Crackdowns, Organized Crime Expansion, and State Capture in Mexico

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Abstract

Scholars have long argued that organized crime expansion is extremely hard and rare because criminal organizations (COs) need some degree of state protection to operate, which they often lack outside their historical strongholds. Yet, Latin America is currently experiencing significant CO expansion. Why do COs expand beyond their historical strongholds and what explains where they go? Moreover, what are the implications for local democratic accountability and citizen well-being? I argue that government crackdowns can create incentives for drug trafficking organizations, or drug cartels, to diversify their activities and expand beyond their strongholds in search of new business opportunities. Cartels then exploit electoral incentives to capture local politicians and acquire state, which allows them to establish their operations, worsening citizen well-being. Studying organized crime expansion is difficult due to a lack of data on COs and because expansion is not random. I overcome these limitations by creating a novel dataset on the geographic presence of cartels in Mexico and leveraging a temporal shock (War on Drugs) and geography (new business opportunities) to identify where cartels moved. I first provide evidence that the government's War on Drugs of 2007 pushed drug cartels to diversify, and particularly, that all cartels began stealing oil from pipelines. Using a spatial difference-in-differences design, I then show that the crackdown pushed cartels to target their expansion to territories with new business opportunities—oil pipelines. I exploit this pattern to instrument the presence of cartels after the crackdown with the location of oil pipelines and find that cartels entering new territories led to lower electoral competition and higher levels of violence and crime. Finally, I provide a case study to illustrate state capture in new territories.

1 Introduction

An estimated 13% of the population, or 80 million people, in Latin America live under criminal governance[1] (Uribe et al. 2021). This is a grave problem for citizen well-being in the region. Latin America is the most violent region of the world despite having no active civil conflicts—it has less than 10% of the world's population but makes up 35% of all homicides—and this violence is driven primarily by criminal organizations (COs)[2] (Muggah and Aguirre 2018; Rettberg 2020). Moreover, research in the region has also highlighted the negative impact COs can have on democratic accountability in their strongholds, particularly at the local level (Arias 2017; Trejo and Ley 2020; Albarracín 2018; Córdova 2019; Bullock 2021).

In response, governments across Latin America have increasingly turned to heavy-handed law enforcement policies to combat COs (Flores-Macías and Zarkin 2021). Despite these government crackdowns, over the past two decades COs in Latin American continue to expand their operations to new territories (Garzón et al. 2013; Arratia Sandoval 2016; Stahlberg 2022; Zaitch and Antonopoulos 2019). In Mexico, "cartels"[3] went from having presence in about 5% of Mexican municipalities before 2006 to operating in over 25% of municipalities by 2017.[4] Yet, existing research has primarily focused on studying COs in their historical strongholds, for example, in Rio de Janeiro, Brazil, Medellin, Colombia, Kingston, Jamaica, and Michoacan, Mexico. Given the negative impacts COs can have on democratic accountability and citizen well-being in their strongholds, investigating the impacts of CO expansion is critical.

Organized crime expansion is puzzling both because it is occurring precisely during periods of government crackdowns and because scholars have argued that COs cannot operate or exist without some degree of state protection, cooperation, or collusion (Reuter 1985; Gambetta

[1] Criminal governance is defined as "the imposition of rules or restrictions on behavior by a criminal organization" (Lessing 2021, 3)

[2] I use the term criminal organization (CO) as opposed to terms more recently introduced by some political scientists like "organized criminal group" given the long history of the term in criminology, economics, and sociology (e.g. see Lampe (2021)). I also use "organized crime" to refer to criminal organizations, or the organizations involved in organized crime.

[3] Generally, I use the term criminal organization (CO) when speaking broadly, "Mexican cartel" or "cartel" when speaking specifically about Mexican COs, and "drug cartel" when discussion Mexican COs prior to the government crackdown when they were specialized drug trafficking organizations.

[4] See Data section for details on these figures.

1993; Arias 2017; Durán-Martínez 2017; Trejo and Ley 2020), which they often lack outside of their historical strongholds. For this reason, it has long been argued that organized crime expansion is extremely hard and rare (Reuter 1985; Gambetta 1993). Indeed, research on mafias in Europe and the United States has found that their expansion has not been a result of strategic choices but rather a byproduct of migration waves and government policies that relocate convicted mafia members (Varese 2006, 2011; Scognamiglio 2018; Dipoppa 2021). The questions thus follow: Why do cartels expand beyond their historical strongholds and what explains where they go? Moreover, what implications does cartel entry into new territories have for local democratic accountability and citizen well-being?

In this paper, I question the longstanding prevailing theory that COs are profit-maximizing actors, and instead argue that they care about both maximizing profit and minimizing risk. I use this novel framework to explain why government crackdowns against drug trafficking organizations, or "drug cartels," can push them to expand beyond their strongholds. Specifically, I argue that government intervention in the drug trade through a "drug war" can increase the risk of investing in the drug market, and to counterbalance this increased risk, drug cartels diversify their activities to spread the risk across various investments. To the extent that lucrative new business opportunities can only be exploited in territories outside of their strongholds, diversification may push drug cartels to expand to new territories. I further argue that in order to establish their presence and operate with some degree of impunity in new territories, cartels seek to capture local politicians by exploiting electoral incentives and interfering with democratic processes.

To test this theory and its implications I turn to Mexico. However, studying the political and criminal consequences of organized crime is difficult due to a lack of data on organized crime and because where COs move is not random. I go beyond the conventional wisdom and examine the political consequences of expansion by creating a novel dataset on the geographic presence of COs in Mexico, and leveraging (i) a temporal shock (War on Drugs) that pushed Mexican drug cartels to diversify their activities and expand beyond their historical strongholds and (ii) geography (new business opportunities) to identify where these cartels moved.

I first provide qualitative evidence that Mexican drug cartels quickly began diversifying following the 2007 government crackdown and that all cartels turned to stealing refined oil products from underground pipelines. Importantly, oil pipelines are geographically fixed and most run through territories where cartels did not operate prior to the government crackdown. Thus, cartels had to expand to territories with oil pipelines to exploit this market.

To investigate expansion and its consequences empirically, I create a novel dataset on where Mexican cartels operated at the local level per year between 2000 and 2017 (Sobrino, Marco Alcocer, and Signoret 2022). To create this dataset we scrape over 1.3 million articles from Google News using municipality-cartel pairs, use a convolutional neural network (CNN) to discard irrelevant information, and then use natural language processing to extract the location each cartel was operating in per year. The resulting dataset identifies whether cartels were operating in a given municipality per year.

Using data the georeferenced location of the pipelines and information on federal operations against drug trafficking, I estimate a staggered spatial difference-in-differences and find that the government crackdown led cartels to expand, and particularly, to target that expansion to territories with oil pipelines. Using a conservative model, I find that cartel presence doubled in municipalities with oil pipelines after the crackdown when compared to other municipalities.

I then exploit this targeted expansion following the crackdown to estimate the effect that COs have on local democracy and citizen well-being. More precisely, I instrument the presence of cartels with the location of oil pipelines after the crackdown. Using data on local elections in Mexico, I find that cartels depress local democratic accountability by reducing electoral competition and the number of candidates running for office. Following the argument that capturing the local state apparatus allows COs to establish their operations, I also estimate the effect that cartels have on crime and violence using the same empirical strategy and find that they increase violence, theft, kidnapping, and drug dealing.

Finally, I illustrate an instance of state capture through a qualitative case study of a municipality with oil pipelines in Central Mexico that saw cartel intrusion following the crackdown. The case study builds credibility in the consequences of expansion proposed by

the theory and estimated by the quantitative analysis and adds nuance through a real-world example.

These results as a whole demonstrate that heavy-handed government crackdowns can have unintended political consequences by pushing COs to extend their tentacles beyond their strongholds and depress democratic accountability in the places they expand to. This also deteriorates citizen well-being by increasing crime and violence.

The main contributions of this paper are threefold. First, it questions the longstanding theory of COs as profit-maximizers and provides a new way of understanding COs. This framework has the potential to provide new important insights about COs. Second, it analyzes the determinants and pattern of CO expansion. While there exists a large body of work investigating the violent repercussion of government crackdowns against COs (Calderón et al. 2015; Osorio 2015; Dell 2015; Lessing 2017; Castillo and Kronick 2020; Trejo and Ley 2020; Barnes 2022), the literature has given much less attention to other consequences, such as expansion, facilitating recruitment for prison gangs (Biondi 2016; Wolf 2017), worsening human rights abuses (Flores-Macías and Zarkin 2021), and increasing the militarization of police and policing (Flores-Macías and Zarkin 2021). This project also contributes to burgeoning literature on organized crime expansion, including the nascent literature on mafia-style COs expanding internationally (Varese 2011) and subnationally (Moro and Villa 2017; Scognamiglio 2018; Dipoppa 2021) in Europe. This paper complements this growing literature by focusing on cartels and looking at the developing world. This study also contributes to a related set of studies exploring how positive market shocks can cause COs to expand (Sobrino 2021) and how globalization has aided organized crime diversification and expansion (Shelley 1995; Naim 2010). Finally, this paper investigates the consequences of COs in territories outside their strongholds, which is an novel endeavor (with the notable exceptions of Scognamiglio (2018) and Dipoppa (2021), who study this topic in Italy).

More broadly, this paper also provides an interesting case that parallels the literature on the resource curse that links natural resources like oil to rebel groups, civil wars, and undemocratic practices (see Ross (2015) for an overview of this extensive literature). Here oil attracts and fuels a different type of non-state actor, COs, and leads to less democratic accountability and

higher levels of crime and violence.

The paper proceeds as follows: The following section presents a theory of CO expansion and its implications. I then introduce the Mexican case and provide background information. The paper then turns to examining the pattern of CO expansion prompted by the crackdown and evaluating the consequences of CO expansion. I then present a case study illustrating state capture. Finally, the conclusion summarizes the findings and discusses some broader implications of the paper.

2 A Theory of Government Crackdowns and Organized Crime Diversification and Expansion

Over the past 15 years, Mexico cartels experienced a major transformation, evolving from being primarily drug traffickers to what I call criminal enterprises, or criminal organizations systematically involved in a diverse set of activities. At the same time, cartels went from having presence in about 5% of Mexican municipalities before 2006 (those central to the drug trade) to operating in over 25% of municipalities by 2017.

In this section, I present a theory detailing how government crackdowns can unintentionally prompt COs specialized on drug trafficking, or drug cartels, to diversify their activities and expand their presence beyond their historical strongholds. Looking at the territories cartels expand to, I then present expectations about the political consequences and the implications for citizen well-being.

2.1 Theoretical Framework

I draw on modern portfolio theory (MPT) (Markowitz 1952) to understand the economic incentives of COs.[5] MPT focuses on analyzing contexts where economic actors seek to invest their capital in one or more assets. The different activities an actor invests in and the degree of investment in each activity is called a portfolio. Generally speaking, to optimize investments, MPT argues that the goal of building a portfolio should be to minimize risk,

[5]The argument is presented descriptively in this section, and formalized in the Appendix.

or *the variation of expected returns*, for a given level of return. Under this framework, high expected returns are desirable while uncertainty over returns is undesirable. I extend this theory to COs. Under this framework, drug cartels face the choice of keeping their portfolios concentrated in drug trafficking or diversifying them to include other activities.

While the argument that drug cartels, and COs more generally, care about risk is novel in academia, anecdotal evidence suggests that they do make decisions like investors, considering profit and risk. For example, during a court hearing in New York in 2018, Jesus Reynaldo Zambada, an important leader of the Sinaloa Cartel arrested in 2008, "pointed out that when the Sinaloa Cartel buys tons of drugs... it does so with a pool of investors. The expenses, profits and risks are divided among all" (Hernández 2019, 102). He added:

> For the Sinaloa Cartel [investing together] is the way to strengthen and protect the investors' capital, and at the same time make them financially powerful... If you are investing 9 million to get a total of 45, the profit is very, very important... [but] If something is lost, divided among the investors each of them loses a small amount. (Hernández 2019, 102).

Separately, Fernando Gaxiola, lawyer for Vicente Zambada Niebla, a Sinaloa Cartel leader arrested in 2009, explained on behalf of his client that:

> The drug trafficking game is a high-risk investment game like the stock market. If you win, you win a lot and immediately, if you lose, you don't recover until the next risky investment... [Sinaloa Cartel leaders] jointly invest for the purchase and transportation of [drugs], if the operation is successful they share the millions in profits, if not, they share the losses. (Hernández 2019, 89).

While these accounts are of investment decisions in drug trafficking, they point to the calculus that goes into decisions about profits, risks, and investments within COs and provide credibility to the novel framework proposed here. It is important to note that this framework continues to assume that COs seek to maximize profit, albeit while considering risk as well, and is therefore consistent with our existing understanding of COs as profit-maximizers.

2.2 Drug Wars and Risk

As specialized organizations with concentrated portfolios, drug cartels invest in a single activity with extremely high returns—the drug market is the most profitable illicit market in Mexico and in the world (May 2017). Under low government enforcement against drug trafficking, specializing in drug trafficking means that expected returns are maximized and the risk is minimal, and drug cartels therefore face minimal incentives to diversify.

I argue that intensified government intervention in the drug trade through a crackdown can increase the risk of operating in the drug market. Government crackdowns against drug trafficking, commonly known as "Drug Wars" or "War on Drugs", can take different forms, but generally involve intensified law enforcement efforts against drug cartels and drug trafficking. In Latin America, crackdowns have increasingly involved heavy-handed militarized approaches (Flores-Macías and Zarkin 2021).[6] A crackdown means that drug cartels are more likely to lose drug shipments, precursor drugs, clandestine laboratories, illicit crops, traffickers, among other assets, which increases the probability that investments in the drug trade are negatively impacted. This increases the volatility, or risk, of drug profits.

Note that these changes are about *risk* and not *profit*. In fact, looking at Mexico, Castillo and Kronick (2020) theorize that government crackdowns increase profits for drug cartels because interdiction reduces drug supply, which increases drug prices for consumers. More broadly, Caulkins and Reuter (2010, 247) note that extreme changes is drug availability due to crackdowns in different countries have been associated with temporary increases in drug prices in consumer countries in a handful of cases. Interestingly, the existing theoretical framework that understands COs as profit-maximizers cannot explain why drug cartels would diversify during crackdowns when they see increasing drug profits.

2.3 Criminal Diversification and Expansion

Under government crackdowns, drug cartels face a new choice set: Continue specializing in drug trafficking while accepting high risk, or diversify and significantly reduce risk by

[6] See Appendix for a discussion on crackdowns, including contextualizing different types of crackdowns and scope conditions for the theory proposed here.

accepting lower expected returns. Unless a drug cartel is unaffected by risk and is a complete risk-taking actor, crackdowns can create strong incentives for them to diversify.[7]

But what activities are cartels most likely to turn to when seeking to diversify? The theoretical framework suggests that cartels are incentivized to seek activities whose returns are uncorrelated or negatively correlated with the returns of drug trafficking so that if drug profits decrease at any given moment, returns from the other activity(s) remain steady or even increase, effectively minimizing risk.

Generally speaking, activities cartels diversify to can be categorized as capital intensive or non-capital intensive. Most non-capital intensive activities, such as extortion, protection rackets, loan sharking, kidnapping for ransom, drug dealing, property theft, prostitution, and illegal gambling, among others, are not geographically constrained and can be carried out almost anywhere. In contrast, more profitable capital intensive activities requiring sophisticated capabilities are often geographically restricted, and can only be exploited in certain places. For example, illegal mining, illegal logging, wildlife trafficking, human smuggling, and oil theft.

An important implications is that if cartels want to enter and exploit geographically fixed activities, they need to purposefully target their expansion to territories where these activities can be fully exploited. In this case, cartels face strong incentives to expand beyond their strongholds in search of these new business opportunities.

2.4 Consequences of Cartel Expansion

Successful criminal expansion is puzzling because scholars have long argued that COs depend on localized factors, including social embeddedness, reputation, knowledge, and ability to monitor agents and collect reliable information (Reuter 1985; Gambetta 1993). A key factor highlighted by a growing body of work on Latin America is that COs cannot survive or operate without some degree of state protection, cooperation, or collusion (Arias 2017;

[7] I emphasize, however, that drug trafficking remaining such a lucrative market despite the increased risk means that drug trafficking will remain a key, if not the key, component of their new diversified portfolios. In other words, incentives push cartels to invest in new activities *in addition to* drug trafficking, rather than pushing them *away from* drug trafficking.

