

The Monopoly of Peace: Gang Criminality and Political Elections in El Salvador

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Abstract

Despite the growing body of qualitative evidence suggesting collusion between gangs and political parties in various parts of the world, little has been done to study quantitatively the extent to which criminal organizations may affect political elections in a context where all parties must negotiate. After conducting interviews with stakeholders in El Salvador and reviewing journalistic reports, we have proposed a model of political crime. In this model, politicians offer incentives to gangs in exchange for an increase or decrease in criminal activity, with the aim of maximizing their electoral support. We test our predictions using police data and voting results in El Salvador and find that homicides in gang-controlled neighborhoods tend to decrease by 31 percent of the mean during electoral seasons. We also estimate that gang control is associated with a 2.5 percentage point increase in electoral participation. These effects are especially significant in the neighborhoods where political parties have a strong voting base and where political participation is low. This suggests that parties negotiate with gangs to mobilize electoral participation in the areas where they are more likely to receive electoral support and thus increase their chances of winning. To conduct our analysis, we geolocated the homicides reported daily in the registry of the National Civil Police from 2011 to 2019 crossed with electoral results reported at the voting-center level across El Salvador. We exploit the sudden and exogenous decrease in criminality resulting from the 2012 truce between the government and the two main gangs in El Salvador to identify gang-controlled neighborhoods.

Keywords: political elections, organized crime, participation

JEL codes: D72, P48

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“All parties have sought rapprochement with us”

Gang leader of a Barrio 18 faction

The New York Times, August 2020

“If you want to be a politician in this country you have to deal with them”

Ernesto Muyschondt, former Vice President of Arena Party, former mayor of San Salvador

El faro, March 2016

“In the municipality of Alegría, for example, the deputy who is a substitute wants votes and approaches someone there and does it... and around here the mayor of the municipality of Jucuapa, or in a municipality X, approaches the kids to tell them they want to win and they already make their deal. They all do! They do it in the communities, the public relations representative is the one who arrives, opens the way, and then the candidate arrives and... it’s normal! There are photographs of all those things that have occurred, and all the parties have done that. Everyone looks for that approach”

Gang leader of a Barrio 18 faction

El faro, April 2016

1 Introduction

How do criminal organizations influence elections? Criminal groups threaten democracy and the development of free institutions. From a theoretical standpoint, criminal organizations may interfere with political elections to seek their own gain, either by strong-arming candidates or colluding with them (Dal Bó and Di Tella, 2006). In various geographical contexts indeed, evidence shows that organized crime may increase violence prior to elections, either to deter inconvenient politicians from running in the election (Daniele and Dipoppa, 2017) or to force voters' participation (Bullock, 2021). Alternatively, organized crime may target newly elected politicians shortly after the elections to sway their policy making (Pinotti, 2012; Alesina, Piccolo and Pinotti, 2019). However, when it comes to generalized collusion between criminal organizations and political parties, empirical evidence on organized violence and its consequences on political elections remains limited.

This is what we explore using neighborhood-level police data and election results between 2011 and 2019 in El Salvador, one of the most violent countries in Latin America with deeply rooted criminal groups (Figure 1). We provide novel evidence that gangs may leverage their control of violence and instrumentalize the absence thereof to sway elections in a context of collusion with political parties.

We conducted interviews with two journalists, one campaign manager, one former congressman, two academics, and one member of the Supreme Electoral Court (SEC). From these discussions, we understand that gangs seem to affect elections mostly by controlling political campaigns' access to gang-controlled areas, and electoral participation, by either encouraging votes or gate keeping voting centers.

Based on the mechanisms we uncovered during these interviews, we propose a model of supply and demand to understand crime variations at the neighborhood level during electoral seasons. Politicians can offer an *incentive* to gangs (e.g., a bribe) in exchange for an increase or a decrease in criminality. On the one hand, politicians incur a material and personal cost by negotiating with gangs ; on the other hand, crime variations affect voters'

turnout in a way that may benefit politicians. The model predicts that when politicians have a strong voting base and participation is low in a given neighborhood, they incentivize gangs to decrease crime and increase participation, in order for them to win more votes. Similarly, less popular politicians have an incentive to increase crime and deter participation. However, they face a higher marginal cost to do so, hence the overall level of criminality reduces in gang-controlled areas.

To verify these predictions, we use the electoral results from local and national elections in El Salvador disaggregated at the voting-center level between 2011 to 2019 as reported by the SEC. We also geolocated the homicides reported daily in the registry of the National Civil Police from 2005 to 2019 across El Salvador based on street addresses. We then matched the homicides to the corresponding neighborhoods and voting centers across the entire country, which allows use to study variations in violence in relation with electoral results. We exploit the sudden and exogenous decrease in criminality resulting from the 2012 truce between the government and the two main gangs in El Salvador to identify gang-controlled neighborhoods. Since the truce was enforced by gang leaders across the country, any significant reduction in criminality after the truce reveals gang activity and tighter gang-control. We verify this measure using reports of gang-related murders in the National Police data prior to the truce.

In line with Alesina, Piccolo and Pinotti (2019) and Daniele and Dipoppa (2017), our first set of estimation relies on a Two-Way Fixed Effect (TWFE) model (year-week and voting center fixed effects) to study the differential effect of electoral seasons and gang-control on violence at the voting-center level. In a second set of estimations, we also use year and municipality fixed effects to identify the effect of gang-control on participation and electoral results at the voting-center level. Variations in electoral participation and violence are place and time dependent. The TWFE strategy enables us to estimate the differential impact of gang-control and electoral seasons on our outcomes, while controlling for place and time related confounders.

First, during electoral seasons, we have observed a decrease of about 31 percent in homi-

cides that occur in neighborhoods controlled by gangs, in comparison to the mean. This reduction has been found to be consistent and remains unchanged even after controlling for any potential relocation of police forces that may have taken place before elections. Second, we find that electoral participation is higher by about 2.5 percentage point in gang-controlled neighborhoods. These effects are especially significant in the neighborhoods where participation and political competition is low, meaning that political parties have more certainty about the strength of their voting base and more favorable voters to mobilize. This is consistent with the first prediction of our model and the interviews we conducted, suggesting that parties, left and right, negotiate with gangs to mobilize electoral participation in the areas where they believe they are more likely to receive electoral support and thus increase their chances of winning. Our findings remain consistent even when using different measures of gang-control obtained from incarcerated gang members' place of origin, as revealed by penitentiary data. Additionally, our results are in line with other data sources like the LAPOP survey. We also notice that the impact is greater in areas with stricter gang control. In aggregate, we do not observe local violence surge during elections in gang-controlled areas, suggesting that politicians experience a high enough cost, moral and financial, not to encourage criminality and dissuade voters from participating.

This paper makes a valuable contribution to the expanding literature on the impact of criminal organizations on politics, particularly in contexts where state institutions are weak and unable to provide adequate security in areas controlled by these criminal groups. Numerous authors have examined the intricate relationship between criminal organizations and political dynamics (Dal Bó and Di Tella, 2006; Acemoglu, Robinson and Santos, 2013; Buonanno, Prarolo and Vanin, 2016; De Feo and De Luca, 2017; Acemoglu, De Feo and De Luca, 2020; Murphy and Rossi, 2020; Accardo, De Feo and De Luca, 2021; Bullock, 2021). Some studies have specifically focused on identifying patterns of criminal activity and its effects during electoral periods (Pinotti, 2012; Sberna and Olivieri, 2014; Dell, 2015; Daniele and Dipoppa, 2017; Alesina, Piccolo and Pinotti, 2019; Córdova, 2019; Buonanno, Prarolo and Vanin, 2016).

Dal Bó and Di Tella (2003) developed a model that explores how "nasty" groups can ma-

nipulate policymakers into implementing policies that serve their interests instead of those of society as a whole. Expanding upon these findings, Dal Bó and Di Tella (2006, 2007) demonstrate how a combination of monetary incentives ("plata") and coercive measures ("plomo") can undermine the quality of policymakers and foster corruption within weak judicial systems. Alesina, Piccolo and Pinotti (2019) introduce a model in which an honest political party competes against a criminally captured party, leading to instances of heightened violence prior to elections, particularly in regions where electoral outcomes are uncertain. In our study, we develop an alternative model wherein all political parties may collude with criminal gangs, who offer their services to the highest bidder.

While much of the empirical evidence has focused on violence against politicians as a means for criminal organizations to enforce their agenda, Daniele and Dipoppa (2017) utilize media data to illustrate that violence against local politicians in southern Italy tends to increase in regions with high levels of organized crime, primarily after elections and particularly following changes in local government. This suggests that mafia groups target newly elected politicians at the beginning of their terms. Conversely, Pinotti (2012) and Alesina, Piccolo and Pinotti (2019) find that violence against politicians rises before national elections in regions with significant organized crime influence, especially when the election outcome is uncertain. This suggests that mafia groups primarily concentrate their actions before elections to deter unfavorable candidates from running for office. Consistent with this perspective, Bullock (2021) also discovers that organized crime reduces political competition by preventing rival candidates from campaigning in areas dominated by criminal activity. In our analysis, we uncover evidence of gatekeeping, but we conclude that crime tends to decrease during electoral seasons in gang-controlled neighborhoods. Our qualitative study did not reveal targeted violence against politicians themselves, but rather revealed widespread collusion between political parties and criminal gangs.

On political participation, the empirical evidence is also mixed, if not contradictory. According to one view, organized crime seems to increase turnover through different mechanisms. Politicians may strike alliances with criminal groups, who will tilt the elections in their favor by mobilizing the voters they control. In areas controlled by organized crime, this trans-

lates into higher coerced participation (Bullock, 2021). More indirectly, Blattman (2009) finds that greater exposure to violence increases electoral participation, as traumatic effects could bolster personal growth and political activity. These findings are generalizable to different geographic contexts, especially in Latin America. Conversely, another viewpoint indicates that gang activities tend to diminish both electoral and non-electoral political involvement (Córdova, 2019). This is further supported by research indicating that efforts to boost electoral turnout in El Salvador have been largely ineffective in gang-dominated areas (Baires, Sviatschi and Vargas, 2019). Moreover, gangs in El Salvador are known to significantly influence human capital dynamics by restricting resident mobility (Melnikov, Schmidt-Padilla and Sviatschi, 2020). Our findings suggest a positive correlation between gang control and electoral participation, implying that gangs might either encourage or coerce voting, especially in areas with low electoral competition.

Finally, this study contributes to the extensive body of research examining how politicians and institutions modify their behavior in response to electoral cycles. The concept of the Political Business Cycle (PBC), initially explored by pioneering scholars such as Nordhaus (1975); Lindbeck (1976); Tufte (1978), is particularly pertinent. There is a wealth of evidence indicating that the effects of electoral cycles are more pronounced in developing countries (De Haan and Klomp, 2013; Schuknecht, 1996; Block, 2002). Strategies targeting highly visible social programs have been identified as the most effective in influencing voter behavior (Zucco Jr, 2013; Baez et al., 2012; Galiani et al., 2019; De Haan and Klomp, 2013). In the context of El Salvador, crime rates could play a similar role in influencing electoral outcomes. The scope of research has broadened to include other tactics, such as the tendency for judges to impose harsher sentences during their own political cycles as a means to garner votes (Berdejo and Yuchtman, 2013; Abrams et al., 2023). Our findings suggest that in areas with high crime rates and where crime is a major voter concern, political candidates are more likely to engage in negotiations with gangs. This strategy often results in a decrease in crime and an increase in voter turnout in regions where candidates have a strong voter base.

