Unintended consequences of state action: how the kingpin strategy transformed the structure of violence in Mexico's organized crime

Oscar Contreras Velasco[1] (ORCID)

Abstract

This paper builds on social network analysis and structural balance theory to analyze, with a novel approach, some of the unintended consequences of Mexico's kingpin strategy on the network of criminal organizations. I use data on violent conflicts between Mexico's criminal organizations, between 2004 and 2020, from the Uppsala Conflict Data Program (UCDP), and a combination of statistics, social network analysis, GIS, and archival methods to understand the patterns and geography of violent conflicts and alliances before and after the war on drugs. The goal of this paper is threefold: first, to show that the kingpin strategy is associated with the fragmentation of criminal organizations in Mexico; second, to show that criminal organizations developed a set of structurally balanced arrangements before the government waged a war against them and that the kingpin strategy disrupted such arrangements, which led to an increase in the number of violent conflicts; third, I will argue that the fragmentation of criminal organizations also produced a process of clustering of violence, where sets of organizations started fighting each other in specific regions of the country, increasing the levels of violence in those geographical spaces.

Introduction

Violent conflicts between organized crime groups have become one of the main sources of violent deaths in Mexico for the last two decades. Recent studies have argued that political decentralization coupled with a kingpin strategy pursued by the

✉ Oscar Contreras Velasco
  osfer123@ucla.edu

1 Sociology Department, University of California Los Angeles, 405 Hilgard Avenue, Los Angeles, CA 90095, USA

federal government only worsened violence. In 2007, former president Felipe Calderon announced a war on drugs that sought to uproot these organizations and bring back peace to the population. This meant, among other things, the use of the military to tackle criminal organizations and a kingpin strategy to behead them. But far from ending violence, such a strategy only provoked the fragmentation of criminal organizations, who started fighting each other for territorial control and trafficking routes, spreading the violence across the country (Trejo and Ley 2020; Rios Contreras 2013; Atuesta and Pérez-Dávila 2017). Between 2000 and 2009 there were more than 20,000 murders attributed to organized crime in Mexico (Shirk and Astorga 2010: 2). The number skyrocketed in the following decade. Only in 2020, 36,773 people suffered violent deaths, which accounts for a 77% increase compared to 2015 and points to a continuing uphill trend (INEGI 2021).

This paper aims to build on social network analysis and structural balance theory to analyze some of the unintended consequences of the kingpin strategy pursued by ex-president Calderon, and subsequent administrations, on the structure of conflicts and alliances between criminal organizations. While the detrimental effects of the war on drugs on the population have been widely analyzed, there is less research on how this strategy affected the way these organizations structured their conflicts and alliances.[1] I use data on violent conflicts between Mexico's criminal organizations, between 2004 to 2020, from the Uppsala Conflict Data Program (UCDP). I use a combination of statistics, social network analysis, GIS, and archival methods to understand the patterns and geography of violent conflicts and alliances before and after the war on drugs. What was the effect of the kingpin strategy on the structure of conflicts and alliances among criminal organizations? Were there specific arrangements between criminal organizations that were disrupted after the strategy was implemented? How did this affect the levels and geography of violence in the country?

The goal of this paper is threefold. First, to show that the kingpin strategy is associated with the fragmentation of criminal organizations in Mexico; second, to show that criminal organizations developed a set of structurally balanced arrangements before the government waged a war against them and that the kingpin strategy disrupted these arrangements, which led to an increase in the number of violent conflicts; third, I will argue that the fragmentation of criminal organizations also produced a process of clustering of violence, where sets of organizations started fighting each other in specific regions of the country, increasing the levels of violence in those geographical spaces.

The rest of the paper will be structured as follows: the second section will be a brief historical context of the conflicts between the most powerful drug trafficking organizations from the early 2000s to the present (2020). I will describe the main

---

[1] Studies that analyze drug related violence in Mexico, have studied some of the social consequences of drug related violence (Trejo and Ley 2018; Shirk and Astorga 2010; Guerrero 2009; Escalante 2009), the role of the state and the impact of political decentralization on the rise of drug related violence (Rios, 2013), and how the fragmentation and cooperation of drug trafficking organizations in Mexico had an effect on violence levels (Atuesta and Perez-Davila 2017).

configurations of conflicts and alliances that were produced during this period, inter-lacing them with the socio-political context that set the stage for such configuration; the third section will address a brief literature review on social networks and structural balance theory, which will serve as a framework for the rest of my analysis; the fourth section describes the datasets used for my analysis and the model specifications; in the fifth section analyzes the results of my statistical and structural balance models. The results of my models will show that the beheading of criminal organizations is associated with their fragmentation, and that their network of conflicts and alliances was structurally balanced before 2010, but that the process of fragmentation ultimately led to an unbalanced structure; in the sixth section, I implement the Louvain method for community detection to show that the strategy of the government produced a regionalization or clustering of violence, with a greater number of violent conflicts occurring throughout the country and with geographically limited scope. Finally, I will include some concluding remarks and policy implications of my findings.

Historical background

Mexico's drug trafficking organizations consolidated their power in the late 1980s and early 1990s, a process facilitated by both suppression of the Colombian cartels and the Caribbean route, and the signing of NAFTA (North American Free Trade Agreement) in 1993. The dominant political party, the PRI, had been in power for over 70 years, in an arrangement that novelist Vargas Llosa called "the perfect dictatorship". This was the time of big and centralized drug trafficking cartels like the Guadalajara, Juarez, Gulf, and Arellano Felix organizations, who controlled vast territories and trafficking routes and were allowed to operate under the protection of various government agencies (Hernandez 2010). The end of the Caribbean route made Mexico the new natural way up north, and the new trade agreement (NAFTA) made smuggling in big quantities much easier. With more money and power, drug trafficking organizations intensified their activities and increased territorial control, which led to turf wars and increased levels of corrupting power and violence.

In the 2000s, a new ruling party meant the realignment of former agreements between the government and criminal organizations, and the rise of new criminal groups, which intensified turf wars and violence (Trejo and Ley 2018). Local governments now had more power and autonomy which allowed them to renegotiate their allegiances with old and new criminal organizations. More importantly, in 2007 the new government, under the leadership of ex-president Felipe Calderon Hinojosa, decided to focus its efforts on dismantling organized crime groups. Calderon sent the military to the streets and started a kingpin strategy with the hope that by beheading these criminal organizations, they would remain too weak to sustain their structure and activities. Two famous examples were Operation Baja California, in early 2007, and Joint Operation Michoacan, later that same year. But the kingpin strategy led to further fragmentation of criminal organizations and an increase in violence. The lack of leadership in these organizations created power vacuums that led to splinter groups that now contested the territory and trafficking routes of

the original organizations. As a result of these political rearrangements and policies, between 2000 and 2009 there were more than 20,000 murders attributed to organized crime, and more than half were registered between the years 2008 and 2009. Meanwhile, 1,100 police officers and soldiers lost their lives between 2006 and 2009 in the war against these drug cartels (Shirk and Astorga 2010: 2). Furthermore, the number of organized crime groups skyrocketed from 5, in 2006, to around 60 in 2012 (Trejo and Ley 2018). Some cartels like the Zetas, and Cartel Jalisco Nueva Generacion (CJNG) became notorious for their capacity to produce violence and rapidly expand their geographical areas of influence. The Zetas splintered from the Gulf Cartel in 2010, following internal disputes and transforming the geography of violence throughout the whole country. Other organizations faced fragmentation right after their leaders were captured or killed by the government or enemy organizations. Such was the case of the Knights Templar, which splintered from La Familia Michoacana in 2011 right after one of their leaders was killed by the military.

When former president Enrique Pena Nieto was elected, in 2012, there were high expectations that he would change Calderon's strategy of militarization, but this did not happen. By the end of Pena Nieto's administration, the levels of homicides reached unprecedented levels: 33,341 only in 2018, which accounts for a 15% increase from the previous year, making it the most violent year in Mexico's history as of that date. That same year, Andres Manuel Lopez Obrador (AMLO) was elected president. He promised to put an end to the militarization of public safety but as of 2022, he has done just the opposite. AMLO increased the budget and role of the military in the war against organized crime.

