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Land titling and political alternation: Seeds of Mexico's drug war

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Abstract: The Mexican drug war escalated dramatically since 2007, yet its roots lie in municipal turf wars of the 1990s and early 2000s involving the main drug-trafficking organisations operating in the country. We trace the turf wars to two concurrent shocks: the weakening of the PRI's long-standing control over local offices and PROCEDE, the programme that converted PRI-dominated communal ejidos into individually titled parcels. By turning untitled land into marketable property, PROCEDE made rural parcels far easier to acquire or extort. Meanwhile, opposition victories at municipal and state levels dismantled PRI-brokered protection networks, leaving incumbent cartels exposed. Together, marketable land and vanishing political cover created fertile ground for rival organisations to invade and clash. Using a difference-in-differences framework, we show that municipalities exposed to both shocks—the PROCEDE land-titling rollout and opposition victories—experienced a pronounced rise in organised-crime deaths during 1995-2006. The surge is greatest when an opposition mayor is elected in the same year that the governorship also turns against the PRI, signalling a full collapse of the party's protective network. Cartel-presence data also reveal that these municipalities attract both first-time entrants and multiple rival groups, confirming that violence is driven by fresh competition over newly contestable territories. In short, land titling combined with PRI losses opened the door for cartels to expand into entirely new municipalities and operate alongside incumbents.

JEL classification: D72; K42; Q15

Keywords: land reform; PROCEDE; PRI; democratisation; organised-crime deaths

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1. Introduction

On 11 December 2006—just ten days after taking office—President Felipe Calderón launched *Operación Michoacán*, widely regarded as the opening salvo of Mexico's 'war on drugs'. Around 6,500 soldiers and federal police officers were deployed to the state of Michoacán to confront the state's increasingly violent drug trafficking organisations (DTOs). Although the operation initially appeared successful, the situation quickly deteriorated. It is estimated that drug-related violence resulted in an "additional" 60,000–70,000 homicides between 2007 and 2012 (see Shirk and Wallman, 2015).[1] Prior research indicates that the post-2007 spike in violence was largely confined to municipalities with cartel turf wars in the 1990s and early 2000s (e.g., Dell, 2015; Trejo and Ley, 2018).[2] Motivated by that pattern, the present study probes the factors that fuelled municipal-level turf wars during 1995-2006—dynamics that appear to have set the stage for the post-2007 escalation.

In the early 1990s four major DTOs— located in Tijuana, Juárez, Gulf, and Sinaloa — dominated Mexico's trafficking landscape (see, Astorga, 1999). Under the Institutional Revolutionary Party (*Partido Revolucionario Institucional*, PRI) and its single-party rule since 1929, the DTOs thrived in a tightly centralised system where corrupt officials exchanged protection for bribes (see, Snyder and Durán-Martínez, 2009). This arrangement kept violence comparatively low, limited competition, and left the main trafficking "plazas" clearly defined.[3] However, during the 1990s Mexico underwent a democratic revolution at the municipal and gubernational levels and reached the

[1] Beyond the death toll, the escalation has been linked to a range of adverse outcomes, including slower economic growth (Enamorado et al., 2014), lower labour-force participation (Velásquez, 2019), reduced birth weights (Brown, 2018), and declining school-completion rates (Brown and Velásquez, 2017).

[2] Echoing earlier evidence in the literature, Table 1 (Sub-section 3.1) provides evidence that municipalities recording even a single drug-related homicide during 1995–2006 went on to face significantly higher levels of narco-violence after 2007.

[3] In fact, state protection kept competition among Mexican DTOs limited and their territories clearly defined, prompting some observers to label them "cartels." However, this term is a misnomer: these organisations do not collude to restrict drug production or set prices (see, Astorga and Shirk, 2010; Dell, 2015). Throughout the paper we use the terms "drug-trafficking organisations" (DTOs), "cartels," and "criminal groups" interchangeably to refer to the same actors, while acknowledging the imprecision of the cartel label.

presidency in 2000 with Vicente Fox's National Action Party (*Partido Acción Nacional*, PAN) victory—momentum that carried through to Felipe Calderón's PAN win in 2006. Prior research shows that when opposition parties displace the PRI at the gubernatorial level but also in municipalities the long-standing protection pacts between corrupt officials and drug traffickers break down, weakening incumbent cartels and triggering local turf wars that raised drug-related violence (Dell, 2015; Osorio, 2016; Trejo and Ley, 2018). Against that backdrop a wave of newer groups with sharper competitive or expansionary strategies— such as La Familia Michoacana, or Los Zetas—entered the scene, reoccupying abandoned territories, co-locating with incumbents, or spearheading incursions into completely new municipalities (see, Coscia and Rios, 2012).

In the 1990s Mexico not only entered an era of competitive sub-national elections but also radically reshaped its post-revolutionary land order. Communal ejidos, which covered nearly half of the country's terrain, had long granted peasants only usufruct rights. Real authority rested with local *Comisariado* presidents, who were often PRI-allied *caciques*. These caciques distributed parcels, farm inputs, and social programs; mediated disputes; and mobilized votes (de Janvry et al., 2014; Castañeda Dower and Pfutze, 2015).[4] The 1992 reform of Article 27 launched PROCEDE (*Programa de Certificación de Derechos Ejidales*), a voluntary programme that mapped ejido boundaries and issued individual title certificates. PROCEDE took fifteen years and certified over 90 per cent of communal land weakening caciques' discretionary power (see, Villarreal, 2002; Castañeda Dower and Pfutze, 2015; Murphy and Rossi; 2016; Castañeda Dower and Pfutze, 2020). While these political and agrarian changes were underway, Mexican traffickers were rapidly diversifying their drug portfolios. From the 1930s through the 1970s they mainly supplied the United States market with marijuana and some heroin (Astorga, 1999), but Caribbean crackdowns in the late 1970s and 1980s rerouted Andean

[4] Case studies and historical analyses also show that caciques long mediated between the Mexican state and organised crime, providing informal governance that kept the narco-economy stable (Pansters, 2018; Aviña, 2021). Work on Guerrero and Michoacán, among other regions (Aranda 2013; Guerra Manzo, 2017), confirms that caciques coordinated with officials, managed violence, and shaped drug production and trafficking throughout the twentieth century.

cocaine through Mexico, delivering unprecedented profits (Astorga and Shirk, 2010). United States meth-lab crackdowns in the 1990s then created a new market gap that Mexican groups filled with cheap, high-purity methamphetamine (Smith and Toro, 1997). As cartels expanded their portfolios of drugs over time, controlling rural land became essential for fulfilling multiple strategic purposes (see McSweeney et al., 2017). By commodifying ejido parcels and displacing communal gatekeepers during the period that PRI protection networks were weakening, PROCEDE may have created fertile ground for rival cartels to consolidate new "plazas". We test this possibility by asking whether land privatisation, in interaction with political alternation, helps explain the 1995-2006 surge in drug-related violence.

In most contexts, competitive elections and secure land titles are expected to improve welfare. Cross-country studies demonstrate that democratisation reduces infant mortality, increases schooling, and raises long-term income (Kudamatsu, 2012; Acemoglu et al., 2019), while micro evidence links multiparty elections to free primary education and increased local spending on social services (Brown and Hunter, 2004; Harding and Stasavage, 2014). Similarly, stronger property rights lead to parallel gains: land titling spurs housing investment and school completion in Argentina and Peru (Field, 2007; Galiani and Schargrodsky, 2010), increases enrolment in Ethiopia and parental education spending in China (Fors, et al., 2019; Wang-Lu et al., 2024), and at the firm level, boosts R&D and allows for more efficient outsourcing when legal protections tighten (Guerriero and Pignataro, 2024). Given this consensus, Mexico's simultaneous drive for political alternation and land titling should have fostered broad gains in welfare and stability, making the subsequent surge in drug violence a striking anomaly and the central issue this paper addresses.

Using the Criminal Violence in Mexico (CVM) dataset (Trejo and Ley, 2018), which records organised-crime deaths (*OCDs*) between 1995–2006 and a difference-in-differences (DiD) specification we find evidence consistent with our hypothesis: municipalities in which PROCEDE's land certification made territory more contestable—and that simultaneously elected a non-PRI

mayor—experienced a statistically significant surge in *OCDs*, indicating that the interaction of land privatisation with local political turnover facilitated cartel entry and violence. Specifically, the marginal effect of PROCEDE, when paired with municipal alternation, increases the probability of a homicide by about 2 percentage points—nearly matching the sample mean of 2.3%—thus representing a substantial escalation in drug-related violence. Moreover, we provide evidence that certified municipalities that elected an opposition mayor and its state elects an opposition governor, the rupture extends from the communal level up to the statehouse, removing protection networks run by higher-ranking officials who oversee wider territories (Trejo and Ley, 2018). This *top-to-bottom* shock returns the strongest and more robust association with *OCDs*. In turn, using the municipality-level cartel-presence data compiled by Coscia and Rios (2012), we further show that this latter scenario is linked to a greater likelihood of cartel entry—and, in many cases, the simultaneous presence of multiple rival groups—underscoring that a full rupture of PRI protection networks invites intensified competition and violence. Finally, we investigate whether cartel expansion is associated with "traditional" activities—marijuana and poppy cultivation—or with higher-margin operations such as cocaine transit and methamphetamine production (see, Astorga and Shirk, 2010). The interaction of PROCEDE land titling with political alternation is not associated with marijuana- or poppy-eradication/seizure rates, indicating that expansion is unlikely to be driven by additional plantings of these crops. It likewise fails to raise cocaine or meth seizures—unsurprising, given that most cocaine is caught at border crossings and mobile meth "super-labs" operate outside interior municipalities. Overall, the data reject a traditional-crop boom in PROCEDE-plus-alternation areas; any shift toward cocaine transit or itinerant meth labs likely escapes routine seizure statistics.

Our results speak directly to—and help bridge—two parallel strands of the literature. First, they add an important layer to the debate on PROCEDE's effects on violence dynamics. Murphy and Rossi (2016) show that municipalities with a larger share of ejido land—hence greater exposure to PROCEDE—recorded the steepest post-reform declines in rural homicides, consistent with the idea

that formal, individual titles lower incentives for violent appropriation. Castañeda Dower and Pfutze (2020) qualify that result: titling lowers violent deaths almost exclusively in PRI strongholds, while it has little or no pacifying effect where the PRI has already lost power. They reason that certification undercuts caciques' land-based coercion and settles boundary disputes, but peace materialises only if the old PRI machinery remains in place to enforce the new rules. According to our findings one plausible reason why certification failed to pacify municipalities that voted out the PRI is cartel expansion. Second, our study contributes to a literature that explores the implications of sub-national democratic pluralism on *OCDs* prior to escalation of drug-related violence in 2007. Dube et al. (2013) show that United States gun inflows lifted border homicide rates in 2002-06 and that competitive municipal elections amplified this effect by destabilising local criminal groups. Trejo and Ley (2018) find that gubernatorial alternation produced sharp 1995-2006 spikes in *OCDs*: once PRI protection vanished, cartels recruited police-and-army defectors into militias that quickly shifted from defence to seizing rival territories, fuelling most late-1990s/early-2000s killings. Our study complements the literature on sub-national democratic pluralism by incorporating Mexico's PROCEDE reform. We show that this reform amplifies the destabilising impact of political turnover, converting an otherwise muted municipal alternation into the most violent scenario when paired with state-level change.

This paper also contributes to the broader literature that examines the determinants of drug-related violence in Mexico. Dube et al. (2016) show that exogenous movements in Mexican maize prices—driven by weather shocks in US maize-growing regions—alter marijuana and opium cultivation and, in turn, drug-trade violence across Mexico between 1990 and 2010. Moreover, Rios (2015) finds that, between 1990 and 2010, growth in the number of localities where different parties controlled different tiers of government made it more likely that traffickers would violate the long-standing informal prohibition on selling cocaine inside Mexico, thereby setting the stage for violent cartel warfare. Furthermore, Dell (2015) analyses enforcement policy—specifically Felipe Calderón's (PAN) 2006–2012 'war on drugs'—and shows that drug-trade violence rose sharply between 2007 and

2010 in municipalities where PAN mayors were narrowly elected. Finally, Dell et al. (2019) show that trade-induced manufacturing job losses in urban areas increased drug-related homicides between 2007 and 2010 in municipalities where criminal organisations were present.

The remainder of the article is structured as follows. Section 2 reviews Mexico's institutional evolution and outlines the channels through which PROCEDE and sub-national democratisation may have influenced drug-related violence. Section 3 details the data, key variables, and empirical strategy. Section 4 reports the baseline econometric results and a battery of robustness checks, while Section 5 probes the underlying mechanisms of drug-related violence. Section 6 concludes.