Durán-Martínez 2017; Trejo and Ley 2020). Yet, when COs expand to territories where they have never operated, they often do not count with the political protection or local networks they have successfully established over decades, or centuries, in their historical strongholds. For these reasons, scholars have long believed that CO expansion is extremely hard and rare (Reuter 1985; Gambetta 1993), and is why most existing research study COs in their strongholds.

This need for state protection explains why COs often actively seek to capture politicians in their strongholds (Buonanno, Prarolo, and Vanin 2016; De Feo and De Luca 2017; Daniele and Dipoppa 2017; Alesina, Piccolo, and Pinotti 2019; Albarracín 2018; Dipoppa 2021; Arias 2017; Durán-Martínez 2017; Trejo and Ley 2020). Capturing politicians can provide COs with state protection because politicians can affect, through formal or informal channels, whether or how policies are implemented. For example, depending on the context, politicians may have the power to appoint high-level civil servants such as the chief of police, treasurer, or comptroller, influence the hiring of police and prosecutors, allocate funds strategically, affect police investigations, and give insider knowledge about intelligence and operations to COs.

In democracies, the literature has found that election cycles play a key role in the pursuit of state capture by COs because electoral incentives are essential for politicians (Buonanno, Prarolo, and Vanin 2016; De Feo and De Luca 2017; Daniele and Dipoppa 2017; Alesina, Piccolo, and Pinotti 2019; Albarracín 2018; Trejo and Ley 2020; Dipoppa 2021). Whether we assume politicians are policy or office-oriented, politicians seek to win elections and COs can provide their preferred candidate an electoral advantage by using coercion against rival politicians (Alesina, Piccolo, and Pinotti 2019; Trejo and Ley 2020), or providing electoral benefits to their preferred candidates (Buonanno, Prarolo, and Vanin 2016; De Feo and De Luca 2017; Albarracín 2018). This has significant implications for the mechanisms and the timing of state capture: Election cycles provide a window of opportunity for COs to capture politicians.

What, then, are the consequences of CO expansion to new territories? I argue that to protect their operations in new territories, like in their strongholds, COs seek to capture local

politicians by exploiting electoral incentives and interfering with democratic processes. If a CO is able to capture a politician in a new territory, they are then able to establish their presence and carry out their activities with some degree of impunity and state protection. The observable implications being that COs should reduce local electoral competition and increase levels of crime and violence when entering new territories.

3 Government Crackdown and Cartel Diversification in Mexico

This section introduces the Mexican case and presents background information on the temporal shock (War on Drugs) and the new business opportunity (oil theft) to identify a systematic pattern of expansion that I leverage in later sections to estimate the effect of COs on political and criminal outcomes.

Organized crime in Mexico was historically composed of a handful of large drug cartels whose primary source of income was drug trafficking. These cartels specialized in supplying the US market with illicit drugs, and operated in regions central for drug cultivation, production, and trafficking. On December 11, 2006 the newly elect President Calderon declared war against cartels and deployed 6,500 military troops and federal police to the state of Michoacán. Throughout the next few years federal operations against drug trafficking followed across the country, with approximately 45,000 members of the federal forces deployed by 2011 (Calderón et al. 2015). This policy, colloquially referred to as the Mexican War on Drugs, significantly intensified the efforts of both federal and state forces in fighting cartels and drug trafficking (Trejo and Ley 2020). Data from the Secretary of Defense (SEDENA) and the Attorney General's Office (PGR) show that drug seizures and the number of investigations of federal drug offenses[8] increased dramatically following the government crackdown (See Appendix Figure A2), suggesting that these counter-drug operations increased the risk of drug trafficking.

[8] not including drug possession for personal use

3.1 Cartel Diversification

To provide evidence that the crackdown prompted cartels to diversify, I conduct a systematic review of over 100 documents tracking cartel activity between 2000 and 2012, including academic articles, government reports, expert reports, investigations by journalists, and news reports. Through these documents, I attempt to identify (i) what activities each cartel entered, and (ii) when they first entered each activity. The list of the sources, documentation process, and full results can be found in the Appendix, including a table summarizing the results (Appendix Table A1).

The evidence shows that all cartels began quickly diversifying following the government crackdown, though there is heterogeneity in the diversification strategies across cartels. First, all cartels quickly turned to some form of non-capital intensive activity, with the most prevalent being extortion, theft, kidnapping for ransom, and drug dealing. However, I find important differences in the degree of diversification to these non-capital intensive activities. Second, all cartels also turned to capital intensive activities, with some turning to migrant smuggling and trafficking, illegal logging, or looting mines.

One key finding is that oil theft, in particular, proved to be a key capital intensive activity that almost all cartels turned to soon after the crackdown. I therefore focus on oil theft to explore the geographic implications of cartel diversification more rigorously. See Appendix for a historical account of oil theft in Mexico that describes *how* cartels entered the oil theft business.

3.2 Oil Theft

Oil theft entails stealing refined oil products, such as gasoline and diesel, from underground pipelines and selling them to local buyers. The pipelines and oil products belong to Pemex, the state-owned petroleum company, who oversees over 17,000 kilometers of pipelines passing through almost 400 municipalities in 24 of its 31 states plus the federal district. To highlight the extend of the oil theft problem, the Federal Government reported that in 2018 Pemex registered an average loss of 55,981 barrels[9] of oil products from oil theft *per day* (Ramirez

[9]One barrel contains 42 gallons, so 55,981 barrels translates to 2,351,202 gallons.

2021).

Oil theft is not an obvious activity for cartels to get involved in, nor is it obvious why they chose to include it as an essential component of their diversified portfolios as opposed to other activities. Cartels had built a tight relationships with the oil industry for decades but never entered the oil theft market until after the crackdown (Pérez 2012). The theoretical framework presented in this paper sheds light on this puzzle: the expected returns were high and negatively correlated with those of drug trafficking.

First, oil theft provided high expected returns. To give some idea about its profitability, Pemex reported annual losses from oil theft to be $1.79 billion USD in 2016, $2.86 billion USD in 2017, and $3.68 billion USD in 2018 (Solis 2018). According to Pérez (2017), stolen refined oil products are usually sold at half their price and cheaper when they are sold wholesale. A rough estimate thus places the upper value of the oil theft market at about $800 million to $1.84 billion USD per year between 2016 and 2018. High returns is not enough to explain cartel entry into oil theft, however, as Mexico is a middle income country with innumerable possible lucrative business opportunities.

Most importantly, the expected returns for oil theft are negatively correlated with those of drug trafficking both in price and geographically. Using data on the price of gasoline in Mexico and the price of wholesale drugs (heroin and cocaine) in the US from 2000 to 2017, Figure 1 shows that there is no correlation between cocaine and gasoline prices, and there is a negative and statistically significant correlation between heroin and gasoline prices. In addition, prior to the crackdown cartels had minimal presence in municipalities with oil ducts, with less than 6% of municipalities with oil pipelines having cartels presence prior to 2007.[10] To provide more systematic evidence, I calculate the distance from each municipality to an oil pipeline and regress this distance on the presence of cartels prior to the crackdown. Results (Appendix Table A5) show that the coefficient is negative and statistically significant. This suggests that the government's crackdown against drug trafficking likely had minimal spillover effects on oil theft operations, at least in the short to medium term until the government readjusted strategies.

[10]See Data section for details about the measure of cartels presence at the municipality level.

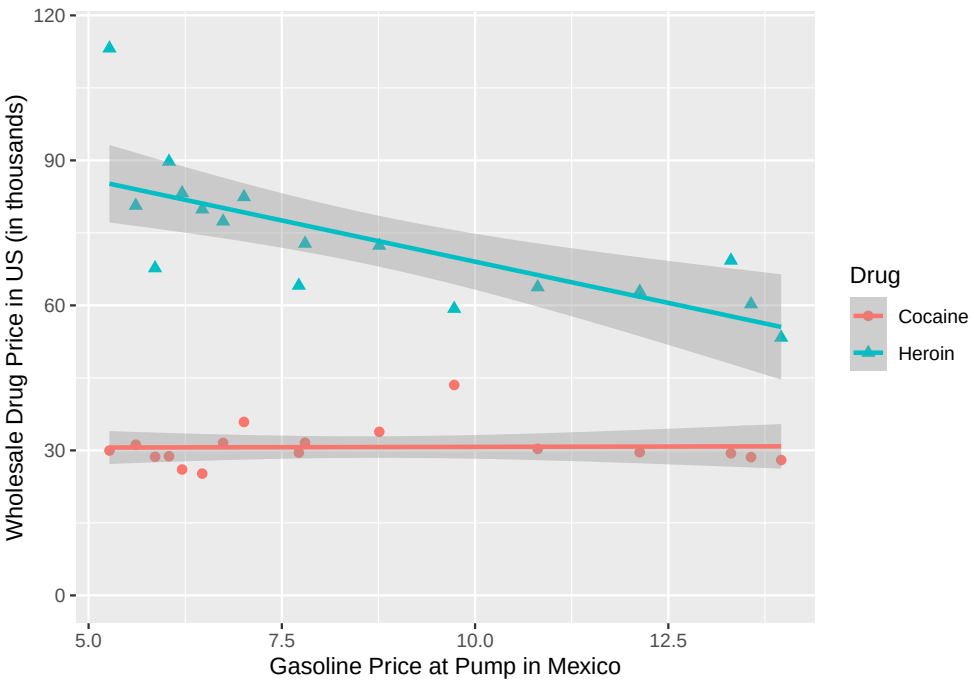

Figure 1: Figure shows correlation between wholesale cocaine and heroin prices per kilogram in the US, in constant 2016 USD, and domestic gasoline prices per liter at the pump in Mexico from 2000 to 2016. Data on drug prices are from UNODC and gasoline prices from Pemex.

3.3 Geographic Implications

Oil theft can only be perpetrated in specific places: municipalities with oil pipelines. Moreover, oil theft is a capital intensive activity that requires building local networks and specialized knowledge. For one, the location of the oil pipelines is confidential, as the Mexican government categorizes this information as part of its national security. Therefore, knowing their exact location as well as when refined products flow through the pipelines (refined products are not transported through pipelines continuously) requires insider information from local Pemex personnel. Stealing oil from pipelines also requires expert knowledge about how to safely tap pipelines as it is very high risk to do so without this knowledge. Additionally, "Pemex allocates millions of dollars to its pipeline monitoring systems, which verify their safety and operation in real time with all kinds of technology" (Pérez 2012, 355), making capturing local Pemex employees essential.

Oil theft also requires developing the local logistical capacities to transport, store, and distribute the oil in large quantities throughout neighboring territories by acquiring warehouses, storage tanks, tanker trucks, and workers, among others. Cartels also need to establish a local network of buyers—effectively building demand—that often includes clandestine gas stations, official gas stations, local businesses like mechanic shops, and large businesses like factories and transportation companies. Thus, to fully exploit this market, cartels needed to operate in places with pipelines. Yet, prior to the crackdown cartels had minimal presence in municipalities with oil ducts.

Figure 2 plots number of oil theft incidents from pipelines between 2000 to 2018 in states with important cartel presence[11] versus states with no or marginal cartel presence[12] in early 2007. By showing the trends and separating them by states with and without cartel presence during the first quarter of 2007 we can see where these activities increased after the crackdown and to what extent. The plot shows a that oil theft increased gradually following the crackdown, albeit more quickly initially in states with preexisting cartel presence, and subsequently in

[11] Aguascalientes, Baja California, Baja California Sur, Campeche, Coahuila, Chiapas, Chihuahua, Durango, Guerrero, Hidalgo, Jalisco, Michoacan, Nayarit, Nuevo Leon, Oaxaca, Quintana Roo, Sinaloa, Sonora, Tabasco, Tamaulipas, Veracruz, and Yucatan.

[12] Colima, CDMX, Guanajuato, State of Mexico, Morelos, Puebla, Queretaro, San Luis Potosi, Tlaxcala, and Zacatecas.

states that did not have cartel presence prior to the crackdown. This suggests that cartels first began expanding to places with oil pipelines that were geographically closer to exploit this market, and then started expanding to states where they had previously not operated to further exploit this market. The slow and gradual increase in oil theft incidents following the government crackdown is also consistent with the capital intensive nature of the market, that is, that cartels did not have the immediate capacity or knowledge to fully exploit this market, and had to build it over time.

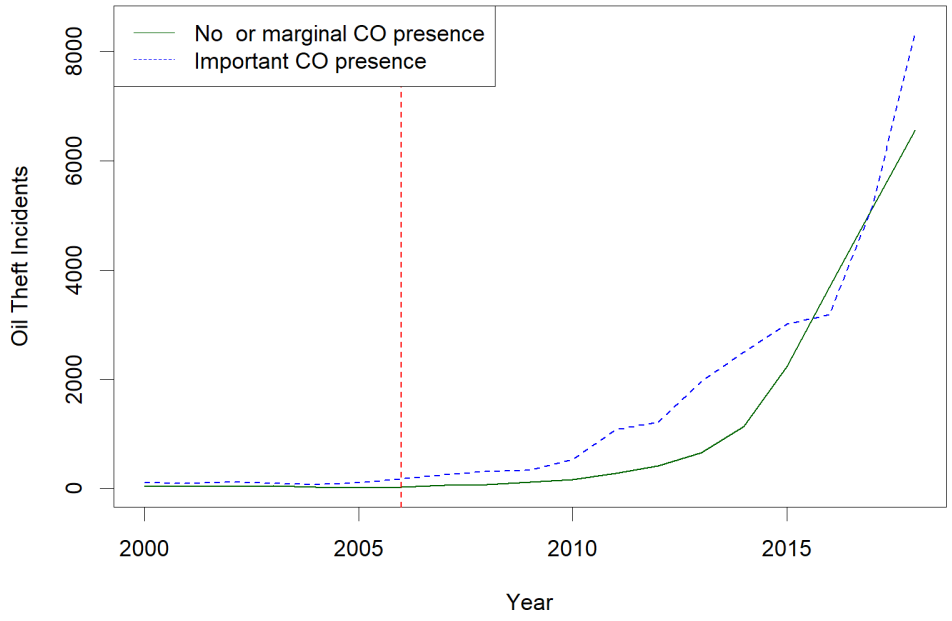

Figure 2: Number of oil pipeline theft incidents from 2000-2018 in states with no or marginal cartel presence versus states with significant cartel presence during the first quarter of 2007. Data on oil theft incidents come from Pemex. Data on state-level cartel presence during the first quarter of 2007 comes from MCO (see data section for details). During the first quarter of 2007 there were 9 states and one federal district with no or marginal cartel presence and 22 with important cartel presence.

The expectation, therefore, is that we should observe cartels expanding their presence to territories with oil pipelines following the government crackdown. I use data on cartel presence at the local level and the location of the oil pipelines[13] to provide descriptive

[13] see Data section for details

evidence of this pattern. Figure 3 shows the mean cartel presence in municipalities with and without oil pipelines. The raw data suggests that cartels expanded significantly after the government crackdown, and that they seem to have targeted that expansion to municipalities with oil pipelines more than other places. This provides preliminary evidence that cartels did strategically target their expansion as a result of the crackdown. I explore this more systematically in latter sections.