Social network analysis and structural balance theory

Social network analysis (SNA) has been widely used to study the structure and relationships between criminal organizations. For instance, Natarajan and Belanger (1998) showed that drug trafficking organizations diversify their opportunities through the generation of diverse supplies, substances, routes, and methods. Smith and Papachristos (2016) analyzed the overlap of criminal, personal, and legitimate networks in Chicago's organized crime networks. Other studies have shown that group leaders have both high betweenness and centrality, which suggests that they are very important actors within their networks (Calderoni 2014; Duijn et al. 2014; Hofmann and Gallupe 2015). This paper uses social network analysis, and builds on the notion of structural balance, to understand the effects of the kingpin strategy on the patterns of conflicts and alliances between Mexico's drug trafficking organizations. Structural balance was first formalized by Heider's (1946) balance theory. It was a psychological model of human relations and asserted that one person's relationship ('positive' or 'negative') with another is interdependent upon their evaluation or attitude towards a third person or entity. The smallest social unit of analysis in which one can assess "balance" is a triad. For any given person (i) who has a relationship with another person (j), person i experiences balance (or cognitive consistency) if and only if both i and j view another persona or an entity k unfavorably and
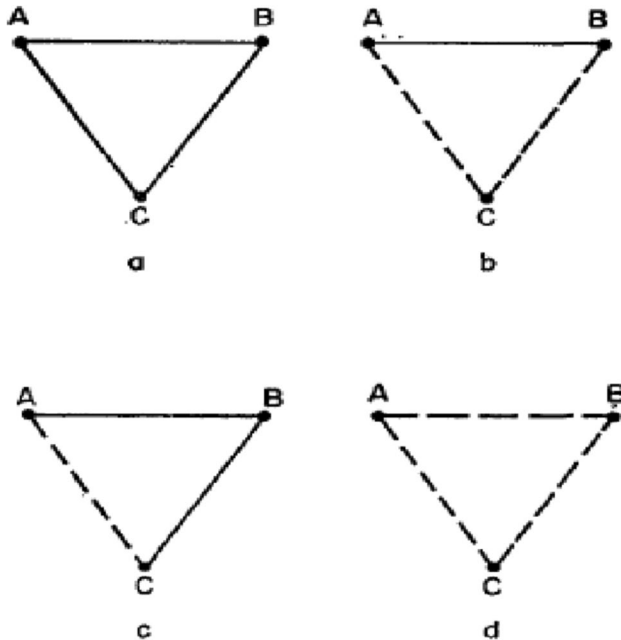
Fig. 1 Structures *a* and *b* are balanced, while c and c are not balanced. Cartwright and Harary (1956)

i and *j* have a positive relationship. In any different configuration, person *i* would experience cognitive incongruence, thus imbalance.

Cartwright and Harary (1956), extended Heider's idea of balance to the theory of social and group structure and defined it as "structural balance". Consider a finite set of actors $N = \{1,2,\ldots,n\}$. Actors cannot have ties with themselves and if *i* has a relation with *j*, then *j* also has a relation with *i* (ties are undirected). The set of all possible relations between the actors is then the set X^n of all two-element subsets *ij* of *N*. A signed graph (hereafter just "graph") $G = (N,X,F)$ combines a set of actors *N* with a set of relations $X \in X^n$, a subset $F \in X$ of which are positive, relations in its complement $E = X \backslash F$ being negative. Cartwright and Harary (1956) argued that within triads (individuals or groups), balance can be achieved if two of the three relations are negative or if all relations among the three actors are positive. In terms of signs, triads +—- and + + + are balanced, while triads—–—and + +—are imbalanced (See Fig. 1). This logic is reflected in aphorisms about how parties may swear allegiance or declare war based on feuds or loyalties with third parties: "The friend of a friend is a friend, the friend of an enemy is a friend, the enemy of a friend is an enemy, and the enemy of an enemy is a friend" (Van De Rijt 2011).

Cycles (triangular relationships in this case) containing an odd number of negative edges are defined as unbalanced, and cycles containing 0 or an even number of negative edges will be balanced. This would imply that the signed network is totally balanced, or structurally balanced. Many signed networks, however, can have the majority of balanced cycles without reaching total balance. Instead of simply stating whether a network is balanced or unbalanced, I will show that some networks can

reach 'partial balance', which will be defined as a state where the amount of balanced cycles is greater than unbalanced ones. Cartwright and Harary (1956) measure this with the degree of balance, which is simply the fraction of balanced cycles:

$$D(G) = \frac{\sum_{k=3}^{n} O_k^+}{\sum_{k=3}^{n} O_k}.$$

where $\sum_{k=3}^{n} O_k^+$ is the sum of balanced cycles (closed walks), and $\sum_{k=3}^{n} O_k$ represents the total number of cycles. I assume that a walk of length k in G denotes a sequence of nodes *V0, V1,…, Vk-1, Vk* such that for each $i = 1, 2,…, k$ there is an edge from *Vi-1 to Vi*. If *V0 = Vk*, the sequence is a closed walk of length k. A cycle of length k will happen when all the nodes in a closed walk are distinct except the endpoints (Aref and Wilson 2019). Having established the basic assumptions of structural balance theory, I will introduce the dataset and the model specifications I used to test the effects of the government strategy on the network of conflicts and alliances between criminal organizations.

Datasets and model specifications

Sample gathering for this analysis consisted of two stages: first, I use the dataset provided by the Uppsala Conflict Data Program (UCDP),[2] which is one of the most comprehensive datasets on violent conflicts that are publicly available and tracks violent conflicts worldwide since 1989. It consistently tracks violent conflicts in Mexico between non-state actors from 2004 to 2020. Choosing this period allowed me to observe the structure of conflicts and alliances between criminal organizations before and after the federal government decided to wage the war on drugs. The initial sample included 7442 violent events between 43 criminal organizations, accounting for an estimated 59,139 violent deaths. I filtered out violent conflicts that included organizations that had no proven links to drug trafficking or other organized crime activities. Such is the case of some civilian organizations or vigilante groups, even though reports have linked some of their members with groups such as La Familia Michoacana and Los Caballeros Templarios (Herrera 2019). In this part of the paper I only included organizations of which I had enough information about their conflicts and alliances. My final sample to test for structural balance includes a total of 5,302 violent events between 11 drug trafficking organizations, from 2004 to 2020, which represents over 70% of the violent events in the original dataset and accounts for 40,055 violent deaths. These organizations are: Sinaloa Cartel, Cartel Jalisco Nueva Generacion (CJNG), Beltran Leyva Organization (BLO), Juarez Cartel, Los Caballeros Templarios, La Familia Michoacana, Tijuana Cartel, Los Zetas, Gulf Cartel, Cartel Independiente de Acapulco (CIDA), and Guerreros Unidos. Each

---

event identifies a dyad of two rival organizations, and each year represents one subset (17 in total).

The second stage of my data collection was focused on using archival methods to reconstruct any positive relationship between these organizations. Because the UCDP only allows me to reconstruct violent conflicts, I had to make use of historical archives, news media outlets, and government reports, to validate every violent conflict presented in my dataset, as well as alliances between these organizations for each year.[3] In particular, I used three credible sources of investigative journalism: Insight Crime, Animal Politico, and Borderland Beat, as well as two of the most renowned newspapers in Mexico: El Universal, and El Reforma. I also used secondary sources from journalists and academics whose systematic and in-depth work helped me understand the complex relationships between some of these organizations during the last two decades. By using social network analysis and building on structural balance theory, I was able to model the structure of conflicts between these Mexican drug trafficking organizations from 2004 to 2020. Negative relationships are represented by red lines connecting nodes when such conflicts are violent, yellow lines connecting nodes when such conflicts are non-violent, and green lines connecting nodes when there is a positive relationship (alliances). Nodes represent drug trafficking organizations. Only green edges represent positive relationships, while yellow and red represent negative relationships.