The rest of the paper is organized as follows. Section 2 provides information on the context

of El Salvador. Section 3 studies the different mechanisms through which gangs may affect elections in El Salvador as gathered from news investigations and our own interviews. Based on these, section 4 introduces a model of political crime. Section 5 presents the data and methodology, while section 6 reports our quantitative results. Section 7 concludes.

2 Context

2.1 Electoral setting

El Salvador has managed to consolidate democracy after the civil war that ended in 1992. After the conflict, a two-party system emerged: the left-wing, represented by the FMLN party, and the right-wing, by the ARENA party. A new party, Nuevas Ideas, was created in the center-right in 2017 and won the most recent elections. According to Freedom House, the country was considered democratically free until 2019 (currently considered partially free). This contrasts with neighboring countries such as Nicaragua, Guatemala, and Honduras and even surpasses other countries with better economic development such as Mexico, Ecuador, and Colombia, which are ranked lower in Freedom House's index.

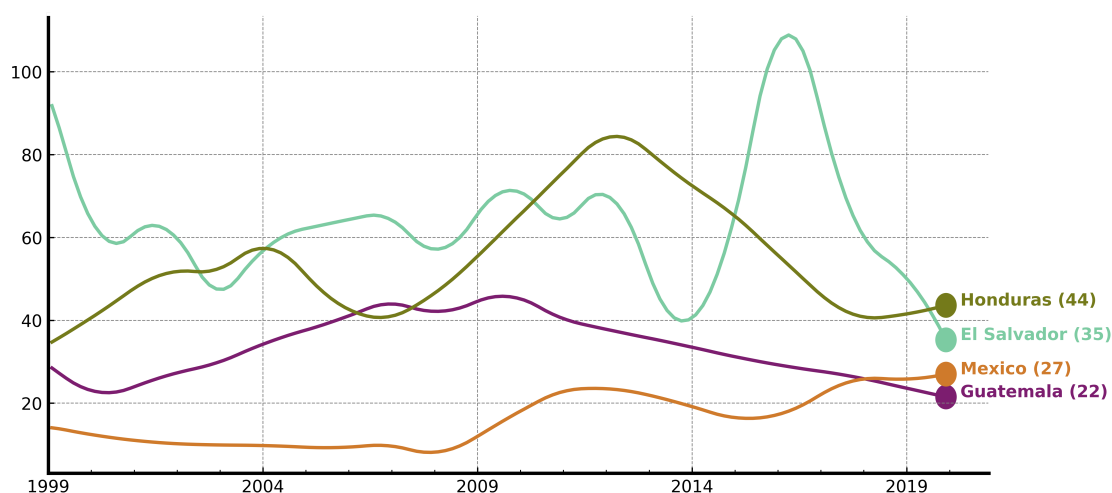
In El Salvador, three types of elections are held: legislative, municipal, and presidential. Legislative and municipal elections are held jointly every three years, but their functioning differs. For municipal elections, eligible citizens may vote for one political party. The winning party in each of the 262 municipalities takes over the positions of mayor and municipal councilors. In legislative elections, voters have the option to split their vote, allocating fractions of it to different candidates. All votes are then added and the candidate with the highest number of votes in each of the 84 districts is elected deputy. Presidential elections are held every five years and may coincide with municipal and legislative elections. An absolute majority is required to win the presidential election, absent of which a second round is held between the two candidates with the highest vote share in the first round.

In our sample, municipal and legislative elections were held in 2012, 2015, and 2018, while presidential elections occurred in 2014 and 2019. A runoff was organized between the FMLN and ARENA candidates during the 2014 presidential election. For that case, we consider the first round to be the start day of the election, and only use the first round to measure participation and political competition.

2.2 Criminal structures in El Salvador

El Salvador is one of the most violent countries in Latin American (Figure 1). In 2015, the country reached a maximum peak that exceeded 100 homicides per 100,000 inhabitants, five times higher than the average for Latin America. According to data from the National Police, a third of homicides are due to gangs. The economic cost of violence as a percentage of GDP is estimated between 6.5% and 16% (Jaitman et al., 2017; Peñate et al., 2016). Gangs are mainly responsible for the high level of crime observed in the country. Melnikov, Schmidt-Padilla and Sviatschi (2020); Kalsi (2018) show that households in gang neighborhoods are seriously affected by gang influence on a broad range of socio-economic indicators: income, education, and housing quality. Gangs impose their own rules and restrict people's freedom. These differences did not exist before the consolidation of gangs in those areas.

Figure 1: Homicide rate comparison (per 100,000 people)



Source: own elaboration based on data from the World Bank and InsightCrime.

The main gangs in El Salvador are Barrio-18 (B-18) and Mara Salvatrucha 13 (MS-13), formed by Latin American migrants in Los Angeles. The gangs developed in poor neighborhoods with high violence rates. In 1996, the US Illegal Immigration Responsibility Act substantially increased the number of deportations targeting convicted migrants, among

which gang members. Between 1998 and 2010, approximately 300,000 people with criminal records were deported to Central America. These massive deportations facilitated the spread of criminal groups throughout Central America, El Salvador being one of the most affected countries (Sviatschi, 2020).

2.3 Political response

In 2012, the government facilitated a highly criticized truce dialogue between the main gang leaders in prisons. According to journalistic investigations, the government offered better incarceration conditions and less police repression to incentivize gang leaders to strike a truce among themselves. The truce became effective after the March 2012 elections and led to a 48% decrease in murders within a month. Despite the significant drop, the public opinion remained mostly opposed to the truce. The government was blamed for legitimizing gangs by engaging with them and indirectly reinforcing gangs' control over some territories by reducing police enforcement. Although murders reduced, petty crimes, extortions, and drug trafficking kept increasing (Lohmuller, 2015).

In 2014, Salvador Sánchez Cerén from the left-wing party FMLN won the presidential elections by 6,364 votes only. Shortly after his election, the administration started backing up from the 2012 truce. Gang leaders were transferred to maximum security prisons in January 2015, battalions of Special Forces were deployed in May 2015 to combat the gangs, and in August 2015, the two main gangs were declared “terrorist groups” by the Supreme Court. Criminality reached a new peak, with about 110 murders per 100,000 inhabitants reported in 2015, almost 1.5 times higher than pre-truce levels.

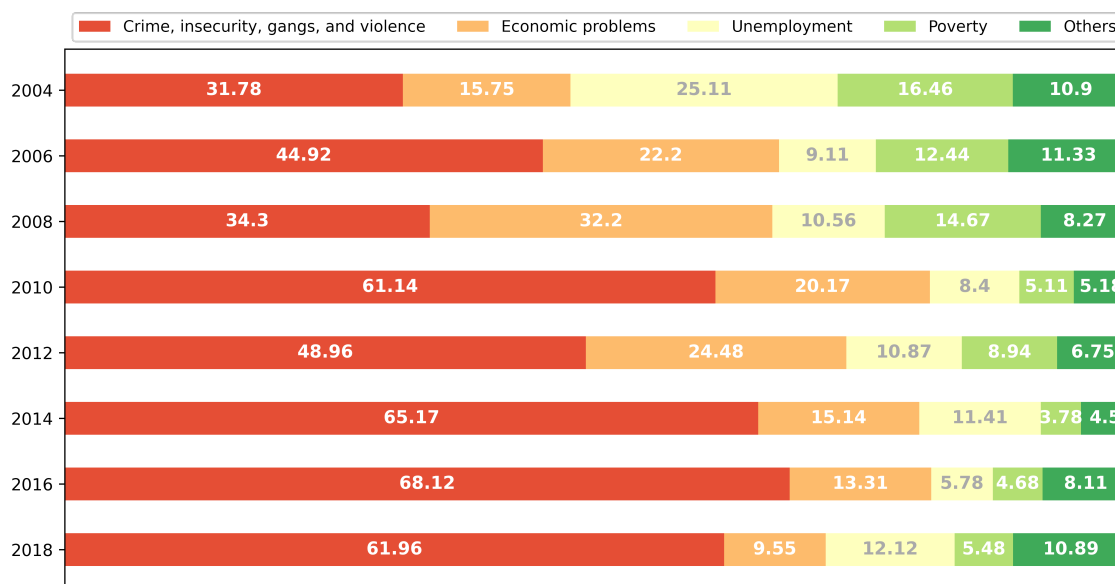
The truce consolidated the gangs' political agenda. In 2015, the two main gangs in El Salvador released a joint statement claiming that they would be open to negotiating a truce with the government (Reuters, 2015). In 2021, investigations by the U.S. Department of the Treasury (2021) indicated that the Government of Nayib Bukele (Nuevas Ideas) held negotiations with gangs to win elections. In other words, the truce shifted the conflict from gang rivalry to politically motivated violence.

3 Gangs and political elections: mechanisms of action

3.1 Crime and voter preferences

According to *The AmericasBarometer by the Latin American Public Opinion Project (LAPOP)* (2004 - 2018), since 2004, Salvadorans have consistently reported that crime, insecurity, gangs, and violence are the most severe problem in the country. These concerns have increased since 2004, from 32% to 62% in 2018. Crime and insecurity seem to have remained the main problem for the country, even in times of economic recession. Hence, voters will tend to favor politicians who are able to reduce criminality (see Figure 2).

Figure 2: Voters' main concerns in El Salvador



Source: *The AmericasBarometer by the Latin American Public Opinion Project (LAPOP)*. 1,500 Salvadorans participate in the survey each year. The surveys are nationally representative.

On the other hand, since 2010, between 15 and 20% of Salvadorans have reported living in a neighborhood seriously affected by gangs. This share increased during the truce between 2012 and 2014, despite decreasing homicides. Although the increase is not significant, it could indicate that the gangs maintained or even strengthened their control during the truce (see Appendix Figure C.2).

3.2 Newspapers and official investigations

Given that crime remains the primary concern of Salvadoran voters, secretly negotiating with gangs to reduce homicides, probably the most high profile crimes, could be an effective strategy to attract voters. After the truce, in 2014, the former mayors of San Salvador, Norman Quijano and Ernesto Muyschondt, were accused of negotiating electoral favors with gang leaders (*Avanza causa penal contra políticos por pacto con pandillas en El Salvador*, 2020; Caceres, 2020). According to journalists from *El Faro*, former Mayor Norma Quijano offered to eliminate the anti-gang law and reduce police control in certain areas in exchange for support in the 2014 presidential elections.

According to journalistic investigations, Martinez (2020) and Roberto Valencia (interviewed), the actual number of negotiations between gangs and political leaders remains unknown. Using videos and audio leaks by gang members, journalists have been able to reveal many negotiations between politicians and gangs. In 2016, the leader of the Barrio-18 gang assured that all political parties engaged in negotiations with gangs (Martinez, 2016) for the 2014 presidential election. This was also confirmed by the former mayor of San Salvador Ernesto Muyschondt in public statements (Labrador and Martinez, 2016).