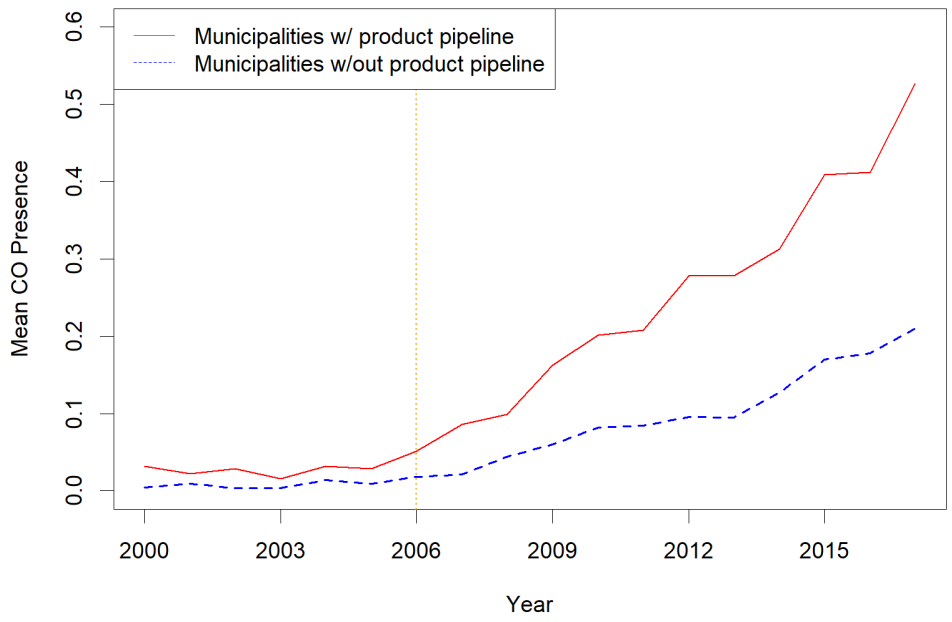

Figure 3: Average CO presence in municipalities with and without oil pipelines. Solid red line shows mean CO presence in municipalities with oil pipelines, whilblue dashed line shows mean CO presence in municipalities without oil pipelines. Original data created by author. See Data section for details on data on CO presence.

4 Data

4.1 Organized Crime Presence

Studies of organized crime, especially in Latin America, have been limited by the availability of high-quality systematic data on COs. In Mexico, there did not exist a list of all cartels or systematic data on their geographic presence at the municipal level past 2010. The Mapping Criminal Organizations (MCO) project addresses this gap by producing a series of novel datasets on cartels in Mexico. The most relevant for this project include the population of cartels and their geographic presence at the municipality level from 2000-2017 (Sobrino, Alcocer, Farfan-Mendez, Signoret 2021). For this project, I focus on the main cartels in Mexico: Cartel de Sinaloa, Cartel del Golfo, Cartel de Tijuana, Cartel de Juarez, Cartel de Milenio, los Zetas, La Familia Michoacana, Los Caballeros Templarios, Cartel Jalisco Nueva Generacion, and the Beltran Leyva Organization. Figure 4 visualizes this data for three years to illustrate the temporal patterns. While not visualized here, I also include the geographic presence of 28 small COs as a control in the section examining the political and criminal consequences of CO expansion.[14]

The algorithm to create this dataset is the following. First, a web crawler is used to scrape Google News Mexico. Google News is a news aggregator that watches more than 50,000 news sources worldwide. Google does not provide the number of sites it tracks for the Mexican version but through the scrape we identified 770 local, 33 national, and 83 international media outlets that report in Spanish. This web crawler looked for any articles between 1990 and 2017 that contained a municipality-cartel pair.

The web crawler collected every article whose main body mentions: i) a Mexican municipality and ii) the name of one of the nine major Drug Trafficking Organizations in Mexico. The number of articles found by the crawler are 1,201,483. We used a sentence extractor to keep the sentences from this articles that included a municipality-cartel pair. If the article

[14]Small COs: CIDA, Cartel Nueva Plaza, Cartel Santa Rosa de Lima, Mazatlecos, La Barbie, Los.Pelones, La Barredora, Guerreros Unidos, Los Tequileros, La Mano con Ojos, Los Chamorros, Cartel del Centro, Los Granados, Los Rojos, Cartel de Tlahuac, Los Metros, Fresitas, Los Rojos-Tampico, Los Dragones, Vieja Escuela, Talibanes, Jose Pineda, Los Tena, Guardia Guerrerense, El Gallito, La Resistencia, Los Teos, Los Rojos-Ciclones-Cardenas, La Union de Leon.

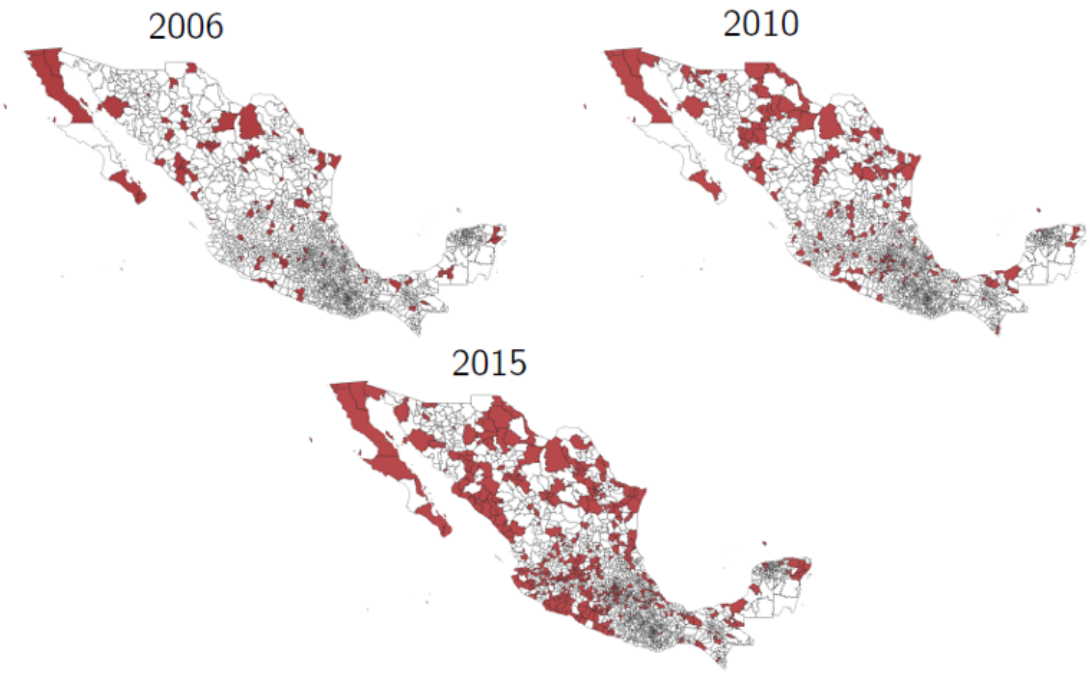

Figure 4: Cartel presence in 2006, 2010, and 2016. Data from MCO Mexico.

contained a year I assign the event to that year, if no year was assigned I use the publication year. The number of sentences that we analyzed are 2,802,224.

Next, we manually classified 5,000 sentences as either presence or not to train a semisupervised convolutional neural network (CNN). We use 80% of this sample as the training set and 20% as the test set. A CNN is a deep learning set of algorithms usually used for image classification but had proven effective in text classification (Kim 2014; Young et al. 2017). The CNN works as follows. Sentences are first broken into words, then transformed into a word embedding matrix. Then several filters are applied that constitute of different word window sizes that go over each sentence. This is followed by a discretization operations that reduce dimensionality of the output. This produces the final sentence representation that is classified. The particular CNN used here has an out of sample classification accuracy of 0.86. In order to validate this data set for cartel presence, we use two datasets that also use news articles to measure cartel presence and DEA aggregated data by state.

4.2 New Business Opportunity

To measure where the new lucrative activity of oil theft from oil pipelines can be fully exploited I use the georeferenced location of the pipelines. Pemex does not make the georeferenced location of the pipelines public since the federal government considers it a matter of national security. However, through freedom of information requests, Carto Critica, a Mexican think tank, has obtained the georeferenced location of the pipeline network. While they do not make the shape file available, I use high definition images to georeference the national pipeline network. This network includes product pipelines that transport refined oil products used by individuals and companies like gasoline and diesel and crude oil pipelines that transport crude oil. Using the cartographic information for municipalities made available by INEGI, I determine which municipalities have a crude pipeline and which have product pipeline. For the main estimation, I use product pipelines since these carry refined products valuable for cartels. I use the location of crude oil pipelines as a placebo test following the main results since crude oil is worthless to COs.[15]

Figure 5 shows the geographic location of product and crude oil pipelines. In total, Pemex oversees over 17,000 kilometers of pipelines passing through almost 400 municipalities, including 5,213 km of crude oil pipelines and 8,946 km of product pipelines. Product and crude oil pipelines were constructed prior to the 2000s and before cartels were involved in oil theft.

4.3 Government Crackdown

The government crackdown against drug trafficking did not affect all territories at the same time. Instead, the federal government began operations across states at different times (SEDENA 2012). The main objective of these operations were drug eradication, drug interdiction, and arrest of high-level drug traffickers. Operations also varied in how they were implemented, from being directly led by federal troops to regional commands where federal forces coordinated efforts with state and local level governments.

I use official documents from the Secretariat of National Defense (SEDENA) and the executive

[15]See placebo test section for more information.

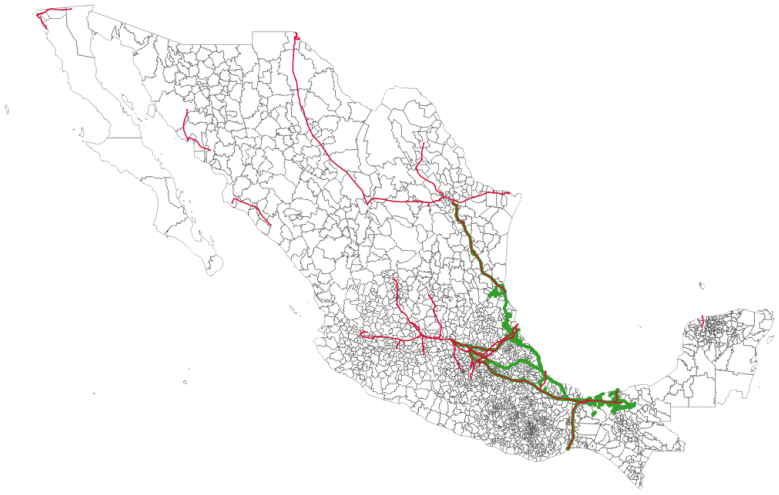

Figure 5: Geographic location of oil pipelines. Red lines show product pipelines. Green lines show crude oil pipelines. Data from CartoCritica.

branch that recorded each operation against drug trafficking between 2006 and 2012 to identify when these operations began in each state. Table 1 shows the years that operations against drug trafficking began in each state.

Year Begin	State
2007	Baja California, Campeche, Chiapas, Chihuahua, Durango, Guerrero, Jalisco, Michoacan (Dec. 2006), Nayarit, Nuevo Leon, Oaxaca, Quintana Roo, Sinaloa, Sonora, Tabasco, Tamaulipas, Veracruz, Yucatan
2008	Aguascalientes, Coahuila, Hidalgo, San Luis Potosi, Zacatecas
2009	Colima, Mexico City, Guanajuato, Morelos, Puebla, Tlaxcala
2010	Baja California Sur
2011	Mexico State

Table 1: Year that operations against drug trafficking–the government crackdown–began in each state. Source: Informe de Gobierno 1, 2, and 3 (2007, 2008, 2009), Sedena (2012).

4.4 Local Democratic Outcomes

The main observable implications of the theory are that COs attack local democratic institutions in attempts to capture politicians. We should thus expect to see lower local-level electoral competition. To measure local electoral competition, I use municipal election results

for mayors between 2007 and 2017 from Magar (2018). Municipal elections are held every three years, the timing varies across states, and they follow plurality rules. To operationalize electoral competition, I first calculate the winning margin, which ranges from 0 (perfect competition) to 1 (no competition). Another common measure of electoral competition is the number of candidates that run in a given election, particularly in a country like Mexico where dozens of political parties exist at the local level and where many candidates run for local office each election. I thus also use the number of candidates for local office (mayor) to measure electoral competition.

4.5 Crime and Violence

The theory further implies that COs are able to successfully establish their activities due to state capture. As a result, we should observe increased levels of criminality in territories COs expand to. To measure criminal activities, I use data on the number of extortions, kidnappings, and property theft at the municipality level come from Mexico's National Public Security System (SNSP), and include the time period from 2011 to 2017. While data aggregated at the state level that was used in previous sections exists prior to 2011, data disaggregated to the municipality level is only available starting in 2011.

Additionally, I follow existing work that uses drug-related hospitalizations as a measure of drug consumption to proxy for local drug markets (Ríos 2015). I use hospitalization records from the Mexican Department of Health to get the number of patients treated for drug use-related reasons in each municipality from 2010 to 2017. This dataset includes both public and private hospitals and clinics, and records all hospital visits due to marijuana, opiate (including heroin), and cocaine use for reasons including overdoses, intoxication, withdraws, rehabilitation, mental or behavioral disorder, treatment, and other health-related reasons. I aggregate this data to a municipality-year unit of observation.

Finally, official data on homicides related to organized crime are only available between December 2006 and September 2011. I therefore rely on homicide data from INEGI to expand the period of analysis. Specifically, I use the homicides of young men (15-39 years old) as a proxy for homicides related to organized crime from 2007 to 2017. These homicides have been

found to correlate highly–both temporally and geographically–with organized crime-related deaths (Calderón et al. 2015).

4.6 Covariates

First, oil pipelines often connect urban places and tend to travel close to, or along roads. To account for this, I calculate the road density of each municipality. I use the National Network of Roads, which geocodes the location of highways and roads in Mexico, and the cartographic information of each municipality–both made available by INEGI–to calculate the road density of each municipality.[16]

A potentially important covariate is the price of gasoline. Fluctuations in the international price of oil is often used to show the effect of oil on outcomes including economic development, regime type, violence, and corruption. A worry would be that steep increases in the price of oil, especially around 2007, could explain why cartels diversified into oil theft. In Mexico this is not a concern because fuel (gasoline and diesel) is subsidized: the prices for consumers are controlled by Pemex and do not depend on international prices of oil so there is very little fluctuation across time and space. This has resulted in a steady increase in prices throughout the past two decades without any steep increases or fluctuations. Nevertheless, I control for this using data from Mexico's Secretariat of Energy on the price of low octane gasoline (Magna)[17] at the pump in constant 2015 pesos per liter.

Another potential covariate could be that oil pipelines run through territories that are valuable for drug trafficking. Since territories closer to the US-Mexico border tend to be the most valuable for drug trafficking, and thus most valued by cartels, I measure the distance of each municipality to the US-Mexico border and include it as a covariate. I also include a dummy for municipalities along the US border, which are most valuable for trafficking drugs into the US as well as a dummy for municipalities with commercial ports, which are crucial for importing precursor chemicals that cartels use to produce drugs. Data on the location of ports are from the National Port System published by Mexico's Secretariat of Infrastructure,

[16]Road density is equal to the length of roads in a municipality (km) divided by the area of a municipality (kmˆ2).

[17]In the United States this would be comparable to regular gasoline.

Communications and Transportation.

Finally, Mexico made major reforms to the energy sector in 2013 and 2014. Some experts have speculated that these reforms may have made the hydrocarbon sector more attractive for cartels. In the Appendix I discuss the energy reforms in detail, but here it suffices to clarify that the reforms allowed private companies to bid for contracts in the exploration and extraction process, which did not affect any of the incentives presented here. Gasoline and diesel prices remained controlled and subsidized, and prices were not allowed to vary by gas station until November 2017.

5 Cartel Expansion: Empirical Strategy

To test the hypothesis that cartels targeted their expansion to municipalities with pipelines following the government crackdown, I employ a staggered difference-in-differences (DiD) strategy using data from 2000 to 2017. In the model, I assign the municipalities with product pipelines to the treatment group and without pipelines to the control group, and I set the start of the treatment as the year that the federal government began operations against drug trafficking in each state as part of the War on Drugs. This treatment timing varies from 2007 to 2011. Once a unit is treated it remains treated.

This specification compares organized crime presence in municipalities with and without oil pipelines before and after the government crackdown affected their state. If specific assumptions are met, this strategy allows us to estimate the causal effect of the government crackdown on organized crime expansion into territories with pipelines. The main assumption of identification under DiD estimation is that the control and treatment groups have parallel trends in the outcome before the treatment period. The trends can be seen in Figure 3, and show that this assumption holds.

One of the primary reasons I argue that the parallel trends assumption is especially strong is that the location of the product pipelines is orthogonal to CO presence since they were installed prior to 2000—before the illicit oil market emerged, before COs were involved in the oil market, before COs had presence outside of limited regions, and before drug cartels had

diversified away from drug trafficking in any meaningful way. Yet, they were not installed in a random or as-if random manner, just as highways are not randomly located, so treating the pipelines as such is not appropriate. The DiD approach is thus appropriate because identification using DiD does not require assignment to treatment to be random or orthogonal to the outcome. Yet, I argue that the location of pipelines being orthogonal to the outcome provides additional confidence in the results.