A key argument in this paper is that the kingpin strategy pursued by the Mexican government had an adverse effect on the levels of violence and the fragmentation of drug trafficking organizations. A similar argument, focusing on the militarization of public safety and the decentralization of the political system, has been elaborated by several scholars (Atuesta and Ponce 2017; Herrera 2019; Ríos and Shirk 2012; Trejo and Ley 2020; Atuesta and Pérez-Dávila 2017). To test my argument, I created a second dataset based on the same sample of relationships between 11 criminal organizations from 2004 to 2020. The dataset consists of 187 observations and I use organization/year as my unit of analysis. "Fragmentation" is the dependent variable, and it represents whether a given organization suffers fragmentation in any given year from 2004 to 2020. The outcome is binary:1 for "Fragmentation" and 0 for "No fragmentation". The model includes 4 explanatory variables: "Military operation", represents whether there is evidence that the federal government was at war with a criminal organization during a particular year. Specifically, I consider military operations against a specific city or state where one or more criminal organizations are present. I also consider specific government actions by the federal police against a specific criminal organization. An example of these military operations is "Operativo Baja California" (Operation Baja California), sanctioned in 2007, to send the military to the state of Baja California, which was considered the bastion of the Tijuana Cartel. "Military operation" is also a binary variable: 1 for "Military operation" and 0 for "No military operation the organization"; "Border control" represents whether an organization

---

[3] I used Python to run all my analysis and to graph the relationships between criminal groups. In particular, the Networkx package allowed me to create, manipulate, and study the structure of these relationships.

Table 1 Contingency table

	Fragmentation		Total
	0 (N=169)	1 (N=18)	
Military_Operation			
0	56 (100%)	0 (0%)	56 (30%)
1	113 (86%)	18 (14%)	131 (70%)
Total	169 (90%)	18 (10%)	187 (100%)
Beheading			
0	163 (100%)	0 (0%)	163 (87%)
1	6 (25%)	18 (75%)	24 (13%)
Total	169 (90%)	18 (10%)	187 (100%)
Border_Control			
0	90 (93%)	7 (7%)	97 (52%)
1	79 (88%)	11 (12%)	90 (48%)
Total	169 (90%)	18 (10%)	187 (100%)
War			
0	44 (100%)	0 (0%)	44 (24%)
1	125 (87%)	18 (13%)	143 (76%)
Total	169 (90%)	18 (10%)	187 (100%)

controlled a border city during a given year. It is a binary variable: 1 for "controls a border city" and 0 for "does not control border city"; "War" represents whether an organization was at war with another organization during a given year. It is also a binary variable: 1 for "war" and 0 for "no war"; "Beheading" represents whether the leader of an organization was killed or extradited in a given year. It is a binary variable: 1 for "leader extradited or killed" and 0 for "leader not extradited nor killed"; finally. I fitted a nested model with four regressions: the first is a logistic regression with "Fragmentation" as the dependent variable, and "Beheading" as the independent variable; the second, third, and fourth models are multivariate logistic regressions with "Fragmentation" as the dependent variable.

The role of the government is crucial when analyzing violent conflicts between drug trafficking organizations, but rather than understanding the role of the government only in opposition to that of organized crime groups, this paper sides with Trejo and Ley (2018), and Herrera (2019), who demonstrate that criminals and state agents collude and create a 'gray zone of criminality' that allows for organized crime to coexist with the state. Criminal organizations in Mexico have historically operated with the protection of government agents, but these relationships became more complex with the decentralization of political power in the 2000s. Slack and Campbell (2016), for instance, argued that the Mexican clientelist political system created the conditions for violence to erupt when the one-party system ended. This has led criminal organizations to decentralize their power structures into regional organizations and to seek the protection of local and state governments. Such findings show a complex scenario where government institutions can work with criminal groups in a non-cohesive fashion while pursuing conflicting agendas between the local, state,

Table 2 Effects of four predictors on the fragmentation of criminal organizations

Logistic regression results				
	Fragmentation			
	1	2	3	4
Beheading	.75***	.74***	.74***	.75***
	(.03)	(.03)	(.04)	(.04)
Military operation		.02	.02	.05
		(.03)	(.03)	(.04)
Border control			-.01	0.00
			(.02)	(.03)
War				–0.04
				(.05)
Constant	0.00	–.01	–.01	–0.00
	(.01)	(.02)	(.02)	(.02)
Observations	187	187	187	187
Log likelihood	82.14	82.45	82.57	82.87
Akaike Inf. Crit	−160.27	−158.90	−157.13	−155.73

*P < 0.05

**P < 0.01

***P < 0.001

and federal levels, and sometimes even within the same institution. The assumption of this paper is that, for every conflict between two drug trafficking organizations that is analyzed, local governments might be embedded to some capacity, directly or indirectly in those conflicts, and that the kingpin approach is a strategy exclusively used by the federal government with the help of the military (Table 1).

The kingpin strategy: fragmentation and structural imbalance

In this section, I test the hypothesis that there is an association between the kingpin strategy and the fragmentation of criminal organizations. Figure 1 shows the Phi Correlation Coefficients between the dependent variable and all the proposed predictors.[4] The correlation matrix shows that there is a strong positive correlation between the beheading of an organization and its fragmentation (0.96). Next, I fit a simple logistic regression and three multivariate logistic regressions. Table 2 shows the results of my nested model.[5] The simple logistic regression (Model 1) shows that extraditing or killing the leader of an organization ('Beheading') is associated with an increase in the log odds of its fragmentation by 0.75 ($p < 0.01$), compared

---

[4] The Phi coefficient is a statistical measure used to analyze the association between two binary variables. The interpretation is similar to that of the Pearson correlation (Osborn 2006).

[5] I used several R packages to fit both the simple logistic and the multivariate logistic regressions.
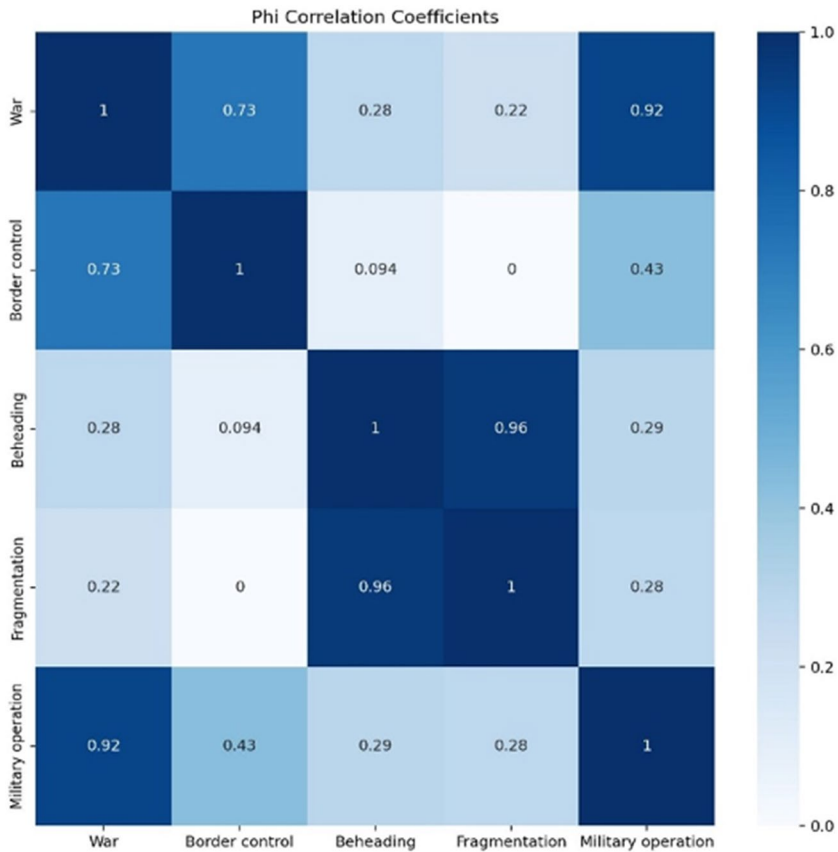
Fig. 2 Correlation matrix

to when there is no 'Beheading'. Similarly, the multivariate logistic regressions (Models 2 and 3) show that, holding all other predictors constant, the 'Beheading' of an organization is associated with an increase in the log odds of its fragmentation by $0.75(p < 0.01)$, compared to when there is no 'Beheading' present. Finally, the results of Model 4 should be considered with caution because one of its predictors ('War') is highly correlated with 'Military Operation' (0.92) and 'Border Control' (0.73), and multicollinearity might be present. The results of the simple logistic regression and the multivariate logistic regression are consistent with Atuesta and Ponce (2017), who found a causal relationship between interventions by security forces in Mexico and an increase in the number of criminal organizations (Fig. 2).