More recently, the U.S. Department of the Treasury (2021) revealed that Osiris Luna, Vice Minister of Justice of the Nayib Bukele Government, held secret negotiations with MS-13 and Barrio-18 gang leaders. According to the Treasury, in 2020, the Government offered financial incentives for the gangs to keep the number of homicides low and support the Nuevas Ideas party in the legislative and municipal elections of 2021. In addition, the Government of El Salvador offered special privileges to leaders in prisons such as cell phones and prostitutes. This is not the first time that members of the Nuevas Ideas party have been accused of negotiating with gangs. Martinez (2018) revealed that in 2015, delegates from Nayib Bukele offered money to gang leaders not to disturb his candidacy.

Candidates also seem to be interested in the gang members' votes themselves. The exact number of gang members is currently unknown, but some estimates points toward 60,000

members and 500,000 support base (relatives and collaborators), which would represent 8% of the population of El Salvador (Zaidi, 2019; Raderstorf and Meléndez Sánchez, 2015; International Crisis Group, 2017). This number is significant, especially when considering that there was only about 6,000 votes separating the winner from the defeated candidate during the 2014 presidential election.

3.3 Expert interviews

To complement these reports, we conducted interviews with two journalists, one campaign manager, one former congressman, two academics, and one member of the Supreme Electoral Court (SEC). We adopted an emic approach and derived common themes from our discussions. We understand that gangs seem to affect elections mostly electoral participation.

The following is based on what our interviewees have experienced or observed themselves on the field. This enables us to elaborate a theoretical model and formulate hypotheses that we test quantitatively in the next sections. The interviewees will remain anonymous.

Voters' choice. First, interviewees reported that gangs can prevent parties from campaigning within the neighborhoods they control. Gangs have checkpoints controlling the entrance of certain neighborhoods, otherwise have groups reporting activity within the neighborhood. If politicians enter without having negotiated first and received prior authorisation, they face threats and need to give away something (cash or in-kind). Besides safe access for campaigning purposes, gang leaders usually offer their members' votes to the candidates in exchange for several advantages (cash, in-kind favors, reduced police enforcement). Gangs can also ask their relatives to support a specific party.

Electoral participation. Second, interviewees mentioned that gangs can affect electoral participation in both ways. Gangs can increase violence prior to the elections and use check-

points to prevent people from moving to the voting centers on election day. Gang members may be collecting identity cards prior to the elections to prevent certain people from voting. They can also announce that they will check hands to verify that these people did not go to vote (voting centers mark voters' hands with ink to prevent multiple voting). Conversely, gangs can help parties mobilize voters. On election day, certain people are in charge of encouraging people to vote. Usually this role is performed by a member of a party (moving people on buses, reminding residents to vote, etc). In some neighborhoods, gang members take on this role to tacitly force people to vote. People in the neighborhoods are intimidated by the role of authority that gang members have in the community.

4 Gerrymandering violence: a model of political crime

We propose a model of supply and demand to understand crime variations at the neighborhood level¹ during electoral seasons. In the steady state, gangs set the level of crime \bar{c} that maximizes their profit in each neighborhood. Importantly, we assume that gangs do not have political preferences of their own and would sell their services to the highest bidder, as it has been the case in the past (see section 3.2). During electoral seasons, politicians can offer an incentive b (e.g., a bribe or the promise of lower police enforcement if they get elected) in exchange for an increase ($b > 0$) or a decrease ($b < 0$) in criminality. This has two consequences: on the one hand, politicians incur a material and personal cost by negotiating with gangs ; on the other hand, crime variations affect voters' turnout in a way that may benefit politicians. Appendix Table D.6 documents the negative association between criminality prior to elections and electoral participation.

We derive below the optimal incentive b^* when it exists. When a politician has a strong voting base in a given neighborhood and participation is low, we find that it is optimal for them to incentivize gangs to decrease crime and increase participation, in order for them to win more votes. This is consistent with what we learned from our interviews and infer from the data in El Salvador. Conversely, in neighborhoods where politicians have little support and when their personal cost to negotiate with gangs is low, it may be optimal for them to bribe gangs to increase crime and deter participation, hence reducing votes for the opposing politician. Empirically, we do not observe this latter behavior in El Salvador, either in the data or in our qualitative study, which suggests that politicians may face a high personal cost to negotiate increases in crime against civilians.

¹In El Salvador, every municipality holds on average 6 different voting centers.

4.1 Gangs and the supply of crime

In the steady state, gangs maximize the profit π they derive from crime c

$$\pi(c) \equiv u(c) - d(c)$$

where gangs' utility u is an increasing function of crime c with decreasing returns² and gangs' costs d associated with crime is an increasing and marginally increasing function of crime³. Additionally, gangs' can only derive a set utility from a given neighborhood (limited number of inhabitants and businesses) while the associated costs are minimized in the absence of crime. Under these hypotheses, gangs' profit is a concave function of crime with an upper bound, which ensures the existence and uniqueness of a maximizing crime \bar{c} for each neighborhood.

$$\begin{aligned} \bar{c} &\equiv \operatorname{argmax} \pi(c) \\ &\text{s.t. } c > 0 \end{aligned}$$

During electoral times, politicians can offer an incentive b conditional on an increase ($b > 0$) or a decrease ($b < 0$) in criminality. Gangs' profit becomes

$$\tilde{\pi}(c) = u(c) - d(c) + b(c - \bar{c})$$

The first order condition for $c \equiv \bar{c} + \Delta c$ gives

$$\pi'(\bar{c} + \Delta c) + b = 0$$

A Taylor expansion around \bar{c} enables us to simplify

$$\pi'(\bar{c} + \Delta c) \simeq \pi'(\bar{c}) + \pi''(\bar{c}) \Delta c$$

²It becomes harder for gangs to extract value from crime as crime increases: businesses pay diminishing rents, drug trafficking becomes less profitable etc.

³For example, police enforcement becomes tighter when crime increases, even more so when crime is high and high profile, inhabitants become more hostile etc.

By construction, $\pi'(\bar{c}) = 0$. Hence

$$\Delta c^* = \left(-\frac{1}{\pi''(\bar{c})} \right) b$$

Under the assumption of a linear profit from incentive b , gangs provide a linear amount of crime in the same direction as the incentive, multiplied by a factor $\gamma \equiv -\frac{1}{\pi''(\bar{c})} > 0$. The sharpest crime costs are, the more bribe it will take to reach a given variation of crime Δc .

4.2 Politicians and the demand for crime

Setup. In all elections, local or national, politicians compete over several neighborhoods⁴. Whoever wins most votes in aggregate, wins the election. As a result, in any given neighborhood, politicians aim to maximize the vote gap to their closest contender. For a popular candidate (P), facing their challenger (U), the vote gap is

$$v_p(c) - v_u(c) = \frac{v_p(c) - v_u(c)}{v_p(c) + v_u(c)} (v_p(c) + v_u(c))$$

where $v_p(c)$ (resp. $v_u(c)$) is the number of votes cast in favor of the popular candidate (resp. their challenger). In a two party system, the total number of votes $v(p)$ is equal to $v_p(c) + v_u(c)$. Gangs can influence turnout: the more violence, the less voters feel safe to participate ($v' < 0$). We assume this effect is marginally dwindling ($v'' < 0$). However, we further assume that candidates cannot affect their underlying vote share $\frac{v_p(c) - v_u(c)}{v(c)}$ through bribes and crime. Indeed, we understand from our interviews that gangs cannot identify voters' individual preferences nor influence them. Voters remain free to choose their preferred candidate once inside the privacy of voting booths. Therefore, the popular candidate's vote gap becomes

$$v_p(c) - v_u(c) = \alpha_p v(c)$$

where $\alpha_p \geq 0$ represents the popular candidate's vote gap as a share of votes, which does not depend on crime. Similarly, $\alpha_u \leq 0$ denotes the challenger's vote gap as a share of votes. In

⁴In El Salvador, each municipality counts 6 neighborhoods on average.

a two party system, α_u is mechanically the opposite of α_p . Let us write $\alpha = \alpha_p = -\alpha_u \geq 0$.

As we established above, politicians can affect criminality by providing an incentive b to gangs. By doing so nonetheless, they incur a loss $l_{p,u}(b)$, both monetary (to pay the bribes) and personal (politicians' morality, risk of being uncovered and face prosecution). The loss is an increasing function of the incentive b . Marginally, the loss also increases with the incentive since heavy investigations may be triggered only beyond a certain level of collusion. We assume a quadratic functional form, with positive parameters l_p and l_u

$$l_{p,u}(b) = l_{p,u} b^2$$

Optimization problem. Given these assumptions, the popular candidate offers the incentive b_p that maximizes the following target function

$$\max_{b_p, c} V_p(b_p, c) \equiv \alpha v(c) - l_p b_p^2$$

The level of crime c is simultaneously set by the incentives provided by the popular candidate and their challenger $c = \bar{c} + \gamma b_p + \gamma b_u$. Hence the target function

$$\max_{b_p} V_p(b_p, b_u) = \alpha v(\bar{c} + \gamma b_p + \gamma b_u) - l_p b_p^2 \quad (1)$$

Similarly, the challenger's target function writes

$$\max_{b_u} V_u(b_p, b_u) = -\alpha v(\bar{c} + \gamma b_p + \gamma b_u) - l_u b_u^2 \quad (2)$$

Voters' turnout is negatively affected by crime ($v' < 0$) and is bound between zero votes and the finite number of registered voters in the neighborhood. Hence, both target functions have an upper bound and tend to minus infinity when the incentives hit plus or minus infinity. This guarantees the existence of a maximum and no minimum. As a result, if the target functions admit a unique critical point, then this is a global maximum.

Solving the Nash equilibrium. Given the challenger's bribe b_u , the popular candidate's best response $BR_p(b_u)$ is the solution to the following first order condition

$$\alpha\gamma v'(\bar{c} + \gamma BR_p(b_u) + \gamma b_u) - 2l_p BR_p(b_u) = 0$$

A Taylor expansion around \bar{c} enables us to simplify

$$v'(\bar{c} + \gamma BR_p(b_u) + \gamma b_u) \simeq v'(\bar{c}) + \gamma v''(\bar{c}) (BR_p(b_u) + b_u)$$

Hence

$$BR_p(b_u) = \frac{\alpha\gamma v'(\bar{c}) + \alpha\gamma^2 v''(\bar{c})b_u}{2l_p - \alpha\gamma^2 v''(\bar{c})}$$

Similarly,

$$BR_u(b_p) = -\frac{\alpha\gamma v'(\bar{c}) + \alpha\gamma^2 v''(\bar{c})b_p}{2l_u + \alpha\gamma^2 v''(\bar{c})}$$

The uniqueness of these solutions ensures that the best responses indeed maximize their respective target functions.