An important substantive concern, however, is that organized crime could have been following a straightforward expansion strategy where they moved to territories bordering those where they already operated, as the literature on Mexico seems to suggest (Calderón et al. 2015; Dell 2015).[18] If cartels were already operating close to or in territories adjacent to those with product pipelines, they could have expanded to these territories for reasons other than stealing oil. This outward expansion strategy could perhaps explain the main results.

This substantive concern also raises an important methodological concern: spatial spillover effects. Due to the spatial nature of expansion, a concern with the data-generating processes is non-independence of units and spillover effects. This implies spatial spillover, or spatial interference, where unit i's outcome is affected by the outcome of its neighbors. Methodologically, the DiD estimator assumes units are independent of each other (part of SUTVA), an assumption that does not always hold when there is possible spatial interference, also referred to as spillover effects (Delgado and Florax 2015). If unit i's outcome is being influenced by unit j, then the DiD estimate could be biased as it may be capturing both the direct effect of the treatment and the indirect effect of its neighbors.

To test for spatial autocorrelation of the cartel presence variable, I conduct the commonly used Moran's I test for spatial dependency, which estimates how unit i's value at time t is correlated with the values of its neighbors at $t-1$ (Moran 1948). Moran's I statistic ranges from -1 (perfect dispersion) to 1 (perfect clustering of units with equal values). Running this test on the data on cartel presence gives a test statistic of 0.13 with a p-value < 0.001, confirming that some spatial interference is present in the data on cartel presence.

To account for this spatial interference and control for outward expansion, the main DiD

[18] See Appendix for a review of these arguments.

strategy employed is a spatial DiD that estimates both direct and indirect effects. I do so by using the spatial autoregressive model (SAR), which accounts for spatial spillover by modeling the spatial interference in the regression analysis (Anselin 2001). SAR does this by controlling for the average outcome of observation i's neighbors $j \in \Phi$ at time $t-1$. That is, for each municipality I determine its contiguous neighbors–the municipalities it shares borders with, calculate the mean outcome of these neighbors at $t-1$, and use this measure as a control in the regression (by lagging this variable I assume that the outcome of the neighboring municipalities last year might affect this year's outcome). The spatial DiD is as follows:

$$\begin{aligned} cartel_{it} =& \alpha_i + \tau_t + \rho cartel_{\Phi(t-1)} + \gamma_1 pipeline_i + \gamma_2 crackdown_{st} \\ &+ \delta_{DiD}(pipeline_i * crackdown_{st}) + \gamma_3 X_{it} + e_{it} \end{aligned} \tag{1}$$

where the outcome variable $cartel_{it}$ denotes either the total number of cartels or a dummy variable indicating presence for municipality m in year t. This way I estimate both the intensive and extensive margins of organized crime presence. $cartel_{\Phi(t-1)}$ is the mean outcome for unit i's neighbors Φ at time $t-1$. In this model ρ estimates the indirect effect of the treatment on unit i (the spatial interference) while δ_{DiD} estimates the causal effect of interest. $crackdown_{st}$ is a dummy variable whose value is a 1 starting on the year that federal operations against drug trafficking began in each state, s, and 0 otherwise. The variable $pipeline_i$ takes on a value of 1 if a municipality has a pipeline and 0 if it does not. Finally, X_{it} denotes the controls and α_i and τ_t are municipality and time fixed effects. Standard errors are clustered at the municipality level.

The main coefficient of interest is δ_{DiD}, which estimates the average treatment effect on the treated (ATT), tells us the effect that the crackdown had on cartels expanding to territories with pipelines. The coefficient ρ is also of interest, since it captures contiguous expansion–the spillover effects.

I use three different estimators to estimate Equation 1. First, I use a two-way fixed effects (TWFE) interaction model to estimate the standard DiD that applied researchers are most familiar with. However, recent scholarship has shown that the DiD estimate from TWFE can

sometimes be a weighted average of underlying causal treatment effects, making it difficult to interpret the coefficient directly, and may be subject to some bias (Goodman-Bacon 2021; Sun and Abraham 2021; Callaway and Sant'Anna 2021; Athey and Imbens 2022). To account for this, I also estimate the DiD using the approaches suggested by Sun and Abraham (2021) (herein SADiD) and Callaway and Sant'Anna (2021) (hererin CSDiD). Following CSDiD, I employ the doubly robust unconditional DiD given that the raw data show parallel trends. A limitation of this approach is that covariates can only be incorporated to create covariate-specific parallel trends, not to control for or estimate their coefficients. I therefore also estimate the SADiD, which is based on a dynamic TWFE regression and does allow for the integration of covariates since, unlike CSDiD, their "estimation method can be cast as a regression specification" (Sun and Abraham 2021, 177).

It's important to note the spatial specification is conservative as it likely underestimates the direct effect of product pipelines on cartel expansion because it assumes that all of the indirect effect on municipality i by its neighbors, Φ, is due to spatial spillover. In other words, it assumes that if a municipality with a product pipeline running through it has contiguous municipalities with organized crime presence, organized crime presence in the treated municipality is partially due to spatial spillover. Yet, it could be that organized crime expanded to this neighboring municipality not because it was adjacent to their territory but specifically because it has a product pipeline.

5.1 Results

Table 2 shows the main results using the cartel dummy as the outcome measure. Columns (1)-(2) present the results using TWFE, columns (3)-(4) present the results using SADiD, and column (5) presents the results using CSDiD. Columns (1), (3), and (5) do not use the spatial lag of cartel presence in neighboring territories while (2) and (5) do. Results using the number of cartels in a municipality as the outcome are included in the Appendix and show the same results. All models use cluster robust standard errors. Figure plots the dynamic average treatment on the treated of the crackdown on municipalities with oil pipelines before and after the government crackdowns with 95% confidence intervals estimated from model 5

in Table 3.

Table 2: Table shows main DiD results using a cartel dummy as the outcome measure. Models 1 and 2 estimate the DiD using TWFE, models 3 and 4 use the method proposed by Sun and Abraham (2021), and model 5 uses the estimation method proposed by Callaway and Sant'Anna (2021).

	Cartel Dummy				
	TWFE		SADID		CADID
	(i)	(ii)	(iii)	(iv)	(v)
Crackdown*Pipeline	0.152***	0.119***	0.139***	0.106***	0.138***
	(0.016)	(0.015)	(0.017)	(0.017)	(0.017)
Spatial Spillover		0.370***		0.356***	
		(0.019)		(0.020)	
Covariates	Yes	Yes	Yes	Yes	No
Municipality fixed effects	✓	✓	✓	✓	
Year fixed effects	✓	✓	✓	✓	
Observations	43,974	41,531	43,974	41,531	44,208
R^2	0.412	0.447	0.419	0.452	

*p<0.1; **p<0.05; ***p<0.01
Robust standard errors are clustered at the municipality level.

First, the results support the two patterns of cartel expansion following crackdowns: expansion to contiguous territories *plus* targeted expansion to territories with lucrative new markets, in this case municipalities with oil pipelines. Specifically, the results show that spatial spillovers, or expansion to contiguous territories, are substantively and statistically significant. Estimates from Table 2 model (4) suggest that a one unit increase in the neighboring municipalities average cartel presence the year prior, $t-1$, is associated with a 0.356 increase in cartel presence for municipality i in year t. This is not trivial, quite the contrary, as the mean number of cartels per municipality after the crackdown is 0.127.

Moreover, the results all strongly support hypothesis that cartels targeted their expansion to territories with oil pipelines following the crackdown. Again, spatial models likely underestimate the effect of expansion to municipalities with oil pipelines as the spatial lag may capture some or all of the effect of contiguous expansion even if the contiguous expansion is due to pipelines being present in a neighboring municipality.

Nevertheless, I interpret the more conservative model (4) from Table 2, which estimates the effects of the crackdown on the presence of cartels in municipalities with oil pipelines. These estimates suggest that the crackdown nearly doubled the mean number of cartels in municipalities with oil pipelines after the crackdown compared to those without pipelines. The results together imply that a significant portion of cartel expansion was targeted to municipalities with pipelines.

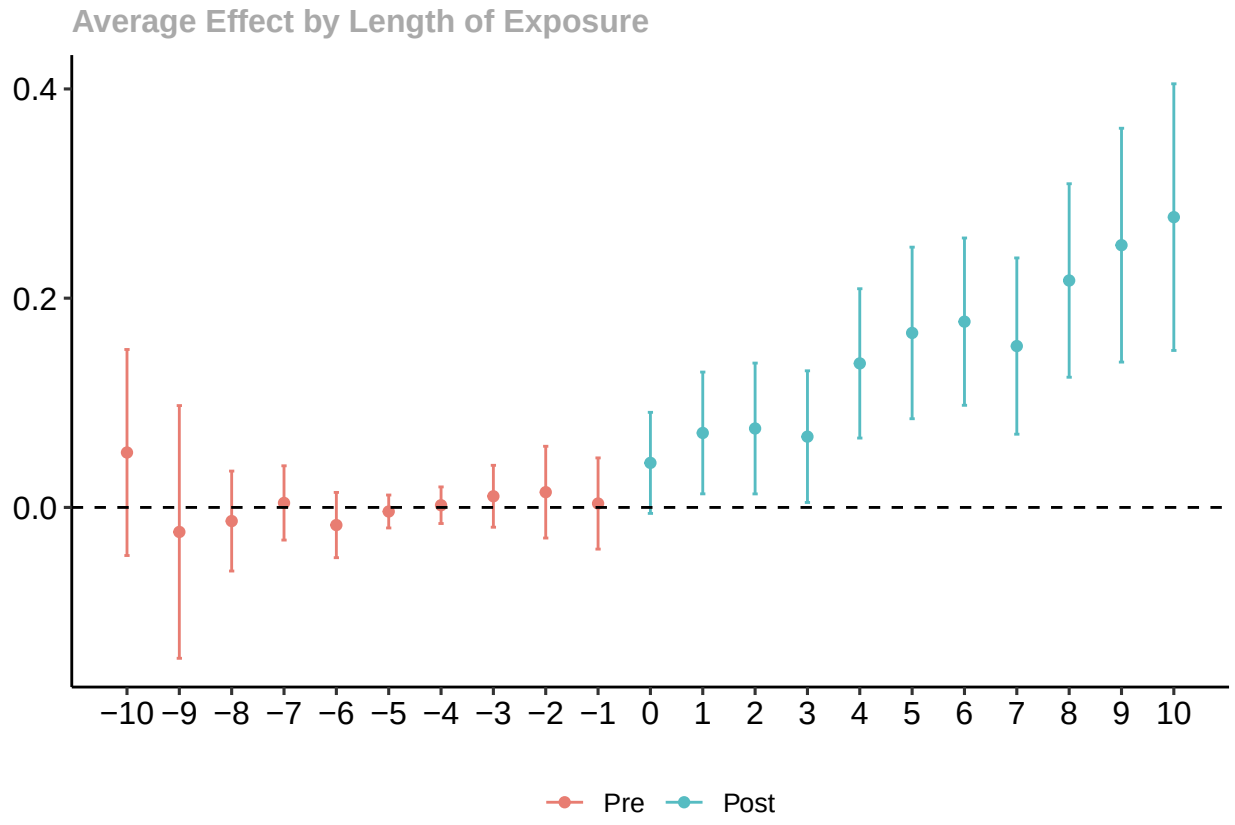

Figure 6: Results from model 5 in Table 4. Plot shows the dynamic average treatment on the treated of the crackdown on municipalities with oil pipelines before and after the government crackdowns with 95% confidence intervals.

5.2 Threats to Inference and Alternative Explanations

The baseline DiD provides evidence that supports the main hypothesis. Yet, certain methodological or theoretic concerns might remain that are unaddressed by the main specification.

Methodologically, one might worry that the results are driven by some third variable related

to where oil pipelines are installed and not pipelines themselves. In other words, places where oil pipelines are located, for some reason, might also be places that COs are attracted to for reasons other than natural resource theft. To address this concern I use crude oil pipelines, which are worthless to COs, as a placebo test to show that factors related to having pipelines are not driving the main results (see details in Appendix). Alternatively, organized crime could have expanded throughout the country for reasons other than new business opportunities and simply by chance moved to territories with pipelines more than other territories. To address this concern I use a Monte Carlo simulation to simulate CO expansion and see how likely it is that we observe the main point estimates due to chance. Results, shown in the Appendix, show that it is extremely unlikely that we see these results due to chance.

Theoretically, there are alternative explanations that might not be fully addressed by the DiD. First, it could be the case that sharp increases in oil prices around 2007 suddenly made oil theft a lucrative market to enter for cartels. The literature on the resource curse often uses shocks to the oil market to explain changing behavior of state or non-state actors. However, gasoline and diesel prices in Mexico were controlled and subsidized in Mexico during the time covered in this study. Appendix Figure A7 plots gasoline prices at the pump in Mexico from 2000-2017, showing that gasoline prices gradually increased year to year but without any sharp increases or fluctuations. However, the gradual increase over time does increase the value of the market, making it increasingly lucrative for COs once they diversified to it.

Second, the prevailing explanation for cartel diversification and expansion in Mexico is suggested, though not tested, by both Guerrero-Gutiérrez (2011) and Trejo and Ley (2020). Both studies suggest that drug cartels may "seek to diversify their revenues in order to sustain costly and prolonged wars" (Guerrero-Gutiérrez 2011, 38). This argument implies that we should observe the following: drug cartels going to war over drug trafficking and subsequently diversify and expand. Yet, the timing of criminal wars and diversification are inconsistent with this argument. Deadly criminal wars over trafficking routes began in the 1990s and intensified in the early 2000s (Trejo and Ley 2020, Ch. 2-5), with "Mexico's five major cartels... engag[ing] in six prominent turf wars between 1990 and 2006" (Trejo and

Ley 2018, 3). Trejo and Ley (2018, 2020) track the creation of military militias by cartels to fight criminal wars during this period and place them in 1990, 1993, 1995, 1998, and 2002. If criminal wars over trafficking routes was the main driver of diversification and expansion, we should observe cartels diversifying and expanding during the 1990s and early 2000s to fund their military militias and criminal wars. Instead, I find that drug cartels quickly diversified after the government crackdown, which began "[a]fter sixteen years of inter-cartel conflict" (Trejo and Ley 2020, 4). Nevertheless, it is very possible that the increasing number of wars between criminal organizations that began after the government crackdown likely exacerbated the incentives to diversify prompted by the crackdown.

Third, both scholars and policy circles have advanced the idea of the "balloon" or "cockroach" effect, where stronger enforcement in one place displaces them to other territories, that is, crackdowns cause displacement not expansion (Friesendorf 2007; Dion and Russler 2008; Windle and Farrell 2012; Bagley 2013). If the 2007 government crackdown in Mexico caused COs to migrate rather than expand, and their displacement targeted territories with lucrative new business opportunities, we would risk misinterpreting empirical results as expansion rather than displacement. Anecdotal accounts place doubts that this was the case in Mexico. Historical CO strongholds continue to be so, for example, Michoacan, Tamaulipas, Sinaloa, and Baja California, among others. However, to systematically examine the possibility, I calculate the percent of municipalities with CO presence before and after the crackdown, and find that 91.51% of municipalities that had CO presence between 2000 and 2006 also had CO presence between 2006 and 2012.

Fourth, cartel fragmentation is sometimes mentioned as the driving force of criminal diversification in Mexico. Some have suggested that it was cartel fragments, not drug cartels themselves, that diversified into other activities as they could not compete against drug cartels in the drug trade once they fragmented and were thus forced to move to territories where they could engage in other criminal activities. First, the qualitative evidence presented here shows that large drug cartels *did* diversify, and second, the evidence provided by this paper further shows that drug cartels expanded to places with oil pipelines as a result. Additionally, using data from the MCO project that tracks CO fragmentation from 2000 to

2018, I plot the temporal order of cartel fragmentation from 2006 to 2018 in Appendix Figure A8. The figure shows that, with one important exception, cartel fragmentation began *after* the crackdown, with the proliferation of smaller COs beginning in 2010, *after* drug cartels had already diversified their portfolios, not the inverse.