2. The Mexican context

2.1 A brief history of the evolution of drug trafficking in Mexico

The roots of Mexican DTOs date back to the early twentieth century, when laws prohibiting the production, distribution, and consumption of alcohol and psychotropic substances began to be enacted in the United States and worldwide (Astorga, 1999). In the 1930s, marijuana production was already measured in tonnes in states like Guerrero, whereas drug traffickers from the northwestern region were making fortunes smuggling opium. Throughout the mid-20th century, Mexican smugglers remained active but relatively small-scale. The main drugs were marijuana (cannabis) and opiates (opium and heroin) grown domestically. The emergence of the United States counterculture movement in the early 1960s, coupled with the collapse of the "French Connection" heroin trafficking ring in the late 1960s, established Mexico as a primary foreign supplier of illicit cannabis and heroin to the United States (Pansters and Smith, 2022). Meanwhile, greater United States consumption of cocaine in the 1970s and 1980s led to the rise of powerful Colombian DTOs, which moved the Andean-produced drug into Miami via the Gulf of Mexico and the Caribbean. However, United States interdiction efforts squeezed those routes pushing Colombians to collaborate with Mexican smugglers. By the mid-1980s, Mexican traffickers had begun transporting Andean cocaine overland through Mexico, which enabled them to achieve unprecedented levels of power and prosperity (Astorga and Shirk, 2010). During this time, a

fledgling coalition of traffickers based in Sinaloa rose to prominence, later becoming known as the Guadalajara Cartel, or "The Federation" (*La Federación*).[5] Miguel Ángel Félix Gallardo, also known as the "boss of the bosses," was the leading figure of this coalition.[6]

Since 1929, Mexico has been under the single-party rule of the Institutional Revolutionary Party (*Partido Revolucionario Institucional*, PRI), which has resulted in an extremely centralised and hierarchical power structure. While the PRI regime did not tolerate criminal activity in general, it was more likely to turn a blind eye when substantial payoffs were promised to corrupt government officials. This corruption often occurred at the highest levels, creating a blanket of impunity that protected DTOs who could afford it (Snyder and Durán-Martínez, 2009). Competition among Mexican traffickers was significantly limited, with territories or "plazas" often clearly defined (Astorga, 2016). A pivotal moment came in 1985, when the Guadalajara Cartel murdered Drug Enforcement Administration (DEA) agent Enrique "Kiki" Camarena.[7] This prompted the Mexican government to take action, resulting in the arrest of Félix Gallardo in 1989. Without its central leader, the Guadalajara Cartel fractured. Rising lieutenants carved up the trafficking territories in the power vacuum, giving birth to the era of cartels controlling specific corridors: the Sinaloa Cartel led by Joaquín "El Chapo" Guzmán it was estimated to control as much as half of Mexico's drug trade by the late 1990s; the Tijuana Cartel run by the Arellano-Félix family (former protégés of Félix Gallardo); the Juárez Cartel led by Amado

[5] In the mid-1970s, the Mexican federal government launched *Operación Cóndor*, a military operation involving 10,000 soldiers aimed at stopping the flow of drugs from Mexico to the United States. Many drug traffickers from Sinaloa regrouped in Guadalajara, Jalisco, to continue their operations, which led to the formation of the Guadalajara Cartel (see, Campbell, 2009).

[6] Félix Gallardo was born near Culiacán and trained as a police officer. He soon became the bodyguard of Sinaloa Governor Leopoldo Sánchez Celis, who later served as his wedding godfather. Gallardo used this political patronage to build a respected public profile while secretly emerging as Mexico's leading drug trafficker by the mid-1970s (see, e.g., Astorga, 1999).

[7] Officially, Camarena was killed because of the damage he had caused the traffickers. He was working on a special assignment called *Operación Padrino*, which aimed to investigate the activities of Félix Gallardo, the suspected "Godfather" of drug trafficking in Mexico. The operation led to the discovery of *Búfalo*—an enormous 12-square-kilometre marijuana plantation in the state of Chihuahua (see, e.g. Astorga, 1999).

Carrillo Fuentes in the 1990s; and the Gulf Cartel surged in power during the 1990s under leaders like Juan García Ábrego and later Osiel Cárdenas Guillén. By the early 2000s, these organisations and a few smaller allies dominated the landscape. Each controlled key trafficking routes or "plazas". For instance, the Sinaloa Cartel controlled the Pacific coast and border crossings in Sonora. Although they shared a common heritage in the Guadalajara networks, they had become bitter rivals by the 2000s (Astorga and Shirk, 2010). The 2000s also marked the end of the PRI's 70-year single-party rule. This further intensified the tension between organised crime groups, as the PRI regime was not only permissive, but also protective of organised criminal activities (see, e.g., Flores Pérez, 2009; Snyder and Duran-Martinez, 2009).

2.2 The fall of the PRI regime and drug-related violence

The state party PRI dominated the political landscape in Mexico for seven decades both nationally and sub-nationally. At the sub-national level, the PRI had won every gubernatorial election in Mexico's 31 states up to 1988, until its first loss in 1989 in the state of Baja California. At the municipal level, fewer than 10 % of municipalities had ever been governed by a party other than the PRI before 1990 (see Castañeda Dower and Pfutze, 2015). However, beginning in the 1990s Mexico underwent a democratic transformation at municipal and gubernatorial levels, culminating in the 2000 national victory of the main opposition party, the National Action Party (*Partido Acción Nacional*, PAN), led by Vicente Fox. Moreover, at the sub-national level until 2006, the centre-right PAN won ten governorships, the centre-left Party of the Democratic Revolution (*Partido de la Revolución Democrática*, PRD) won six, and two-thirds of Mexican municipalities were governed by a party other than the PRI (see, Trejo and Ley, 2016). In December 2006, the PAN party won a second consecutive general election under Felipe Calderón's leadership. Just two weeks after taking office, Calderón deployed 6,500 Mexican army soldiers to Michoacán, his home state, to end drug violence. This deployment is considered the first major government action against cartels and is widely regarded as the beginning of the Mexican drug

war. By the end of Calderón's administration in November 2012, the war had resulted in at least 60,000 deaths (Shirk and Wallman, 2015). According to Dell (2015), drug-trade violence significantly increased in municipalities following electoral victories by the incumbent PAN between 2007 and 2010. This surge is attributed to drug cartels contesting areas where traffickers were weakened by close elections of PAN mayors who implemented anti-drug campaigns locally (see also Osorio, 2015). Furthermore, the study reveals that this escalation was concentrated in municipalities that had above-average homicide rates prior to 2007. Essentially, the local violence that had unfolded since the 1990s—albeit on a much smaller scale—is crucial for understanding its subsequent escalation.

Following the dissolution of the Guadalajara Cartel in 1989 and the unravelling of the PRI's political monopoly, Mexico's drug trade transitioned from a "one protector, one organisation" equilibrium to a fragmented system. This post-1990 landscape, with multiple cartels vying for power, was far more prone to violence (see Astorga, 2016; O'Neill, 2009; Snyder and Durán-Martinez, 2009). During the PRI's national and sub-national hegemony, entrenched relationships between drug traffickers and corrupt state officials resulted in relatively low violence for decades.[8] However, sub-national democratic pluralism in the 1990s—before the federal government launched the war on drugs—destabilised this equilibrium. Municipal and gubernatorial electoral victories by non-PRI opposition parties undermined the long-standing implicit agreements between corrupt local officials and criminal organisations. This weakened the latter, resulting in turf wars between rivals and an increase in drug-related violence.

Consistent with this, Trejo and Ley (2018) demonstrated that the occurrence of gubernatorial changes was strongly associated with a rise in OCDs between 1995 and 2006. According to the authors, state-level political alternations that disrupted long-standing informal protection networks incentivised

[8] These informal networks of protection can be crated through the penetration of state officials by cartels with bribes and coercion (Snyder and Durán-Martínez, 2009), or through corrupted state officials that may seek to regulate illicit profitable activities in exchange for rents (Astorga, 2016).

drug lords to create private militias to defend themselves from encroaching rival cartels.[9] This was mainly done by recruiting defectors from the state judicial police, the army and other security corporations. Despite being used first as a mean of defence, the cartels started to use those armies to conquer rival territories causing the majority of drug trade-related deaths in the mid-1990s and early 2000s in Mexico (O'Neil, 2009; Trejo and Ley, 2020). Essentially, according to Trejo and Ley (2018), political alternation signals the weakness of local criminal groups, attracting the attention of rivals, which in turn leads to turf wars and an increase in *OCDs*. However, there is also evidence that municipal-level changes matter as well. Specifically, according to Dube et al. (2013), the 2004 expiration of the United States Federal Assault Weapons Ban had a spillover effect on gun supply in Mexican municipalities, resulting in differential increases in homicides close to the non-California border states between 2002-2006. The authors also provide evidence that political competition in municipal elections, which undermined informal sanctions, played a mediating role between guns and violence because it contributed to the destabilisation of criminal organisations. Finally, Ríos (2015) shows that, between 1990 and 2010, growth in the number of localities where different parties controlled different tiers of government made drug traffickers more likely to violate the long-standing informal ban on selling cocaine inside Mexico, thereby setting the stage for violent cartel warfare.

2.3 The role of land titles

Sub-national democratisation was not the only major change Mexico witnessed during the 1990s. The country also experienced a significant shift in its post-revolutionary agrarian order. In post-

[9] According to Trejo and Ley (2018), during the 1980s the PRI's intelligence agency, the federal security directorate (DFS) led by military personnel, regulated the criminal underworld. Drug trafficking was on the rise at that time, and it was at that moment when protection networks between the PRI regime and the criminal groups were mainly established. Nevertheless, corruption and political repression related cases compelled the Mexican government to disband the agency, resulting in many of the agents to migrate at the state level. The political transition in the 1990s disturbed those networks when the newly elected governments replaced those security officials with new personnel unaware of previous protection pacts.

revolutionary Mexico, ejidos were communal landholdings granted to peasant communities under Article 27 of the 1917 Constitution. Members of the ejidos (*ejidatarios*) only held usufruct rights; they could work and inherit their plots of land, but they could not sell or rent them. The state retained final authority over any redistribution. The ejido institution's importance is evident in its coverage of approximately 32,000 ejidos, which is nearly half of the country's total area (Deininger and Bresciani, 2001; de Janvry et al., 2001).[10] In 1992, the Salinas administration amended Article 27 and introduced PROCEDE (*Programa de Certificación de Derechos Ejidales*), a nationwide initiative that aimed to establish boundaries for ejidos and individual land plots, providing ejidatarios with land tenure and property rights certificates (World Bank, 2001).[11] Participation in PROCEDE was voluntary; ejidos could apply for certification at their own discretion. The process began with an informational meeting in each ejido attended by government officials and community members (de Janvry et al., 1997; Johnson, 2001). Importantly, these meetings were scheduled sequentially, creating a discernible spatial pattern (Castañeda Dower and Pfutze, 2015). Officials first visited the most accessible ejidos—typically those near state capitals or large cities—and only later proceeded to the more remote communities. Initially, the government thought PROCEDE would take no longer than the remaining two years of its term. Ultimately, PROCEDE took 15 years to complete, ending in 2007 with over 90% of ejidos certified.

Before the 1992 reform, the internal structure of ejidos consisted of: (i) the general assembly, which was the highest authority and was composed of all ejido members; (ii) a three-member *Comisariado Ejidal*, which was composed of a president, secretary, and treasurer who executed assembly decisions. (iii) an oversight council, which was composed of three members who were in charge of auditing the Comisariado (see, for example, Baitenmann, 1998). However, since individual

[10] Around 2,000 of these refer to pre-colonial indigenous communities with a slightly different regime.

[11] Policymakers hoped clearer land rights would improve investment and productivity. In particular, technocrats aimed to recapitalise the sector and increase its export potential in light of the recently negotiated North American Free Trade Agreement (NAFTA) (see, e.g., Cornelius and Myhre, 1998).

parcels only held undocumented usufruct rights, day-to-day enforcement depended on local discretion. This elevated the Comisariado president—often a regional *cacique*—to an arbiter of both land and politics (see, Villarreal, 2002). As the PRI's grassroots broker, the cacique distributed parcels, farm inputs, and social programmes; mediated disputes; and mobilised votes. Empirical studies confirm the coercive power inherent in this system. Castañeda Dower and Pfutze (2015) show that insecure ejido rights suppressed opposition voting, whereas the PROCEDE titling programme—by formalising those rights—significantly eroded the PRI's rural vote share.[12] Murphy and Rossi (2016) demonstrate that municipalities with a greater proportion of ejido land—and consequently, greater exposure to PROCEDE—witnessed the most significant post-reform reductions in rural homicides. This finding aligns with the notion that secure, individualised property rights diminish the incentives for violent appropriation. However, Castañeda Dower and Pfutze (2020) offer a nuanced view of this result. They found that certification reduced violent deaths almost exclusively in areas that remained PRI strongholds. This is because titling simultaneously removed caciques' discretionary control over land, their primary means of coercion, and resolved boundary disputes that had long fuelled conflict. In municipalities where the PRI had already lost power, violence was driven by other factors, so removing land-based patronage provided little or no additional peace dividend.

One likely cause of these diverging effects was the wave of cartel expansion in municipalities during the 1990s and early 2000s where political alternation overlapped with PROCEDE land titling. In these areas, the PRI's sub-national protection networks and the entrenched cacique order were weakened simultaneously, creating unusually fertile ground for rival criminal groups to move in and consolidate new territories. A rich literature provides qualitative evidence, based on historical analysis,

[12] In ejidos, voting behaviour was easy to supervise since being small rural communities allowed the PRI successfully to apply a clientelistic scheme (Larreguy, 2013). In that regard, Johnson (2001) argued that ejidos were the preferred political instrument of the PRI to control elections, allowing the party to control rural votes and helping the PRI win elections by significant margins. These electoral victories were essential for legitimizing the regime and demonstrating widespread support for PRI rule (Klesner et al.,2001; Larreguy, 2013).

and detailed case studies to illustrate the role of caciquismo in managing informal governance and interactions between state actors and organised crime. For instance, Pansters (2018) argues that during much of Mexico's 20th century, drug-related crime, violence, and governance were part of and regulated by informal orders, including caciquismo. Pansters (2018) posits that these local power structures provided stability and regulation within the narco-economy by mediating between criminal organisations and the state. Aviña (2021) examines the Guerrero hotlands, illustrating how caciques collaborated with state forces to suppress agrarian movements and maintain control over opium production, thereby entrenching informal power structures within the drug trade. Guerra Manzo (2017) provides a historical analysis of violence in Tierra Caliente, Michoacán, identifying different waves and modalities of violence, and illustrating how caciques have historically played a role in managing these forms of violence, thereby influencing the region's narco-economy (see, also Aranda, 2013). Collectively, these studies suggest the pivotal role of local power brokers, or caciques, in regulating the narco-economy in Mexico.

