]		190 [120]	190 [120]	190* [120]	1.1 [1.2]	1.1 [1.2]
department fixed effects	no	no	yes	yes	yes	yes	yes	yes
precision weights	no	no	yes	yes	yes	yes	yes	yes
sample	full	full	full	full	full	w/o San Salvador	full	full
# observations	255	251	255	251	251	232	251	251
F-stat	22.33	3.15	7.85	9.91	9.26	8.94	11.41	10.5
R ²	0.08	0.14	0.31	0.5	0.51	0.51	0.54	0.54
adj. R ²	0.08	0.09	0.27	0.45	0.45	0.45	0.49	0.49

Heteroscedastic robust standard errors are given in squared brackets. The dependent variable in columns 1 to 6 is an estimation of gang-related killings, proxied by the drop in homicides during the truce between rivaling gang members. The dependent variable in columns 7 and 8 are encounters between police and presumed gangs (weighted by population size and logged). Stars denote statistical significance at 10% (*), 5% (**) and 1% (***). See text for details.

Social and demographic variables in 1992 do not show a clear pattern with respect to the prevalence of gang-related killings today: Other than population size, none of the variables is statistically significant. A moderate negative effect is found for levels of out-migration (columns 5 and 6): Municipalities with a larger relative number of emigrants in 1992 have a lower level of gang-related violence today. This suggests that it is not migration as such that is related to violence. The share of households receiving remittances in 1992 has a positive sign in column 6. Population size enters with a negative sign, indicating that a larger drop in violence as a result of the truce was measured in small municipalities. Historical rates of violence are negatively correlated with gang-related killings. Partly, the negative sign should reflect an urban bias in the indicator based on crime reported in the printing press with better coverage of urban areas. With that limitation in mind, available data provides no evidence that historical rates of violence predict current rates of gang-related killings.

The one variable that is strongly statistically significant in all regressions is diasporas' exposure to violent crime at destination. As formulated in hypothesis H1, exposure to more crime at destination is associated with larger rates of current gang-related homicides (i.e. a stronger reduction in homicides during the truce). Since the variable on exposure to US violent crime has been normalized, the coefficient indicates the expected level of gang-related violence in the most exposed compared to the least exposed municipality. The effect of migrants' exposure is robust to the inclusion of pre-treatment municipality controls as well as other destination variables (columns 2, 4 and 5), and the exclusion of the Metropolitan area of San Salvador (column 6). Giving a lower

weight to small municipalities (precision weights in columns 3 to 6) increases the effect. Results are also robust to using encounters between police forces and gangs as an alternative dependent variable in columns 7 and 8.

Fig. 6 visualizes output from Table 1, by drawing the predicted level of gang-related violence from spec. (5) as a function of municipalities' exposure to violent crime in the US with a 95% confidence interval. Larger circles refer to more populated municipalities, that are given a larger precision weight in the regression. Note that the model predicts negative values at the lowest range, a result of using linear regression on data that should be censored at the left. Since 95% of municipalities have values above 0.2 on the x-axis, the OLS predictions hardly differ from the truncated model for the range of interest. See Annex 2 for estimation results based on the tobit model for censored variables.

Column 6 in Annex 2 also reports results from a spatial lag model, where a binary weighting matrix is applied to all municipalities sharing a common border. The coefficient is almost identical to the regression without spatial weights (column 2 in Table 1). Moreover, the negative and insignificant spatial lag parameter (rho) indicates that gang-related killings are not characterized by strong spatial correlation. This confirms the visual impression from the map in Fig. 4 that gang-related killings are not strongly correlated in space: Gang-ridden municipalities - i.e. municipalities where homicides dropped sharply during the truce - often share boundaries with municipalities where the truce had no visible effect.