6 Consequences of Cartel Expansion: Empirical Strategy

In this section I exploit that COs expanded to territories with oil pipelines after the crackdown to test the hypothesis that COs negatively influence local democratic accountability and increase crime. Endogeneity is an important concern when studying the relationship between cartels and electoral outcomes, illicit activities, and violence. It might be that cartels choose to expand to places that have have less political participation, are more corrupt, have less political accountability, more crime, or that are more violent. If this is the case, simple linear regression would underestimate the effect of COs on political outcomes and crime. Moreover, the data generating process I propose follows from cartels expanding to places with product pipelines to cartels capturing local state officials, to COs establishing their activities in these territories.

To overcome endogeneity concerns and to follow the data generating process, I use an instrumental variable (IV) approach by instrumenting cartel presence with product pipelines *after* the government crackdown (2007-2017). To estimate the IV I rely on the two-stage least squares (2SLS) estimator. Formally, the first-stage equation models the relationship between pipelines and cartels presence:

$$cartel_{it} = \alpha_1 + \gamma_1 pipeline_i + \gamma_2 fragment_{it} + \gamma_3 X_i + \tau_t + e_{it} \tag{2}$$

where $cartel_{it}$ denotes a dummy variable indicating presence for municipality m in year t. $pipeline_i$ is a dummy variable denoting whether a municipality has a product pipeline or not, X_i denotes the municipality-specific covariates (logged population, log of employed

population, average education level, Gini coefficient, and road density), and τ_t are year fixed effects. Standard errors are clustered at the municipality level.

Additionally, as scholars have documented, Mexican cartels experienced a period of fragmentation after the crackdown where smaller cells that had operated under a larger parent cartel began operating independently (Guerrero-Gutiérrez 2011). Some of these smaller fragmented cartels are known to be involved in oil theft. As described in the identification section below, not including these COs in the regression would violate the exclusion restriction. To take this into account, I control for the geographic presence of these fragments in the IV specification, denoted by $fragment_{it}$.

The second-stage equation estimates the impact of cartel presence in territories with oil pipelines:

$$Y_{it} = \alpha_2 + \delta_1 \hat{cartel}_{it} + \delta_2 fragment_{it} + \delta_3 X_i + \tau_t + u_{it} \tag{3}$$

where Y_{it} denotes the different measures electoral accountability, crime, and violence, $\hat{cartel}_{it}$ are the fitted values from the first stage, X_i are the municipality-specific covariates, and tau_t are year fixed effects. Standard errors are clustered at the municipality level. The coefficient of interest is δ_1, which estimates the local average treatment effect (LATE) of cartels on electoral outcomes and crime.

Prior expectations are that the reduced form OLS coefficients will be smaller than the IV-2SLS coefficients for the following reasons. First, I expect most of the treatment effect to be driven by compliers, making the LATE bigger than the ITT. Second, if cartel presence is measured with some error, the IV-2SLS coefficients are likely to be larger than the OLS as an instrument can correct for the downward bias of measurement error (Lal et al. 2021).

6.1 Identification

Identification with IV relies on two primary assumptions, relevance and validity. Relevance is the assumption that the instrument predicts the main independent variable, or $\gamma_1 \neq 0$. In this case, it means assuming that oil pipelines predict the presence of cartels. While previous

sections of paper have provided strong evidence that this is the case *after the government crackdown of 2007*, the first stage of the IV directly tests this assumption. Table 3 shows that this assumption is met.

The validity assumption entails both unconfoundedness and the exclusion restriction. Unconfoundedness means that there are no confounder variables in the first stage and that conditional on controls, the instrument is uncorrelated with unobservables. The exclusion restriction assumption states that the instrument must only affect the outcome through the independent variable being instrumented. In this case, it must be that underground pipelines only affect criminal activity, cartel-related homicides, and electoral competition through cartels.

Unlike the first assumption, validity cannot be directly tested. Nevertheless, I provide substantive reasons for why it may hold and also conduct two placebo tests to build confidence in the instrument's validity. Substantively, the instrument is plausibly valid because oil pipelines run underground, were built decades before cartels turned to oil theft, their exact location are not public, and municipalities do not get any financial benefits or payments for having pipelines running through them.[19] Their location was also determined by a company owned by the national government, and thus municipalities did not self-select into having or not having pipelines, with their location being determined by the location of refineries and important logistical hubs, not socioeconomic factors.

Empirically, given that an instrument's validity cannot be directly tested, scholars may accidentally overlook some confounder or violation to the exclusion restriction. In this case, geographic instruments face the concern that they may be correlated with some geographic factor that violates the exclusion restriction and leads to pipelines being correlated with cartel activities. In applied work, placebo tests have become increasingly common to build additional confidence in the validity of the instrument. I rely on two placebo tests to build additional confidence in the instrument.

First, Lal et al. (2021) suggest a "zero-first-stage" test where a subsample of the population

[19]With the exception of municipalities with refineries, which do get financial benefits. I therefore exclude the six municipalities with pipelines that also have refineries from the analysis.

where the instrument is believed not to affect the treatment is used as the first stage. I do this by exploiting the timing of the crackdown by separating the sample into pre- and post-crackdown periods, with the expectation that the instrument, oil pipelines, only correlates positively with cartels presence after the crackdown began and not before. Second, I estimate the post-crackdown first stage using the location of crude oil pipelines instead of product pipelines to see whether they predict cartel presence. Crude oil pipelines provide an appropriate placebo test because they were built by the same company, Pemex, and their placement was also determined by the location of refineries and important logistical hubs. Importantly, however, crude oil pipelines were not lucrative for cartels, so we should not expect a correlation between them and cartels.

Table 3 presents the first stage of the IV, including both both placebo tests. Results show that oil pipelines only predict the presence of cartels *after* the government crackdown, not before, and that crude oil pipelines are not correlated with cartel presence after the crackdown.

6.2 Results

Table 3 shows the results for the first stage and the two placebo first stage tests: pre-crackdown sample and post-crackdown sample using crude oil pipelines. The table shows that only post-crackdown product pipelines predict cartel presence, with the F-statistic being 50.77. The first stage results provide evidence that the relevance assumption is met, and build confidence in the validity assumption. That is, there does not seem to be some third factor connecting the location of pipelines and cartels other than the theft of refined oil products from product piplines. The results for the reduced form are included in the Appendix. For space, I show results using the cartel dummy in this section and include those using the cartel count in the appendix. All results are consistent.

First, Table 4 shows the main results for the effect of cartels on democratic accountability. In short, results find that COs reduce electoral competition. Specifically, IV estimates suggest that Mexican cartels reduced the number of candidates running in local elections by seven candidates. This is a substantively large effect, as the mean number of candidates is 5.14. Cartels also reduced electoral competition, increasing the margin of victory for winning

Table 3: Cartel Presence and Oil Pipelines (First Stage). Column (1) shows placebo test using product pipelines prior to the government crackdown. Column (2) shows placebo test using crude oil pipelines after the crackdown. Column (3) shows the main results using product pipelines after the crackdown.

	Dependent variable:		
	Cartel Dummy		
	Pre-Crackdown (Placebo)	Post-Crackdown (Placebo)	Post-Crackdown
	(1)	(2)	(3)
Product pipelines	0.005		0.046***
	(0.004)		(0.008)
Crude oil pipelines		−0.005	
		(0.008)	
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	17,038	26,774	26,774

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

candidates by 0.33. These results provide evidence that cartels expanding to territories with oil pipelines began attacking local democratic institutions to capture the state.

Table 4: Cartels and Local Electoral Outcomes (Second Stage)

	Dependent variable:	
	Winning Margin	Num. of Candidates
	(1)	(2)
Cartel Dummy	0.331**	−7.204***
	(0.139)	(2.520)
Controls	Yes	Yes
Year FE	Yes	Yes
Outcome mean | Cartel = 1	0.134	5.867
Outcome SD | Cartel = 1	0.129	2.126
Observations	6,952	6,952

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

Second, Table 5 shows the main results of the second stage for crime and violence. As argued, cartels seek to capture the local state apparatus to establish their presence and operations. Results suggest that cartels in Mexico have successfully accomplished this, with all point

estimates being positive. That is, cartel presence in territories with pipelines is positively related with more violence and crimes, although the results for extortion are not statistically significant. The results are not only statistically significant, but also substantively meaningful. Looking at municipalities with cartel presence, IV estimates suggest that cartels increase homicides by 1.07 standard deviations (SDs), kidnappings by .5 SDs, drug use by 1.53 SDs, and theft by 1.25 SDs. These results suggest that cartels not only expanded their presence to territories with pipelines, but that they also exported other illicit activities to these territories.

In the appendix I also run the same model but using rates of crime and homicides per 1,000 people and without population on the right-hand side. The results are unchanged except for the drug hospitalization rate, which becomes statistically insignificant.

Table 5: Cartels and Crime (Second Stage)

	Dependent variable:				
	CO-related violence	Extortion	Kidnapping	Drug use	Theft (in thousands)
	(1)	(2)	(3)	(4)	(5)
CO Dummy	66.763***	2.097	2.987*	17.618***	3.783***
	(18.811)	(7.456)	(1.760)	(5.022)	(1.005)
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Outcome mean | Cartel=1	17.312	9.193	1.772	1.901	1.113
Outcome SD | Cartel=1	62.455	25.387	5.939	11.482	3.032
Observations	26,774	17,038	17,038	19,472	17,038

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

7 State Capture in New Territories: Case Study

The quantitative evidence presented provides evidence of the *implications* of state capture: COs impact democratic accountability and increase crime and violence in new territories. It does not, however, shed light on *how* state capture works. Drawing on qualitative data collection, fieldwork, and interviews with local actors,[20] this section provides a case study of a municipality in Central Mexico with oil pipelines that saw CO intrusion following the

[20]Fieldwork for this study was approved by the University of California, San Diego IRB Project #210532S.

crackdown.

7.1 Municipality "A"

Municipality "A" is an urban municipality in Central Mexico. In an interview, the director of municipal public security that served between 2003 and 2005 said that during his time there was no organized crime, with the biggest issues being auto parts theft and family disputes. At that time, they had never heard of "huachicol,"[21] and major crimes included occasional small-scale marijuana offenses and on rare occasion, small-scale cocaine offenses. In an interview, a member of the municipal council that served from 2006 to 2009 said that during their time on the municipal government public security topics were not covered in depth since there were no issues of organized crime.

The first evidence of CO presence in municipality "A" is in 2008 when a cell of La Familia Michoacana Cartel (LFM) entered the municipality and began operating there. Soon after, in 2009, it was clear that a cell from the Zetas had also entered and began operating in the municipality. In an interview, a high-level civil servant in the municipality's public security agency from 2008 and 2009 said that state and federal authorities began to inform him in 2008 that CO cells were entering the municipality. In 2009 he began receiving phone calls with death threats against him and his family from the Zetas, which pushed him to leave the public security agency out of fear.

In 2009, the newly elected municipal government created a public security commission whose job explicitly included topics related to organized crime. A high-level civil servant that worked for the municipal government between 2009 and 2011 said in an interview that by 2010 they clearly remember starting to hear about links between municipal civil servants and COs. In 2010, municipality "A" experienced its first assassinations of police officers by COs when two municipal police officers were killed during a shootout with Zeta members. The same year, a civil servant working in in municipality "A" from the State Attorney General's Office was assassinated in his home.

Around this time, oil theft by COs began to increase significantly in municipality "A". Oil theft

[21] Term used to describe oil theft by non-state actors.

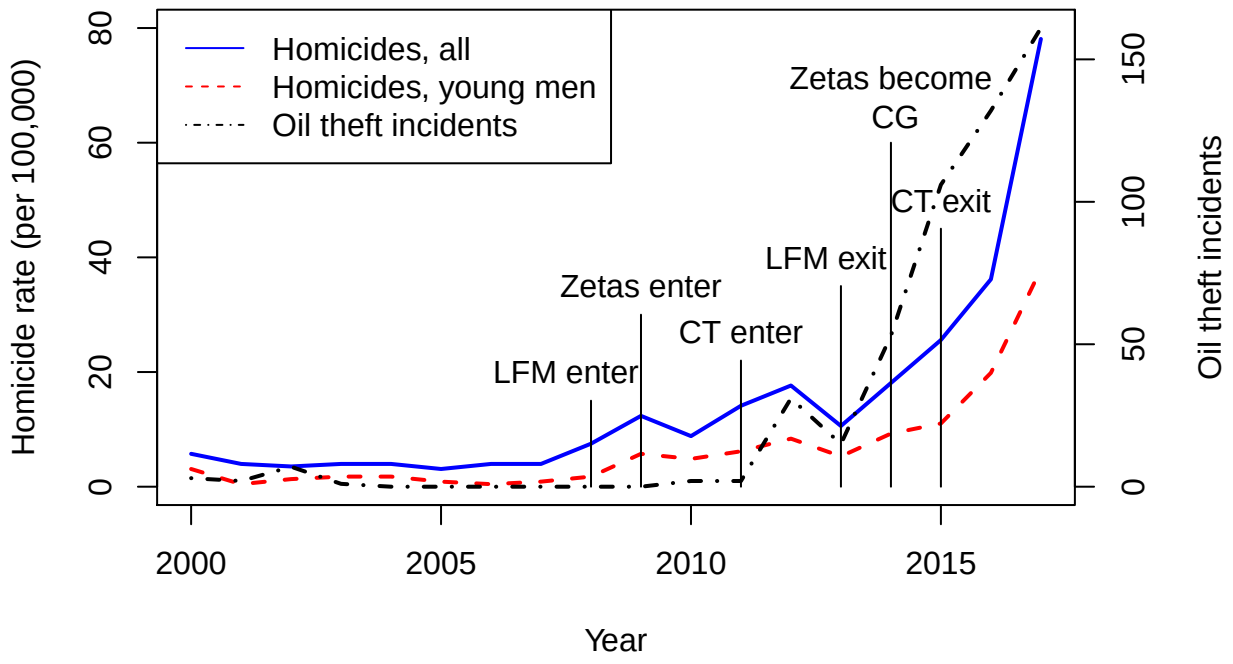

Figure 7: Municipality 'A' homicide rates, number of oil theft incidents, and CO entry and exit, 2000-2017. LFM = La Familia Michoacana, Zetas = Zetas, CT = Caballeros Templarios, CG = CG. Data on homcides comes from INEGI. Data on oil theft incidents is from Pemex. Data on COs was collected by author.

had been occurring for decades in municipality "A", though it was historically perpetrated by Pemex employees. This type of oil theft primarily included lower-level Pemex employees stealing refined oil products like gasoline and diesel from tanker trucks. This started to change when COs began stealing oil from pipelines. There are two versions, both of which could have happened simultaneously. First, in an interview, a local security analyst stated that around 2009, Pemex employees began to hire criminals (members of the Zetas cell) to help them steal, transport, store and sell the stolen oil products. However, as these criminals gained power, they eventually took the business for themselves and imposed themselves over the Pemex employees. The second more common account is that COs independently began seeking to enter the oil theft market by capturing Pemex employees.

In early 2011, the Caballeros Templarios Cartel (CT) fragmented from LFM and took over most LFM operations, though LFM continued operating in a much weaker state in municipality "A" until 2013. COs began intensifying their efforts to capture Pemex employees in their efforts to increase their involvement in the oil theft business. In 2012, the head of security for the Pemex installation in municipality "A" was assassinated in public. Months later, two additional Pemex employees were murdered by alleged cartel members.

In 2012, a new municipal government was elected. In an interview with an individual with direct knowledge of the event, soon after the new mayor took office, the mayor received a phone call from an alleged member of LFM threatening him. The mayor changed his phone number and began taking more security precautions.