If beheading increases the likelihood of an organization splitting, we should observe larger networks of criminal organizations after 2007 in Mexico, which is when the federal government started its war on drugs and focused its efforts on a kingpin strategy. Focusing on the same sample of 11 organizations, I test my second hypothesis: that the network of conflicts and alliances between criminal

Table 3 Balanced and unbalanced triangular relations between drug trafficking organizations

Year	Nodes	Edges	Violent edges	Conflicting edges	Triangular relations	Balanced	Unbalanced	Degree of balance	Balance
2004	4	6	3	3	4	4	0	1	Structural
2005	4	6	3	3	4	4	0	1	Structural
2006	4	6	3	3	4	4	0	1	Structural
2007	4	6	3	3	4	4	0	1	Structural
2008	5	10	3	4	10	10	0	1	Structural
2009	5	10	3	4	10	10	0	1	Structural
2010	6	15	6	8	20	20	0	1	Structural
2011	9	36	8	21	84	56	28	0.666666667	Partial
2012	10	45	9	24	120	80	40	0.666666667	Partial
2013	10	45	7	24	120	80	40	0.666666667	Partial
2014	10	45	7	24	120	80	40	0.666666667	Partial
2015	10	45	8	23	120	80	40	0.666666667	Partial
2106	10	45	8	23	120	80	40	0.666666667	Partial
2017	10	45	5	23	120	80	40	0.666666667	Partial
2018	9	36	6	17	84	58	26	0.69047619	Partial
2019	9	36	6	17	84	58	26	0.69047619	Partial
2020	9	36	6	17	84	58	26	0.69047619	Partial

organizations was structurally balanced before the government waged war against them, but the kingpin strategy led to the fragmentation of many of these organizations, which ultimately led to an unbalanced structure. Table 3 summarizes the results of the structural balance analysis. Two distinctive periods can be observed: the first, from 2004 to 2010, shows structural balance because all triangular relationships are balanced; the second from 2011 to 2020, does not show structural balance, but the ratio of balanced triads is always higher than that of unbalanced triads, which can be understood as "partial balance" (Aref and Wilson 2019). In general, the number of violent edges is lower than that of non-violent edges for almost every year (except for the first four years), and as the number of edges increases, the relative number of violent edges seems to decrease. This means that the number of violent conflicts is relatively small compared to what it could potentially be, even when the number of organizations in the network increase.

The period from 2004 to 2007, before the war on drug trafficking, follows a configuration of violent conflicts that is structurally balanced, with a small number of conflicting organizations that controlled large territories: The Sinaloa Cartel, Juarez Cartel, Gulf Cartel, and the Tijuana Cartel. This is consistent with what historians and experts assert on drug-related violence during this period (Hernandez 2010; Escalante 2009; Guerrero 2009; Serrano 2010; Blancornelas 2010). When the Guadalajara Cartel disintegrated, in the late 1980s, three organizations emerged: The Sinaloa Cartel, The Tijuana Cartel, and the Juarez Cartel (the Gulf Cartel already existed), and violent conflicts between them quickly ignited. By the early 2000s, the
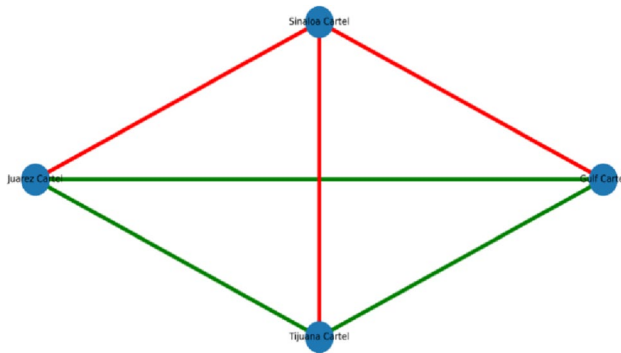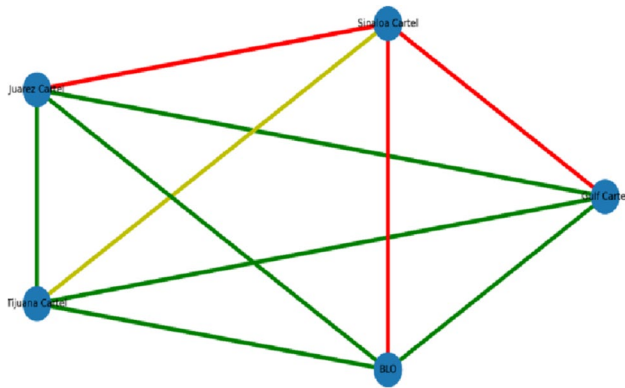
Fig. 3 Structural balance in conflicts and alliances between the most powerful drug trafficking organizations between 2004 and 2007. Red edges represent violent conflicts and green edges represent alliances. Only red edges represent negative relationships

Sinaloa Cartel started to consolidate as the most powerful drug trafficking organization in Mexico, and probably the world. As a result, the rest of the organizations forged alliances to fight off the Sinaloa Cartel. Figure 3 shows the conflicting relationships and alliances between these four organizations between 2004 and 2007. There is a total of 4 nodes (organizations) and 6 edges (relationships), 3 of which are negative (violent). All four of the 4 triangular relationships are structurally balanced.

In 2007, the federal government declared a war on drug trafficking organizations and started a military campaign to behead and disarticulate the most important cartels. As a result, in just a few years, the leaders of some of the most important cartels started to be apprehended and extradited or killed in shootouts with the government. Their absence quickly ignited internal disputes over who would replace them and fragmentation followed. The 'balanced arrangement', observed between organizations from 2004 and 2007, started to experience important changes: in 2008, when the Beltran Leyva Organization (BLO) appears for the first time as another important player in the network of violent conflicts. The BLO was originally an organization working under the Sinaloa Cartel. They were in charge of providing security and building a team to fight off one of Sinaloa's main rivals in the early 2000s, the Gulf Cartel. But in 2008 internal disputes led the two organizations to split and started a bloody war that spilled over several states and that lasted over a decade. During this same period, the Tijuana cartel experienced several blows to its leadership: first, in 2002, when Benjamin Arellano Felix was captured by the federal government. His brother, Ramon, was killed a few months earlier in a shootout with the police. Then, in 2006, another brother and successor to the leadership of the organization was captured with the help of the DEA (Blancornelas 2010). Finally, in 2008, the Tijuana cartel also split and two factions emerged. The second faction was backed by the Sinaloa Cartel who wanted a foothold in Tijuana.

The networks of conflicts and alliances between drug trafficking organizations in 2008 and 2009 are exactly the same (Fig. 4). They both have a total of 5 nodes (organizations) and 10 edges, 3 of which are violent and 4 are conflicting edges (violent and non-violent). There are 10 triangular relationships in both networks. 10 of
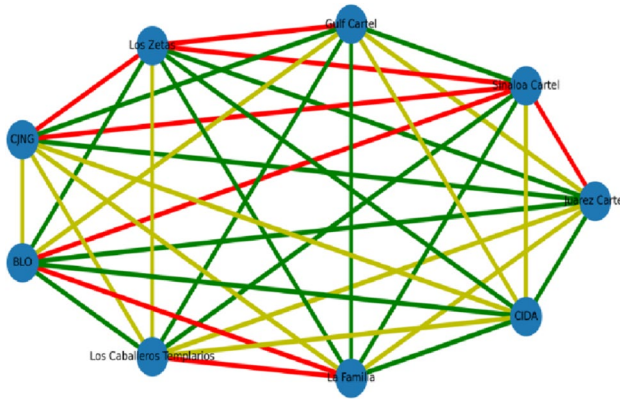
Fig. 4 Conflicts and alliances, in 2008 and 2009, are structurally balanced. Red edges represent violent conflicts, yellow edges represent non-violent conflicts, and green edges represent alliances. Only red edges represent negative relationships

these relationships are balanced and 0 are unbalanced, which means that both networks are structurally balanced.