As already mentioned, after the dissolution of the Guadalajara Cartel in the aftermath of the 1989 arrest of Félix Gallardo, the poly-cartel epoch emerged. Additionally, there has been a shift in the predominant drugs that have been traded over time. In the early stages of the drug epidemic, marijuana and heroin were the primary drugs of concern. The proliferation of the lucrative cocaine trade fostered the rise of autonomous cartels within the context of the Guadalajara Cartel network. Moreover, after United States meth-lab crackdowns in the 1990s, Mexican cartels supplied cheaper, higher-quality meth, outcompeting domestic groups (Smith and Toro, 1997). As cartels broadened their drug portfolios, control of rural land became vital to fulfil multiple strategic purposes (see McSweeney et al., 2017). In particular, strengthening territorial control and deepening their embeddedness in local economies was necessary —not only for cultivating marijuana and poppies but also for routing cocaine northward and for manufacturing and trafficking methamphetamine. PROCEDE, by commodifying ejido parcels and weakening communal gatekeepers, may have opened

precisely the territories that traffickers needed—titling made land easier to purchase, coerce, or launder.[13] In fact, Villarreal (2002) empirically demonstrates that increased electoral competition in predominantly rural Mexican municipalities between 1987 and 1999—the period immediately preceding and coinciding with PROCEDE's rollout—significantly disrupted established local hierarchies traditionally maintained by caciques, resulting in heightened violence. The present study narrows this focus to organised-crime-related deaths, exploring whether the known effect of sub-national democratisation on drug-related violence interacts specifically with the weakening of local power brokers due to PROCEDE-driven land privatisation. This interaction potentially created power vacuums exploited by rival drug cartels to expand their influence, thus escalating violence and instability in the affected regions.

3. Data and empirical strategy

3.1 Data and main variables

Our data on organised-crime deaths (*OCDs*) are sourced from the Criminal Violence in Mexico (CVM) dataset compiled by Trejo and Ley (2018). This dataset, which covers the period from 1995 to 2006, documents 4,257 homicides that were directly attributed to drug cartels and their associates. The CVM dataset was constructed using content from Mexico's three most widely circulated newspapers: *El Universal* (1995–2006), *Reforma* (1995–2006), and *El Financiero* (1997–2006).[14] When news reports did not explicitly name the criminal organisations involved, Trejo and Ley (2018) applied a consistent coding protocol using three indicators to identify *OCDs*: the use of assault weapons, signs of torture

[13] According to de Janvry et al. (2015), PROCEDE raised the probability that a household sent at least one migrant—especially land-poor young males—by about 25 per cent, yet total cultivated area did not decline because departing farmers rented or informally transferred their plots.

[14] Among these, *Reforma* is the most specialised source for reporting on drug trafficking (Shirk and Wallman, 2015). *El Universal* primarily covers the Pacific and Gulf coast regions as well as central Mexico, while *El Financiero* focuses more on the central region. Nonetheless, all three publications provide coverage of the southern region as well.

or extreme violence, and the presence of narco-messages left on bodies or at the crime scene.[15] Using the CVM dataset, we construct our primary dependent variable as a binary indicator, which takes the value of one if a drug-related killing —including either inter-cartel confrontations or clashes between cartels and state security forces— is recorded in a municipality in a given year, and zero otherwise.[16] Figure 1 maps the geographic distribution of *OCDs* at the municipal level across Mexico for the period 1995–2006. Moreover, Table A1 in the Appendix provides explicit definitions, descriptive statistics and sources of the main variables employed in the analysis.

[Insert Figure 1 here]

As indicated by studies of the relevant literature, the escalation of violence subsequent to 2007 exhibited a concentration in municipalities where turf wars erupted between rival cartels during the 1990s and early 2000s (see, e.g., Dell, 2015; Trejo and Ley, 2018). To test this link, we correlate municipal-level drug-related violence recorded between 1995–2006 and violence observed in the subsequent period, 2007–2010. In particular, we transform our variable *OCDs* to take the value of one if there was at least one homicide in a municipality between 1995 and 2006, and zero otherwise. Regarding data on drug-related killings from 2007 to 2010, the information comes from Dube et al. (2016), whose primary source was the Mexican National Security Council. Specifically, we build four municipal-level variables from 2007-2010 incident totals, expressed as the natural logarithm of the count per 10,000 inhabitants plus one: (i) *Log Executions*—execution-style murders and killings attributed to criminal groups; (ii) *Log Confrontations*—fatalities from clashes between rival cartels or with the army; (iii) *Log Cartel Attacks*—deaths from assaults on state-security forces; and (iv) *Log*

[15] The database starts in 1995 due to the absence of reliable media-based data on cartel-related killings before that year. This limitation partly reflects the emergence of Reforma in 1995 as a primary national source for tracking drug violence (see, Trejo and Ley, 2018).

[16] In robustness checks, we also experiment with an alternative continuous version of this variable, using the yearly count of cartel-related murders per municipality.

Drug-related Killings, the sum of the previous three, capturing overall narco-violence. Table 1 reports eight OLS models—two for each 2007-2010 violence outcome. Odd-numbered columns regress each measure on *OCDs* with state fixed effects; even-numbered columns repeat the regressions but add the full slate of municipal covariates discussed in the next sub-section. Our full specification in the even-numbered estimates shows that having at least one homicide between 1995 and 2006 is associated with an increase in the log rate of total drug killings by 0.352 (≈ 42%), driven mainly by executions, whose log rate rises by 0.339 (≈ 40%). Between 1995 and 2006, approximately 15% of municipalities in our sample recorded at least one homicide. As expected, the prevalence rate was higher in the North (21.8%) due to the presence of the Tijuana, Juárez, Gulf, and Sinaloa cartels following the collapse of the Guadalajara cartel in 1989; the Centre (13.3%) and South (12.1%) showed much lower shares. Table A2 in the Appendix tests whether the heavier concentration of cartel activity in northern municipalities drives our estimates. Excluding those municipalities leaves the size and statistical significance of *OCDs* unchanged, so Mexico's drug-war escalation still aligns with the turf battles waged by the country's major cartels during the 1990s and early 2000s. Consequently, to understand today's violence, it is crucial to unpack the forces that enabled those turf wars to spread and intensify.

[Insert Table 1 here]

Sub-national democratisation has been shown to increase drug-related violence by breaking down the long-standing ties between traffickers and corrupt PRI officials (Snyder and Durán-Martínez 2009; Dube et al., 2013; Trejo and Ley, 2018). To investigate this relationship, we are using a municipal-level dataset from Trejo and Ley (2018), which is based on information from the Centro de Investigación para el Desarrollo A.C. (CIDAC). The CIDAC data, publicly accessible, contain electoral results in Mexico since 1980. Gubernatorial and local elections in Mexico occur every six and three years, respectively, although the precise years vary across states.[17] To link political alteration

[17] Municipal elections are overseen at the state level, with minor procedural variations across jurisdictions, except in areas where indigenous customary voting methods are used. Voters cast a single ballot for a political party or coalition. The party

to *OCDs*, we construct binary indicators that capture every occasion on which the PRI loses executive office between 1995 and 2006. A first indicator, *Municipal alternation*, equals one in any municipality–year in which the mayor is from a party other than the PRI; 36% of the observations meet this condition (Table A1). Second, because executive control can change at one, the other, or both sub-national tiers, we differentiate three mutually exclusive scenarios: (i) *Municipal only alternation* is coded one when a municipality elects a non-PRI mayor while the governorship remains in PRI hands (26.0% of observations); (ii) *State only alternation* is coded one when a non-PRI governor is elected but the mayoralty stays PRI (13.1%); (iii) *Municipal-state alternation* is coded one when both offices switch away from the PRI in the same year (9.9%). These three dummies enter the regressions simultaneously, with their joint complement—all zeros—serving as the reference category in which the PRI retains power at both tiers of sub-national government.

Furthermore, to analyse whether the PROCEDE land-titling programme that weakened the cacique order over land interacted with political alternation to shape turf wars between 1995–2006, we construct a municipality-level indicator of PROCEDE implementation. From the National Agrarian Registry (*Registro Agrario Nacional*, RAN) we obtain the exact certification date for every ejido. We then merge these dates with a polygon shapefile of ejido boundaries in ArcGIS. For each year between 1995 and 2006 we compute, for every municipality, the share of ejido land that has been certified—i.e. the ratio of titled-ejido area to total ejido area. This annual certification ratio serves as our *PROCEDE* measure.

Overall, our dataset comprises 1,876 municipalities over the period of analysis. We excluded municipalities that were not formed by 1990 and those that opted for a local administration based on traditional institutions (*usos y costumbres*) instead of a party-based one (see, for example, Castañeda Dower and Pfutze, 2015; Trejo and Ley, 2018; Trejo and Ley, 2021). Additionally, following Dube et

that receives the most votes wins the mayoral office. The same process applies to gubernatorial elections, in which the elected governor is subject to a single-term limit.

al. (2016), we excluded approximately ninety urban municipalities because ejido land coverage predominantly affects rural areas and the well-being of rural populations. This rural focus is particularly relevant since caciques typically derive their power from rural settings, making these municipalities the most suitable context for examining how weakening their authority through PROCEDE impacted violence and cartel activity (see also Villarreal, 2002).

3.2 Empirical specification

To assess if the joint removal of political and communal constraints amplified cartel expansion fuelling the turf wars between cartels between 1995 and 2006, we adopt the following difference-in-differences (DiD) specifications where political alteration and PROCEDE are the "treatments" assigned to municipalities and *OCDs* is the dependent variable:

$$OCDs_{it} = \alpha + \beta_1 PROCEDE_{it} + \beta_2 Municipal\ alteration_{it} + \beta_3\ PROCEDE_{it} * Municipal\ alteration_{it} + zX_i * \varphi_y + \theta_i + \theta_t + \varepsilon_{it} \quad (1)$$

$$OCDs_{it} = \alpha + \gamma_1 PROCEDE_{it} + \gamma_2 Municipal\ only\ alteration_{it} + \gamma_3 State\ only\ alteration_{it} + \gamma_4 Municipal\ state\ alteration_{it} + \gamma_5\ PROCEDE_{it} * Municipal\ only\ alteration_{it} + \gamma_6 PROCEDE * State\ only\ alteration_{it} + \gamma_7\ PROCEDE * Municipal\ state\ alteration_{it} + zX_i * \varphi_y + \theta_i + \theta_t + \varepsilon_{it} \quad (2)$$

where $OCDs_{it}$ in Eq. (1) and (2) denotes our binary indicator of drug-related violence in municipality *i* and year *t*. $PROCEDE_{it}$ is our staggered treatment (where the intervention of interest occurs at different times for different municipalities) measured as the ratio of certified ejido area to total ejido area in municipality *i* and year *t*. Political alteration variables entered in Eq. (1) and (2) are non-absorbing treatments, where municipalities can enter and exit the treatment state multiple times. In particular, the variable $Municipal\ alteration_{it}$ in Eq. (1) flags any year *t* in which municipality *i* is headed by a non-PRI mayor, irrespective of the party governing at the state level. The principal

coefficient of interest is β_3, attached to the interaction term $PROCEDE_{it} * Municipal\ alteration_{it}$, which tests whether the simultaneous loss of PRI control over the municipal and communal levels is associated with the spread of turf wars. Eq. (2) differentiates three mutually exclusive patterns of political alteration—*Municipal only alteration*, *State only alteration*, and *Municipal-state alteration*—and interacts each with *PROCEDE*. This specification allows us to assess, among others, whether a *top-to-bottom* rupture of PRI control—from the statehouse down to the communal level— (captured by coefficient γ_7, attached to the interaction term $PROCEDE_{it} * Municipal\ state\ alteration_{it}$), exerts the strongest influence on turf-war violence between 1995-2006.

Moreover, X_i denotes a set of predetermined municipal characteristics measured before the beginning of our sample in order to reduce endogeneity concerns (see, e.g., Bahar et al., 2021). Interactions of these variables and year dummies (φ_y) aim to account flexibly for potential differential non-parametric trends on a number of municipal characteristics. In particular, to control for municipal socioeconomic factors that may affect *OCDs*, we include the following 1990 census variables: (i) *Log population 90*, (ii) *Young males' ratio 90*, (iii) *Adult females' ratio 90*, (iv) *Access to electricity 90*, and (v) *Indigenous ratio 90*. State presence is proxied by three geographic measures, each entered in logarithms: (vi) *Log distance to nearest police station*, (vii) *Log distance to nearest military region*, and (viii) *Log distance to nearest air force base*. Greater distances indicate weaker state capacity, which can foster violent competition among criminal groups (Skaperdas 2001). Moreover, because homicides rose unevenly across the country, we also include (ix) *Log distance to border* to capture proximity to the United States (Dube et al., 2013), and (x) *Log male homicides 90-94* to control for pre-existing violence. We also include the variable (xi) *Maize suitability* to control for the effect of shocks in the production of maize that in turn can affect the production of illicit crops and cartel activity (see Dube et al., 2016). Related to that, following Dube et al. (2016), we use marijuana and poppy eradication figures from 1990–1994—i.e., up to one year before our sample begins—as proxies for illicit-crop suitability. From these data we derive two variables: (xii) *Log marijuana suitability* and

(xiii) *Log poppy suitability*, both of which can directly influence cartel activity. We further control for geographic isolation by adding (xiv) *Log rugged terrain*, (xv) *Log distance to city*, and (xvi) a *Highway* (presence) dummy, as these variables can be correlated with hard-to-reach areas where illicit crops can be grown and where the state's presence is often weak. Finally, we include two binary indicators: (xvi) *Non-PRI Governor* and (xvii) *Non-PRI Mayor*. Each equals one if, before our sample begins in 1995, the respective office was held by a politician from a party other than the PRI. Early breaks in PRI dominance may have set distinct trajectories for cartel presence and violence, which these dummies are designed to capture. All models include also municipality fixed effects (θ_i) and year fixed effects (ϑ_t) to absorb time-invariant local characteristics and shocks common to all municipalities. Standard errors are clustered at the municipality level; and ε_{it} denotes the idiosyncratic error term.