In 2014, the Zetas cell that operated in several municipalities in and around municipality "A" and specialized in oil theft became independent, calling themselves CG.[22] During this time, a high-level civil servant in the municipal public security agency and the mayor stated that they began coordinating operations against oil theft with the military. In 2014, the mayor's bodyguard, a municipal police officer assigned to protect the mayor's family home, went missing while on duty. The bodyguard was found assassinated three days later with a gunshot wound to the head. According to the high-level civil servant in the municipal public security agency, this event was a message, " 'calm down or we come for you, for now we kill

[22] I omit the name of this group.

your bodyguard,' so we reduced [the operations] to the minimum, we stopped looking for huachicol."[23]

At the same time, three separate individuals that were interviewed, two co-partisans with the mayor that held positions in the local government, independently stated that during the 2012-2015 administration, high-level civil servants in the local government were involved with COs, including a civil servant in the treasury office. One of the interviewees provided the names of four high-level civil servants closely linked with a CO and oil theft activities and described their sudden unexplained enrichment. Two of these interviewees, in addition to another co-partisan civil servant that worked for the state's Attorney General's Office, claimed that the mayor was involved with "huachicoleros," with the other interviewee saying that they wanted to give the mayor the benefit of the doubt, and stated that the mayor was not directly working with a CO, but rather indirectly through an understanding that took the form of, "let us work and we let you work."[24]

Between 2016 and 2017, seven police officers were murdered by COs in municipality "A", including the director of the municipal police agency who was shot in public with over 60 bullets. In interviews, a Pemex engineer working at the municipality's Pemex installation since 2011 and a civil servant that served in the municipal government from 2018 and 2021 both claimed that during the 2015-2018 administration there was an explicit understanding between the municipal government and CG.

In 2017, evidence arose suggesting that Cartel Jalisco Nueva Generacion (CJNG) was extending its operations to municipality "A". In August 2018, CJNG published a video online formally announcing their arrival to municipality "A" and threatening CG.

This led to the CG and CJNG competing over state capture in municipality "A", which was aggravated by the 2018 local elections. Allegedly, given the ties that CG had been able to build with certain members of the local party machine that had ruled municipality "A" for more than two decades, CJNG sought to make agreements with opposition candidates. In an interview with a candidate from the ruling party who was running for a seat on the

[23]Quote translated by author.
[24]Quote translated by author.

municipal council in 2018, they recalled how, during a campaigning event at a local market, a man approached the party's mayoral candidate, shook his hand, and said "f*ck your mother, from El Mencho [leader of CJNG]."[25] The mayoral candidate left immediately and told the interviewee that he was done and did not want to continue as mayoral candidate. A few weeks later, one month before the elections, six municipal police officers were ambushed and killed by armed men in broad daylight. According to various individuals interviewed, this event marked the moment they realized the party would lose the election after more than two decades ruling municipality "A", which they did.

In 2020, a leader of CG stated in an interview with a local reporter:[26]

> If [politicians we know] run for mayor we support them with the campaign and everything, we tell them 'you'll support us when you're there, work with us.' Once they are there, well they support us but others don't. We tell them, 'we did this and that for you and you didn't work for us, work for us or else.' Here for example, the mayor of [redacted] didn't want to... [so] we kidnapped one of their cousins.

In a separate interview with a CG leader, when the reporter asks about the upcoming election and whether they had identified candidates working for the rival CO, the CG member stated, "Yes, yes, they are sponsoring their candidates, we are also sponsoring our candidates, and we already have located those who CJNG are sponsoring."

Ten days after the 2021 elections, the governor where municipality "A" is located stated:

> Enough with [COs] approaching the elected [mayors] to try to reach criminal pacts via bribery or intimidation. Some candidates have already had to suffer the arrival of an emissary from organized crime to request control of the municipal police, control over the directors of the transit agency, control over directors of public works.

After losing their political protection in 2018, by the end of 2020 CG was practically forced out of municipality "A" by CJNG.

[25] Translated by author: "Chinga tu madre, de parte del Mencho."
[26] I omit the sources of these interviews to not disclose the name of municipality "A".

8 Conclusion

Mexican cartels have significantly expanded their presence beyond their historical strongholds over the past two decades. Why do they expand and what explains where they go? Moreover, what are the consequences of this expansion for the territories cartels enter? I have argued that COs care about both profit *and* risk, and that intensified government intervention in the drug market through a crackdown can increase the risk involved in drug trafficking. This can incentivize drug cartels to diversify their portfolios as they seek to reduce the risk of their investments. Diversification can therefore push cartels to expand beyond their strongholds in search of new business opportunities. This, in turn, can have detrimental consequences for the places cartels move to.

Looking at Mexico, I have provided evidence that the government crackdown of 2007 pushed drug cartels to diversify. Using a novel dataset on cartel presence in Mexico, I have shown that this led cartels to expand beyond their strongholds, and specifically, to target that expansion to territories with lucrative new business opportunities. Moreover, I also find that this expansion had detrimental consequences for democratic accountability and citizen well-being.

Existing literature has largely focused on investigating the effects of crackdowns on violence, this paper demonstrates that considering the effects of such government policies beyond the use of violence is a promising new avenue of research. One conclusion that can be drawn from this paper is that heavy-handed government responses to COs may backfire and have detrimental *political* consequences.

Moreover, the theory presented by this paper provides policymakers and scholars with a novel framework to analyze the economic incentives of COs. Incorporating risk into our understanding of COs may uncover new insights that were previously puzzling. Of particular importance to political scientists is analyzing how government policies affect the behavior of COs, including understanding which activities they are involved in and its geographic implications. Understanding how government policies meant to combat organized crime can push COs to enter new markets and expand is both important and innovative, especially

given that tough-on-crime policies are increasingly common in Latin America.

Finally, while this paper focuses on one reason COs strategically expand, new business opportunities, this is likely just one contributing factor. Future research is needed to uncover additional factors that improve our understanding of organized crime expansion and its consequences. Studying the drivers and consequences of CO expansion is increasingly important, I argue, as COs in Latin America continue to expand their operations to new territories. However, there are likely many other consequences associated with CO expansion beyond those investigated in this study. Future scholarship would benefit from increasing its focus on investigating CO expansion and its consequences.

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10 Appendix

10.1 Modern Portfolio Theory and Organized Crime

The basic MPT setup is the following. Let us denote each activity a CO is involved in with i, and the CO's capacity to invest—their budget constraint—as ρ. A CO must decide how much to invest in each activity w_i, so that $\rho \geq \sum_i w_i$. Each activity has return r_i. Returns are a function of investment and profits: $r_i = \frac{profit_i}{investment_i}$. The returns r_i of each activity then, depend on how profitable it is.

To adapt it to COs I assume that the returns for each activity is a function of government intervention in that market g_i, so $r_i(g_i)$. I assume that r_i is decreasing on g_i. For example, in the drug market, g_i could entail actions such as drug seizures, illicit crop eradication, destroying clandestine laboratories, arresting suppliers of precursor drugs, among others. In other words, this means assuming that government intervention in different activities affects the returns of that activity.

Other forms of government intervention do not affect returns, but do affect how much a CO is able to invest into its portfolio, such that $\rho = \sum_i w_i - g_w$, where g_w denotes these types of government actions. These could include arrests, freezing of bank accounts, confiscation of assets, among others.

Importantly, because neither firms, investors, or COs know the future returns of any investment, these actors must base their actions on future expectations of returns. The expected return for a given portfolio $E(r_p)$ is given by $E(r_p) = \sum_i w_i E(r_i(g_i))$.

MPT defines the risk of a given portfolio as the variance of the expected returns $Var[E(r_p)] = \sum_i \sum_j w_i w_j Cov(E[r_i(g_i)], E[r_j(g_i)])$, which is the weighted average covariance of the expected returns across the different activities in a given portfolio.

The optimization problem faced by CO is therefore:

$$
\begin{aligned}
\min_{w} \quad & \sum_{i}\sum_{j} w_i w_j Cov(E[r_i(g_i)], E[r_j(g_i)]) \\
\text{s.t.} \quad & E(r_p) = \sum_{i} w_i E(r_i(g_i)) \\
& \rho \geq \sum_{i} w_i - g_w \\
& w_i \geq 0
\end{aligned}
\tag{4}
$$

Given information on budget constraints and data on returns for different activities, solving this optimization problem returns a set of portfolios that minimize the risk given a level of expected returns. This can be seen in the top left plot of Figure A1, which presents a stylized example of activities COs may choose to be involved in. The subset of these optimal portfolios that maximize expected returns for a level of risk is called the efficient frontier, and is represented by the red line in the top right plot in Figure A1. Portfolios under the efficient frontier are suboptimal since they do not provide the maximum expected return for a given level of risk. An economic actor seeking an optimal portfolio will therefore select one of the portfolios along the efficient frontier depending on their level of risk aversion.[27]

10.1.1 Drug Cartels and Low State Enforcement

The starting point in this paper is a context where governments do not strongly enforce the law against drug cartels or drug trafficking. With a concentrated portfolio, drug cartels expect returns $E[r_{drugs}(g_{drugs})]$ and are exposed to risk $Var[E(r_{drugs}(g_{drugs}))]$. Under low government enforcement against drug trafficking, g_i for $i = drugs$ and g_w are low and thus investment, $\rho(g_w)$, and expected returns for the portfolio, $E(r_p)$, are maximized and the risk is minimal.

[27]The single optimal portfolio chosen from the set of optimal portfolios along the efficient frontier by legal economic actors is selected by maximizing the Sharpe ratio, which takes into account risk-free assets like government bonds. However, these risk-free investments are not investments COs make, so this specific approach to selecting a portfolio from the efficient frontier cannot be implemented by COs.

In this situation, drug cartels face minimal incentives to diversify their portfolios, and even if they do, the efficient frontier shows that they will remain primarily drug traffickers with some minimal involvement in other activities. To see this, we can compare the expected returns and risk for each portfolio. For a drug trafficking-only portfolio, since g_i is low, risk $Var[E(r_{drugs}(g_{drugs}))]$ will also be low, and expected returns $E(r_{drugs}(g_{drugs}))$ will be high given that drug trafficking is so profitable. In the best case scenario where there is another activity with negatively correlated returns vis-a-vis drug trafficking, risk might be slightly lower in a diversified portfolio, but expected returns will be also be lower, $E(r_{diversified}(g_i)) < E(r_{drugs}(g_{drugs}))$, since the secondary activity has lower expected returns that drugs.

Thus, under low enforcement, a concentrated portfolio focused on drug trafficking has minimal risk and high returns in contrast to a diversified portfolio with equal or slightly lower risk but with fewer expected returns. In other words, a marginal increase in risk leads to higher expected returns if a drug cartel selects to invest the majority of its capital in drug trafficking. Thus, low enforcement allows drug cartels to concentrate their portfolios and maximize profits with marginal risk.

10.1.2 Changing Incentives: Government War on Drugs

Government crackdowns against drug cartels increase both g_i for $i = drugs$ and g_w. Since g_w simply affects a drug cartel's budget constraint, here I focus on g_{drugs}. Given Equation 4, the main implications of government crackdowns against drug trafficking, g_{drugs}, is increasing the risk of operating in the drug market.

The optimization in Equation 4 shows that expected returns for drug trafficking, $E(r_i(g_i))$ for $i = drugs$, depend on g_i. We can deconstruct the effect of g_i on drug cartels by looking at $r_i(g_i) = \frac{profit_i(g_i)}{investment_i(g_i)}$.

Increased government intervention in drug markets means that even if expected returns remain

constant or even increase, drug cartels are still more likely to lose drug shipments, clandestine laboratories, illicit crops, traffickers, among other assets. Uncertainty over the duration and intensity of the crackdown plus increased probability of losing drug shipments means that drug cartels may become uncertain about the stability of their revenue streams from the drug market in the medium to long-term. This implies that $Var[E(r_p(g_{low}))] < Var[E(r_p(g_{high}))]$. Given that risk is defined as $Var[E(r_p)]$, crackdowns may increase the risk associated with portfolios that only invest in the drug market.

10.1.3 Creating Criminal Enterprises: Diversification as a Response to Government Crackdowns

If a crackdown increases the risk of drug trafficking, drug cartels now face a different choice set: Keeping concentrated portfolios where they continue to specialize in drug trafficking after the crackdown means accepting a very risky portfolio. In contrast, selecting to diversify their portfolios and enter new activities can significantly reduce risk with only a marginal reduction in expected returns. That is, while $E(r_{drugs}(g_{high})) = E(r_{diversified}(g_{high})) + \epsilon$ where ϵ is a small positive quantity, $Var[E(r_{diversified}(g_{low}))] \ll Var[E(r_{drugs}(g_{high}))]$. In other words, diversifying means accepting slightly fewer expected returns in exchange for far more stable expected returns.

Unless a drug cartels is unaffected by risk and is a complete risk-taking actor, crackdowns against drug trafficking create strong incentives to diversify. The shifted efficient frontier means that the new diversified portfolio will thus be a combination of drug trafficking *plus* other activities. This shift in the efficient frontier is visualized in the bottom left plot in Figure A1.

Next is specifying what type of activities drug cartels are most likely to turn to when seeking to diversify. The framework presented here argues that drug cartels want to create efficient portfolios, which entails choosing which activities to diversify to and to what extent with the goal of maximizing expected returns while also minimizing expected risks *of the portfolio*.

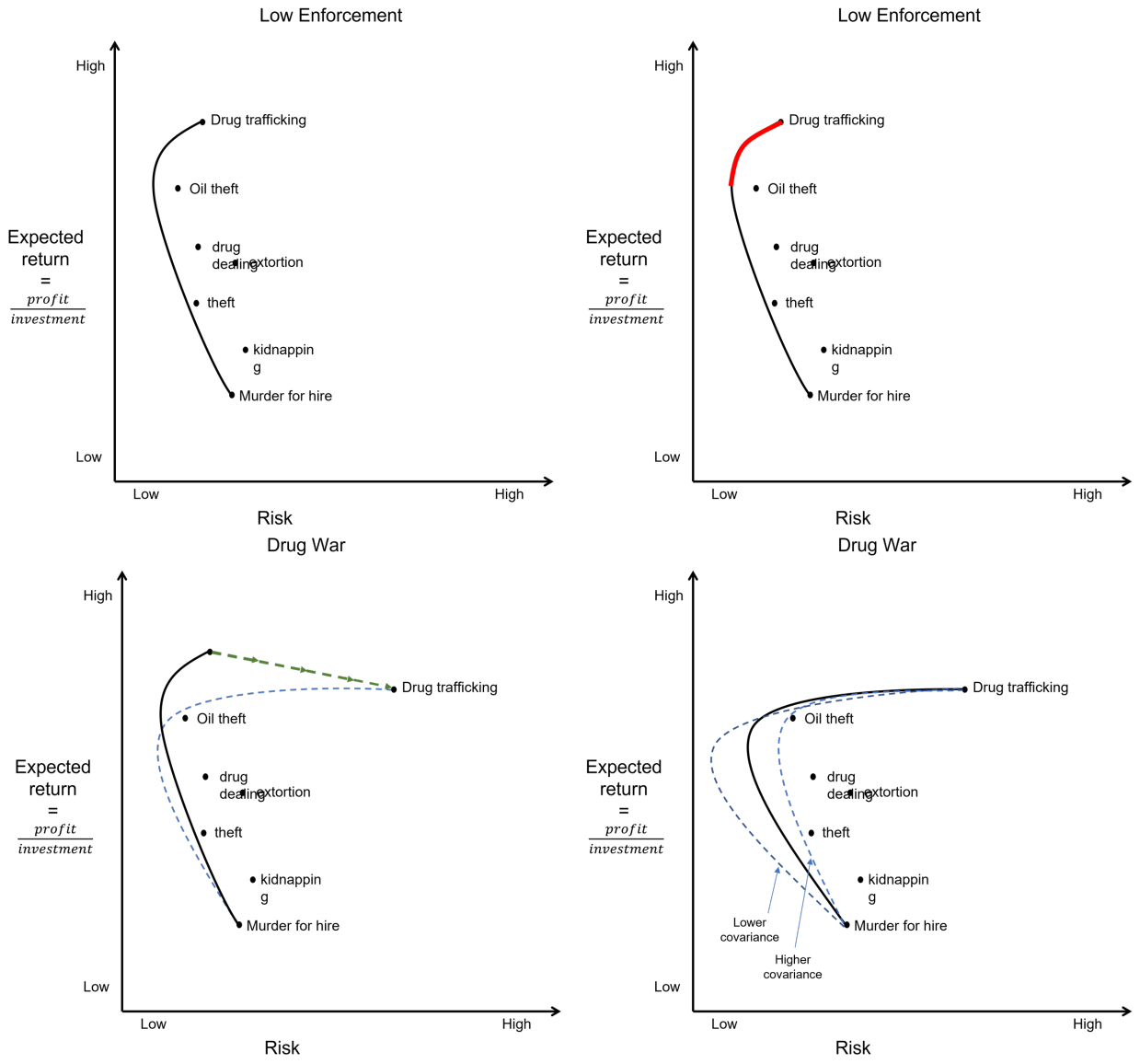

Figure A1: Stylized examples of different activities COs may choose to be involved in and the efficient frontier under various contexts. The top left plot provides an example of optimized portfolios under low enforcement (black line connecting murder for hire and drug trafficking). Top right plot shows the efficient frontier (in red) under low enforcement. Bottom left plot shows how government crackdowns against drug trafficking shifts the efficient frontier. Bottom right plot shows how different levels of covariance between the expected returns of activities changes the efficient frontier.