But this balanced arrangement between criminal organizations did not last for long. The year 2010 marked a shift in the configuration of conflicts and alliances: The Zetas split from the Gulf Cartel and started a violent war that spilled over the whole country. The Zetas were formed in 1999, when Osiel Cardenas Guillen, a notorious leader of the Gulf Cartel, lured more than thirty soldiers from the Mexican special forces to work for him (Castellanos 2013). Cardenas Guillen was captured by the government and extradited to the U.S. in 2007. His brothers, Antonio and Eduardo Costilla, took charge. But in 2010 Antonio was gunned down by the military and Eduardo took charge of the Gulf Cartel. This created an internal fraction and the Zetas decided to start their own operations, which fueled a war with the Gulf cartel. Dissatisfied, the Gulf cartel forged an alliance with the Sinaloa cartel and the Familia Michoacana to fight off the Zetas (Correa-Cabrera 2017).

In the state of Michoacan, La Familia Michoacana had been fighting off the Zetas for several years, but in 2010 their leader, Nazario Moreno Gonzales was allegedly gunned down in a shootout with the federal police. This led to a split among cartel leaders. One faction stayed with La Familia Michoacana, and the other created a new organization: Los Caballeros Templarios. They called themselves a "self-defense" movement focused on expelling other organizations from Michoacán and took the name from the medieval military-religious order the Knights Templar (Ávalos 2022). Another vicious organization, Cartel Jalisco Nueva Generacion (CJNG), also emerged in 2010, after former Sinaloa Cartel capo Ignacio Coronel was killed by the Mexican military. The CJNG has been associated with the use of extreme forms of violence against enemies, civilians, and state agents alike. By 2011 they were actively engaged in violent conflicts with other organizations. For instance, they claimed authorship of a massacre of 35 people in Veracruz that same year. They also killed around 15 police officers during an ambush, in 2015 (Ávalos 2022).
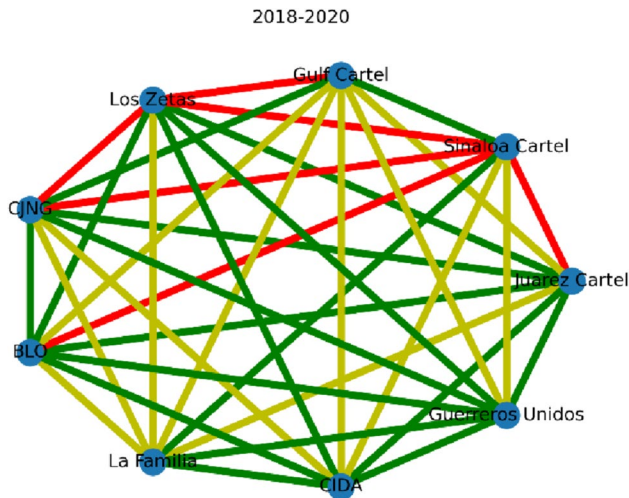
Fig. 5 Network of violent conflicts in 2011. The degree of balance is 0.654, which accounts for 'partial balance'. Red edges represent violent conflicts, yellow edges represent non-violent conflicts, and green edges represent alliances. Only red edges represent negative relationships
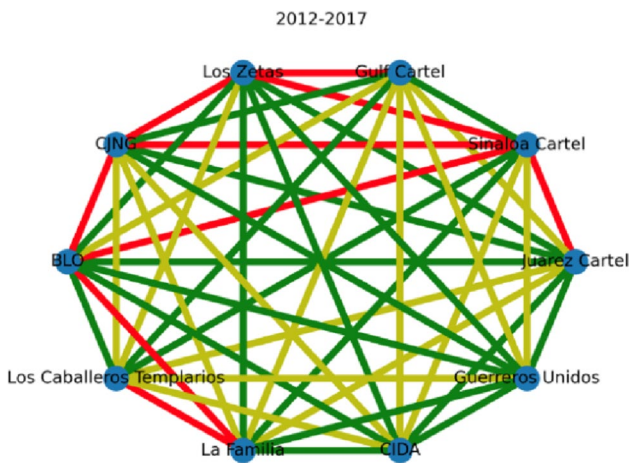
Fig. 6 Network of conflicts and alliances between 2012 and 2017. Red edges represent violent conflicts, yellow edges represent non-violent conflicts, and green edges represent alliances. Only red edges represent negative relationships

The network of conflicts and alliances shows significant changes in 2011. Figure 5. shows a total of 9 nodes and 36 edges, 8 of which are violent, and 21 are conflicting edges. The total number of triangular relationships is 84, of which 55 are balanced, and 29 are unbalanced. This is the first year in which the network does not show structural balance. The degree of balance is 0.654, which accounts for 'partial balance'.

The period from 2012 to 2017 shows almost the exact same network of conflicts and alliances between these organizations with a total of 10 nodes and 45 edges (See Fig. 6). For instance, the year 2012 shows 9 violent edges and a total of 24 conflicting edges (violent and non-violent). Although 2013 and 2014 show only 7

2018-2020

Fig. 7 The network of conflicts and alliances between 2018 and 2020 shows a partial balance of 0.69. Red edges represent violent conflicts, yellow edges represent non-violent conflicts, and green edges represent alliances. Only red edges represent negative relationships

violent edges, the total of conflicting edges continues to be 24. The years 2015 and 2016 both show 8 violent edges and a total of 23 conflicting edges (violent and non-violent). Finally, 2017 shows 5 violent edges and 23 conflicting edges. Despite these small variations, all the networks in this period show a degree of balance of 0.683. This is because 82 triadic relationships are balanced, while only 38 are imbalanced.

The period from 2018 to 2020 follows a similar network to the previous period. The most notable difference is the absence of Los Caballeros Templarios, who dissolved into small cells in 2017 (Bowman et al. 2021). These three networks all have 9 nodes and 36 edges, 6 of them are violent, and 17 are conflicting nodes (violent and non-violent). For all these years the degree of balance is 0.69, with 58 balanced triads and 26 unbalanced triads (See Fig. 7).

This analysis suggests that, after 2010, this network of criminal organizations stopped being structurally balanced. As the federal government continued beheading drug trafficking organizations across the country, the balanced arrangement that existed between them became increasingly more difficult to handle, until it reached a tipping point in 2010. After that year, every year in the sample shows networks that are structurally imbalanced.

Fragmentation and clustering of violence

In the last section, I showed that the kingpin strategy was associated with the fragmentation of criminal organizations and that it disrupted the balanced arrangements in the network of conflicts and alliances. In this section, I test my third hypothesis: that the fragmentation of criminal organizations was associated

with a 'regionalization' or clustering of violence. I use the original dataset of 7442 violent events between 43 criminal organizations, accounting for an estimated 59,139 violent deaths. The results show that, from 2004 to 2007, there is a total of four organizations partaking in 3 violent conflicts. Much of the violence happened in border cities and along drug trafficking routes. Cities like Tijuana and Ciudad Juarez were of particular importance because they were important entryways into the United States, and drug trafficking organizations have historically fought to gain or maintain their control. Likewise, ports like Acapulco and Mazatlán are vital because they allow organizations to control big shipments of drugs and precursors into Mexico (See Map 1). The number and the spread of violent events between the Sinaloa and the Gulf cartels are remarkable, as they were both striving to take control of most of the country and trafficking routes. By 2012, when Calderon's presidency ended, the number of violent conflicts had increased to 14, and the number of organizations partaking in the violence reached 19.[6] There is also a gradual clustering of conflicts, with a notable increase of violence in central and southern Mexico, specifically The Bajio region and Tierra Caliente. Veracruz continues to be a violent state, with conflicts between CJNG and the Zetas (See Map 2).

When former president Enrique Pena Nieto took office, in 2012, he promised to end the violence and the militarization of the country, but the use of the military continued and so did the kingpin strategy. In 2018, President Andres Manuel Lopez Obrador also promised to end the militarization of the country, but he has so far shown nothing but the same old strategy. The consequences of how both administrations have handled organized crime in Mexico can be observed in the new geography of violence. The period from 2013 to 2020 shows a further spillover of violent conflicts across the country, with Oaxaca and Chiapas becoming part of the contested states. There is a total of 34 violent conflicts between over 40 organizations. Despite the multiplicity of organizations fighting each other in different parts of the country, it is notable the amount of geographical clustering of these conflicts. Only two conflicts seem to reach more than one geographical region: The Gulf – Zetas, and the Sinaloa – CJNG conflicts. The vicious fighting between CJNG and Sinaloa for Tijuana's turf is also notable (See Map 3).