Table 2 shows results for several additional specifications. Column 1 repeats column 5 from Table 1 but adds several post-

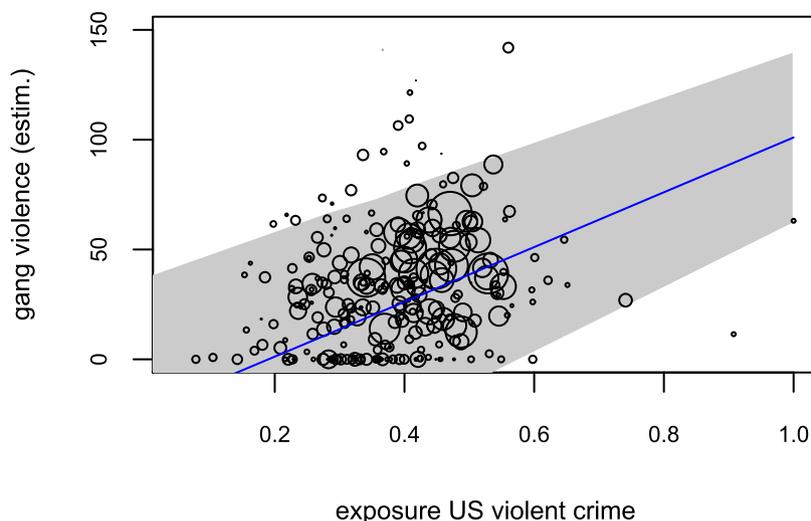


Fig. 6. Exposure to US crime and predicted gang violence. The figure draws the predicted effect of migrants’ average exposure to US violence (normalized) on gang-related killings, based on specification (5) in Table 1, with a 95% confidence interval. Larger circles refer to more populated municipalities, that are given a larger precision weight in the regression.

Table 2
Exposure to US violence and gang-related homicides (OLS, alternative specifications).

	gang-related homicides				
	(1)	(2)	(3)	(4)	(5)
(Intercept)	280** [140]	210 [150]	360*** [130]	390*** [130]	390*** [130]
exposure US violence	92** [42]	97** [43]			
Los Angeles		-120 [90]	55 [51]		
Long Island		9.8 [58]		-23 [48]	
Washington		69 [46]			-0.042 [37]
exposure housing costs	23 [28]	38 [37]			
exposure Latin population	10 [25]	70* [42]			
pre-treatment ctrls. (1992)	yes	yes	yes	yes	yes
additional ctrls. (2007)***	yes	yes	no	no	no
department fixed effects	yes	yes	yes	yes	yes
sample	full	full	full	full	full
precision weights	yes	yes	yes	yes	yes
# observations	251	251	251	251	251
F-stat	9.31	8.78	7.68	7.57	7.55
R ²	0.56	0.57	0.44	0.43	0.43
adj. R ²	0.5	0.51	0.38	0.38	0.38

Heteroscedastic robust standard errors are given in squared brackets. The dependent variable is an estimation of gang-related killings, as described in the text. Additional post-treatment controls include an average of per capita value added tax paid in each municipality over the periods 2001 to 2012 (*Ministerio de Hacienda, Dirección de Impuestos Internos*), the share of household with emigrants as well as the share of households receiving remittances as reported in the 2007 census (*Digestyc, Censo de Población y Vivienda 2007*), and the 2005 poverty head count at the municipal level *FISDL-FLACSO (2005)*. Pre-treatment controls refer to all controls included in Table 1, based on the 1992 census. Stars denote statistical significance at 10% (*), 5% (**) and 1% (***).

treatment variables: Average value added tax per capita raised over the years 2001 to 2012, population size in 2007, the poverty gap in 2005, the share of households receiving remittances and the share of households with emigrants in 2007. Results are robust to the inclusion of these post-treatment variables. Column 3 also controls for the three main destinations of migrants in the US (New York, Washington D.C. and Long Island). The coefficient for exposure to US violent crime is hardly affected. The remaining columns 4 to 6 provide estimated coefficients for each of the main destinations in the US separately. As expected, the sign for Long Island is negative (the destination with the lowest levels of violent crime in the 1980s) and the coefficient for Los Angeles is positive (the city with the strongest gang activities). However, none is sta-

tistically significant. What drives the result seems to be average exposure to violent crime rather than specific destinations.