We derive the Nash equilibrium by intersecting the two best responses: $b_p^* = BR_p(BR_u(b_p^*))$ and $b_u^* = BR_u(BR_p(b_u^*))$. More details can be found in Appendix B. Eventually

$$b_p^* = \frac{\alpha\gamma v'(\bar{c})l_u}{2l_p l_u + \alpha\gamma^2 v''(\bar{c})(l_p - l_u)}$$

and

$$b_u^* = -\frac{\alpha\gamma v'(\bar{c})l_p}{2l_u l_p + \alpha\gamma^2 v''(\bar{c})(l_p - l_u)}$$

Comparing these quantities

$$\frac{b_p^*}{b_u^*} = -\frac{l_u}{l_p} \tag{3}$$

And the overall crime level

$$c^* = \bar{c} + \frac{\alpha\gamma^2 v'(\bar{c})(l_p - l_u)}{2l_u l_p + \alpha\gamma^2 v''(\bar{c})(l_p - l_u)} \tag{4}$$

Discussion. Looking back at the optimization problem 1, given that $\alpha, \gamma \geq 0$ and v is a decreasing function, we see that for $b_p \geq 0$, $V_p(b_p, b_u) \leq V_p(0, b_u)$. Hence, necessarily, the popular candidates' optimal bribe b_p^* is negative. In other words, popular candidates will endeavor to reduce crime in order to increase participation and convert their popularity into additional votes in their favor. Symmetrically, looking at optimization problem 2, we can conclude that the challengers' optimal bribe b_u^* has to be positive. Challengers have an incentive to bribe gangs to increase crime and reduce participation in order to silence votes that are not in their favor.

By bribing gangs to increase crime, challengers are more at risk than popular candidates. If words spread, they are more likely to face criminal charges and to raise public backlash. Besides, challengers' moral cost when they encourage crime is most likely higher than popular candidates' who aim to appease crime and make sure voters can participate. Gangs themselves might be more lenient towards popular candidates in their neighborhood than their challengers, even though, on average across the country, gangs have no set political affiliation. For these reasons, we expect popular candidates' marginal cost to bribing gangs to be lower than their challengers: $l_p \leq l_u$.

From there, identity 3 enables us to conclude that the optimal bribe popular candidates are willing to pay (in absolute terms) is higher than their challengers' $|b_u^*| \leq |b_p^*|$. As a consequence, looking at identity 4, the overall crime after bribes is lower than in the steady state $c^* \leq \bar{c}$, by an amount

$$c^* - \bar{c} = \frac{\alpha\gamma^2 v'(\bar{c})(l_p - l_u)}{2l_u l_p + \alpha\gamma^2 v''(\bar{c})(l_p - l_u)} \leq 0$$

The overall crime reduction is an increasing function of $v'(\bar{c})$, α , and γ , which means we expect larger crime reductions in neighborhoods where participation is low to begin with ($v'' < 0$), where popular politicians have a strong voting base (high α), and where gangs are easy to bribe (high γ).

In summary, in a context where gangs do not have strong political ties, we expect to see crime reductions during electoral seasons. Popular politicians will incentivize gangs to de-

crease crime and increase participation, in order for them to win more votes. We expect to see larger effects in neighborhoods with low participation, large political support for one candidate, and where gangs are easy to bribe. In the following sections, we conduct empirical tests of these predictions in the context of El Salvador.

5 Data and methodology

5.1 Data

Table 1 below summarises the data sources we use in this paper.

Table 1: Data summary

Source	Description	Geographic unit	Time span
Electoral Supreme Court	Electoral results	1500 voting centers	2009 - 2019
National Police	Daily murders	Neighborhood	2011 - 2020
National Police	Daily murders	Municipality	2005 - 2020
National Police	Number of officers	Neighborhood	2011 - 2020
General Directorate of Prisons	Detentions' data	Neighborhood	2000 - 2020

Electoral results. To analyze elections, we use the number of votes cast for each party at the voting-center level. Based on these data, we derive parties' outcomes and electoral participation. We also compute competitiveness indicators (see Appendix A). The data includes all voting centers in El Salvador from 2011 to 2019 (1500 units per year, with their geographic locations and associated areas).

Registry of the National Civil Police. We measure criminality based on the homicides reported in the daily registry of the National Civil Police (NPC). From this registry, we calculate weekly homicide rates excluding non-culpable homicides. The database was cross-verified with other sources of information such as the health system homicide data. It also includes information about the victims' occupations and the textual address where the homicide was committed.

We georeferenced these addresses using a database of all the neighborhoods in El Salvador

and their coordinates from the General Directorate of Statistics and Census. We could not use Google Maps as many areas in El Salvador are not referenced there. Once georeferenced, we matched the homicide data with the voting centers by counting the number of homicides that occurred within each voting center's geographic polygon.

We also use data on officer allocation to each police station. These stations are georeferenced, enabling the precise merging of police personnel distribution with the corresponding geographical areas of the election data.

General Directorate of Prisons. To validate and complement the analysis of gang presence, we use carceral data. This data enables us to identify the main neighborhoods where convicted gang members lived before going to prison. We use the same methodology as for the homicides to georeference the addresses in this base.

5.2 Identifying gang-controlled areas

5.2.1 Gang-related homicides

Along with the homicides and their approximate location, the daily registry of homicides made available by the National Police also reports victims' occupations. Based on this, we identified gang-related murders by looking for victims either directly categorized as gang members or involved in extortion and drug trafficking. We also included murders committed against the police as markers of gang violence.

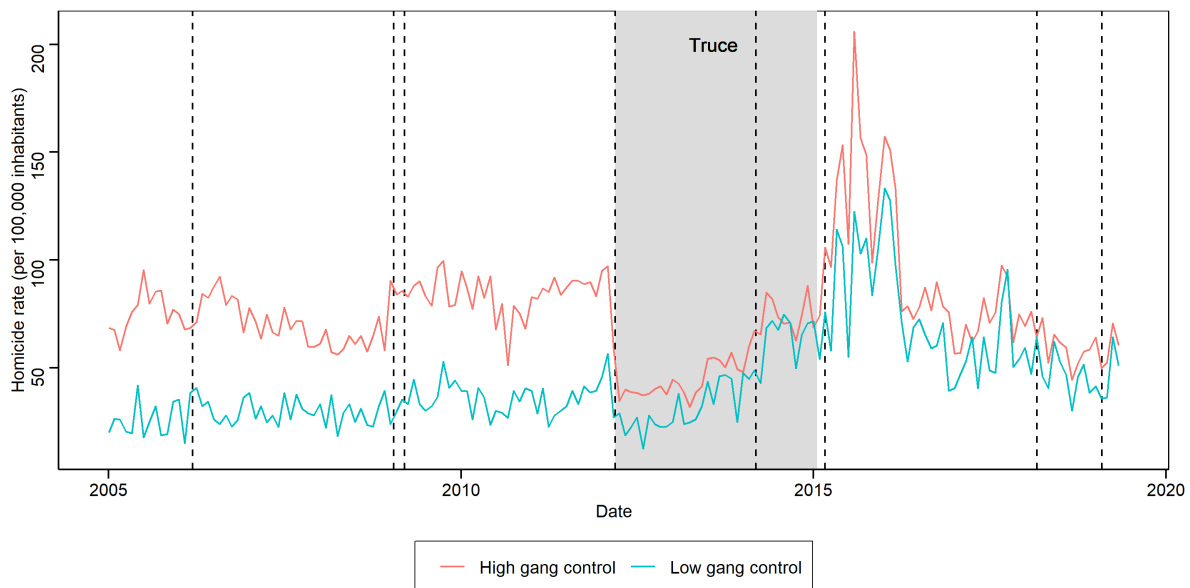
This measure of gang control may present two problems. First, gang-related murders reported by the police may be a sign of gang weakness rather than gang control. In the municipalities where gangs wield enough influence, they might be able to act so that the homicides they commit don't get linked to them, or don't get reported altogether. High gang violence could also be the result of gangs struggling to keep their power over certain localities. Second, gang-related homicides are strongly correlated with the measure of homicides

in general (correlation at .51). This poses endogeneity concerns when it comes to analyzing criminality in gang-controlled areas as measured through gang-related criminality.

5.2.2 The 2012 truce: an exogenous shock revealing gang control

To mitigate these identification concerns, we consider the variation in criminality brought by the 2012 truce. The government and gangs endeavoured to keep the negotiation process secret as long as they could. Gangs agreed to split some territories and committed to reducing violence. As soon as the agreement was reached on March 2012, national gang leaders, most of them from prisons, sent orders to their members. This led to a sudden and exogenous variation in criminality, especially so in locations where gangs had an influence (see Figure 3).

Figure 3: Homicide rate evolution: gang-controlled areas compared to non-gang-controlled areas



Source: own elaboration based on police data (PNC) at the municipality level. Dotted lines indicate elections.

This exogenous shock in criminality enables us to identify the municipalities and voting centers where gangs had control in 2012. More specifically, we define gang-controlled lo-

cations as those where the relative decrease in homicide rates, measured over a one-year period before and after the truce, was above the median. In addition to this baseline definition, we also measure different intensities of gang-control, by taking the neighborhoods where the decrease in homicide rate was above the third quartile. We also identify the neighborhoods where the decrease in homicide rate was statistically significant at the 10%, 5%, and 1% level. The more significant the decrease, the tighter gang-control should be.

5.2.3 Gang-control and truce: validity check

To verify the relevance of our indicator of gang-control, we associated the decrease in criminality induced by the truce in 2012 with the number of gang-related murders before the truce since 2005 at the municipal level. Results are reported in Appendix Table D.1. All estimates are positive and statistically significant, meaning that the municipalities where the criminality rate reduced the most following the truce are also those municipalities where gang-related murders were high before the truce. This correlation holds both looking at short-term (column (1)) and longer-term trends (columns (2) and (3)). These results tend to validate that the variation in criminality during the truce reveals gang-control at the time of the truce.

5.2.4 Alternative measures of gang presence and gang heterogeneity

Using the data we georeferenced based on the General Directorate of Prisons, we are able to identify the neighborhoods where gang members were sent to jail. This provides another metric of gang-presence that we use for robustness: neighborhoods where the number of convicted gang-members is above median. We also use journalistic information about 29 gang leaders and their neighborhoods of origin among convicted gang members. We use this as a last robustness metric of gang-control: neighborhoods where at least one gang leader was living before being convicted.

Prior to the truce, gang members used to be incarcerated in different penitentiaries based

on their gang affiliation (Barrio-18 or MS-13) to avoid bringing gang wars from the streets to the prisons. For this purpose, gang affiliation was systematically gathered in the data, which allows us to distinguish neighborhoods with a higher MS-13 or Barrio-18 control.

5.3 Regression models

Our main estimations rely on a Two Way Fixed Effects strategy at the voting center level where we use cumulatively year (v_t), week (w_t), and voting center (f_n) fixed effects. This allows us to identify variations in criminality independently from the expected level of criminality at a given time in a given place and better isolate the effect of electoral seasons and gang-control. The week fixed effect in particular enables us to control for crime seasonality, knowing that elections are not always held during the same week of the year.

$$\begin{aligned} \text{Homicide Rate}_{n,t} = & \alpha \text{ Electoral Season}_t \\ & + \beta \text{ Electoral Season}_t \times \text{Gang Control}_n \\ & + \gamma v_t + \sigma w_t + \tau f_n + \epsilon_{n,t} \end{aligned} \quad (5)$$

In the estimation above, the term Gang Control_n alone is absorbed by the voting center fixed effect f_n . The TWFE controls for place and time related confounders, such as socio-demographic characteristics, partisan history, and baseline criminality. Only confounders varying both in time and space are not accounted for.