Map 3 shows that by 2020 there are far more organizations involved in violent conflicts than in previous years (a total of 33), but it also shows an interesting pattern of clustering of conflicts. To test for the clustering of violence, I run a modularity test to observe whether there is an increase in the number of clusters of conflicts in the network between 2004 and 2020. In social network analysis, clusters or communities are sub-networks where a node is directly connected to any other node of the sub-network. The number of communities can be obtained through the modularity of a network. The modularity of a partition in an undirected, unweighted network is defined as:

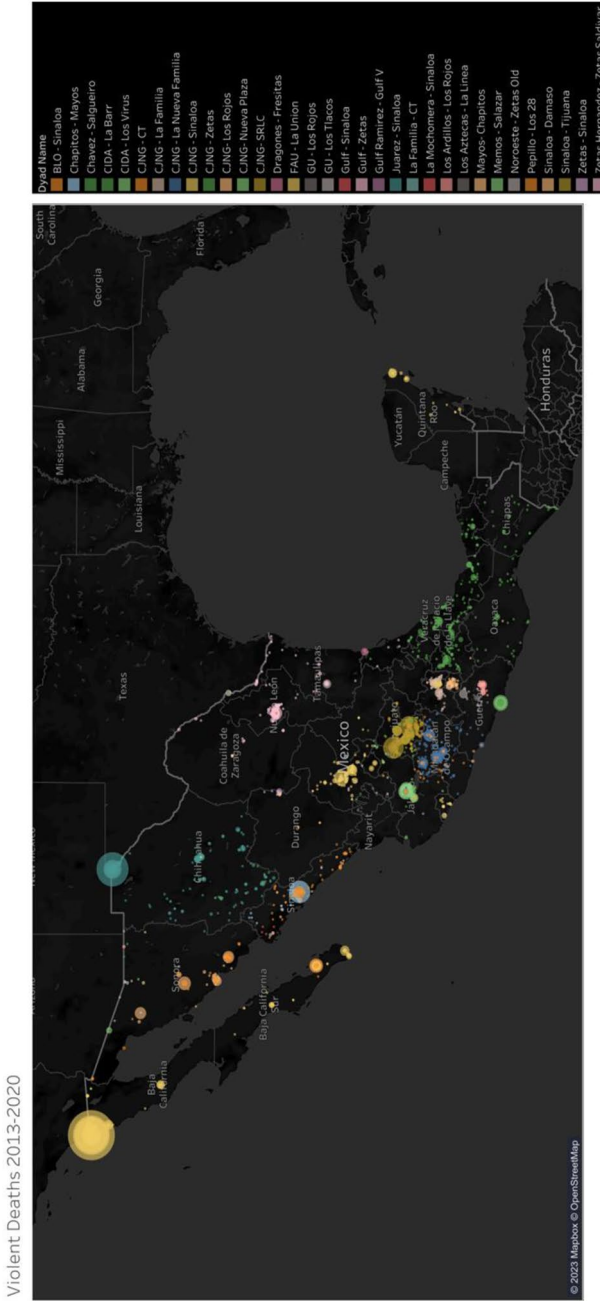[6] Some authors argue that the number of groups reached almost 60 (Trejo and Ley, 2021).
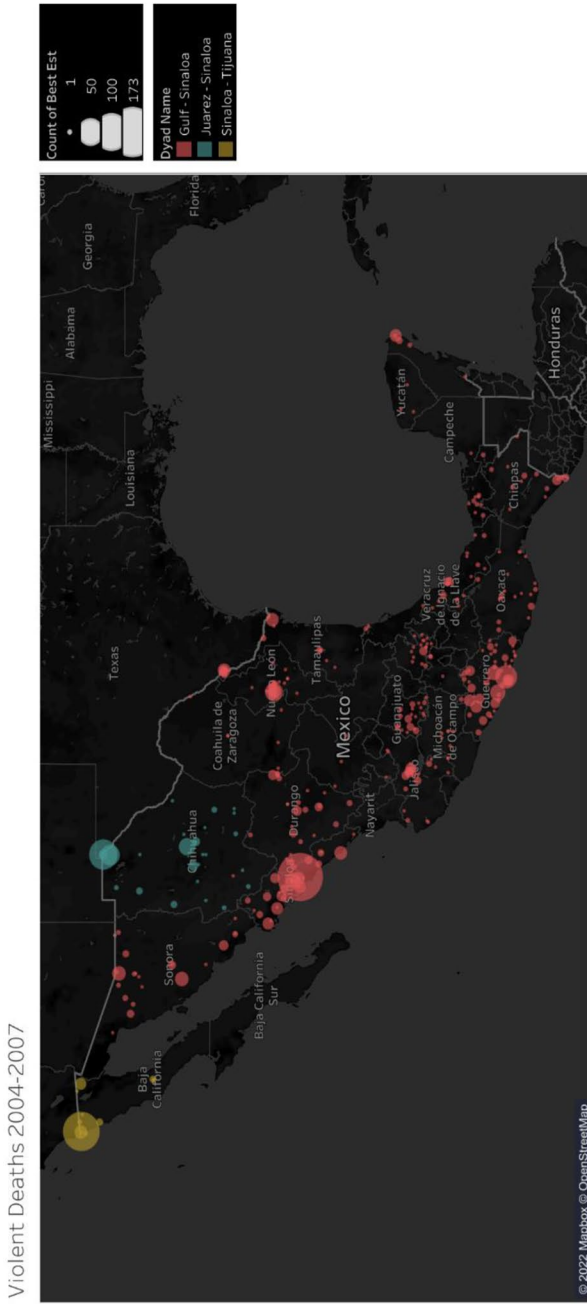
Map 1 Geography of deaths related to violent events between criminal organizations (2004–2007)
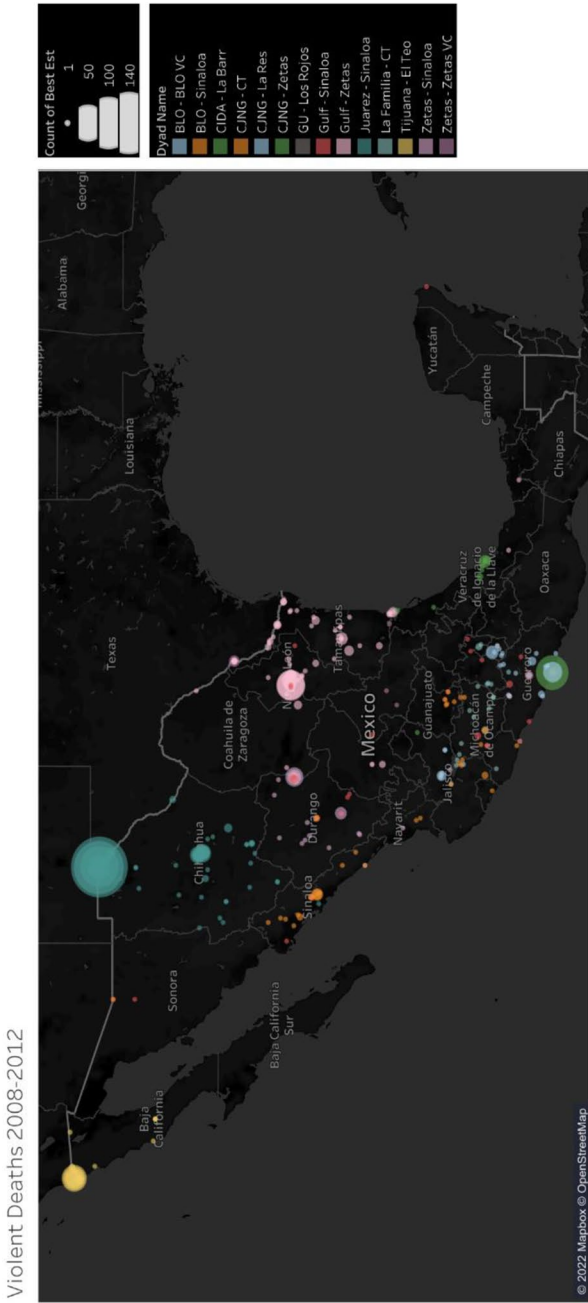
Map 2 Geography of deaths related to violent events between criminal organizations (2008–2012)