Recent econometric advances in DiD designs emphasise potential pitfalls when adopting a two-way fixed effects (TWFE) estimation with a (continuous) staggered treatment (*PROCEDE*) and/or a non-absorbing treatment (political alteration variables) (see, e.g., Callaway and Sant'Anna, 2021; de Chaisemartin and D'Haultfoeuille, 2022). With staggered treatment timing, if the effects of interest are heterogeneous, a negative-weighting problem in the conventional fixed effects estimation may produce biased or even sign-reversed results. As shown by Goodman-Bacon (2021), the negative weights arise from the way the fixed effects estimator compares outcomes across units and periods—groups undergoing the intervention may be erroneously compared with groups that were already exposed to the intervention in the past. In a non-absorbing setting, TWFE can similarly produce inappropriate comparisons. For example, a municipality that leaves treatment (reverts to control) might later be compared to a newly treated municipality as if it were a never-treated control, even though it experienced treatment before. While alternatives to TWFE that provide more consistently unbiased estimation such as the Local Projections (LP)-DID (Dube et al., 2023) have been proposed, our analysis cannot accommodate such techniques as these new methods are not really suited for the estimation of interaction terms. In a recent simulation study, Rüttenauer and Aksoy (2024) show that the new DiD

estimators offer notable advantages in capturing heterogeneous treatment effects, though they also demonstrate that the main threat to applied research remains the violation of the parallel-trends assumption. Violating the parallel-trends assumption introduces a stronger bias than simply mis-specifying time heterogeneity (see Chiu et al., 2023). In a DiD framework, parallel trends are effectively an alternative statement of strict exogeneity (Cunningham, 2021). In Sub-section 4.2.1 we adopt an event study strategy to test if this assumption holds in our data.

4. Empirical Analysis

4.1 Main results

Table 2 reports the baseline estimates. Columns (1)–(2) correspond to Eq. (1), and columns (3)–(4) to Eq. (2). Within each pair, the odd-numbered column includes only municipality and year fixed effects, while the even-numbered column additionally controls for the predetermined municipal covariates interacted with year effects. As shown, the coefficient of the variable *PROCEDE* is positive though statistically insignificant in all columns, a pattern we observe through the empirical analysis. This suggests that land-titling by itself does not alter inter-cartel violence in municipalities that are under PRI rule. Interestingly, in columns (1)–(2) the variable *Municipal alternation* returns a negative and statistically significant coefficient at the 1% and 5% levels, respectively. This implies that an opposition mayor is associated with fewer *OCDs* while the communal-land (ejido) system remains in place. Three caveats temper this finding. First, this finding is not robust across different specifications reported later in the paper. Second, in columns (3) and (4), where the variable *Municipal alternation* is disaggregated into *Municipal only alternation* and *Municipal-state alternation*, the standalone coefficients of political alternation remain negative but lose statistical significance. Third, subsequent results in Sub-section 5.2 suggest that eradication and seizures of "traditional" illicit crops marijuana and poppies decline when political alteration is not accompanied by land titling. One cautious interpretation is that ousting PRI-affiliated local leaders may have disrupted the protection typically afforded to the established local cartel, prompting it to shift away from traditional drug operations

toward potentially more lucrative cocaine and methamphetamine trafficking routes—particularly in municipalities where PROCEDE's land certification rendered territory more contestable and easier for rival cartels to penetrate. Related to this, the interaction term *PROCEDE*Municipal alternation* is positive and significant at the 1% level—its coefficient being more than twice as large as the (negative) standalone alternation effect—precisely underscoring this scenario. Therefore, evidence suggests that when political alternation at the municipal level coincides with the dismantling of communal land institutions, the resulting power vacuum—created by the undermining of informal sanctions and traditional governance structures dominated by local caciques—facilitates cartel infiltration and escalates drug-related violence. In column (2), *PROCEDE* raises the predicted probability of *OCDs* by about two percentage points when a municipal political alternation occurs. Given that the mean incidence of *OCDs* is 2.3%, this represents a substantial rise in drug-related violence.

[Insert Table 2, here]

In columns (3) and (4) all three scenarios of political alteration are taken into account - *Municipal only alteration, State only alteration,* and *Municipal-state alteration*- and their interactions with the variable *PROCEDE*. As Table 2 shows, the interaction term *PROCEDE*Municipal-state alternation* has the strongest association with *OCDs*: in the fully specified model (column 4) its coefficient is 0.043 and statistically significant at the 1% level. By contrast, the standalone coefficient for *Municipal-state alternation* is negative but statistically indistinguishable from zero, as is also the case for the standalone coefficient of *Municipal only alternation*. However, when the latter is interacted with the variable *PROCEDE,* we obtain a coefficient that is 0.010 and statistically significant at the 10% level. For *State only alternation* we obtain a positive coefficient of 0.021, statistically significant at the 5% level, whereas its interaction with *PROCEDE* is small and statistically insignificant. These findings echo Trejo and Ley (2018): losing a PRI governorship can disrupt entrenched criminal-protection networks and heighten violence. They also suggest that municipal

change—especially when paired with state-level turnover in PROCEDE areas—was pivotal. Following the dissolution of the Guadalajara Cartel competing cartels sought new territories to expand their operations. In the absence of a PRI-affiliated communal land arbiter and with PRI officials removed from municipal and state offices, cartels already active in a locality may have been more exposed to incursions by rival groups. Likewise, municipalities that had previously been free of cartel activity could have become more attractive expansion targets once these political and communal constraints were lifted. It is important to note that, among the three political-alteration scenarios, the *top-to-bottom* rupture of shields returns the strongest association with *OCDs* and remains consistent across all sensitivity checks.

4.2 Robustness checks

4.2.1 Addressing identification threats

An important consideration at this stage is the extent to which the observed relationships can reasonably be interpreted as causal. Closely related to this is the potential concern regarding endogeneity arising from the implementation of PROCEDE. As previously discussed, PROCEDE was implemented by state-level teams moving sequentially across ejidos, resulting in a spatial certification pattern primarily shaped by logistical factors—such as distance from the state capital, terrain flatness, and adjacency to already-certified neighbours—rather than local political or economic factors (Castañeda Dower and Pfutze 2015, 2020). Beyond these geographic correlates, the timing of implementation is statistically unrelated to a wide array of municipal socioeconomic and political characteristics, underscoring the quasi-random nature of the rollout (Castañeda Dower and Pfutze 2020). De Janvry et al. (2014) further show that certification was orthogonal to pre-existing electoral trends because the programme was a top-down federal initiative over which ejidatarios had little influence. To reinforce these findings, Table A3 in the Appendix replicates the baseline specification of column (2) in Table 2 using an instrumental-variables strategy that follows de Janvry et al. (2014) and Castañeda Dower and Pfutze (2015): the *Instrument* is the proportion of ejidos in each municipality

that held their first PROCEDE information meeting before certification. Castañeda Dower and Pfutze (2015) thoroughly discuss the exclusion restriction, showing that their instrument is not correlated with municipal socioeconomic or political characteristics. The primary correlates are geographic factors such as distance to the capital and ruggedness of the terrain. One might argue that remoteness impacts cartel deaths in areas with weak state presence, high suitability for drug crop cultivation, or other factors that make them more susceptible to illicit drug production, such as underdevelopment.[18] If there were a correlation between remoteness and cartel deaths, we would expect to see markedly different IV estimates. Columns (1) and (2) confirm that the instrument easily satisfies the relevance requirement: the first-stage Kleibergen–Paap F-statistics are well above the conventional threshold of 10, indicating a strong correlation between the instrument and PROCEDE rollout consistent with prior empirical evidence. Column (3) reports IV estimates that are consistent with and very close to the baseline coefficients obtained in Table 2. In fact, the only notable difference is that the standalone coefficient for *Municipal alternation* loses its statistical significance in the IV specification. These results provide further support for the idea that the interaction between municipal political change and PROCEDE's land titling program played an important role in the increase in *OCDs*.

Although our IV strategy specifically addresses potential endogeneity associated with the rollout of PROCEDE, it does not directly resolve endogeneity concerns related to political alternation. To mitigate this limitation, we complement our IV analysis with a panel event-study design. In fact, the validity of our findings relies on the parallel-trends' assumption. For this reason, we employ a panel event study that allows us to access whether the relationship between *OCDs* and the intensity of PROCEDE lines up with the timing of the political alteration rather than preceding it. It is important to note that the event-study approach assumes absorbing states by design. This means that once a

[18] Our exclusion restriction remains reasonable, particularly since we control for various measures of state presence (e.g., distance to a police station), the suitability of growing maize or drugs, and other relevant municipal characteristics (e.g., access to electricity) that could potentially correlate with remoteness and the likelihood of experiencing cartel deaths.

political alteration occurs, as in the case of the PROCEDE rollout, it should remain until the end of the considered period. For this reason, we choose to limit our sample to either non-treated municipalities or municipalities that experience a single, irreversible political alteration, so the pre- and post-periods can be cleanly isolated (see, Dube et al, 2023). In Eq. (2), the specification includes three mutually exclusive political-alteration states that a municipality can enter at different times. An event-study would therefore need a separate set of leads and lags for each state—and for each interaction with certification—multiplying the number of parameters and leaving very few observations in every lead/lag cell. We therefore apply the event-study logic to Eq. (1), which features a single political-alteration dummy. We replace that dummy with ten relative-time indicators—five leads and five lags—and interact each of them with $PROCEDE_{it}$**,** allowing the certification effect to vary year-by-year around the solitary, irreversible switch:

$$OCD_{it} = \alpha + \beta_1 PROCEDE_{it} + \sum_{r=-5}^{4} \delta_r D_{it}^r + PROCEDE * \sum_{r=-5}^{4} \beta_r D_{it}^r + zX_i * \varphi_y + \theta_i + \theta_t + \varepsilon_{it} \quad (3)$$

The lead interactions—spanning five to two years before the political change, with the year immediately prior omitted—are each multiplied by the share of certified ejido land. If the coefficients on these pre-alteration terms are all near zero, municipalities with higher certification levels were not already on a different trajectory of cartel killings, helping to support the parallel-trends assumption and reduce endogeneity concerns. The lag interactions—from year 0 (the first year after the political shift) through year 4—show how the *PROCEDE* effect builds over time. Because both land certification and the new political leadership need time to influence land use and crime, we expect these post-alteration coefficients to grow in size over the first few years rather than jump all at once. Figure 2 presents the event-study estimates. As can be seen, none of the pre-treatment coefficients is individually significant, and a joint test for the lead terms fails to reject the null of no effect (F = 1.53, p = 0.19), supporting the parallel-trends assumption. After the political switch the profile turns upward:

by the second year the interaction effect peaks at roughly five percentage points, then tapers slightly yet remains positive through year 4, indicating a substantive and persistent rise in *OCDs* once land certification and political alternation coincide. Both tests therefore provide coherent and complementary evidence supporting the validity of our baseline findings.

[Insert Figure 2 here]

Next, columns (1) and (2) of Table A4 (Appendix) replicate the column (2) and column (4) specifications from Table 2, but they are estimated on the event-study sub-sample—municipalities that either never switch from the PRI or do so exactly once. Although this reduced sample is too small for a fully dynamic event study with the three mutually exclusive political-alternation dummies, it is sufficient for the original static interaction terms. Finally, in columns (3) and (4) we explore temporal heterogeneity by dividing 1995–2006 into four three-year blocks (1995-97, 1998-2000, 2001-03, and 2004-06) and interacting each block dummy with the treatment variables in Eq. (1) and (2). This "blocked-time" specification captures any gradual build-up or fade-out in the effects of land titling and political alternation, testing whether the static model masks important dynamics. As Table A4 shows, only the interaction terms *PROCEDE*Municipal alternation* (columns 1 and 3) and *PROCEDE*Municipal-state alternation* (columns 2 and 4) are statistically significant, and both exhibit positive associations with *OCDs*. Specifically, the *PROCEDE*Municipal alternation* interaction remains statistically significant at the 5% level, while the *PROCEDE*Municipal-state alternation* exhibits the strongest and most robust association with *OCDs*. By contrast, all standalone political alternation terms and remaining interaction terms are statistically insignificant.