5. The inflow of deportees and homicide rates: evidence from panel data

Several open questions remain from the cross-sectional analysis. For one, while establishing a correlation between migrants’ exposure to violent crime in the US and current gang-related killings, the actual channel of transmission – the deportation of convicts - is unobserved. Second, municipalities might self-select into more violent destinations in the US. Unobserved omitted vari-

ables may pose a threat to identification, if these explain both the self-selection into US destinations and the prevalence of gang-related violence today. For example, migrants from urban municipalities might self-select into urban destinations with larger crime, but urban municipalities at origin might also pose a more fertile ground for criminal activities.

In response to these concerns, this section provides additional evidence for the postulated hypothesis on violence contagion via deportations. By analyzing time-dynamics of homicide rates over the period 1999 to 2015, annual deportations can be related to changes in homicide rates at the municipal level. As put forward in hypothesis H2, the inflow of deportees is expected to increase homicide rates along migration corridors. If this is the case, deportations are the likely mechanism that explains the transnational contagion of violent crime as observed in the cross-sectional model. In addition, time variation at the municipal level allows evaluating the effect of the inflow of convicts vs. the inflow of non-convicts according to hypothesis H3. At the same time, the inclusion of municipality fixed effects permits to control for all time-invariant variables that could be related to self-selection into migrants' destination, for example social, cultural and institutional legacies or whether migrants came from urban or rural areas.

Table 3 summarizes results from linear panel data regressions with municipality and year fixed effects for up to 255 municipalities covering the period 1999 to 2015. The dependent variables in Table 3 are annual homicide rates at the level of municipalities (per 100 thousand). Although the inflow of deportees into specific municipalities is unknown, the interaction of aggregate deportations from the US to El Salvador with the exposure to US violent crime provides time-variation at the level of municipalities. Hence, the explanatory variable of interest is an interaction of the exposure to US violence – the same indicator used in the cross-sectional analysis – with the stock and inflow of deportees (see Eq. (2) above). The underlying idea here is that although average homicide rates increased at the national level since the late 1990s, local patterns differ strongly. Whereas homicide rates have been relatively stable in some places, they skyrocketed in others. If contagion occurred via deportations, we should see an increase of homicides in parallel to an increasing stock and inflow of depor-

tees, but only in municipalities whose migrants have been exposed to violent destinations in the US and in particularly for the inflow of deported convicts.

As in the cross-sectional analysis, all regressions in Table 3 include precision weights according to size of municipality. Regressions are run on mean values for the dependent variable (logged homicide rates) and the explanatory variables (the stock and inflow of deportees) over biannual periods. As mentioned above, two-year intervals take account of the fact that the inflow of deportees may translate into homicide rates with some lag and that means over two-year intervals reduce the effect of outliers for single years. Municipal and year fixed effects in all regression take account of time-constant differences across municipalities as well as common time trends.

Output in column 1 is estimated from an interaction between the aggregated stock of deportees and the exposure to US violence from 1999 up to the year 2011 before the truce entered into effect. Column 2 extends until 2015 and adds an interaction between the truce years and exposure to US violence as well as two control variables (value added tax per capita and population size). Since controls are only available from 2001 onwards, observations for the years 1999 and 2000 are dropped. Columns 3 to 7 explain homicide rates as the result of news inflows of deportees instead of the stock of deportees. Column 3 repeats the specification from column 2 but uses an interaction with the inflow of new deportees over two-year intervals instead of the stock of deportees. Column 4 and 5 show results for an interaction of exposure to violence at destination with the average new annual inflow of convicts, with and without the Metropolitan area of San Salvador in column 5. Column 6 interacts exposure to violence with the inflow of non-convicts. Column 7 uses interactions with the both the inflow of convicts and the inflow of non-convicts within the same regression.