Map 3 Geography of deaths related to violent events between criminal organizations (2013–2020)
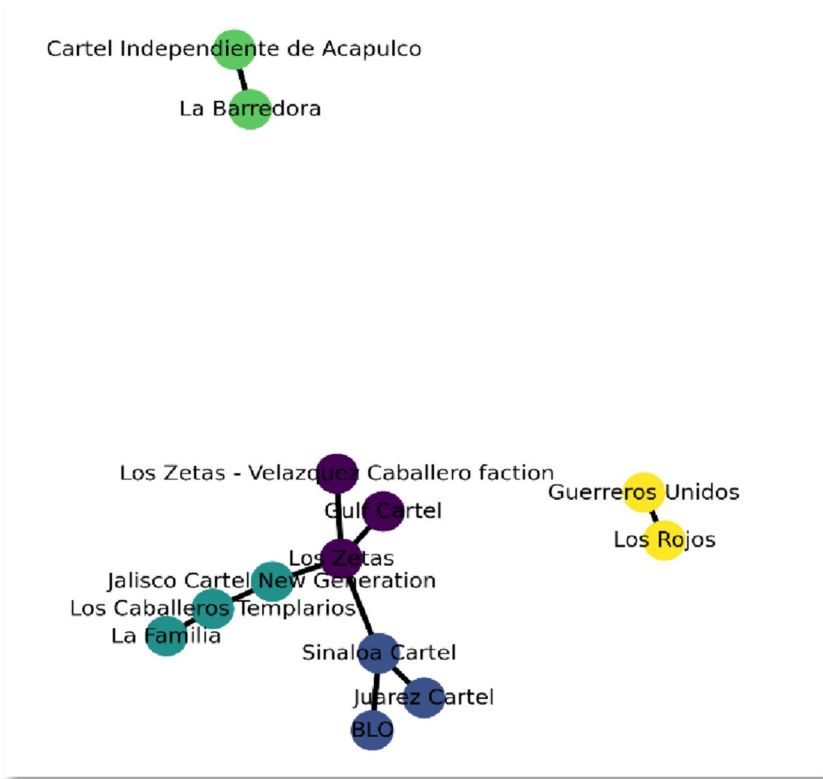
Fig. 8 The Louvain Algorithm for Modularity Optimization shows a total of 5 clusters of violence in 2012

$$Q = \frac{1}{L} \sum_C \left(Lc - \frac{k_c^2}{4L} \right)$$

Where the sum runs over all clusters of the partition, Lc is the number of internal links in cluster C, k_c is the total degree of the nodes in C, and L is the number of links in the network. I use the Louvain community detection algorithm, which allows for modularity optimization. It randomly orders all nodes in the network, and then removes and inserts each node in a different community. Networks with higher modularity will normally have dense connections within communities but sparse connections between nodes in different communities (Menczer et al.; 2020). Figure 8 gives an example of what the Louvain algorithm produces. It shows the network of violent conflicts between organizations in 2012, where each color represents a cluster such that all nodes with the same color belong to the same cluster of conflicts. The total amount of clusters for that year is 5. Finally, Fig. 9 shows how the number of clusters of violent conflicts consistently increased from 1 in 2004, to 7 in 2020. This confirms the hypothesis that not only do we observe a greater number of conflicting organizations from 2004 to 2020, but that these organizations cluster together in smaller and more localized conflicts over time.
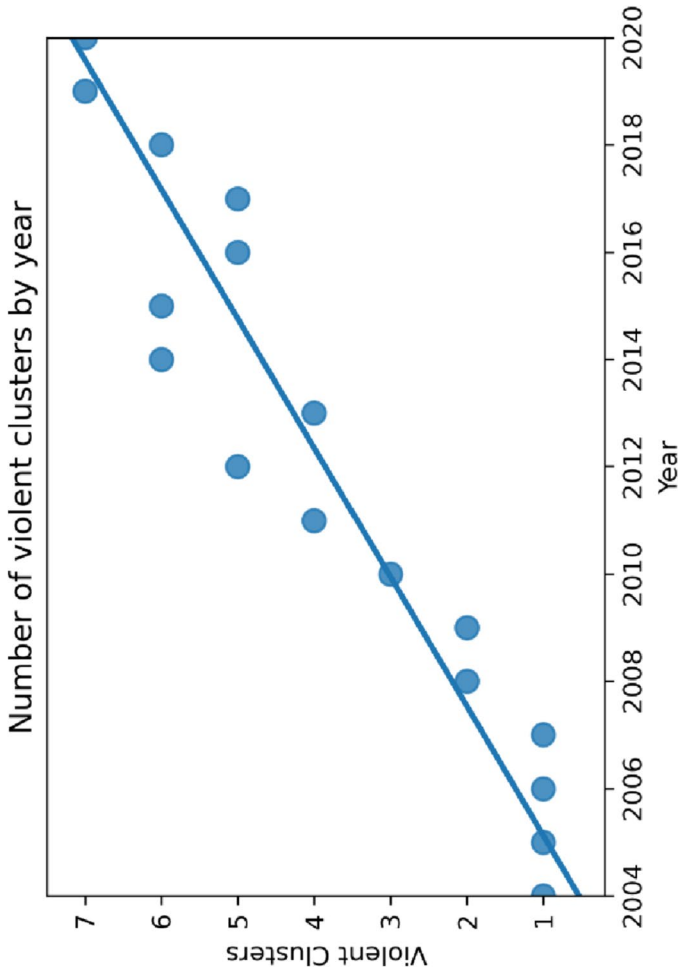
Fig. 9 Clusters of violence from 2004 to 2020

Conclusions

Several conclusions can be drawn from the present paper. First, the results of the simple logistic regression and multivariate logistic regression models show that the beheading of an organization due to extradition or killing of the leader has a significantly positive effect on its immediate fragmentation. This is consistent with the historical evidence of how Mexico's criminal organizations suffered increased levels of fragmentation once the government started its kingpin strategy and how it led to increased levels of violence. It is also consistent with previous studies that show a positive relationship between increased levels of fragmentation of criminal organizations and violence (Atuesta and Perez-Davila 2017).

Second, when testing for structural balance, there seem to be two distinct periods: the first from 2004 to 2010, and the second from 2011 to 2020. The first period consistently shows structurally balanced networks, while the second does not. More specifically, the period from 2004 to 2007, follows a configuration of violent conflicts that is structurally balanced, with a small number of conflicting organizations that controlled large territories. In 2007, the federal government declared a war on drug trafficking organizations and started a military campaign to behead and disarticulate the most important cartels. As a result, in just a few years, the leaders of some of the most important cartels started to be apprehended and extradited or killed in shootouts with the government. Their absence quickly ignited internal disputes over who would replace them and fragmentation followed. After 2010 the network stops being structurally balanced and more organizations become a part of it as a consequence of fragmentation. As the federal government continued beheading drug trafficking organizations across the country, the balanced arrangements that existed between them became increasingly more difficult to sustain. The year 2011 seems to be the tipping point where the network stops being structurally balanced.

An unavoidable question is whether the absence of militarization and a kingpin strategy would have sustained such a structural balance or if other variables would lead to the same effect of fragmentation and increase in violence. Regardless, both the theory and the present findings show that more conflicting organizations inevitably increase the possibility for the network not to be balanced, and unbalanced networks will tend to increase tensions within the network compared to balanced networks (Cartwright and Harary 1956), which translates into more violence and more deaths of civilians. These results show that the kingpin strategy produced unintended consequences by disrupting the network of conflicts and alliances between criminal organizations, creating a situation prone to chaos and disorder in the network, and increasing the levels of lethal violence throughout the country.

Third, the geographical analysis of violent conflicts and the analysis of the modularity of conflicts show that the total amount of clusters of violent conflicts consistently increased from 1 in 2004, to 7 in 2020. Likewise, there is a consistent spread of violence to new regions of the country, particularly in the south. This confirms that not only do we observe a greater number of conflicting organizations, but that these organizations tend to cluster together in smaller and more localized conflicts. The trend is unambiguous and shows that the kingpin strategy not only was unsuccessful

in bringing down the violence, but it also had the unintended consequence of fostering a much more complex network of conflicts with an increasing number of clusters of violence.