Given Equation 4, which other activities cartels decide to invest in depends primarily on (1) each activity's expected returns, (2) each activity's expected risk, and *most importantly*, (3) the covariance in expected returns between the new activity(s) and drug trafficking.

10.2 Contextualizing Crackdowns and Scope Conditions

It is important to note that crackdowns can take different forms. As the theory presented here suggests, the incentives for drug cartels to diversify are driven by crackdowns increasing the risk associated with drug trafficking. For example, the current crackdown in Mexico, as I argue in the following sections, fits this description.

However, crackdowns that take different forms and do not increase risk may not create the incentives proposed here. For example, other countries, like Brazil and Colombia, have at times relied on "conditional" crackdowns that selectively focus on drug cartels that use violence against the state and are meant to reduce violence, not drug trafficking (Lessing 2017). Likewise, certain crackdowns may focus on targeting drug cartels members, usually leaders, or their finances while remaining permissive towards drug trafficking. These more limited crackdowns may not create the incentives that push drug cartels to diversify their criminal activities.

Additionally, more narrow crackdowns that target drug trafficking but do not increase risk or increase it enough may also not result in the incentives outlined here. For example, Operation Condor in Mexico spanning from the mid-1970s to the mid-1980s targeted drug cultivation but was geographically restricted to the "Golden Triangle" region between the northern states of Sinaloa, Durango, and Chihuahua. This allowed drug traffickers to simply move parts of the drug cartels structure and activities to the nearby state of Jalisco and other states where they could freely operate, and thus did not face incentives to diversify.

However, there appear to be political incentives constantly nudging politicians towards adopting unconditional crackdowns like the current one in Mexico (Lessing 2017), perhaps

explaining why heavy-handed militarized approaches to combat crime and violence are becoming more common (Flores-Macías and Zarkin 2021). It is therefore important to understand the effects of these types of policies.

Moreover, while I focus on drug cartels, the theory likely applies to other specialized criminal organizations. For example, the Mexican government's crackdown against oil theft in 2019 reportedly pushed Cartel Santa Rosa de Lima and Sangre Nueva Zetas, two powerful criminal organizations specializing in oil theft, to significantly increase their involvement in other activities in their strongholds and nearby territories (Infobae 2019; Bhave 2019; Hernandez Estrada 2018).

10.3 Effects of Government Crackdown Against Drug Trafficking in Mexico

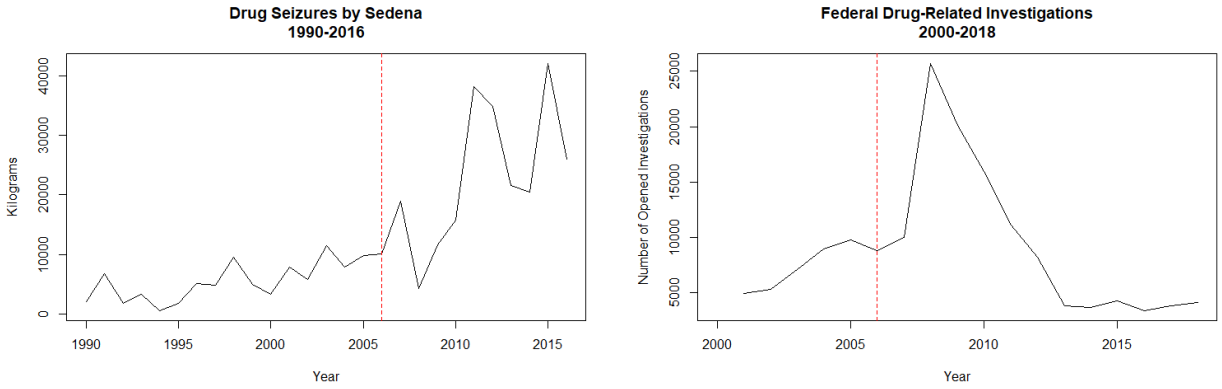

Figure A2: Plots show the time trends of drug seizures and investigations of federal drug crimes (not including investigations for drug possession). Drug seizures include amphetamine, pseudoephedrine, cocaine, opium gum, heroin, and methamphetamine. Data on drug seizures is from SEDENA. Data on drug investigations comes from Mexico's Attorney General's Office.

10.4 Drug Cartel Diversification in Mexico

This section presents the qualitative findings of cartels diversification.

10.4.1 Data Collection

I first sought to process all documents (reports, articles, maps, tables, charts) from official and expert sources that provided systematic information on cartels in Mexico from 2000 to 2012. By "systematic" I mean documents providing information on all cartels and for the entire country. I did this to get an initial general picture of the type of information available and identify gaps. We collected documents from two types of sources: U.S. and Mexican government agencies and non-government specialists or news media. There were 11 sources in total, from which I collected over 60 documents. The table below shows these sources.

After this process, I began searching for cartel-specific information through systematic internet searches. This process provided dozens of additional sources of information, primarily news media, NGO and expert reports, freedom of information requests, and academic research.

Source	Documents
Mexico attorney general's office	Five responses from the attorney general's office (*Procuraduría General de la República*, PGR) to freedom of information requests asking for lists Mexico's drug trafficking organizations or major criminal groups and their areas of presence: • Report on 7 cartels. Response to folio 0001700012307 (responded 19 Feb 2007); information undated but refers to events at least through Jan 2007. • Report on 7 cartels. Response to folio 0001700108207 (responded 27 Jun 2007); information undated but refers to events at least through April 2007. • Report on 8 cartels and 80 cells. Document SJAI/DGAJ/5211/2013 related to folio 0001700001913 as published by *Contralínea* June 2013[1]; information dated 25 Mar 2013. Available directly from PNT through folio 0001700221713 (responded 22 Nov 2013). • Report on 9 cartels and 43 cells. Response to folio 0001700202114 (responded 12 Sep 2014); information dated May 2014. Same list provided at least nine additional times through March 2015 and reported as new by some newspapers. • Report on 9 cartels and 36 cells. Provided in response to over 50 requests from July 2015 through at least 2018. First response found on the freedom of information platform is to folio 0001700240615 (responded 15 Sep 2015). Initial responses dated the information 30 Jun 2015. Future responses provided either no dates or later dates, but the documents were identical to those dated 30 Jun 2015. Information was reported as new by several newspapers at least through 2019. One news article on new drug trafficking organizations that cited PGR as its source: • "Operan siete nuevos cárteles en México", *Crónica* Aug 2015.[2] Specifically, the article cited a document from PGR's organized crime unit.[3]
Mexico public security ministry	One report by a research network citing three public safety ministry sources: • "Los principales cárteles. 2007-2009." Table 111 of *Atlas de la seguridad y la defensa de México 2009*, Casede (2009).[4] Three responses to freedom of information requests asking the Federal Police to list Mexico's drug trafficking organizations or major criminal groups and their areas of presence: • Report on 7 cartels by antidrug division. Response to folio 0413100069210 (responded 28 Dec 2010). Information undated; presented as current. • Report on 10 cartels by antidrug division. Response to folio 0413100010511 (responded 11 Feb 2011). Information undated; presented as current. • Report on 6 cartels by antidrug division. Response to folio 0413100082511 (responded 17 Jan 2012). Information undated; presented as current.
Mexico security cabinet	Federal government report on organized crime that a secondary source attributed to the security cabinet: • "Información sobre el fenómeno delictivo en México", August 2010.[5]
U.S. Drug Enforcement Administration	Two annual reports with Mexico OCG location information:[6] • 2015 National Drug Threat Assessment Summary. • 2016 National Drug Threat Assessment Summary. Six maps of Mexican cartels' areas of influence / dominant influence dated as follows: • May 2009, found in Congressional Research Service 2009 (see below).
Zeta Tijuana	One article by investigative news magazine *Zeta Tijuana* providing a national overview based on a combination of government sources and its own archives: • "28 carteles en México". *Zeta Tijuana*, Jan 2012. Archived online here.
Eduardo Guerrero / Lantia Intelligence	Two reports by Mexican organized crime expert Eduardo Guerrero Gutiérrez, co-founder of Lantia Intelligence, based on systematic tracking of open sources from 2007 to 2011: • "Los hoyos negros de la estrategia contra el narco." *Nexos* August 2010. Online here. • ""Security, Drugs, and Violence in Mexico: A Survey." *Lantia Consultores*, prepared for the 7th North American Forum, Washington DC 2011. Online here.

Source	Documents
	• April 2011, found in Michael Lauderdale UT Austin blog *Failed State*.[7] • May 2011, found in Congressional Research Service 2012 (see below). • January 2012, found in Congressional Research Service 2013 (see below). • September 2013, found in Congressional Research Service 2015 (see below). • April 2015, in DEA "Mexico: Updated Assessment of the Major Drug Trafficking Organizations' Areas of Dominant Control", July 2015. No longer on DEA site; saved by Public Intelligence here.
U.S. Department of Justice	One report by the National Drug Intelligence Center (NDIC): • "Mexican Drug Trafficking Organizations: Developments Impacting the United States." May 2010. Downloaded from Wikileaks Global Intelligence Files (the Stratfor archive) here.
U.S. Congressional Research Service	Seven reports on Mexican drug trafficking organizations, all authored by June S. Beittel: • "Mexico's Drug Cartels." October 16, 2007. Online here. • "Mexico's Drug-Related Violence." May 27, 2009. Online here. • "Mexico's Drug Trafficking Organizations: Source and Scope of the Rising Violence." September 7, 2011. Online here. • "Mexico's Drug Trafficking Organizations: Source and Scope of the Rising Violence." June 8, 2012. Online here. • "Mexico's Drug Trafficking Organizations: Source and Scope of the Rising Violence." April 15, 2013. Online here. • "Mexico: Organized Crime and Drug Trafficking Organizations." July 22, 2015. Online here. • "Mexico: Organized Crime and Drug Trafficking Organizations." April 25, 2017. Online here. Though published in 2017, included updates that allowed us to extend information from the July 2015 report through the end of 2015. (There was no 2016 report.) All reports were authored by June S. Beittel. Some of these reports contained DEA maps of cartel presence that were not available elsewhere. We distinguish between those maps (listed in the DEA section above) and the content found in the rest of these reports, which was based on open sources and interviews.
U.S. Department of Homeland Security	Two reports containing maps of Mexico OCG territories: • "Mexico: The Sinaloa Drug Cartel." October 28, 2010. Online via Public Intelligence here. Despite its focus on one cartel, the report contains a map of all cartels' presence. • "Mexico: Cross-Border Gangs and their Mexican Drug Cartel Affiliations." December 2011. Online via Public Intelligence here.
U.S. Treasury	Multiple office of Foreign Assets Control (OFAC) press charts:[8] • 47 OFAC press charts on Mexican groups from 2006 to 2016 that contained location information. (An additional 26 charts had no territory data but supported our qualitative research on group structures and affiliations.) These are the charts that accompany press releases announcing kingpin sanctions on "significant narcotics traffickers". They provide information on the players in and structures of such trafficking organizations, including the locations of businesses they allegedly use to launder money.
Stratfor	27 annual and quarterly reports by consultancy Stratfor, variously titled "Mexican Drug Cartels", "Mexican Drug War Update", or "Mexico's Drug War". • Annual reports 2008–2016. • Mid-year update in 2010 and quarterly updates from 2011 to 2015. • Annual reports 2017–2019, which contained some data points that covered the 2007–2015 period. These reports were based on open sources and include 10 distinct maps of cartel territories through 2014. Stratfor tracked Mexican OCGs closely during most of this period, including through weekly updates for its subscribers.

10.4.2 Defining Cartel Activities and Timing of Entry

When reviewing each document, I sought to identify when a cartel entered an activity in a systematic manner and not in a transient or isolated manner. For example, an individual instance of cartel members being arrested for extorting a business was not sufficient to classify that cartel as being systematically involved in extortion.

I purposefully exclude certain activities that are commonly tied to COs and sometimes presented as profit-making activities. I do so because these activities, in my understanding, are not profit-generating activities. Most notably, these include real estate, hitmen (sicariato), cash-based businesses, money laundering. First, "sicariato" is sometimes mentioned as an activity that Mexican cartels are involved in by popular media. By this they mean cartels paying individuals to kill people, that is, to be hitmen. However, I do not consider this a profit-making activity, rather an activity to build coercive capacities. Second, real estate, cash-based businesses, and money laundering are frequently mentioned as activities COs are involved in. Again, I do not consider these activities as profit-generating activities. Instead, these are common ways to launder profits from other activities. That is, they are activities meant to take profits from other activities and integrate them into the formal economy.

In addition, to identifying specific activities each cartel diversified to, I attempt to identify when they diversified to these activities. I rely on identifying the timing on two different factors: (i) evidence of a cartel not being involved in the activity to identify the lower bound, and (ii) evidence that a cartel is systematically involved in the activity to identify the upper bound. The implication is that the upper bound is likely a conservative, or slightly delayed, estimate.

10.4.3 Limitations

The data collection process has important limitations, most due to the difficulty studying illicit non-state actors that rely on secrecy. The most notable is that because Mexican cartels

were specialized drug traffickers for so long, it took the government, experts, and reporters time to recognize their diversification. For example, in the state of Sinaloa, home to the Sinaloa Cartel, security experts began identifying important increases in oil theft in 2007-2008, but it took two years to explicitly connect the Sinaloa Cartel to this increase. More broadly, this means that there are important information gaps during those crucial years when cartels began to diversify (~2007-2010). These information gaps are most notable for specific cartels (Cartel del Milenio, Cartel de Juarez) and certain activities (e.g., Extortion and drug dealing).

10.4.4 Results

Cartel de Sinaloa (CDS)

CDS seems to have maintained a strong hold on drug trafficking following the crackdown. It appears that CDS did diversify to other activities, though sources make it clear activities beyond drug trafficking remained secondary activities, at least in the first few years after the crackdown. Sources seem to suggest that while CDS did turn to predatory activities like extortion and kidnapping for ransom, their involvement in these activities was relatively limited. Data on oil theft in CDS strongholds suggests CDS turned to oil theft around 2007-2008, though this activity remained a small part of their portfolio until later years. It has been suggested that one reason CDS seems to not have diversified to the same degree as other cartels is that its capabilities to corrupt high-level government officials may have protected its investments in drug trafficking from the crackdown to some degree. If this is accurate, it may be the case that corruption, like diversification, could also be a strategy to reduce risk under market shocks.

Cartel de Tijuana/Cartel de los Arellano Felix (CAF)

It appears that CAF quickly turned to predatory activities following the crackdown. Operating in a major border crossing, sources also report that CAF turned to migrant smuggling. Sources seem to suggest that CAF did diversify to a large degree following the government crackdown.

Cartel	Activity	Year Entered
Cartel del Golfo/Zetas	Migrant fees	2004
	Oil theft	2007
	Human smuggling	2007
	Migrant kidnapping	2007
	Drug dealing	2007
	Extortion	2007-2008
	Kidnapping for ransom	2007-2008
	Looting mines	
	Piracy	
Cartel de Sinaloa/BLO-CPS	Oil theft	2007-2008
	Oil theft	2007-2009
	Extortion	2007-2010
	Human smuggling	
	Looting mines	
Cartel de Juarez/Nuevo Cartel de Juarez/La Linea	Oil theft	2007-2014
	Extortion	2009-2010
	Kidnapping for ransom	2009-2010
	Migrant smuggling	
	Looting mines	
Cartel de Tijuana	Oil theft	2007-2010
	Drug dealing	2007-2009
	Human smuggling	2008
	Prostitution	2008
	Extortion	2008
	Kidnapping for ransom	2008
Cartel del Milenio/Cartel Jalisco Nueva Generacion	Oil Theft	2007-2010
	Extortion	<2010
	Drug dealing	<2010
	Vehicle theft	<2010
	Piracy	
	Counterfeit medical goods	
	Avocados	
La Familia Michoacana/Caballeros Templarios	Oil Theft	2007-2010
	Kidnapping for ransom	
	Extortion	<2010
	Drug dealing	<2010
	Vehicle theft	<2010
	Piracy	
	Migrant smuggling/trafficking	
	Illegal logging	
	Looting mines (iron)	<2010
	Avocados	

Table A1: (this table is currently a work in progress) Activities beyond drug trafficking that each cartel entered and the timing, 2000-2012. Novel dataset created by author.