All results are as expected and confirm hypotheses H2 (the inflow of deportees is associated with an increase in homicide rates along migration corridors) and hypotheses H3 (the effect is driven by deported convicts). An increasing stock of deportees is associated with rising homicide rates in municipalities with a stronger exposure to US violent crime (columns 1 and 2). The magnitude of the effect hardly changes when the period is extended through

Table 3
Deportations and homicide rates at the municipal level. Panel results (OLS).

	logged homicide rates						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exposure US violence * stock of deportees	0.00067*	0.00067**					
	[4e-04]	[0.00031]					
exposure US violence * inflow total deportees			0.0051*				
			[0.0028]				
exposure US violence * inflow deported convicts				0.018**	0.019**		0.028**
				[0.0078]	[0.0078]		[0.012]
exposure US violence * inflow deported non-convicts						0.0061	-0.0057
						[0.004]	[0.0065]
exposure US violence * truce		-0.49	-0.0029	-0.74	-0.74	0.3	-1.2
		[0.74]	[0.78]	[0.79]	[0.8]	[0.83]	[1.1]
value added tax per capita		-0.0065	-0.0054	-0.0059	-0.0043	-0.0049	-0.0059
		[0.012]	[0.012]	[0.012]	[0.015]	[0.012]	[0.012]
population size (log)		0.25	0.25	0.25	0.26	0.25	0.25
		[0.25]	[0.25]	[0.25]	[0.25]	[0.25]	[0.25]
sample	1999–2011	2001–2015	2001–2015	2001–2015	2001–2015	2001–2015	2001–2015
	full sample	full sample	full sample	full sample	w/o San Salvador	full sample	full sample
observations	1701	1925	1925	1925	1781	1925	1925
T	7	8	8	8	8	8	8
R ²	0.55	0.57	0.57	0.57	0.56	0.57	0.57
adj. R ²	0.47	0.51	0.51	0.51	0.5	0.51	0.51
F-stat	7.03	8.84	8.8	8.84	8.51	8.78	8.81

Heteroscedastic robust standard errors clustered at the municipality level are given in squared brackets. All results are estimated on two-year intervals with municipality and year fixed effects as well as precision weights by size of municipalities. Logged homicide rates as well as stocks and changes of deportations are measured as mean values over two-year periods. Stars denote statistical significance at 10% (*), 5% (**) and 1% (***). See text for details.

2015 and when controls are added in column 2. In line with the cross-sectional analysis, the truce is associated with a drop in homicides in municipalities with a higher exposure to violent crime in the US. This effect is statistically not significant, likely because two-year intervals only partially match the year of the truce. Using an interaction of exposure to violence with the inflow of new deportees in column 3 backs results based on the stock of deportees. In line with hypothesis H3, the effect seems to be driven by the inflow of convicts: The coefficient in column 4 increases in size and statistical significance when using the inflow of convicts only. Excluding the Metropolitan Area of San Salvador from the sample in column 5 has little effect on the results. The inflow of deported non-convicts (column 6) is much smaller in size when compared to the inflow of convicts in columns 4 and 5 and statistically insignificant. When including interactions with both the inflow of convicts and the inflow of non-convicts simultaneously in column 7, the magnitude of the effect of incoming convicts increases, whereas the interaction with non-convicts turns negative and stays statistically insignificant. In confirmation of hypothesis H3, this suggests that it is the inflow of deported convicts that affects violence¹⁷.

How many homicides can be attributed to the inflow of convicts? While the model does not identify an average effect of deportations on homicide rates, comparing effects of an inflow of deportees in municipalities with high and low exposure to US violence does provide some information on the magnitude of contagion. The stock and inflow of deportees is interacted with a normalized variable that measures exposure to violence at migrants' destination, where a difference of one refers to the most exposed municipality compared to the least exposed municipality. The coefficient for the interaction therefore measures how much homicides increases in response to the inflow (or stock) of deportees in the most exposed municipalities, taking the least exposed municipality as a baseline. A coefficient for the interaction with new inflows of deported convicts is almost 0.02 in columns 4 and 5. The mean value of logged homicide rates in the sample is about 2.8, corresponding to 16 homicides per 100 thousand in levels. For this value, an inflow of 10 deported convicts per 100 thousand increases expected homicide rates per 100 thousand by 3 to 4 in the most exposed municipality compared to the least exposed municipality (the difference between $\exp(2.8)$ and $\exp(3)$). This value is close to an average effect of around 3 that has been estimated by Ambrosius and Leblang (2020) for a panel of Latin American and Caribbean countries.