Literature on organized crime-related violence has shown that the Mexican clientelist political system created the conditions for violence to erupt when the one-party system ended (Rios Contreras 2013; Herrera 2019; Trejo and Ley 2020; Shirk and Astorga 2010; Slack and Campbell 2016). Consequently, criminal organizations decentralize their power structures into regional organizations and seek the protection of local and state governments. This paper builds on social network analysis and structural balance theory in a novel fashion to expand the argument: the kingpin strategy and the political decentralization unintentionally fostered the fragmentation of criminal organizations which increased the number of violent conflicts throughout the country. This also shifted the geography of violence and a process of clustering of conflicts. The transformation was structural because it altered the network of criminal organizations, geographical because it shifted the geography of violence, and organizational because it was associated with the fragmentation of criminal organizations.

These findings also have important public policy implications: it is clear that the kingpin strategy needs to be reimagined in light of the growing evidence of its failure, but the "how" might not be easy to answer. Going back to a structure where a few organizations controlled most of the territory and had balanced arrangements between them and the federal government is unlikely. Many new smaller criminal organizations have established arrangements with local governments and might be too embedded in the local dynamics of power, which makes uprooting them increasingly difficult. Instead of following a uniform strategy, the federal government should acknowledge the complexities and the local and specific conditions under which violence and organized crime happen. Criminal groups are multiple and heterogeneous, and it is unrealistic to think that they can all be tackled the same way. For instance, this paper shows that some organizations are more violent than others, which can be observed by the geographical expansion of their conflicts and their central position in the network. That is the case of the Sinaloa cartel, the Zetas, and the Cartel Jalisco Nueva Generacion (CJNG). There are also some organizations that have a greater capacity to link different clusters of violence, even though they might not seem to be that central in the network. Such types of organizations function as 'brokers' in the network and can be thought of as 'super-spreaders' of violence (Smith and Papachristos 2022). This line of analysis is compelling and should be revisited in any future research agenda on criminal organizations and violence.

A practical, yet controversial, public policy approach, could be to focus all military action only against those organizations that are so violent that represent an imminent threat to the safety and well-being of the population and the stability of the state. Of course, this would have to be accompanied by strict laws and actions that tackle the financial structure of criminal organizations, as well as all forms of corruption. Finally, the judicial system would have to be reformed to regain the trust of the population. A country where 93.2% of crimes committed go unreported, and only 1.1% are resolved (INEGI 2022) is a country where organized crime is set to thrive.

Data Availability The Uppsala Conflict Data Program data are available at https://ucdp.uu.se/country/70.

Declarations

This research involves no human participants, their data or biological material.

Informed consent No informed consent is needed.

Conflicts of interest I have no conflicts of interest to disclose.

References

Aref S, Wilson MC (2019) Balance and frustration in signed networks. J Complex Netw 7(2):163–189. https://doi.org/10.1093/comnet/cny015

Atuesta LH, Pérez-Dávila YS (2017) Fragmentation and cooperation: the evolution of organized crime in Mexico. Trends Organ Crime 21:235–261

AtuestaPonce LH (2017) Meet the *Narco*: increased competition among criminal organisations and the explosion of violence in Mexico. Glob Crime 18(4):375–402. https://doi.org/10.1080/17440572.2017.1354520

Ávalos HS (2022) *Familia Michoacana*. InSight Crime. Retrieved November 17, 2022, from https://insightcrime.org/mexico-organized-crime-news/familia-michoacana-mexico-profile/

Blancornelas J (2010) *El Cartel*. Random House Mondadori

Bowman P, Previde S, Dittmar P (2021) Las nuevas facciones criminales detrás de la violencia en México. InSight Crime. Retrieved November 10, 2022, from https://es.insightcrime.org/noticias/algunos-principales-grupos-surgieron-fragmentacion-criminal-mexico/

Calderoni F (2014) Social Network Analysis of Organized Criminal Groups. *Encyclopedia of Criminology and Criminal Justice*. ISBN : 978–1–4614–5689–6

Cartwright D, Harary F (1956) Structural balance: a generalization of Heider's theory. Psychol Rev 63(5):277–293. https://doi.org/10.1037/h0046049

Castellanos G (2013) Historia del narcotráfico en Mexico. Aguilar, Mexico City

Correa-Cabrera Guadalupe (2017) Los Zetas Inc. Criminal Corporations, Energy, and Civil War in Mexico. University of Texas Press, Austin

Duijn PAC, Kashirin V, Sloot PMA (2014) The relative ineffectiveness of criminal network disruption. Sci Rep 4(4238):1–15

Escalante F (2009) 'Homicidios 1990–2007', en *Nexos* 381. Septiembre, México

Guerrero E (2009) 'Las tres guerras. Violencia y narcotráfico en México', en *Nexos* 381, Septiembre. México

Heider F (1946) Attitudes and cognitive organization. J Psychol: Interdiscip Appl 21:107–112. https://doi.org/10.1080/00223980.1946.9917275

Hernandez A (2010) Los Senores del Narco. Mexico, D.F., Grijalbo

Herrera J (2019) Cultivating violence: trade liberalization, illicit labor, and the mexican drug trade. Latin Am Polit Soc 61(3):129–153. https://doi.org/10.1017/lap.2019.8

Hofmann DC, Gallupe O (2015) Leadership protection in drug trafficking networks. Glob Crime 16(2):123–138

INEGI Instituto Nacional de Estadística, Geografía e Informática (2021) [Web.] Retrieved from the Library of Congress. https://lccn.loc.gov/2005544414. Accessed 12, 16 Dec 2022

INEGI Instituto Nacional de Estadística, Geografía e Informática (2022) Retrieved April 22, 2023, from https://www.inegi.org.mx/programas/envipe/2022/

Menczer F, Fortunato S, Davis C (2020) A First Course in Network Science. Cambridge University Press, Cambridge. https://doi.org/10.1017/9781108653947

Natarajan M, Belanger M (1998) Varieties of drug trafficking organizations: a typology of cases prosecuted in New York City. J Drug Issues 28:1005–1026

Osborn CE (2006) Statistical Applications for Health Information Management. Jones and Bartlett Publishers, London

Rios Contreras V (2013) How Government Structure Encourages Criminal Violence: The causes of Mexico's Drug War. Doctoral dissertation, Harvard University

Ríos V, Shirk DA (2012) Drug Violence in Mexico: Data and Analysis through 2011. Justice in Mexico Project, San Diego

Serrano M (2010) 'El problema del narcotráfico en México: una perspectiva latinoamericana', en Gustavo Vega y Blanca Torres (coord.) Los *grandes problemas de México XII: Relaciones Internacionales*, México, El Colegio de México

Shirk DA, Astorga L (2010) Dru Trafficking Organizations and Counter-Drug Strategies in the U.S.-Mexican Context. Evolving Democracy. Center for U.S.-Mexican Studies, UC San Diego

Slack J, Campbell H (2016) On narco-coyotaje: illicit regimes and their impacts on the US–Mexico border. Antipode 48:1380–1399. https://doi.org/10.1111/anti.12242

Smith C, Papachristos AV (2022) Violence brokers and super-spreaders: how organised crime transformed the structure of Chicago violence during Prohibition. Glob Crime 23(1):23–43. https://doi.org/10.1080/17440572.2021.1998772

Smith CM, Papachristos AV (2016) Trust thy crooked neighbor: multiplex in Chicago organized crime networks. Am Sociol Rev 81(4):644–667

Trejo G, Ley S (2018) Why did drug cartels go to war in Mexico? Subnational party alternation, the breakdown of criminal protection, and the onset of large-scale violence. Comp Pol Stud 51(7):900–937

Trejo G, Ley S (2020) Votes, Drugs, and Violence. In Votes, Drugs, and Violence: The Political Logic of Criminal Wars in Mexico (Cambridge Studies in Comparative Politics, pp. I-Ii). Cambridge: Cambridge University Press

Van De Rijt A (2011) The micro-macro link for the theory of structural balance. J Math Sociol 35(1):94–113