4.2.2 Additional robustness checks

Our next robustness check partitions the sample into Mexico's three macro-regions—North, Centre, and South—and re-estimates the model separately for each region to assess whether the effects are

geographically uniform. Columns (1) and (2) of Table 3 replicate the column (2) and column (4) specifications from Table 2 but restrict the sample to municipalities in the North the region that already hosted the four principal cartels that emerged after the 1989-90 breakup of the Guadalajara Cartel (Tijuana, Juárez, Gulf, and Sinaloa). Columns (3) and (4) apply the same specifications to the Centre, while columns (5) and (6) do so for the South. According to the estimates in columns (1) and (2), the coefficients retain the same signs as those in Table 2, but they are smaller in magnitude and less precisely estimated. A likely explanation is that turf wars in the North were already well entrenched before our sample period begins in 1995, owing to the presence of the four dominant cartels (Trejo and Ley, 2018; Dávila-Cervantes and Pardo-Montaño, 2023). With violence starting from a high baseline, subsequent political turnover and land certification had limited scope to push homicide rates even higher, producing weaker and less precisely measured effects. In contrast, columns (3) and (4) of our estimations are broadly consistent with those in Table 2 for Central Mexico. Notably, just two weeks after taking office, President Calderón selected the central state of Michoacán as the initial target of his new security strategy. In December 2006, he deployed over 6,500 soldiers and federal police to confront the escalating cartel violence (see Ríos, 2013). Finally, although the South has historically been the least violent region (see, e.g., Gonzalbo, 2009), columns (5) and (6) demonstrate that turf-war violence can still spread there when land titling coincides with political alternation. This pattern is more pronounced in municipalities experiencing simultaneous alternation at both the municipal and state levels. Overall, the regional breakdown reveals an uneven pattern. Though heterogeneous, the regional results fit Mexico's long-term geography of violence, providing a coherent picture of how cartel conflict has evolved in the North, Centre, and South

[Insert Table 3, here]

Next, according to Castañeda Dower and Pfutze (2020), PROCEDE's land certification effectively reduced the overall homicide rate predominantly in municipalities where the PRI remained in power. In these areas, certification clarified property rights by establishing clear and enforceable

boundaries, thereby diminishing the scope for land-related disputes. Conversely, in municipalities where the PRI lost power, probably other underlying sources of violence persisted or increased, and thus land certification provided little or no additional reduction in homicides. To capture the setting in which the PRI's political capacity remained intact, in column (1) of Table 4 we use a sub-sample of municipalities that never experienced a PRI-to-opposition mayoral turnover between 1995 and 2006. In this "PRI-stronghold" sample, the coefficient on *PROCEDE* is essentially zero, indicating that land titling neither intensified nor reduced the likelihood of *OCDs* when the party's brokerage networks remained intact. We then run the mirror regression in column (2) on non-PRI strongholds. Here the *PROCEDE* point estimate rises to 0.008, but the effect is only marginally insignificant ($p \approx 0.11$). Finally, estimating the model on the full sample in column (3) and including an interaction between *PROCEDE* and *non-PRI stronghold*—a dummy equal to one for municipalities that experienced at least one PRI-to-opposition mayoral turnover during 1995-2006 and zero otherwise—produces an interaction coefficient of 0.016, which is statistically significant at the 10 % level. A post-estimation linear-combination test shows that adding this interaction to the baseline *PROCEDE* coefficient yields a net marginal effect of 0.009 in switch municipalities statistically significant at the 10% level. Thus, our regression results align closely with those of Castañeda Dower and Pfutze (2020), despite our focus on *OCDs* rather than general homicide rates, underscoring the central importance of the political context in determining the impact of PROCEDE.

[Insert Table 4, here]

Finally, Table A5 in the Appendix presents our last set of robustness checks for the estimates reported in Table 2. Columns (1) and (2) replicate the specifications in Table 2, columns (2) and (4), but scale certification as the log certified area per 10,000 inhabitants plus one. Furthermore, columns (3) and (4) have a similar structure, though this time, we replaced the dichotomous dependent variable with the log count of OCDs per 10,000 inhabitants, plus one. In both cases, once municipal political turnover is divided into its two mutually exclusive forms, the pattern becomes clear: the interaction

between certification and *Municipality state alteration* seems to exert the higher influence in drug-related violence. Columns (5) and (6) provide a falsification test, using the log count of accidents and suicides per 10,000 people plus one as dependent variable; all key coefficients are statistically insignificant, as expected. Columns (7) and (8) augment the full Table 2 specifications with municipality-specific linear time trends. The interaction coefficients remain very similar in magnitude and significance, indicating that our baseline estimates are not driven by smooth, linearly evolving shocks within municipalities.

5. Mechanisms

5.1 Cartel expansion dynamics

Our results thus far strongly suggest that the increase in *OCDs* coincides with areas experiencing both land certification under PROCEDE and political alternation at the municipal level, with the effect especially pronounced in municipalities undergoing simultaneous alternation at the municipal and state levels. We now turn to examine whether cartel presence and competition follow the same geographical pattern. Between 1995 and 2006, four major cartels—Tijuana, Juárez, Gulf, and Sinaloa—were already well-established, having operated independently since at least 1990. Over the same period, new groups such as the Beltrán Leyva Organisation, La Familia Michoacana, and Los Zetas emerged, all vying for power and a larger share of the drug-trade profits. Coscia and Rios (2012) created a dataset tracking the presence of ten drug cartels at the municipal level in Mexico between 1990-2010. Specifically, the authors used a search algorithm that queried archived publications in Google News. The algorithm identifies the presence of a criminal organisation in a municipality when the frequency of hits for a municipality-organisation pair surpasses the threshold established by the available searchable material for that municipality-year. Dube et al. (2016) used this data to construct the variables *Any cartel*, *First cartel presence*, and *Multiple cartels* which we employ in our empirical analysis. The variable *Any cartel* captures whether any cartel is present in the municipality; the variable *First cartel presence* is

an indicator for the first year in which any cartel is present in that municipality; the variable *Multiple cartels* is an indicator for the operation of multiple cartels in that municipality.

Eq. (1) and (2) are re-specified to include our three indicators of cartel presence as dependent variables. Odd-numbered columns in Table 5 report the results for Eq. (1) across these outcomes, while the even-numbered columns present the analogous estimates for Eq. (2). According to our findings in Table 5, the variable *PROCEDE* by itself shows a borderline-significant association with all cartel presence in the odd-numbered columns. More importantly, the marginal effect of *PROCEDE* when accompanied by *Municipal alternation* exhibit significant increases in *Any cartel* presence (p=0.055), *First cartel presence* (p=0.021), and *Multiple cartel presence* (p=0.089). Moreover, in the even-numbered columns we obtain evidence that simultaneous turnover at both tiers of government is linked to a lower probability of cartel presence – the variable *Municipio state alternation* is negative and statistically significant at the 5–10% level. However, once simultaneous alternation coincides with extensive land titling, the resulting *top-to-bottom* shock attracts new entrants and encourages cartel coexistence—the very competitive mix most likely to ignite turf violence. In particular, in all cases the interaction term *PROCEDE*Municipal-state alternation* is positive and significant at the 1% level, whereas obtained coefficients are at least two times the (negative) stand-alone simultaneous alternation effect. One legitimate concern is that our news-based cartel indicators could increase simply because the spike in *OCDs* improves reporters' ability to detect the presence of cartels, rather than reflecting genuine expansion. Specifically, in municipalities that experience both PROCEDE exposure and the loss of PRI control, an increase in the *Any Cartel* and *First Cartel presence* metrics might reflect improved detection due to heightened violence rather than actual entry or expansion. However, the significant rise in the *Multiple cartels* measure is less susceptible to this interpretation because reporting on two or more rival organisations simultaneously implies active confrontation and rivalry rather than merely increased visibility of existing, previously concealed cartel activity. Therefore,

although detection bias could partly explain the increase in general cartel visibility, it is unlikely to fully account for the intensified inter-cartel competition that we observe.

[Insert Table 5, here]

5.2 Drug-related motives

Our results so far indicate that the simultaneous weakening of PRI-affiliated communal land arbiters and the removal of PRI officials left municipalities vulnerable to cartel incursions, resulting in heightened *OCDs*. Mexico is a key supplier of drugs and a major trafficking corridor for the United States market. Since at least the 1960s, it has been the dominant supplier of cannabis to the United States (see, Astorga, 1999). More recently, Kilmer et al. (2010) based on DEA reports, survey results, and market analyses, estimated that the average market share of marijuana produced in Mexico and sold in the United States during the second half of the 2000s was 54%. Moreover, the dismantling of the Corsican-run "French Connection" pipeline in the early 1970s—until then the principal source of United States heroin— established Mexico as the main supplier of heroin to the United States (Pansters and Smith, 2022). Five decades later, Ciccarone and Kraus (2009) using data compiled by the DEA estimated that Mexico's share of United States heroin imports in 2004 was well above 40%. However, over time cartels evolved from brokers of marijuana and heroin into pivotal suppliers of both cocaine and methamphetamine. In the mid-1980s, crackdowns on Colombian drug trafficking routes forced most cocaine bound for the United States to take a detour through Mexico (Astorga, 1999). Another development was the crackdown on meth laboratories in the United States in the 1990s, which led Mexican drug organisations to begin producing high-quality, low-priced methamphetamine, thereby outcompeting United States-based groups (Smith and Toro, 1997). Higher margins made cocaine and, later, meth far more lucrative than crop-based marijuana or opium (see, Astorga and Shirk, 2010). Moreover, methamphetamine could be manufactured year-round without the risks of outdoor cultivation. Until 1970, the amount of cocaine seized by drug enforcement officials was symbolic — less than ten kilos — but surpassed four metric tons in 1985, reaching nearly 50 metric tons in 1990.

According to Brouwer et al. (2006) during the mid-2000s, up to 70% of all South American cocaine was passing through the Central America–Mexico corridor. The Brouwer et al. (2006) study also revealed that, by the mid-2000s, Mexican cartels were supplying 70–90% of the methamphetamine demand in the United States.

As cartels expanded their portfolios of drugs over time, rural land became strategically valuable for both cultivating and trafficking drugs (see McSweeney et al., 2017). On the one hand, PROCEDE's land privatisation, when paired with the collapse of PRI political protection, may have made certain areas newly contestable, enticing cartels to cultivate, process, and transport "traditional" drugs there. If this is true and rival groups converge on the same territory, then competition for control of the new territories would intensify, providing a credible pathway from these institutional shocks to the surge in *OCDs*. On the other hand, these newly contestable municipalities offered ideal staging points for higher-margin activities, such as serving as land corridors for cocaine bound for the United States or hosting clandestine methamphetamine "super-labs. These lucrative opportunities provided additional motivation for rival criminal groups to battle for territorial control, further amplifying the violence associated with the loss of communal protections and PRI patronage.[19]

Although there are no official statistics on illicit crop production, we follow Dube et al. (2016) and use government eradication data as an indicator of cultivation levels. United States and Mexican

[19] Beyond vying for trafficking routes and production sites, cartels also tend to acquire rural land to launder illicit profits, build local legitimacy, and entrench long-term influence within communities (McSweeney et al., 2017). In turn, research shows that these laundering activities often leave a fiscal footprint: by channelling funds into legal businesses, criminal organisations impact on the economy and on the revenues of the State, through higher local tax revenues (Chabat, 2005; Murphy and Rossi, 2020). Although the bulk of municipal revenues originate from federally collected taxes transferred to states and municipalities (~80%), cartel activity associated with a surge in "legitimate" investments can create a measurable uptick in per capita tax receipts (composed predominantly by property taxes) through the expansion of the local formal sector. Indeed, additional findings (available upon request) suggest that the *PROCEDE*Municipal state interaction* term is correlated with the largest tax revenue boost in settings that exhibit the most pronounced cartel expansion and *OCDs*. The fact that municipal taxes rise where conflict intensifies supports the money laundering argument: cartels appear to invest in "legitimate" businesses even as violence escalates, which is contrary to the expectation that local (internal) conflict depresses legitimate economic activity and tax revenue (Besley and Persson, 2008; Akitoby et al., 2020).

antinarcotics officials estimate that eradication campaigns destroy approximately 75% of opium poppy and cannabis plantings each year (Humphrey, 2003). We obtained the eradication figures from Dube et al. (2016), who used reports from Mexico's Secretariat of National Defence (SEDENA) as their source. These records list the number of hectares of marijuana and opium poppy fields eradicated each year at the municipality level. We define our variables, *Log marijuana eradication* and *Log poppy eradication*, as the log of hectares of the respective illicit crop eradicated per 10,000 hectares, plus one. If local political destabilisation is associated with a rise in illicit crop production, seizures of drugs can also rise as a result. Therefore, we construct the variables *Log marijuana seizures* and *Log poppy seizures*, defined as log of kilograms of marijuana and poppies seized in the municipality plus 1. Moreover, given the expansion of cocaine trafficking through Mexico as well the production and trafficking of methamphetamine, we also construct the variable *Log cocaine and meth seizures*, measured as the log of kilograms of cocaine and meth seized in the municipality plus 1.