We also extend Equation 5 to identify the patterns of criminality during electoral seasons in gang-controlled neighborhoods where political competition is low (meaning that a certain party has a strong electoral base). To prevent endogeneity concerns, we measure political

competition as given by the previous election.

$$\begin{aligned}
 \text{Homicide Rate}_{n,t} = & \alpha \text{ Electoral Season}_t + \omega \text{ Low Competition}_{n,t-1} \\
 & + \delta \text{ Electoral Season}_t \times \text{ Low Competition}_{n,t-1} \\
 & + \beta \text{ Electoral Season}_t \times \text{ Gang Control}_n \\
 & + \phi \text{ Gang Control}_n \times \text{ Low Competition}_{n,t-1} \\
 & + \psi \text{ Electoral Season}_t \times \text{ Gang Control}_n \times \text{ Low Competition}_{n,t-1} \\
 & + \gamma v_t + \sigma w_t + \tau f_n + \epsilon_{n,t}
 \end{aligned} \tag{6}$$

In order to identify the distinctive effect of gang-control on outcomes such as political participation and specific parties' vote shares ($Y_{n,t}$), we use a variation of Equation 5, where the voting center fixed effect becomes a municipality fixed effect \tilde{f}_m :

$$Y_{n,t} = \alpha \text{ Gang Control}_n + \gamma y_t + \sigma w_t + \tau \tilde{f}_m + \epsilon_{n,t} \tag{7}$$

This estimation allows us to identify the specific effect of gang-control while controlling for location confounders at the municipality level. Similarly as for criminality patterns, we use a variation of Equation 7 allowing for an heterogeneous effect in Low Competition neighborhoods.

$$\begin{aligned}
 Y_{n,t} = & \beta \text{ Low Competition}_{n,t-1} \\
 & + \delta \text{ Low Competition}_{n,t-1} \times \text{ Gang Control}_n \\
 & + \gamma y_t + \sigma w_t + \tau f_n + \epsilon_{n,t}
 \end{aligned} \tag{8}$$

For all estimations, we use robust standard errors clustered at the voting center level.

6 Quantitative Results

6.1 Buying peace: gang criminality during electoral seasons

We first turn to criminality patterns to study quantitatively the effect of gangs on political elections. We relate the annualized homicide rate per 100,000 inhabitants (measured weekly) to an indicator variable equal to one during electoral seasons. We define electoral seasons as the period starting three months prior to an election and ending three months after, three months being the typical campaign duration in El Salvador. We also verify the robustness of our results using different time windows (see Appendix Table D.3).

We excluded the 2012 and 2015 elections from this analysis to ensure that our estimates would not be biased by the particular events that unravelled these years. Indeed, the 2012 truce was struck three days before the elections and mechanically led to a strong reduction in criminality. Conversely, the FMLN government announced drastic measures against gangs two weeks before the 2015 elections, including the return to maximum security prisons for gang leaders and the deployment of special forces in gang areas. This was effectively the end of the truce, and the beginning of a new era of high crime (see Figure 3).

Table 2 reports the results we obtained following the Two Way Fixed Effect specification described in section 5.3 (Equation 5). Columns (2) and (3) show that homicides tend to increase during electoral seasons across El Salvador. In gang-controlled areas however, the homicide rate significantly reduces when compared to non gang-controlled areas (column (2)). The effect is larger prior to an election, with a decrease in homicides of about 0.31 mean in gang-controlled areas (column (3)). We observe similar patterns for gang-related murders (columns (4) and (5)) with a differential decrease of about 0.40 mean prior to an election.

This rather large reduction in criminality in gang-controlled areas supports the hypothesis that gangs use peace rather than violence itself to weigh on political elections in El Salvador. On average, neighborhoods in El Salvador fall more often in the scenario where an incentive

Table 2: Criminality in gang-controlled areas during electoral seasons

	Dependent variable				
	Homicide rate (per 100,000 inhabitants)			Gang-related	
	(1)	(2)	(3)	(4)	(5)
Election	3.02 (2.94)	12.61*** (3.80)		6.60*** (2.06)	
Election × Gang-Control		-19.90*** (4.73)		-8.82*** (2.33)	
Before Election			11.76*** (4.39)		8.14*** (2.54)
After Election			12.83*** (4.96)		4.39* (2.46)
Before Election × Gang-Control			-22.87*** (5.69)		-9.39*** (2.84)
After Election × Gang-Control			-14.08** (6.56)		-7.70** (3.76)
Time and voting center FE	X	X	X	X	X
Observations mean	73.75	73.75	73.75	23.64	23.64
Observations	415,224	415,224	415,224	415,224	415,224
R ²	.06	.06	.06	.02	.02

*Notes: This table reports the association between criminality and electoral season, specifically in gang-controlled areas between 2012 and 2019. Election is an indicator variable equal to one 12 weeks before and after an election. The homicide rate is measured weekly and annualized per 100,000 inhabitants. Gang-Control is defined as the neighborhoods where the decrease in homicides due to the 2012 truce was above median. Standard errors, shown in parentheses, are clustered by voting center. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center × week. The 2012 and 2015 elections were removed from the sample because of outside events affecting the depending variable (resp. truce and end of truce).*

to reduce crime is more profitable for politicians than an incentive to increase crime, as defined in the model Section 4.

Importantly, Appendix Table D.4 shows that the results are robust to controlling for police presence. The reduction in criminality we observe does not seem to be the consequence of changes in police allocation during electoral seasons in gang-controlled areas.

Table 3 reports the estimates we obtain when using increasingly tighter definitions of gang-control: the tighter gang-control, the larger the reduction in criminality during electoral seasons. The estimates range from 0.27 mean (column (1)) to 2.80 mean (column (5)) when isolating the neighborhoods where the decrease in homicides due to the 2012 truce was significant at the 1% level.

Table 3: Criminality in gang-controlled areas during electoral seasons (robustness to different intensities of gang-control)

	Dependent variable				
	Homicide rate (per 100,000 inhabitants)				
	(1)	(2)	(3)	(4)	(5)
Election	12.61*** (3.80)	9.06*** (3.49)	6.77** (3.32)	6.37* (3.30)	4.90 (3.22)
Election × Gang-Control (baseline)	-19.90*** (4.73)				
Election × Gang-Control (3rd quartile)		-24.00*** (6.13)			
Election × Gang-Control (p<10%)			-66.71*** (19.78)		
Election × Gang-Control (p<5%)				-102.51*** (32.01)	
Election × Gang-Control (p<1%)					-206.86** (92.29)
Time and voting center FE	X	X	X	X	X
Observations mean	73.75	73.75	73.75	73.75	73.75
Observations	415,224	415,224	415,224	415,224	415,224
R ²	.06	.06	.06	.06	.06

*Notes: This table reports the association between criminality and electoral season, specifically in gang-controlled areas between 2012 and 2019. Electoral season is an indicator variable equal to one 12 weeks before and after an election. The homicide rate is measured weekly and annualized per 100,000 inhabitants. Gang-Control (baseline) and Gang-Control (3rd quartile) are defined as the neighborhoods where the decrease in homicides due to the 2012 truce was above median and above the third quartile respectively. Gang-Control (p<x%) indicates the neighborhoods where the decrease in homicides due to the 2012 truce was statistically significant at x%. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center × week. The 2012 and 2015 elections were removed from the sample because of outside events affecting the depending variable (resp. truce and end of truce).*

Table 4 reports the same analysis conducted with our alternative measures of gang-control: neighborhoods with a high number of convicted gang members (High-Prisoners), and gang leaders' neighborhoods of origin (Gang-Leaders). We observe similar results: criminality reduces in gang-controlled areas during electoral seasons. We also introduced gang-heterogeneity (columns (4) and (5)) and observe that the reduction in criminality is particularly significant in neighborhoods controlled by MS-13, less so in neighborhoods controlled by B-18. MS-13's leadership is known to have a tighter control on its members (Lohmuller, 2015) as compared to B-18 which suffers more internal divisions. Hence, MS-13 could be better positioned to negotiate agreements with parties themselves, especially during national elections.

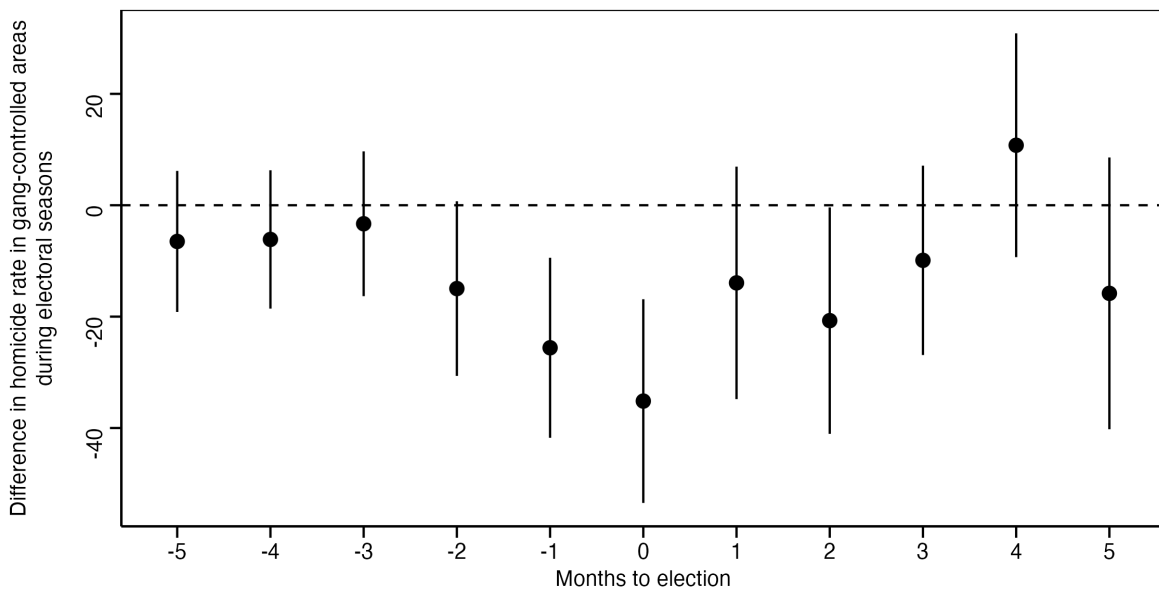
Table 4: Criminality in gang-controlled areas during electoral seasons (robustness to different measures of gang-control)

	Dependent variable				
	Homicide rate (per 100,000 inhabitants)				
	(1)	(2)	(3)	(4)	(5)
Election	12.61*** (3.80)	7.64** (3.43)	3.71 (2.97)	5.25 (3.34)	7.18** (3.44)
Election × Gang-Control	-19.90*** (4.73)				
Election × High-Prisoners		-37.08*** (10.85)			
Election × Gang-Leaders			-35.09* (20.72)		
Election × B-18				-17.37* (10.48)	
Election × MS-13					-32.80*** (10.44)
Time and voting center FE	X	X	X	X	X
Observations mean	73.75	73.75	73.75	73.75	73.75
Observations	415,224	415,224	415,224	415,224	415,224
R ²	.06	.06	.06	.06	.06

Notes: This table reports the association between criminality and electoral season, specifically in gang-controlled areas between 2012 and 2019. Electoral season is an indicator variable equal to one 12 weeks before and after an election. The homicide rate is measured weekly and annualized per 100,000 inhabitants. Gang-Control is defined as the neighborhoods where the decrease in homicides due to the 2012 truce was above median. High-Prisoners represents the neighborhood where the number of convicted gang members was above average. B-18 and MS-13 are constructed similarly based on B-18 and MS-13 convicts. Gang-Leaders represents the neighborhoods of origins of convicted gang leaders. Standard errors, shown in parentheses, are clustered by voting center. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center × week. The 2012 and 2015 elections were removed from the sample because of outside events affecting the depending variable (resp. truce and end of truce).