6. Conclusion

The two gangs that dominate violence in El Salvador – the MS 13 and the 18th street gang (M18) – originated in US cities. Previous qualitative research and journalistic investigations have claimed that deportations of convicted gang members who had mostly come as children of immigrants and were socialized into existing gang cultures at their places of arrival had a strong influence on the spread of gangs in Central America. This paper adds econometric evidence to the hypothesis on violence contagion: The larger migrants' exposure to pre-existing violence at destination, the more gang-related homicides and the more encounters between police and presumed gangs at their places of origin. This observation is backed by an analysis of time-dynamics. A rising

¹⁷ Differences between the effects for convicts and non-convicts may also explain the fact that Bucheli et al. (2019) diagnose lower levels of violence in response to the inflow of returning migrants in a different context of return to Mexico in the wake of the US financial crisis. Their study does not distinguish whether migrants return voluntarily or involuntarily or whether migrants had a record of crime before returning.

stock of deportees and new inflows of deported convicts translated into rising homicide rates mostly in those municipalities whose migrants were exposed to high levels of violent crime at US destinations. The fact that the same is not observed for the inflow of migrants without a penal record in the US lends support to the argument that the contagion of violence occurred via deported convicts.

This is not a denial of country conditions that favored the spread of gang-related violence in Central America. Social exclusion, lack of employment opportunities, weak state capacities, and possibly a tradition of violence that dates back to the civil war and before posed fertile grounds for the extension of gangs and the recruitment of new members from among the local population. However, the goal of this research was to trace the roots of gang-related violence to El Salvador's migration history and to single out an exogenous spark that consisted in migrants' exposure to violent crime in the US.

The Salvadoran experience bears important lessons for current debates on deportation policies in destination countries of immigrants. In the case of Central America, the huge long-term social and economic costs of deportation policies can hardly be assessed in quantitative terms. They pose a serious obstacle to the development of the affected countries and are the major cause of recent emigration waves from the Northern triangle in Central America (Honduras, Guatemala and El Salvador), that made headlines when Central American migrant caravans crossed Mexico on their way to the US in the autumn of 2018. Whereas contexts may differ, this study should be read as a warning also against deportation policies in other countries and contexts. Parallels may exist, for example, to the forced return of suspected terrorists towards countries that may lack capacities and resources to control and contain criminal activities.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.worlddev.2020.105373>.

References

- Ambrosius, C., & Leblang, D. A. (2020). Exporting Murder: US Deportations and the Spread of Violence." *International Studies Quarterly*, March. <https://doi.org/10.1093/isq/sqaa014>.
- Anselin, L., Cohen, J., Cook, D., Gorr, W., & Tita, G. (2000). Spatial analyses of crime. *Criminal Justice*, 4(2), 213–262.
- Anzoategui, D., Demirgüç-Kunt, A., & Martínez Pería, M. S. (2014). Remittances and Financial Inclusion: Evidence from El Salvador. *World Development*, 54, 338–349.
- Arana, A. (2005). How the Street Gangs Took Central America. *Foreign Aff.* 84, 98.
- Baller, R. D., Anselin, L., Messner, S. F., Deane, G., & Hawkins, D. F. (2001). Structural covariates of U.S. county homicide rates: Incorporating spatial effects. *Criminology*, 39(3), 561–588.
- Barsbai, T., Rapoport, H., Steinmayr, A., & Trebesch, C. (2017). The effect of labor migration on the diffusion of democracy: Evidence from a former Soviet Republic. *American Economic Journal: Applied Economics*, 9(3), 36–69.
- Beine, M., Docquier, F., & Schiff, M. (2013). International migration, transfer of norms and home country fertility. *Canadian Journal of Economics/Revue canadienne d'économie*, 46(4), 1406–1430.
- Blake, G. O. (2014). America's deadly export: Evidence from cross-country panel data of deportation and homicide rates. *International Review of Law and Economics*, 37, 156–168.
- Bucheli, J. R., Fontenla, M., & Waddell, B. J. (2019). Return migration and violence. *World Development*, 116, 113–124.
- Carcach, C. A. (2008). El Salvador. Mapa de Violencia y Su Referencia Historica. San Salvador.