Eq. (1) and (2) are adjusted to incorporate the dependent variables defined above in Table 6. The odd-numbered columns estimate Eq. (1) for the five eradication and seizure outcome variables. The even-numbered columns have a similar structure and estimate Eq. (2). Interestingly, coefficients on political alternation are either insignificant or negative and statistically significant when the dependent variable is marijuana or poppy eradication/seizures. The only exception is in the poppy-seizure regression (col. 8) where a state-only alternation—a new governor while the municipality remains PRI—raises seizures, yet the accompanying interaction term with the *PROCEDE* variable, is negative and offsets the main effect. Overall, this negative association aligns with our earlier cartel-presence results, which also show fewer cartel activities in areas experiencing municipal-state alternation without PROCEDE. Moreover, all political alteration variables are statistically insignificant when associated with *Log cocaine and meth seizures*. One plausible explanation is that ousting PRI leaders deprived cartels of their usual protection, pushing them to develop new routes for higher-value "new" drugs such as cocaine and meth—rather than "traditional" marijuana and heroin—

especially in municipalities where PROCEDE's land certification made territory more contested and easier to penetrate.[20] It is true though that the interaction between political alternation and *PROCEDE* is statistically insignificant, indicating that land reform did not appreciably modify the alternation effect on these drug metrics. However, this is not surprising given that cocaine is trafficked through Mexico, is primarily being interdicted at border crossings, while meth "super-labs" are highly mobile, so the routes and production sites do not necessarily overlap with detected cartel presence. In fact, according to our data cocaine and meth seizures are five times higher in municipalities located in the borders with the United States than in municipios in the interior of Mexico. Although our findings do not allow us to associate cartel's territorial expansion with drug-related activities, the data allow us to narrow the field. First, the pattern is unlikely to reflect an increase in the cultivation of traditional crops, marijuana or poppy, because the regressions of eradication and seizures show no systematic uptick in PROCEDE-plus-alteration municipalities. Meanwhile, while we cannot rule out the possibility that cartels moved in to traffic cocaine or to produce and ship methamphetamine, seizure metrics on these "new" drugs may not coincide with the strongholds of cartels or areas where they expand their operations.

[Insert Table 6, here]

[20] However, the observed decline in municipal-level cartel presence and reduced eradication/seizures of traditional drugs in municipalities experiencing political alternation without PROCEDE—apart from a few exceptions—does not translate into a similarly robust decrease in *OCDs* during the period 1995–2006. According to Dube et al. (2016), municipalities involved in illicit crop production experienced increased cartel activity between 1990 and 2010, with corresponding rises in drug-related violence between 2007 and 2010. Our study, however, covers the earlier period (1995–2006), preceding the escalation of drug-related killings. Our findings make sense given that prior to political alternation, municipalities were mostly controlled by a single, well-established cartel, resulting in low baseline violence. Therefore, the cartel's partial departure or reduced activity—motivated by new opportunities arising from land titling elsewhere—would have offered limited scope to further diminish already low levels of inter-cartel conflict.

6. Conclusions

The disintegration of PRI-brokered protection rackets that had operated since the 1940s set the stage for cartel turf wars in the 1990s. Two institutional shocks proved pivotal. First, gradual sub-national democratisation replaced PRI officials with opposition mayors and governors, dismantling long-standing informal pacts with traffickers. Second, PROCEDE's land-titling programme turned communal ejidos into marketable property, weakening caciques and making rural parcels easier to buy, coerce, or launder. Our DiD estimates for 1995-2006 reveal a pronounced rise in *OCDs* when the two shocks coincide. Specifically, in municipalities that received PROCEDE certification and elected an opposition mayor, the probability of a homicide rises by roughly two percentage points—almost the sample mean. The effect intensifies when the statehouse also turns against the PRI, indicating that a *top-to-bottom* rupture of political shields leaves incumbent cartels vulnerable to rival incursions. Cartel-presence data confirm that these same municipalities are the most likely to experience first-time entry and overlapping rival groups.

We find no evidence that the land-plus-alternation mix fuels a boom in marijuana or poppy cultivation, nor does it show up in cocaine or meth seizures. The absence of a seizure effect is not puzzling: most cocaine is intercepted at border crossings—beyond the interior municipalities where our interaction operates—and meth is produced in mobile "super-labs" that shift before enforcement can react. Thus, even if cartels are competing for territories to move cocaine or site meth labs, such activity rarely shows up in local seizure data. The violence we observe is therefore unlikely to reflect bigger traditional-crop harvests or easily measured drug flows; instead, it more plausibly reflects battles for strategic "plazas", trafficking corridors, and laundering sites. Conventional wisdom holds that competitive elections and secure property rights promote stability and development; Mexico's 1990s reforms—sub-national political alternation and the PROCEDE programme—should therefore have fostered broad gains in welfare and stability. Instead, our results show that the two reforms, acting together, commodified rural land, removed PRI-brokered protection, and invited rival cartels to invade

newly contestable territories—turning many municipalities into the deadliest battlegrounds of Mexico's post-2007 drug war.

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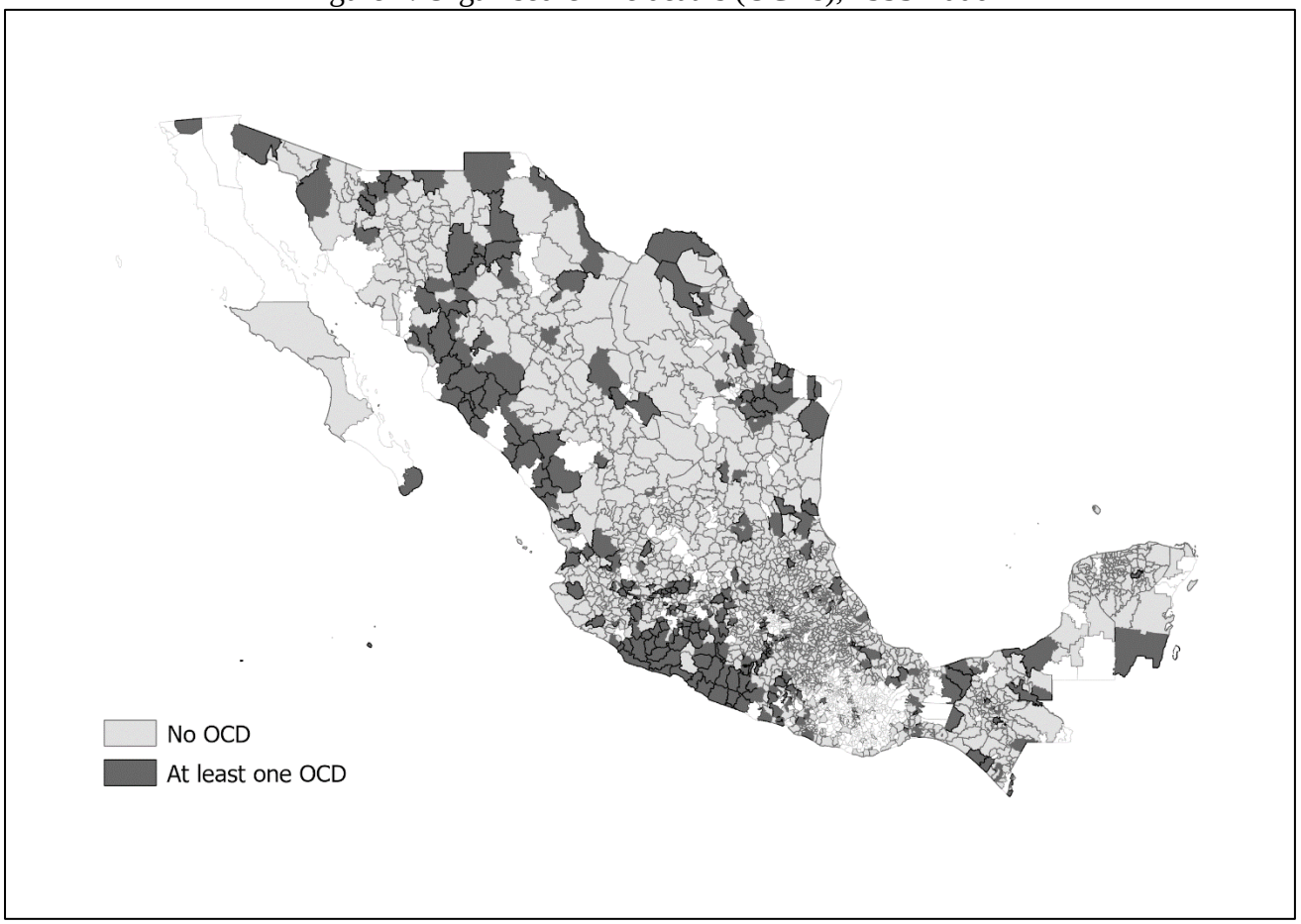
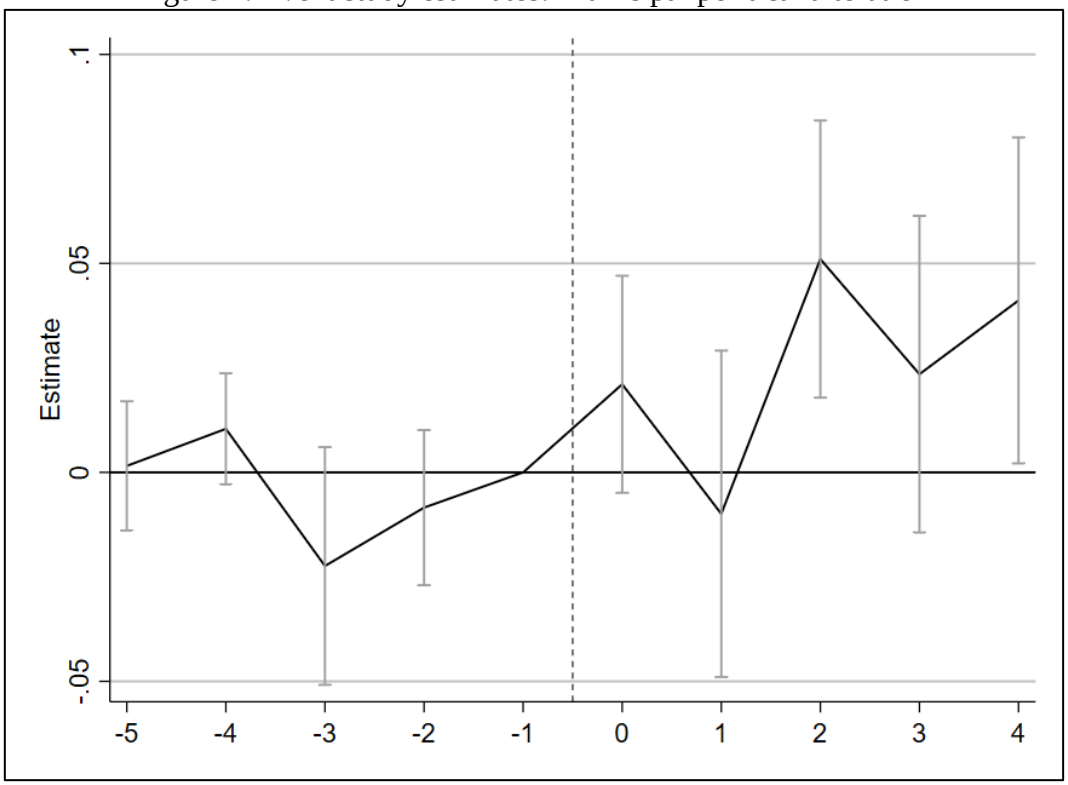
Figure 1. Organised-crime deaths (OCDs), 1995-2006



Notes: This map shows municipalities with at least one drug-related homicide between 1995-2006. White polygons indicate municipalities that do not appear in the sample. The data come from Trejo and Ley (2018).

Figure 2: Event study estimates: Municipal political alteration



Note: The figure plots the yearly impact of municipal alternation by estimating a separate coefficient for the interaction term PROCEDE*Municipal alternation in Eq. (1), following the specification in Eq. (3).The coefficient for the final pre-treatment year is omitted, so all points are interpreted relative to that baseline. The control group consists of municipalities that never experience political alternation. 90% confidence intervals are shown for every non-omitted years.

Table 1. Path dependence in Mexican narco-violence: 1995-2006 turf-war exposure and drug-related killings, 2007-2010

Dependent variable:	*Log Drug-related killings*		*Log Executions*		*Log Confrontations*		*Log Cartel Attacks*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OCDs	0.515***	0.352***	0.485***	0.339***	0.192***	0.128***	0.053***	0.036*
	(0.057)	(0.056)	(0.053)	(0.053)	(0.041)	(0.043)	(0.020)	(0.020)
No of Obs.	1876	1876	1876	1876	1876	1876	1876	1876
R Squared	0.512	0.568	0.516	0.561	0.253	0.339	0.062	0.090
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: The table reports OLS estimates. The dependent variables—Log Drug-related killings, Log Executions, Log Confrontations, and Log Cartel attacks—are each defined as the cumulative number of incidents recorded at the municipal level from 2007 to 2010 and expressed as the natural logarithm of the count per 10,000 inhabitants plus 1. The main independent variable, OCDs, is a binary indicator that equals one if a municipality recorded at least one organised-crime death between 1995 and 2006, and zero otherwise. All estimates include state fixed-effects. Variables not shown but included in the even-numbered columns are: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability and (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table 2. PROCEDE rollout, political alteration, and organised-crime deaths