Lastly, figure 4 plots the differential effect of gang-control on criminality over time during electoral seasons. The reduction in criminality in gang-controlled areas seems particularly strong in the 2 months preceding an election and during the election month. The effect also seems to slightly linger shortly after an election. There does not seem to be any significant difference up to three months prior to and after an election, which partly validates the parallel trend hypothesis underlying our TWFE estimation.

Figure 4: Difference in homicide rate in gang-controlled areas during electoral seasons



Source: own elaboration based on police data (PNC) at the voting center level. This figure plots the difference in homicide rates observed in gang-controlled areas during electoral seasons compared to non gang-controlled areas, using a TWFE estimation. The homicide rate is measured weekly and annualized per 100,000 inhabitants. 95% confidence intervals are represented with vertical bars.

6.2 Mobilizing voters: electoral participation in gang-controlled areas

The reduction in criminality during electoral seasons that we established in the previous section is consistent with our theoretical model and the results of our interviews, according to which parties negotiate safe access to gang-controlled territories in order to campaign. Whether directly because of the overall reduction in criminality, or because parties are better able to campaign in safer neighborhoods, we expect to see an increase in political participation in gang-controlled areas as a result of the decrease in crime.

To test this hypothesis, we analyze the association between homicides prior to elections and electoral participation. We used year and voting center fixed effect to control for the expected turnover in specific locations in specific years. Appendix Table D.6 shows that higher homicide rates prior to elections are indeed associated with less turnover.

Building further on these results, we expect to see an increase in electoral participation in

gang controlled areas along with the observed reduction in criminality. Using the framework outlined in Equation 6, column (2) of Table 5 reports a statistically significant and positive effect of gang-control on voters' participation. The estimate is rather large: close to 2.5 percentage point increase in participation in gang controlled areas. Alternative measures of gang-control lead to consistent estimates, although more modest (columns (3) and (4)).

Table 5: Electoral participation in gang-controlled areas

	Dependent variable			
	Electoral participation			
	(1)	(2)	(3)	(4)
Gang-Control	1.014*** (.319)	2.466*** (.375)		
High-Prisoners			1.096*** (.415)	
High-Leaders				1.240 (.910)
Election and municipality FE		X	X	X
Observations mean	50.9	50.9	50.9	50.9
Observations	6,011	6,011	6,011	6,011
R ²	.207	.412	.406	.406

*Notes: This table reports the association between gang control and voters' turnout, controlling for previous election participation. Electoral participation is expressed in percentage points. Gang-control is defined as the neighborhoods where the decrease in homicides due to the 2012 truce was above median. High-Prisoners represents the neighborhood where the number of convicted gang members was above average. Gang-Leaders represents the neighborhoods of origins of convicted gang leaders. Standard errors, shown in parentheses, are clustered by voting center. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center × election.*

Hence, gang influence seems to be geared toward encouraging participation in the territories they control. These results are also consistent with LAPOP survey data between 2010 and 2018. Respondents declaring that they lived in a neighborhood where gangs had a significant influence reported on average 5.1 percent points more often that they participated during the previous election. The estimate increases to 5.4 percentage points when controlling for socio-economic indicators and adding time and location fixed effects (columns (1) and (3) of Appendix Table D.7).

6.3 Increasing favorable turnover: low-competition, low-participation neighborhoods

Gangs seem to favorably affect political turnover, either by directly encouraging voters to participate, or by generating the conditions of a safer election. Nonetheless, since negotiating with gangs is costly, parties need to have some certainty that an increase in turnover can translate into more votes in their favor. This is more likely to be the case in neighborhoods where parties know, historically, that they have a strong voting base in the first place. Following this reasoning, we expect to see stronger effects in the voting centers where political competition is low. Additionally, our theoretical model predicts that politicians should have stronger incentives to collude with gangs in neighborhoods where participation is low because of the higher potential to increase participation. The theoretical scenario where politicians negotiate to increase criminality in the neighborhoods where they are not popular seem to have been discarded already given the crime reduction and participation increase that we established above.

To measure political competitiveness in any election, we use the results of the previous election and rely on the Herfindahl Hirschman Index (HHI) and the vote gap between first and second candidates (Vote Gap). Low competition neighborhoods are taken as the highest quartile of these measures. On participation, we use Equation 8 to analyze the differential effect of gang-control on voter turnout in low competition neighborhoods. Results are reported in Table 6 below. Regardless of the measure used, participation tends to increase in low-competition and low-participation neighborhoods, but even more so in gang-controlled areas. These findings are consistent with our model: gangs' action is triggered mostly when parties have more certainty that increased participation will translate into more favorable votes, and the potential for more electoral participation is high.

Using the model delineated in Equation 6, we also look at criminality patterns around electoral seasons. Results are reported in Appendix Table D.5. The estimates of interest are reported in the last line. We observe that criminality reduces during electoral seasons

Table 6: Electoral participation in low-competition gang-controlled areas

	Dependent variable	
	Electoral participation	
	(1)	(2)
Previous Participation	-.300*** (.011)	-.301*** (.011)
Low-Competition	.877** (.406)	1.479*** (.436)
Previous Participation × Gang-Control	-.177*** (.026)	-.174*** (.026)
Low-Competition × Gang-Control	1.129** (.551)	1.389** (.582)
Competition measure	HH index	Vote gap
Election and voting center FE	X	X
Observations mean	50.9	50.9
Observations	6,011	6,011
R ²	.767	.769

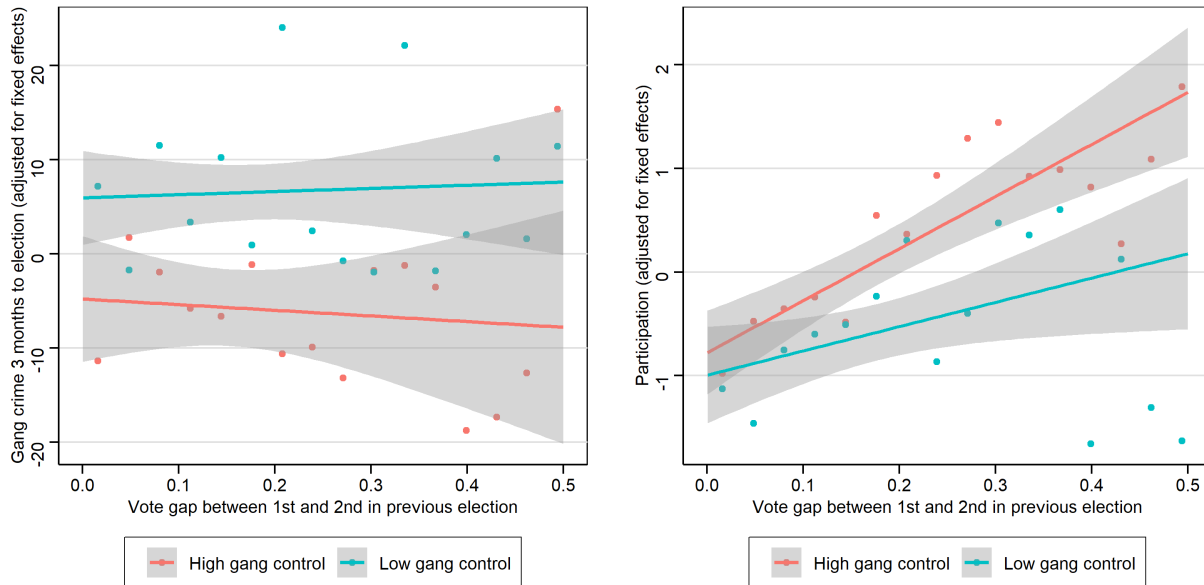
Notes: This table reports the association between gang control and voters' turnout, controlling for previous election participation, in neighborhoods where political competition was low during the previous election. Electoral participation is expressed in percentage points. Gang-Control is defined as the neighborhoods where the decrease in homicides due to the 2012 truce was above median. Low-Competition is an indicator variable equal to one for the highest quartile of either the Herfindahl Hirschman Index (HHI) distribution or the vote gap distribution between first and second candidates. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center × election.

in gang controlled areas particularly in places where political competition was low. Even though the differential effect is not statistically significant, this remains consistent with the hypothesis that gangs' influence is mostly sought in neighborhoods where parties have a strong voting base.

Figure 5 summarises graphically our findings. The left regions of the graphs represent high-competition (low vote gap between first and second), whereas the right regions represents low-competition neighborhoods. In gang-controlled areas (red lines), compared to non gang areas (blue lines), participation increases more in low-competition voting centers and criminality reduces slightly more. This supports the claim that parties may be colluding with gangs especially in the neighborhoods where they have more voters. By increasing

safety, and fostering known-to-be favorable political participation, parties may collude with gangs to increase their votes.

Figure 5: Competitive districts, gang criminality, and participation



Source: own elaboration based on police data (PNC) and electoral results by the Electoral Supreme Court at the voting center level.

These findings are also supported by the fact that there doesn't seem to be any trend difference between gang-controlled areas and non gang areas for the 2012 election (see Appendix Figure C.3), back when gangs and political parties did not systematically collude yet according to journalistic investigations. In areas with gang presence, higher crime rates were observed prior to elections, irrespective of the degree of electoral competitiveness. Additionally, voter turnout in these gang-afflicted areas was consistently lower compared to regions without gang influence, again regardless of the competitive nature of the elections. These results align with expectations: one would anticipate increased criminal activity in territories controlled by gangs, along with reduced electoral participation due to the gangs' restrictive impact on the mobility of residents (Córdova, 2019; Baires, Sviatschi and Vargas, 2019).

In examining voting preferences within gang-dominated areas, our analysis suggests a potential advantage for incumbents (see table D.2). Specifically, in the 2014 elections, the

incumbent party appeared to have a more significant edge over the right-wing opposition party, ARENA. This trend continued in the 2018 municipal and congressional elections, where the incumbent party maintained its advantage in gang areas, despite ARENA securing more votes overall in these elections.

The 2019 elections presented a different scenario. Both the right and left parties experienced a decline in votes at the national level. This shift was largely due to Nayib Bukele, a former member of the FMLN and then mayor of San Salvador, who garnered the majority of votes. Bukele's prior affiliation with the FMLN and his mayoral position in San Salvador might have facilitated more effective negotiations with gangs, thereby sustaining the incumbent advantage in elections influenced by gang negotiations. Notably, Bukele had been previously accused of engaging in negotiations with gangs during his tenure as mayor (Martinez, 2018). Furthermore, investigations by the U.S. Department of the Treasury (2021) also suggest that his party continued these negotiations during the presidential elections.