- Chabat, J. (2008). Franchises for Crime: 'Maras' and North American Security. Working Paper. Mexico D.F.: CIDE.
- Chauvet, L., & Mercier, M. (2014). Do return migrants transfer political norms to their origin country? Evidence from Mali. *Journal of Comparative Economics*, 42(3), 630–651.
- Clemens, M. A. (2017). Violence, Development, and Migration Waves: Evidence from Central American Child Migrant Apprehensions. Working Paper 459. Washington, D.C.: Center for Global Development.
- Corsetti, J. D. (2006). Marked for death: The Maras of Central America and those who flee their wrath. *Georgetown Immigration Law Journal*, 20(3), 407–435.
- Cox Edwards, A., & Ureta, M. (2003). International migration, remittances, and schooling: Evidence from El Salvador. *Journal of Development Economics*, 72(2), 429–461. [https://doi.org/10.1016/S0304-3878\(03\)00115-9](https://doi.org/10.1016/S0304-3878(03)00115-9).
- Cruz, J. M. (2013). Beyond Social Remittances. Migration and Transnational Gangs in Central America. In How Migrants Impact Their Homelands, Susan Eckstein and Adil Najam (pp. 213–233). Duke University Press.
- Cruz, J. M., & Peña, N. P. (1998). Solidaridad y Violencia En Las Pandillas Del Gran San Salvador: Más Allá de La Vida Loca. Vol. 9. Uca Editores.
- Cruz, J. M., Rosen, J. D., Amaya, L. E., & Vorobyeva, Y. (2017). La Nueva Cara de Las Pandillas Callejeras: El Fenómeno de Las Pandillas En El Salvador. Centro Kimberly Green para América Latina y el Caribe.
- Demoscopia, S. A. (2007). Maras y Pandillas, Comunidad y Policía En Centroamérica. Guatemala, Agencia Sueca de Cooperación Para El Desarrollo (Asdi) y Banco Centroamericano de Integración Económica (Bcie).
- Digestyc (1996). Proyección de Población Por Año Calendario, Según Departamento, Municipio y Sexo. 1995–2010.
- Digestyc, UNFPA, and CEPAL (2014). Estimaciones y Proyecciones de Población. Dirección General de Estadística y Censos (Digestyc) (2015). Medición Multidimensional de La Pobreza. Secretaría Técnica y de Planificación de la Presidencia y Ministerio de Economía, a través de la Dirección General de Estadística y Censos.
- Dunn, W. C. (2007). The Gangs of Los Angeles. iUniverse.
- FISDL-FLACSO (2005). Documento Mapa de La Pobreza. Tomo I. Política Social y Focalización. Edited by Fondo de Inversión Social para el Desarrollo Local (FISDL) and Facultad Latinoamericana de Ciencias Sociales (FLACSO) El Salvador. San Salvador.
- Fitzpatrick, J. S. (2013). Globalization—the Beginning and the End of MS-13?. *Global Security Studies*, 4(4).
- Gammage, S. (2006). Exporting people and recruiting remittances: A development strategy for El Salvador?. *Latin American Perspectives*, 33(6), 75–100.
- Hagedorn, John M. 2008a. A World of Gangs: Armed Young Men and Gangsta Culture. Vol. 14. U of Minnesota Press.
- Hagedorn, J. M. (2008b). Making sense of Central American Maras. *Air & Space Power Journal*, 20(2), 42–48.
- Hinojosa, R. (2011). El Salvador–United States Transnational Corridors GIS Interactive Atlas. UCLA-NAID.
- Howell, J. C. (2015). The History of Street Gangs in the United States: Their Origins and Transformations. Lexington Books.
- Howell, J. C., & Moore, J. P. (2010). History of Street Gangs in the United States. National Gang Center Bulletin 4 (May).
- Johnson, M. H. (2006). National Policies and the Rise of Transnational Gangs. Migration Policy Institute.
- Kalsi, P. (2018). The impact of U.S. deportation of criminals on gang development and education in El Salvador. *Journal of Development Economics*, 135, 433–448.