Dependent variable:	*OCDs*			
	(1)	(2)	(3)	(4)
PROCEDE	0.002	0.001	0.001	0.002
	(0.005)	(0.005)	(0.006)	(0.005)
Municipal alteration	-0.011***	-0.009**		
	(0.003)	(0.004)		
*PROCEDE*Municipal alt.*	0.019***	0.019***		
	(0.006)	(0.006)		
Municipal only alter.			-0.007*	-0.005
			(0.004)	(0.004)
*PROCEDE*Municipal only alter.*			0.011*	0.010*
			(0.006)	(0.006)
State only alter.			0.013	0.021**
			(0.008)	(0.009)
*PROCEDE*State only alter.*			0.002	-0.004
			(0.011)	(0.011)
Municipal-state alter.			-0.016*	-0.004
			(0.008)	(0.009)
*PROCEDE*Municipal-state alter.*			0.048***	0.043***
			(0.013)	(0.013)
No of Observations	22512	22512	22512	22512
R Squared	0.019	0.065	0.021	0.068
Mun. and year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Notes: The table reports estimates of Eq. (1) and (2). The dependent variable OCDs is a binary indicator, which takes the value of one if an organised-crime death is recorded in a municipality in a given year, and zero otherwise. The variable PROCEDE is the proportion of certified area of ejidos to the total area of ejidos in a municipality. In columns (1) and (2) the variable Municipal alteration equals one in any municipality–year in which the mayor is from a party other than the PRI, and zero otherwise. In columns (3) and (4) we define three mutually exclusive dummies: (i) Municipal only alternation coded as one when the mayoralty shifts from PRI but the governorship does not; (ii) State only alternation coded as one when the governorship shifts but the mayoralty stays PRI; and (iii) Municipal-state alternation coded as one when both change in the same year. All three enter jointly, with PRI control of both levels as the omitted category. All estimates include municipality and year fixed-effects. The even-numbered columns include the following control variables, each interacted with year dummies but omitted from the table for brevity: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability and (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors, clustered at the municipal level, are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table 3. PROCEDE rollout, political alteration and organised-crime deaths: by region

Dependent variable:	*OCDs*					
Region:	*North*		*Centre*		*South*	
	(1)	(2)	(3)	(4)	(5)	(6)
PROCEDE	0.020	0.024	0.001	0.006	-0.003	-0.005
	(0.017)	(0.019)	(0.008)	(0.007)	(0.006)	(0.007)
Municipal alteration	-0.004		-0.013**		-0.004	
	(0.013)		(0.006)		(0.004)	
*PROCEDE*Municipal alt.*	0.020		0.021**		0.014*	
	(0.018)		(0.009)		(0.007)	
Municipal only alter.		0.006		-0.009		-0.002
		(0.015)		(0.007)		(0.004)
*PROCEDE*Municipal only alter.*		0.007		0.010		0.012
		(0.020)		(0.009)		(0.009)
State only alter.		-0.018		0.033**		0.006
		(0.022)		(0.015)		(0.012)
*PROCEDE*State only alter.*		-0.012		-0.006		0.006
		(0.025)		(0.019)		(0.016)
Municipal-state alter.		-0.039		0.010		-0.009
		(0.024)		(0.016)		(0.012)
*PROCEDE*Municipal-state alter.*		0.031		0.046**		0.032**
		(0.029)		(0.023)		(0.016)
No of Observations	5184	5184	9360	9360	7968	7968
R Squared	0.133	0.134	0.100	0.107	0.063	0.063
Mun. and year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns (1) and (2) report estimates of Eq. (1) and (2) for municipalities in northern Mexico. Columns (3) and (4) replicate the same specifications for municipalities in the Centre, while columns (5) and (6) do so for those in the South. The dependent variable OCDs is a binary indicator, which takes the value of one if an organised-crime death is recorded in a municipality in a given year, and zero otherwise. The variable PROCEDE is the proportion of certified area of ejidos to the total area of ejidos in a municipality. In columns (1), (3) and (5) the variable Municipal alteration equals one in any municipality–year in which the mayor is from a party other than the PRI, and zero otherwise. In columns (2), (4) and (6) we define three mutually exclusive dummies: (i) Municipal only alternation coded as one when the mayoralty shifts from PRI but the governorship does not; (ii) State only alternation coded as one when the governorship shifts but the mayoralty stays PRI; and (iii) Municipal-state alternation coded as one when both change in the same year. All three enter jointly, with PRI control of both levels as the omitted category. All estimates include municipality and year fixed-effects. Controls interacted with year dummies—omitted from the table for brevity but included in all estimates—are: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability and (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors, clustered at the municipal level, are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table 4. PROCEDE rollout, PRI strongholds and organised-crime deaths

Dependent variable:	*OCDs*		
Sample:	*PRI stronghold*	*non-PRI stronghold*	*Whole sample*
	(1)	(2)	(3)
PROCEDE	0.001	0.008	-0.006
	(0.011)	(0.005)	(0.008)
PROCEDE non-PRI stronghold*			0.016*
			(0.008)
No of Observations	3732	18780	22512
R Squared	0.116	0.071	0.065
State FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Notes: The table reports OLS estimates. Column (1) restricts the sample to PRI strongholds—municipalities that kept a PRI mayor every year from 1995 to 2006—while column (2) covers PRI-switch municipalities that experienced at least one first-time PRI-to-opposition mayoral turnover during that window; column (3) pools both groups and adds the interaction PROCEDE*non-PRI stronghold. PROCEDE is the proportion of certified area of ejidos to the total area of ejidos in a municipality. The variable non-PRI stronghold variable is a binary indicator that equals one for municipalities that experienced at least one PRI-to-opposition mayoral turnover during 1995-2006 and 0 otherwise. All estimates include municipality and year fixed-effects. Controls interacted with year dummies—omitted from the table for brevity but included in all estimates—are: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability and (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors, clustered at the municipal level, are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table 5. PROCEDE rollout, political alteration and cartel activity

Dependent var.:	*Any cartel*		*First cartel presence*		*Multiple cartels*	
	(1)	(2)	(3)	(4)	(5)	(6)
PROCEDE	0.011*	0.010	0.008*	0.007	0.006*	0.006*
	(0.006)	(0.006)	(0.005)	(0.005)	(0.003)	(0.003)
Municipal alteration	-0.003		-0.005*		-0.003	
	(0.004)		(0.003)		(0.002)	
PROCEDE Municipal alt.*	0.006		0.005		0.003	
	(0.007)		(0.005)		(0.005)	
Municipal only alter.		0.002		-0.002		0.000
		(0.004)		(0.003)		(0.002)
PROCEDE Municipal only alter.*		-0.002		-0.001		-0.004
		(0.007)		(0.005)		(0.004)
State only alter.		0.006		0.004		0.005
		(0.007)		(0.006)		(0.005)
PROCEDE State only alter.*		0.006		0.007		-0.001
		(0.010)		(0.008)		(0.007)
Municipal-state alter.		-0.019**		-0.013**		-0.012*
		(0.009)		(0.006)		(0.006)
PROCEDE Municipal-state alter.*		0.039***		0.029***		0.025**
		(0.013)		(0.010)		(0.010)
No of Observations	22512	22512	21629	21629	22512	22512
R Squared	0.142	0.143	0.098	0.099	0.101	0.103
Mun. and year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns (1) and (2) re-estimate Eq. (1) and (2) with the dependent variable replaced by Any cartel. Columns (3)–(4), and (5)–(6) apply the same specifications using, respectively, First cartel presence and Multiple cartels as the dependent variables. Any cartel, First cartel presence, and Multiple cartels are binary indicators that equal one when, respectively, (i) at least one cartel operates in the municipality, (ii) a cartel establishes a presence there for the first time, or (iii) more than one cartel is simultaneously active. The variable PROCEDE is the proportion of certified area of ejidos to the total area of ejidos in a municipality. In columns (1), (3) and (5) the variable Municipal alteration equals one in any municipality–year in which the mayor is from a party other than the PRI, and zero otherwise. In columns (2), (4) and (6) we define three mutually exclusive dummies: (i) Municipal only alternation coded as one when the mayoralty shifts from PRI but the governorship does not; (ii) State only alternation coded as one when the governorship shifts but the mayoralty stays PRI; and (iii) Municipal-state alternation coded as one when both change in the same year. All three enter jointly, with PRI control of both levels as the omitted category. All estimates include municipality and year fixed-effects. Controls interacted with year dummies—omitted from the table for brevity but included in all estimates—are: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability and (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors, clustered at the municipal level, are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table 6: PROCEDE rollout, political alteration and drug eradication and seizures

Dependent variable:	*Log marijuana eradication*		*Log poppy eradication*		*Log marijuana seizures*		*Log poppy seizures*		*Log cocaine and meth seizures*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PROCEDE	-0.017	-0.025	-0.012	-0.008	0.014	-0.016	-0.001	0.002	0.006	0.011
	(0.017)	(0.016)	(0.012)	(0.013)	(0.029)	(0.031)	(0.006)	(0.006)	(0.014)	(0.015)
Municipal alteration	-0.019		-0.016		-0.010		-0.004		0.002	
	(0.013)		(0.010)		(0.026)		(0.007)		(0.011)	
*PROCEDE*Municipal alt.*	0.001		0.004		-0.021		0.006		-0.008	
	(0.017)		(0.012)		(0.035)		(0.007)		(0.014)	
Municipal only alter.		-0.028*		-0.016		-0.009		-0.002		0.006
		(0.015)		(0.011)		(0.026)		(0.007)		(0.012)
*PROCEDE*Municipal only alter.*		0.015		0.000		-0.033		0.002		-0.012
		(0.019)		(0.014)		(0.035)		(0.007)		(0.016)
State only alter.		-0.110***		-0.018		-0.253***		0.014***		0.027
		(0.031)		(0.012)		(0.065)		(0.005)		(0.019)
*PROCEDE*State only alter.*		0.039		-0.024		0.149**		-0.022***		-0.034
		(0.035)		(0.017)		(0.071)		(0.007)		(0.022)
Municipal-state alter.		-0.093***		-0.032***		-0.266***		-0.002		0.006
		(0.036)		(0.012)		(0.081)		(0.006)		(0.023)
*PROCEDE*Municipal-state alter.*		-0.010		-0.008		0.152*		0.003		-0.017
		(0.040)		(0.015)		(0.090)		(0.009)		(0.028)
No of Observations	22512	22512	22512	22512	22512	22512	22512	22512	22512	22512
R Squared	0.132	0.137	0.344	0.345	0.038	0.041	0.045	0.045	0.029	0.029
Mun. and year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns (1) and (2) re-estimate Eq. (1) and (2) with the dependent variable replaced by Log marijuana eradication. Columns (3)–(4), (5)–(6), (7)–(8), and (9)–(10) apply the same specifications using, respectively, Log poppy eradication, Log marijuana seizures, Log poppy seizures, and Log cocaine and meth seizures as the dependent variables. Log marijuana and poppy eradication are measured as log of area eradicated per 10,000 hectares plus one. All drug seizures are measured as log of kilograms seized plus 1. The variable PROCEDE is the proportion of certified area of ejidos to the total area of ejidos in a municipality. In columns (1), (3), (5), (7) and (9) the variable Municipal alteration equals one in any municipality–year in which the mayor is from a party other than the PRI, and zero otherwise. In columns (2), (4), (6), (8) and (10) we define three mutually exclusive dummies: (i) Municipal only alternation coded as one when the mayoralty shifts from PRI but the governorship does not; (ii) State only alternation coded as one when the governorship shifts but the mayoralty stays PRI; and (iii) Municipal-state alternation coded as one when both change in the same year. All three enter jointly, with PRI control of both levels as the omitted category. All estimates include municipality and year fixed-effects. Controls interacted with year dummies—omitted from the table for brevity but included in all estimates—are: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability and (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors, clustered at the municipal level, are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Appendix