7 Conclusion

Using neighborhood-level police data and election results between 2011 and 2019 in El Salvador, one of the most violent countries in Latin America, we provide novel evidence that gangs may leverage their control of violence and instrumentalize the absence thereof to sway elections in a context of collusion with political parties.

Based on our interviews and quantitative analysis, we conclude that homicides in gang-controlled neighborhoods tend to decrease during electoral seasons along with an increase in electoral participation. These effects are especially significant in the neighborhoods where political parties have a strong voting base. This suggests that parties negotiate with gangs to mobilize electoral participation in the areas where they are more likely to receive electoral support and increase their chances of winning.

Gangs also affect the quality of campaigns in the neighborhoods they control. According to interviews, parties must ask for permission and give something in return to the gangs to enter those neighborhoods. Permission is usually granted through a party member in the community. This scheme could be depleting parties' campaign resources and hurting small parties that don't have as many members in all neighborhoods.

These findings are consistent with the predictions of the model we developed, within which politicians can offer an incentive to gangs in exchange for an increase or a decrease in criminality. Although empirically we do not see increases in crime, we find that when a politician has a strong voting base and participation is low, they will incentivize gangs to decrease crime and increase participation, in order for them to win more votes.

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Online Appendix

Table of Content

- Appendix A: Measuring political competition
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A Measuring political competition

Effectively measuring political competition has proved to be controversial due to the different alternatives used. Previous researchers have operationalized this concept in a variety of ways, with the empirical results often hinging on which measure is used (Aistrup, 2014). Based on a literature review, three main indicators stood out. The first (1) simply calculates the gap competition (difference in percentage points) of the first (F_{it}) and second place (S_{it}) in the elections (t) for each municipality (i).

$$(1) X_{it} = F_{it} - S_{it}$$

The second competitive indicator (2) considered is the Herfindahl-Hirschman index (HHI) that is usually used to measure the market concentration or level of competitiveness in an industry. In this case, when the indicator is closer to one then a single political party has monopolized the share of votes in the municipality; when it is close to zero, then the share of votes is similar between many political parties. The indicator is calculated as the sum of the square of the share (S_j) of each party(N).

$$(2) X_{it} = \sum_{j=1}^N S_j^2$$

B Additional details to derive the Nash Equilibrium

In section 4, we derived the popular candidates' best response, given challengers' bribes b_u

$$BR_p(b_u) = \frac{\alpha\gamma v'(\bar{c}) + \alpha\gamma^2 v''(\bar{c})b_u}{2l_p - \alpha\gamma^2 v''(\bar{c})}$$

Symmetrically (replacing α with $-\alpha$ and all p under-scripts with l), the challengers' best response is

$$BR_u(b_p) = -\frac{\alpha\gamma v'(\bar{c}) + \alpha\gamma^2 v''(\bar{c})b_p}{2l_u + \alpha\gamma^2 v''(\bar{c})}$$

We derive the Nash equilibrium by intersecting the two best responses: $b_p^* = BR_p(BR_u(b_p^*))$, which leads to

$$b_p^* = \frac{\alpha\gamma v'(\bar{c})}{2l_p - \alpha\gamma^2 v''(\bar{c})} - \frac{\alpha\gamma^2 v''(\bar{c})}{2l_p - \alpha\gamma^2 v''(\bar{c})} \frac{\alpha\gamma v'(\bar{c}) + \alpha\gamma^2 v''(\bar{c})b_p^*}{2l_u + \alpha\gamma^2 v''(\bar{c})}$$

$$\Leftrightarrow b_p^* \left[1 + \frac{(\alpha\gamma^2 v''(\bar{c}))^2}{(2l_p - \alpha\gamma^2 v''(\bar{c}))(2l_u + \alpha\gamma^2 v''(\bar{c}))} \right] = \frac{\alpha\gamma v'(\bar{c})}{2l_p - \alpha\gamma^2 v''(\bar{c})} - \frac{(\alpha\gamma^2 v''(\bar{c}))(\alpha\gamma v'(\bar{c}))}{(2l_p - \alpha\gamma^2 v''(\bar{c}))(2l_u + \alpha\gamma^2 v''(\bar{c}))}$$

Multiplying both sides by $(2l_p - \alpha\gamma^2 v''(\bar{c}))(2l_u + \alpha\gamma^2 v''(\bar{c}))$, we get

$$b_p^* [4l_p l_u + 2\alpha\gamma^2 v''(\bar{c})(l_p - l_u)] = \alpha\gamma v'(\bar{c})(2l_u + \alpha\gamma^2 v''(\bar{c})) - (\alpha\gamma^2 v''(\bar{c}))(\alpha\gamma v'(\bar{c}))$$

Regrouping and simplifying, we get

$$b_p^* = \frac{\alpha\gamma v'(\bar{c})l_u}{2l_p l_u + \alpha\gamma^2 v''(\bar{c})(l_p - l_u)}$$

Symmetrically,

$$b_u^* = -\frac{\alpha\gamma v'(\bar{c})l_p}{2l_u l_p + \alpha\gamma^2 v''(\bar{c})(l_p - l_u)}$$

C Additional figures

Figure C.1: Gang-controlled areas and homicide rates across El Salvador

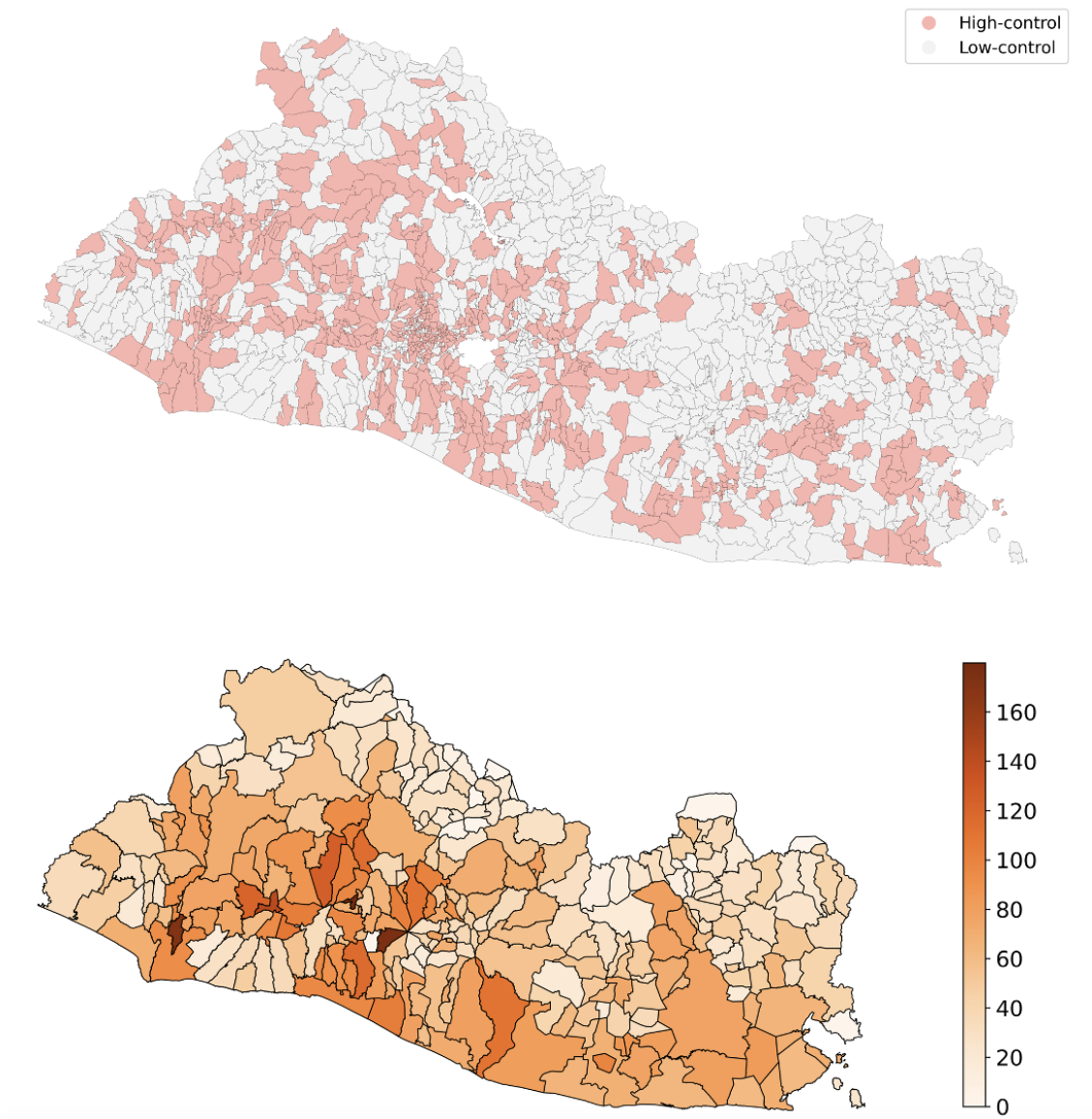
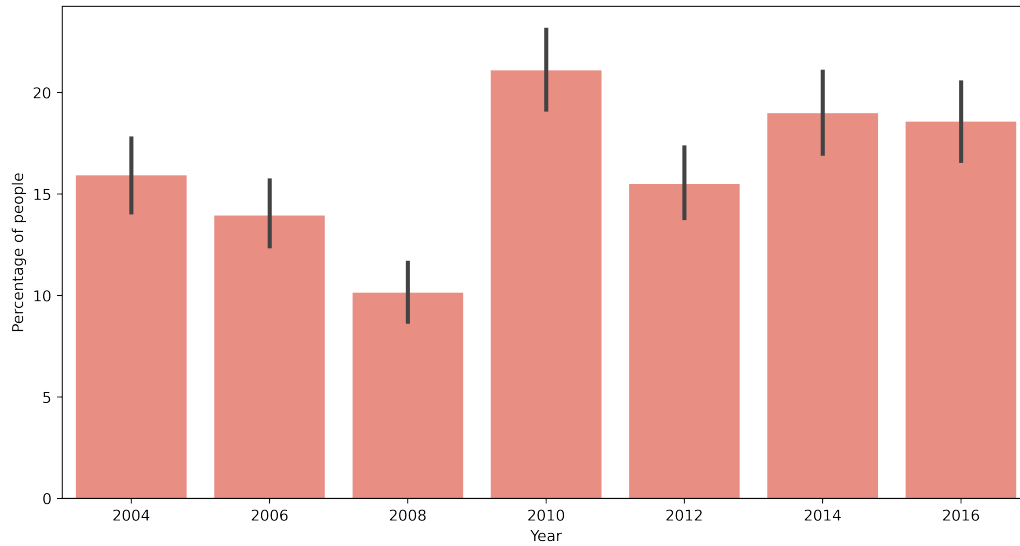
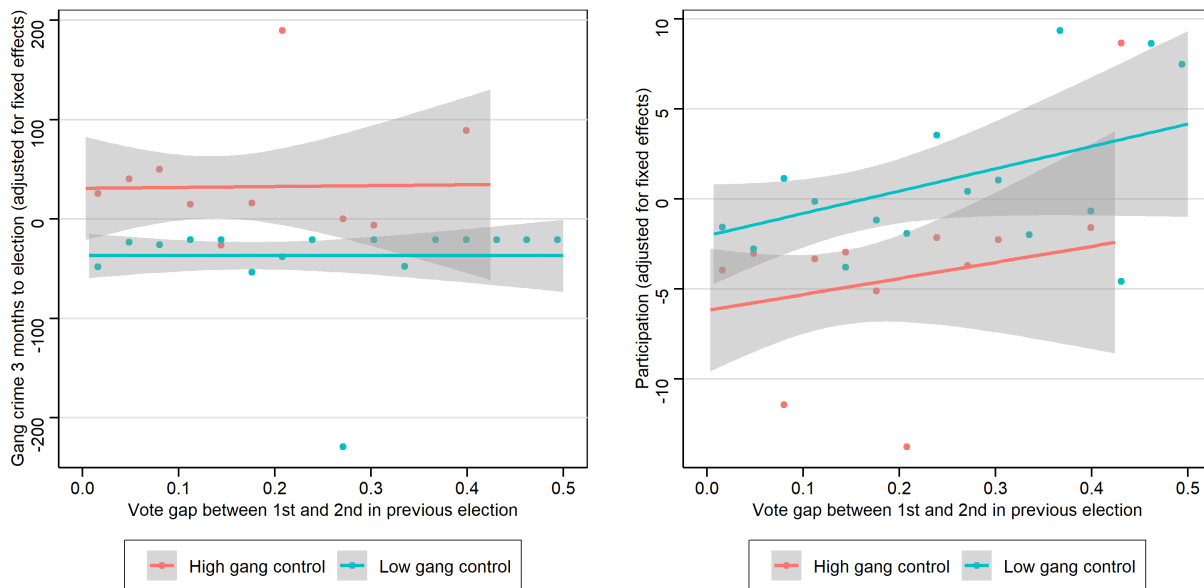