- Latinobarómetro (2017). "Informe 2017." Buenos Aires.
- Levitt, P. (1998). Social remittances: Migration driven local-level forms of cultural diffusion. *International Migration Review*, 32(4), 926–948.
- Lineberger, K. P. (2011). The United States–El Salvador Extradition Treaty: A dated obstacle in the transnational war against Mara Salvatrucha (MS-13). *Vanderbilt Journal of Transnational Law*, 44, 187.
- Martínez, C., & Sanz, J. L. (2012a). El Origen Del Odio. El Faro, June 8, 2012, sec. Sala Negra.
- Martínez, C., & Sanz, J. L. (2012b). La Letra 13. El Faro, June 8, 2012, sec. Sala Negra.
- Martínez, Ó., Martínez, C., Sergio Arauz, & Efrén L. (2012). Gobierno Negoció Con Pandillas Reducción de Homicidios. El Faro, March 14, 2012.
- Migration Policy Institute (MPI). 2010. "Salvadoran Immigrants in the United States."
- Obinna, D. N. (2019). Transiciones e Incertidumbres: Migration from El Salvador, Honduras and Guatemala. Transiciones e incertidumbres: La emigración de El Salvador, Honduras y Guatemala. *Latino Studies*, 17(4), 484–504. <https://doi.org/10.1057/s41276-019-00209-8>.
- Papachristos, A. V. (2005). Gang world. *Foreign Policy*, 147, 48.
- Pew Research Center (2015). Hispanics of Salvadoran Origin in the United States, 2013. Statistical Profile. Washington, D.C.
- Ranum, Elin Cecilie (2006). Pandillas Juveniles Transnacionales En Centroamérica, México y Estados Unidos: Diagnóstico Nacional Guatemala. Instituto Universitario de Opinión Pública.
- Rapport, H. (2018). Diaspora Externalities: A View from the South. World Institute for Development Economic Research (UNU-WIDER).
- Rodgers, D., Muggah, R., & Stevenson, C. (2009). Gangs of Central America: Causes, Costs, and Interventions. Small Arms Survey Geneva.
- Savenije, W. (2009). Maras y Barras: Pandillas y Violencia Juvenil En Los Barrios Marginales de Centroamérica.
- Savenije, W., & Andrade-Eekhoff, K. (2003). Conviviendo En La Orilla. Violencia y Exclusión Social En El Área Metropolitana de San Salvador.
- Seelke, C. R. (2011). Gangs in Central America. *Current Politics and Economics of South and Central America*, 4(1), 67.
- Smutt, M., & Miranda, J. L. E. (1998). *El Fenómeno de Las Pandillas En El Salvador*. FLACSO and UNICEF.
- Sviatschi, M. M. (2019). US Criminal Deportations and Human Capital in Central America. *AEA Papers and Proceedings*, 109, 239–242.
- Tuccio, M., & Wahba, J. (2018). Return migration and the transfer of gender norms: Evidence from the Middle East. *Journal of Comparative Economics*.
- US Census Bureau (2017). USA Counties Online Databases.
- Valencia, R. (2015). La Tregua Redefinió El Mapa de Asesinatos de El Salvador. El Faro, September 3, 2015.
- Valencia, R. (2016). Casi Que Guardia Nacional Civil. El Faro, October 3, 2016. <https://elfaro.net/es/201610/salanegra/19277/Casi-que-Guardia-Nacional-Civil.htm>.
- Vigil, D. (2010). A Rainbow of Gangs: Street Cultures in the Mega-City. University of Texas Press.
- Waldinger, R. (2013). Immigrant transnationalism. *Current Sociology*, 61(5–6), 756–777.
- Wolf, S. (2012). Mara Salvatrucha: The most dangerous street gang in the Americas?. *Latin American Politics and Society*, 54(1), 65–99.
- World Bank (2017). World Development Indicators Online Database.
- Zuñiga Nuñez, M. (2016). Migración, Pandillas y Criminalización: La Conflictividad Social Estadounidense y Su Relación Con El Salvador. In Migraciones En América Central, Carlos Sandoval García (pp. 25–46).