Land titling and political alternation: Seeds of Mexico's drug war

For Online Publication Only

Contents

Additional Tables and Figures

Table A1. Definition of variables, data sources and descriptive statistics

Variable name	Description	Obs.	Mean	SD	Min	Max	Sources
OCDs	Dummy variable that takes the value one if there is an organised-crime death in the municipality, and zero otherwise	22512	0.023	0.149	0.000	1.000	Trejo and Ley (2018)
Log Drug-related killings	The aggregate of executions, confrontations and cartels attacks recorded between 2007 and 2010, transformed as the natural logarithm of the count per 10,000 inhabitants plus one	1876	0.713	0.981	0.000	5.086	Dube et al. (2016)
Log Executions	The cumulative number of execution-style murders and other killings explicitly attributed to criminal organisations recorded between 2007 and 2010, transformed as the natural logarithm of the count per 10,000 inhabitants plus one	1876	0.638	0.912	0.000	5.047	Dube et al. (2016)
Log Confrontations	The cumulative number of deaths caused by cartel assaults on state-security forces recorded between 2007 and 2010, transformed as the natural logarithm of the count per 10,000 inhabitants plus one	1876	0.165	0.509	0.000	4.786	Dube et al. (2016)
Log Cartel Attacks	The cumulative number of deaths caused by cartel assaults on state-security forces recorded between 2007 and 2010, transformed as the natural logarithm of the count per 10,000 inhabitants plus one	1876	0.034	0.189	0.000	2.635	Dube et al. (2016)
Any cartel	Dummy variable that takes the value one if any cartel operates in the municipality, and zero otherwise	22512	0.028	0.166	0.000	1.000	Dube et al. (2016)
Multiple cartels	Dummy variable that takes the value one if multiple cartels operate in the municipality, and zero otherwise	22512	0.009	0.092	0.000	1.000	Dube et al. (2016)
First cartel presence	Dummy variable that takes the value one if a cartel operates for the first time in the municipality, and zero otherwise	21629	0.013	0.114	0.000	1.000	Dube et al. (2016)
Log marijuana eradication	Log of hectares of marijuana eradicated per 10,000 hectares plus one	22512	0.168	0.542	0.000	6.344	Dube et al. (2016)
Log poppy eradication	Log of hectares of poppies eradicated per 10,000 hectares plus one	22512	0.070	0.399	0.000	6.962	Dube et al. (2016)
Log marijuana seizures	Log of kilograms of marijuana seized in the municipality plus one	22512	0.197	1.000	0.000	10.001	Dube et al. (2016)
Log poppy seizures	Log of kilograms of poppy gums seized in the municipality plus one	22512	0.008	0.126	0.000	4.813	Dube et al. (2016)
Log cocaine and meth seizures	Log of kilograms of cocaine and methamphetamine seized in the municipality plus one	22512	0.033	0.372	0.000	8.641	Dube et al. (2016)
Municipal alteration	Dummy variable that takes the value one in any municipality–year in which the mayor is from a party other than the PRI, and zero otherwise	22512	0.360	0.480	0.000	1.000	Trejo and Ley (2018)
Municipal only alteration	Dummy variable that takes the vlaue of one when a municipality elects a non-PRI mayor while the governorship remains in PRI hands, and zero otherwise	22512	0.261	0.439	0.000	1.000	Own calculations based on Trejo and Ley (2018)
State alteration	Dummy variable that takes the value one when a non-PRI governor is elected but the mayoralty stays PRI, and 0 otherwise	22512	0.131	0.338	0.000	1.000	Own calculations based on Trejo and Ley (2018)
Municipal state alteration	Dummy variable that takes the value one when both offices switch away from the PRI in the same year, and zero otherwise	22512	0.099	0.299	0.000	1.000	Own calculations based on Trejo and Ley (2018)
PRI switch	Dummy variable that takes the value one or municipalities that experienced at least one PRI-to-opposition mayoral turnover during 1995-2006 and zero otherwise	22512	0.834	0.372	0.000	1.000	Own calculations based on Trejo and Ley (2018)
PROCEDE	The proportion of certified ejido area to the total area of ejidos in the municipality	22512	0.617	0.374	0.000	1.000	Own calculations based on National Agrarian Registry
Log population 90	Log of population of the municipality in 1990	1876	9.443	1.078	5.932	12.461	National Institute of Statistics and Geography (INEGI)
Young males' ratio 90	The ratio of young males (15-29) to the total population of the municipality in 1990	1876	0.128	0.016	0.043	0.213	INEGI
Adult females' ratio 90	The ratio of adult females to the total population of the municipality in 1990	1876	0.258	0.023	0.188	0.364	INEGI
Access to electricity 90	The ratio of dwellings with electricity to the total number of dwellings in the municipality in 1990	1876	0.753	0.211	0.000	0.990	INEGI
Indigenous ratio 90	The ratio of indigenous population to the total population of the municipality in 1990	1876	0.142	0.250	0.000	0.871	INEGI
Log distance to nearest police station	Log distance to nearest police station	1876	3.249	0.737	0.185	5.326	Dube et al. (2016)
Log distance to nearest military region	Log distance to nearest military region	1876	3.644	0.683	0.691	5.230	Dube et al. (2016)
Log distance to nearest air force base	Log distance to nearest air force base	1876	4.331	0.681	0.561	5.505	Dube et al. (2016)
Log distance to border	Log distance to U.S. border	1876	5.952	0.679	1.931	6.727	Dube et al. (2016)
Log male homicides 90-94	Sum of male homicides between 1990-1994 transformed as the natural logarithm of the count per 10,000 inhabitants plus one	1876	0.504	0.581	0.000	4.691	INEGI
Maize suitability	Average agro-climatically attainable yield for maize (measured in kg DW/ha) for each municipality	1876	6.594	1.688	1.422	9.313	Dube et al. (2016)
Log marijuana suitability	Log of the total hectares of marijuana eradicated between 1990 and 1994, expressed per 10,000 hectares plus one	1876	0.114	0.323	0.000	3.148	Own calculations based on Dube et al. (2016)
Log poppy suitability	Log of the total hectares of poppies eradicated between 1990 and 1994, expressed per 10,000 hectares plus one	1876	0.046	0.254	0.000	3.473	Own calculations based on Dube et al. (2016)
Log rugged terrain	Log of the mean difference in elevation between gridcell i and adjacent gridcells (in meters) plus one	1876	4.579	1.365	0.000	6.638	Own calculations based on Dube et al. (2016)
Log distance to city	Log of distance for the municipality seat to the capital of the state in km plus one	1876	4.401	0.821	0.000	6.266	Own calculations based on Dube et al. (2016)
Highway	Dummy variable that takes the value one for municipalities with highway presence and zero otherwise	1876	0.613	0.487	0.000	1.000	Dube et al. (2016)
Non-PRI Governor	Dummy variable that takes the value one if, before 1995, the state office was held by a politician from a party other than the PRI, and 0 otherwise.	1876	0.035	0.184	0.000	1.000	Owh calculations based on the Centro de Investigación para el Desarrollo A.C. (CIDAC).
Non-PRI Mayor	Dummy variable that takes the value one if, before 1995, the municipal office was held by a politician from a party other than the PRI, and 0 otherwise.	1876	0.222	0.416	0.000	1.000	Owh calculations based on the CIDAC

Table A2. Path dependence in Mexican narco-violence: 1995-2006 turf-war exposure and drug-related killings, 2007-2010, excluding municipalities in the North

Dependent variable:	*Log Drug-related killings*		*Log Executions*		*Log Confrontations*		*Log Cartel Attacks*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OCDs	0.525***	0.394***	0.491***	0.375***	0.163***	0.127***	0.028*	0.019
	(0.059)	(0.057)	(0.056)	(0.055)	(0.037)	(0.036)	(0.014)	(0.015)
No of Obs.	1444	1444	1444	1444	1444	1444	1444	1444
R Squared	0.445	0.509	0.438	0.494	0.150	0.221	0.042	0.055
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: The table reports OLS estimates. The dependent variables—Log Drug-related killings, Log Executions, Log Confrontations, and Log Cartel attacks—are each defined as the cumulative number of incidents recorded at the municipal level from 2007 to 2010 and expressed as the natural logarithm of the count per 10,000 inhabitants plus 1. The main independent variable, OCDs, is a binary indicator that equals 1 if a municipality recorded at least one organised-crime death between 1995 and 2006, and 0 otherwise. All estimates include state fixed-effects. Variables not shown but included in the even-numbered columns are: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability; (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table A3. PROCEDE rollout, political alteration and organised-crime deaths: 2SLS estimates

	First stage		2SLS
Dependent variable:	*PROCEDE*	*PROCEDE* Political var.*	*OCDs*
	(1)	(2)	(3)
Instrument	0.217***	-0.131***	
	(0.014)	(0.009)	
*Instrument*Municipal alter.*	-0.024*	0.619***	
	(0.014)	(0.015)	
Municipal alteration	0.017	0.243***	-0.009
	(0.011)	(0.013)	(0.006)
PROCEDE			0.004
			(0.024)
PROCEDE Municipal alter.*			0.021**
			(0.010)
No of Observations	19968	19968	19968
R Squared			0.072
First stage F-stat			126.394
Mun. and year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Notes: Columns (1) and (2) report the first-stage regressions. In column (1) the dependent variable is PROCEDE, while in column (2) it is the interaction term PROCEDE*municipal alternation. Column (3) presents the second-stage 2SLS estimates with OCDs as the dependent variable. The variable OCDs is a binary indicator, which takes the value of one if an organised-crime death is recorded in a municipality in a given year, and zero otherwise. The variable PROCEDE is the proportion of certified area of ejidos to the total area of ejidos in a municipality. The variable Municipal alteration equals one in any municipality–year in which the mayor is from a party other than the PRI, and zero otherwise. The variable Instrument is the proportion of ejidos to the total number of ejidos in the municipality that had had their first informational meeting prior to certification. All estimates include municipality and year fixed-effects. Controls interacted with year dummies—omitted from the table for brevity but included in all estimates—are: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability and (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors, clustered at the municipal level, are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table A4. PROCEDE rollout, political alteration and organised-crime deaths: Event-study sub-sample

Dependent variable:	*OCDs*			
	(1)	(2)	(3)	(4)
PROCEDE	-0.009	-0.009	-0.009	-0.007
	(0.007)	(0.007)	(0.009)	(0.008)
Municipal alteration	-0.007		-0.019	
	(0.009)		(0.016)	
PROCEDE Municipal alt.*	0.023**		0.026**	
	(0.011)		(0.013)	
Municipal only alter.		-0.001		-0.016
		(0.010)		(0.018)
PROCEDE Municipal only alter.*		0.010		0.018
		(0.012)		(0.013)
State only alter.		0.005		0.010
		(0.008)		(0.009)
PROCEDE State only alter.*		-0.000		0.004
		(0.011)		(0.011)
Municipal-state alter.		-0.015		0.027
		(0.013)		(0.030)
PROCEDE Municipal state alter.*		0.053***		0.058***
		(0.020)		(0.021)
No of Observations	9444	9444	9444	9444
R Squared	0.095	0.097	0.096	0.099
Mun. and year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes: Columns (1) and (2) report estimates of Eq. (1) and (2), respectively for the event study sub-sample. Columns (3) and (4) augment specifications in columns (1) and (2) with three-year block dummies (1995-97, 1998-2000, 2001-03, and 2004-06) interacted with the treatment variables. The dependent variable OCDs is a binary indicator, which takes the value of one if an organised-crime death is recorded in a municipality in a given year, and zero otherwise. The variable PROCEDE is the proportion of certified area of ejidos to the total area of ejidos in a municipality. In columns (1) and (3) the variable Municipal alteration equals one in any municipality–year in which the mayor is from a party other than the PRI, and zero otherwise. In columns (2) and (4) we define three mutually exclusive dummies: (i) Municipal only alternation coded as one when the mayoralty shifts from PRI but the governorship does not; (ii) State only alternation coded as one when the governorship shifts but the mayoralty stays PRI; and (iii) Municipal state alternation coded as one when both change in the same year. All three enter jointly, with PRI control of both levels as the omitted category. All estimates include municipality and year fixed-effects. Controls interacted with year dummies—omitted from the table for brevity but included in all estimates—are: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability and (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors, clustered at the municipal level, are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table A5. PROCEDE rollout, political alteration and organised-crime deaths: Alternative measures

Dependent var.:	*OCDs*		*Log OCDs pc*		*Log suicides and accidents pc*		*OCDs*	
PROCEDE:	*Log PROCEDE pc*		*PROCEDE*		*PROCEDE*		*PROCEDE*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PROCEDE	0.004	0.003	0.001	0.001	0.042	0.040	0.002	-0.004
	(0.005)	(0.005)	(0.001)	(0.001)	(0.027)	(0.029)	(0.006)	(0.005)
Municipal alteration	-0.006**		-0.003		0.024		-0.008*	
	(0.003)		(0.003)		(0.022)		(0.004)	
*PROCEDE*Municipal alt.*	0.011**		0.002		-0.022		0.017***	
	(0.006)		(0.001)		(0.030)		(0.006)	
Municipal only alter.		-0.004		-0.000		0.019		-0.004
		(0.004)		(0.004)		(0.024)		(0.004)
*PROCEDE*Municipal only alter.*		0.007		0.000		-0.020		0.010*
		(0.005)		(0.001)		(0.033)		(0.005)
State only alter.		0.016*		0.016*		-0.042		-0.008
		(0.009)		(0.009)		(0.037)		(0.011)
*PROCEDE*State only alter.*		0.005		0.001		0.010		0.012
		(0.012)		(0.002)		(0.049)		(0.012)
Municipal-state alter.		0.002		0.006		0.002		-0.027**
		(0.009)		(0.010)		(0.043)		(0.011)
*PROCEDE*Municipal state alter.*		0.027**		0.005**		-0.026		0.052***
		(0.013)		(0.002)		(0.055)		(0.013)
No of Observations	22512	22512	22512	22512	22512	22512	22512	22512
R Squared	0.061	0.063	0.065	0.067	0.017	0.018	0.374	0.288
Mun. and year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipio trends	No	No	No	No	No	No	Yes	Yes

Notes: Columns (1) and (2) report estimates of Eq. (1) and (2) substituting PROCEDE with *Log PROCEDE pc* measured as log certified area per 10,000 people plus 1. Columns (3) and (4) report estimates of Eq. (1) and (2) substituting the dependent variable OCDs for Log OCDs pc measured as the log count of organised-crime deaths per 10,000 people plus one. Columns (5) and (6) report estimates of Eq. (1) and (2) substituting the dependent variable OCDs for Log suicides and accidents pc measured as the log count of accidents and suicides per 10,000 people plus one. Columns (9) – (10) augment Eq. (1) and (2) with municipality-specific time trends. In columns (3)-(8) the variable PROCEDE is the proportion of certified area of ejidos to the total area of ejidos in a municipality. In columns (1), (3), (5) and (7) the variable Municipal alteration equals one in any municipality–year in which the mayor is from a party other than the PRI, and zero otherwise. In columns (2), (4), (6) and (8) we define three mutually exclusive dummies: (i) Municipal only alternation coded as one when the mayoralty shifts from PRI but the governorship does not; (ii) State only alternation coded as one when the governorship shifts but the mayoralty stays PRI; and (iii) Municipal state alternation coded as one when both change in the same year. All three enter jointly, with PRI control of both levels as the omitted category. All estimates include municipality and year fixed-effects. Controls interacted with year dummies—omitted from the table for brevity but included in all estimates—are: (i) Log population 90, (ii) Young males' ratio 90, (iii) Adult females' ratio 90, (iv) Access to electricity 90, and (v) Indigenous ratio 90; (vi) Log distance to nearest police station, (vii) Log distance to nearest military region, and (viii) Log distance to nearest air force base; (ix) Log distance to border; (x) Log male homicides 90-94; (xi) Maize suitability; (xii) Log marijuana suitability and (xiii) Log poppy suitability; (xiv) Log rugged terrain; (xv) Log distance to city; (xvi) Highway; (xvii) non-PRI governor (xviii) non-PRI mayor. Robust standard errors, clustered at the municipal level, are reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.