Figure C.2: Share of population living in gang areas



Source: *The AmericasBarometer* by the Latin American Public Opinion Project (LAPOP).

Figure C.3: Competitive districts, gang criminality, and participation (2012 election)



Source: own elaboration based on police data (PNC) and electoral results by the Electoral Supreme Court at the voting center level.

D Additional tables

Table D.1: Criminality reduction at the truce and gang-related murders

	Dependent variable		
	Gang-related homicide rate (2005-2012)		
	(1)	(2)	(3)
6-month decrease in crime at the truce	2.021* (1.139)		
1-year decrease in crime at the truce		2.848*** (.703)	
2-year decrease in crime at the truce			3.217*** (.780)
Observations	197	212	228
R ²	.010	.040	.046

Notes: This table reports the association between gang-related homicide rates prior to the truce (between 2005 and 2012) and the variation in homicide rates due to the truce in 2012, measured over a 6-month, 1-year and 2-year window. The homicide rate is measured weekly and annualized per 100,000 inhabitants. We indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the municipality. The varying number of observations stems from the municipalities where no crime was reported over the observed time windows, and for which the variation of criminality, as ratio, is not defined.

Table D.2: Party preferences in gang-controlled areas

	Dependent variable					
	FMLN (2014)	FMLN (2018)	FMLN (2019)	ARENA (2014)	ARENA (2018)	ARENA (2019)
	(1)	(2)	(3)	(4)	(5)	(6)
Gang-Control	1.394** (.661)	.906 (.692)	-1.369** (.604)	-1.040* (.605)	-.985 (.648)	-2.508*** (.594)
Municipality FE	X	X	X	X	X	X
Observations mean	48.9	28.4	18	37.4	38.9	29
Observations	1,427	1,428	1,422	1,427	1,428	1,422
R ²	.503	.764	.663	.492	.763	.486

Notes: This table reports the association between gang-control and party specific votes in the 2014, 2018, and 2019 elections at the voting center level. Gang-Control is defined as the neighborhoods where the decrease in homicides due to the 2012 truce was above median. We added municipality fixed effects. Standard errors, shown in parentheses, are clustered by voting center. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center during a given election year (resp. 2014, 2018, and 2019).

Table D.3: Criminality in gang-controlled areas during electoral seasons (robustness to different definitions of electoral season)

	Dependent variable			
	Homicide rate (per 100,000 inhabitants)			
	(1)	(2)	(3)	(4)
Election (4 weeks)	9.73*			
	(5.78)			
Election (4 weeks) × Gang-Control	-23.57***			
	(7.06)			
Election (8 weeks)		10.19**		
		(4.44)		
Election (8 weeks) × Gang-Control		-20.30***		
		(5.44)		
Election (12 weeks)			12.61***	
			(3.80)	
Election (12 weeks) × Gang-Control			-19.90***	
			(4.73)	
Election (16 weeks)				19.86***
				(3.39)
Election (16 weeks) × Gang-Control				-11.86***
				(4.03)
Time and voting center FE	X	X	X	X
Observations mean	73.75	73.75	73.75	73.75
Observations	415,224	415,224	415,224	415,224
R ²	.06	.06	.06	.06

*Notes: This table reports the association between criminality and electoral season, specifically in gang-controlled areas between 2012 and 2019. Electoral season is an indicator variable equal to one either 4 weeks, 8 weeks, 12 weeks, or 16 weeks before and after an election. The homicide rate is measured weekly and annualized per 100,000 inhabitants. Gang-control is defined as the neighborhoods where the decrease in homicides due to the 2012 truce was above median. Standard errors, shown in parentheses, are clustered by voting center. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center × week. The 2012 and 2015 elections were removed from the sample because of outside events affecting the depending variable (resp. truce and end of truce).*

Table D.4: Criminality in gang-controlled areas during electoral seasons (robustness to police presence)

	Dependent variable			
	Homicide rate (per 100,000 inhabitants) (1)	(2)	Gang-related (3)	(4)
Election	12.61*** (3.80)	12.43*** (3.82)	6.60*** (2.06)	6.37*** (2.07)
Police Presence		-.03 (.03)		-.04** (.02)
Election × Gang-Control	-19.90*** (4.73)	-19.58*** (4.76)	-8.82*** (2.33)	-8.53*** (2.34)
Gang-Control × Police Presence		.04 (.03)		.04** (.02)
Election × Police Presence		.03 (.03)		.03 (.03)
Election × Gang-Control × Police Presence		-.03 (.04)		-.03 (.03)
Time and voting center FE	X	X	X	X
Observations mean	73.75	73.75	23.64	23.64
Observations	415,224	415,224	415,224	415,224
R ²	.06	.06	.02	.02

*Notes: This table reports the association between criminality and electoral season, specifically in gang-controlled areas between 2012 and 2019. The homicide rate is measured weekly and annualized per 100,000 inhabitants. Gang-control is defined as the neighborhoods where the decrease in homicides due to the 2012 truce was above median. Police presence refers to the number of officers allocated at a given time in a given neighborhood. Standard errors, shown in parentheses, are clustered by voting center. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center × week. The 2012 and 2015 elections were removed from the sample because of outside events affecting the depending variable (resp. truce and end of truce).*

Table D.5: Criminality in gang-controlled areas, prior to elections, in low-competition neighborhoods

	Dependent variable			
	Homicide rate		Gang-related	
	(1)	(2)	(3)	(4)
Electoral Season	.691 (5.319)	3.526 (5.150)	-.671 (2.849)	1.492 (2.885)
Low-Competition	9.703 (6.594)	13.559* (7.212)	5.732 (3.582)	2.783 (4.269)
Low-Competition × Gang-Control	21.503 (14.202)	8.392 (12.594)	5.968 (7.481)	1.306 (6.419)
Electoral Season × Low-Competition	7.836 (7.661)	-1.898 (7.687)	3.161 (4.071)	-4.410 (3.859)
Electoral Season × Gang-Control	-12.802* (6.747)	-15.071** (6.578)	-.475 (3.056)	-3.097 (3.081)
Electoral Season × Gang-Control × Low-Competition	-7.117 (11.709)	-1.188 (13.356)	-8.846 (6.128)	.649 (6.456)
Competition measure	HH index	Vote gap	HH index	Vote gap
Time and voting center FE	X	X	X	X
Observations mean	73.8	73.8	23.6	23.6
Observations	243,262	243,262	243,262	243,262
R ²	.043	.042	.018	.018

Notes: This table reports the association between criminality and political competition, specifically in gang-controlled areas, between 2012 and 2019. The homicide rate is measured three months prior to the elections and annualized per 100,000 inhabitants. Gang-Control is defined as the neighborhoods where the decrease in homicides due to the 2012 truce was above median. Low-Competition is an indicator variable equal to one for the highest quartile of either the Herfindahl Hirschman Index (HHI) distribution or the vote gap distribution between first and second candidates. Standard errors, shown in parentheses, are clustered by voting center. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center × election. The 2012 and 2015 elections were removed from the sample because of outside events affecting the depending variable (resp. truce and end of truce).

Table D.6: Electoral participation and crime prior to elections

	Dependent variable			
	(1)	(2)	(3)	(4)
6-month homicide rate prior to election	-.002** (.001)			
3-month homicide rate prior to election		-.003*** (.001)		
6-month gang homicide rate prior to election			-.004* (.002)	
3-month gang homicide rate prior to election				-.005*** (.001)
Election and voting center FE	X	X	X	X
Observations mean	50.9	50.9	50.9	50.9
Observations	5,234	5,234	5,234	5,234
R ²	.645	.646	.645	.646

*Notes: This table reports the association between criminality 6 months and 3 months prior to elections and voters' turnout. Electoral participation is expressed in percentage points. The homicide rate is annualized per 100,000 inhabitants. We added election and voting center fixed effects. Standard errors, shown in parentheses, are clustered by voting center. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the voting center times election.*

Table D.7: Participation in gang-controlled areas (LAPOP survey)

	Dependent variable		
	(1)	Electoral participation	
	(1)	(2)	(3)
Gang-control (survey)	5.052*** (1.072)	6.763*** (1.867)	5.434*** (1.757)
Years of education		.972*** (.153)	1.053*** (.173)
Urban		-4.586*** (1.522)	-3.539** (1.564)
Gender		1.030 (1.926)	1.218 (1.960)
Age		4.303*** (.180)	4.326*** (.189)
Age ²		-.037*** (.002)	-.038*** (.002)
Income category FE		X	X
Time and Province FE			X
Observations Mean	72.3	72.3	72.3
Observations	7,573	3,950	3,950
R ²	.002	.174	.179

Notes: This table reports the association between gang control and participation using LAPOP survey data between 2010 and 2018. Respondents were asked whether they thought that their neighborhoods was affected by gangs. Gang-control is an indicator variable equal to 1 when respondents replied "a lot". Electoral participation is expressed in percentage points. Standard errors, shown in parentheses, are clustered by province. We compute statistical significance based on the robust p-value and indicate significance at 1, 5, and 10% with ***, **, and *, respectively. The unit of observation is the respondent.