This may be partially explained by their limited operations in drug producing regions of the country, so, as Guerrero (2011) explains, even before the crackdown, CAF relied heavily on other cartels supplying them with large drug shipments that they then smuggled into the US. With a shock to the drug market, this likely affected their business model, making them rely on other activities.

Cartel del Milenio (CDM)

There is not as much information on CDM as there is on other cartels. This may be because, as some sources seem to suggest, they operated more clandestinely than other cartels. However, there is evidence that they turned to oil theft by 2010 and predatory activities soon after the government crackdown. Nevertheless, they seem to have maintained drug trafficking as a primary activity in their portfolios like CDS.

La Familia Michoacana/Caballeros Templarios (LFM)

LFM was the first affected by the government crackdown since the first military deployment was sent to the state of Michoacan, LFM's home state and stronghold. LFM very quickly diversified to predatory activities. While they remained drug traffickers, and specifically, major drug cultivators and drug producers given the international port they controlled and that its characteristics make it suitable to cultivate poppy (used to synthesize heroin), they also became deeply involved in other activities. However, they became extremely predatory as well and turned heavily to activities like extortion and kidnapping for ransom. However, they also quickly turned to capital intensive activities, including oil theft, illegal logging, and looting mines.

Cartel del Golfo/Zetas (CDG/Zetas)

CDG was perhaps the first Mexican cartel to systematically diversify and the Zetas (operating under CDG until 2009) were pioneers of expansion. An ethnographic study of CDG finds that they began diversifying to the migrant exploitation market in 1997 when they first began

charging fees for smugglers moving Central American migrants through their home state of Tamaulipas. In 2004 CDG began charging smugglers of Mexican citizens as well. However, their involvement in this market changed in 2007 after the crackdown when they began directly exploiting migrants themselves and using them as a source of revenue. However, they diversified far more intensely in 2007-2008 following the government crackdown. CDG diversified widely, both to capital and n on-capital intensive activities. Sources point to CDG as the first Mexican cartel to enter the oil theft business, which rivals quickly copied. In fact, scholarly and journalist investigations point to CDG being involved in the theft of crude oil from the refinery in the state of Tamaulipas and selling it to US companies in Texas prior to the crackdown but turning to oil theft of refined products from pipelines following the crackdown. While CDG and Zetas remained drug traffickers, their also began extensively relying on other activities.

Cartel de Juarez (CDJ)

CDJ is another cartel that is covered much less by sources than other cartels. However, the information that exists points to CDJ turning to predatory crimes quickly after the crackdown. The patterns of operation and diversification between CDJ and CAF are very similar.

10.5 Oil Theft in Mexico and Cartels

Mexico's oil sector is run by the state-owned petroleum company Petróleos Mexicanos (Pemex). Pemex is the second largest oil company in Latin America in revenues behind Brazil's Petrobras. Until 2017, Pemex had monopoly over gasoline stations and fuel sales in Mexico, and regulated their prices so that consumers were not affected by international market prices or its fluctuations. Pemex has six functioning refineries, the most recent being inaugurated in 1979. To transport crude oil and its refined products (most importantly gasoline and diesel), Pemex has long relied on trucks and ports, however, for decades its logistical backbone has been oil pipelines that run underground throughout the Mexican territory. In total, Pemex oversees over 17,000 kilometers of pipelines passing through almost 400 municipalities in 24 of its 31 states plus the federal district.

Oil theft has been a problem faced by Pemex for decades. Small-scale theft from fuel tanker trucks and Pemex facilities had existed for decades, with the first official record of oil theft from an oil pipeline dates to 1993 (Olivera Villaseñor and Rodríguez 2007). Between 1993 and 2003, Pemex recorded 304 total oil pipeline thefts (Olivera Villasenor and Rodriguez Castellanos 2005). However, it was not until the late 2000s that oil theft from pipelines became a major issue, with Pemex acknowledging that it cost it billions of USDs annually (Solis 2018; Loredo 2018).

The best account that we have about the history of oil theft in Mexico comes from Pérez (2012). According to this author, prior to the early-2000s, oil theft was undertaken primarily by mid and low-level Pemex employees. These employees employed a variety of methods to steal oil to sell in the black market, including stealing from refineries, production and storage sites, and tapping the pipelines. The employees trained on how to tap oil pipelines, many of which stole oil from pipelines independently, became known as *tapineros*.

Simultaneously, in some parts of the country small groups also participated in rudimentary oil theft from pipelines. For example, there existed some small independent groups that would

find a pipeline, dig a hole around it, bust the pipe, let the hole fill up, and then use buckets or containers to steal the oil. This practice became known as *huachicoleo*, and those involved became known as *huachicoleros*. And while certain *tapineros* amassed small fortunes and many *huachicoleros* benefited financially, theft from oil pipelines was considered a marginal problem prior to the 2000s.

As Perez documents, the Juarez, Tijuana, Sinaloa, and Gulf Cartels (and later the Zetas while still part of the Gulf Cartel) had established relationships with Pemex and the Pemex workers union for decades. These cartels would regularly use the Pemex transportation infrastructure to traffic drugs through the country and up north to the US-Mexico border, for example, by using Pemex tanker trucks with false bottoms to hide and transport drugs. Interestingly, despite decades of close relations with Pemex, these cartels were not interested or involved in oil theft or the illegal oil market.

However, Perez notes that starting in 2007, cartels began getting involved in this activity more systematically and with greater intensity. For example, Perez delineates how *La Compañía* (the name of the organization composed of the Gulf and Zetas cartels) began to take control over pipeline tapping where they already operated in the northeast region of Mexico starting in 2007. *La Compañía* first recruited, intimidated, corrupted and forced Pemex *tapineros* to pay the group a part of their profits, work for them, and teach them how to steal oil from ducts. Soon after, however, *La Compañía* began organizing and integrating the *tapineros* into their structure and took over the oil theft activities themselves. Soon, offshoots of the Zetas and rivals began to enter the oil theft market through *tapineros* and by organizing *huachicoleros*. As Perez notes, "Oil theft did not happen spontaneously: many networks of support and collaboration were gradually woven [between cartels and] Pemex employees and contractors" (39).

Importantly, oil theft requires some level of specialized knowledge and organizational sophistication, specific capabilities that cartels did not have prior to the crackdown. For one, the

location of the oil pipelines is confidential, as the Mexican government says this information is part of its national security. Therefore, knowing the exact location as well as when refined products flow through the pipelines–refined products are not transported through pipelines continuously–requires insider information from Pemex personnel. In addition, stealing oil from pipelines requires expert knowledge about how to safely tap pipelines–it is very high risk to do so without this knowledge. Moreover, "Pemex allocates millions of dollars to its pipeline monitoring systems, which verify their safety and operation in real time with all kinds of technology... In short, oil theft is detected at the precise moment it occurs and it is possible to mobilize all the agents and soldiers required to prevent it" (Pérez 2012, 355).

Therefore, as Perez notes:

> The theft of hydrocarbons from Pemex [by cartels] would not be possible without the participation of the company's employees. Not everyone can connect to the pipeline network[...] This theft involves personnel from operations, distribution, storage, and sales. (Pérez 2012, 154).

Finally, oil theft requires building the logistical capacities to transport, store, and distribute the oil in large quantities throughout neighboring territories by acquiring warehouses, storage tanks, tanker trucks, and workers, among others. In addition, cartels need to establish a local network of buyers–effectively building demand–that often includes clandestine gas stations, official gas stations, local businesses like mechanic shops, and large companies like factories and transportation companies. As Perez notes, "Oil theft did not happen spontaneously: many networks of support and collaboration were gradually woven [between cartels and] Pemex employees and contractors" (39).

10.6 Cartels and Oil Pipelines Geographic Correlation Pre-2007

Table A5 shows the regression results of the geographic correlation between cartel presence and product pipelines before the government crackdown. The statistically significant negative correlation provides evidence that the government crackdown that focused on drug trafficking hubs and thus increased the risk involved in the drug market likely affected oil theft minimally.

Table A2: Cartel presence and distance (in meters) to municipalities with oil pipelines, 2000-2006

	Dependent variable:	
	Distance to Oil Duct	
	(1)	(2)
Cartel number	−6,889.183***	
	(2,660.906)	
Cartel dummy		−19,493.290***
		(4,970.337)
Constant	72,928.840***	73,021.580***
	(531.531)	(532.054)
Observations	17,192	17,192
R^2	0.0004	0.001
Adjusted R^2	0.0003	0.001
Residual Std. Error (df = 17190)	69,378.660	69,361.160
F Statistic (df = 1; 17190)	6.703***	15.381***
Note:	*p<0.1; **p<0.05; ***p<0.01	

10.7 Descriptive Statistics

Table A3 reports descriptive statistics for the the variables used in the analysis of cartel expansion, and Table A4 reports descriptive statistics for the the variables used to estimate the effect of cartel expansion on democratic accountability and crime.

Table A3: Descriptive statistics for variables used in the analysis of cartel expansion, 2000-2017.

	Median	Mean	Std.Dev	Min	Max
Cartel dummy	0.00	0.08	0.27	0.00	1.00
Cartel spillover	0.00	0.08	0.17	0.00	1.00
Product pipeline	0.00	0.13	0.33	0.00	1.00
Crude oil pipeline	0.00	0.09	0.29	0.00	1.00
Year of crackdown per state	2007.00	2007.63	1.08	2007.00	2011.00
Port municipality	0.00	0.01	0.08	0.00	1.00
Border municipality	0.00	0.02	0.12	0.00	1.00
Gas price at pump	7.57	9.08	3.57	5.25	17.79
Distance to US border (thousands of KM)	327.47	335.38	158.04	0.00	1007.74
Road density	0.00	0.00	0.00	0.00	0.00
Gini	0.46	0.46	0.07	0.24	0.71
Log population	9.38	9.34	1.50	4.69	14.39
Mean years of schooling	5.00	5.39	1.56	1.00	12.00
Log economically active population	8.12	8.13	1.55	3.50	13.48

Table A4: Descriptive statistics for variables used to estimate the effect of cartel expansion on democratic accountability and crime, 2007-2017.

	Median	Mean	Std.Dev	Min	Max
Winning margin	0.09	0.12	0.11	0.00	1.00
Number of candidates	5.00	5.14	2.02	1.00	14.00
CO-related homicides	0.00	3.65	23.62	0.00	1891.00
Extortion	0.00	2.37	12.46	0.00	273.00
Kidnapping	0.00	0.45	2.68	0.00	94.00
Drug use	0.00	0.59	6.42	0.00	245.00
Theft (in thousands)	0.00	0.27	1.42	0.00	32.41
Cartel dummy	0.00	0.13	0.33	0.00	1.00
Cartel fragments	0.00	0.06	0.23	0.00	1.00
Product pipeline	0.00	0.13	0.33	0.00	1.00
Crude oil pipeline	0.00	0.09	0.29	0.00	1.00
Gini	0.46	0.46	0.07	0.24	0.71
Log population	9.37	9.33	1.49	4.69	14.39
Mean years of schooling	5.00	5.38	1.56	1.00	12.00
Log economically active population	8.12	8.12	1.55	3.50	13.48

10.8 Mexico's Energy Reform

After being passed in the Legislature in October of 2013, a major energy reform was enacted in December of 2013 by the executive branch. This historic reform was followed by secondary reforms passed by the legislature in 2014 and enacted by the executive in August 2014. While the reform made large structural changes, it did not immediately make any changes that would have affected oil theft or the incentives outlined here.

The part of the reforms that would influence incentives was the elimination of the price controls for gasoline and diesel for domestic consumers, however, this was not implemented until the end of 2017. While prices had been controlled and subsidized for decades so that they were stable and the same across Pemex gas stations, this price control was remove on November 30, 2017. Following this change, gasoline and diesel prices started to vary given market prices and private gas stations could sell these products at different prices.

Below I enumerate the most relevant reforms to the hydrocarbon sector[28] that were part of the 2013 and 2014 energy reforms[29]:

- Maintains natural resources as national property and continues to prohibit concessions to private entities, but does allow the National Commission of Hydrocarbons to give contracts to private entities for the exploration and extraction of crude oil.
- Allows Pemex to provide permits to private entities to participate directly, under regulation, in the transportation and storage of refined oil products.
- Allows private entities to sell gasoline and diesel to public through private gas stations starting in 2016. First non-Pemex gasoline station opened in June of 2016.
- Allows private entities to import gasoline and diesel from abroad starting in 2017.
- Price controls that maintain gasoline and diesel prices stable continue until the end of 2017. Starting in 2018 price is no longer regulated, follows market prices, and gasoline

[28] I do not include reforms to the natural gas or electricity sectors.

[29] Gobierno de la Republica de Mexico. Reforma Energetica: Resumen Ejecutivo. 2014. https://www.gob.mx/cms/uploads/attachment/file/164370/Resumen_de_la_explicacion_de_la_Reforma_Energetica11_1_.pdf

stations can differ in their prices to the public.

  - This reform took effect on November 30, 2017, though prices at Pemex gas stations continue to be subsidized and regulated to some extent.

- Gives Pemex and private entities access to product pipelines and storage depots starting in 2019.

10.9 Cartels and Oil Pipelines: Geographic Correlation Pre-2007

Table A5 shows the regression results of the geographic correlation between CO presence and product pipelines before the government crackdown. The statistically significant negative correlation provides evidence that the government crackdown that focused on drug trafficking hubs and thus increased the risk involved in the drug market likely affected oil theft minimally.

Table A5: DTO presence and distance (in meters) to municipalities with oil pipelines, 2000-2006

	Dependent variable:	
	Distance to Oil Duct	
	(1)	(2)
Cartel Number	−6,889.183***	
	(2,660.906)	
Cartel Dummy		−19,493.290***
		(4,970.337)
Constant	72,928.840***	73,021.580***
	(531.531)	(532.054)
Observations	17,192	17,192
R^2	0.0004	0.001
Adjusted R^2	0.0003	0.001
Residual Std. Error (df = 17190)	69,378.660	69,361.160
F Statistic (df = 1; 17190)	6.703***	15.381***
Note:	*p<0.1; **p<0.05; ***p<0.01	

10.10 Cartel Expansion and Spillover Effects to Neighboring Territories

Scholarly works on crackdowns and criminal violence have indirectly suggested two different types of arguments, generally speaking, about organized crime expansion in Mexico. Both arguments, however, point to crackdowns generating a spillover effect where government intervention in one place pushed COs to expand operations to contiguous neighboring territories.

The first argument stems from a studies on the Mexican War on Drugs and the diffusion of violence. This literature has generally found that the 2007 government crackdown in Mexico increased violence in territories along drug trafficking routes and their neighboring municipalities as drug cartels fought over control of these routes. Implicit in these works is the argument that COs expanded or attempted to expand to territories along or around drug trafficking routes.

For example, Calderon et al. (2015) look at Mexico and find that leadership decapitation intensifies drug-related and overall violence in municipalities where leaders of drug cartels were captured or killed, and that this had spillover effects on neighboring municipalities. The authors theorize that this violence occurs because leadership removal leaves the targeted cartel vulnerable, triggering inter-cartel wars as rival drug cartels attack the territory of the vulnerable drug cartel, and intra-cartel wars as potential successors fight for control of the organization. Osorio (2015) argues that crackdowns can have a spillover effect on violence by disrupting the status quo between COs operating in neighboring territories, and finds evidence supporting the theory when looking at Mexico.

A second, yet similar argument, is proposed by Dell (2015), who argues that in Mexico, local crackdowns in municipalities along major drug trafficking routes diverted drug trafficking around those municipality as drug traffickers sought to circumvent law enforcement. This led to increased violence in municipalities neighboring major drug trafficking routes.

These arguments all imply two types of CO expansion patterns that are geographically limited. One implies an expansion pattern where COs go to other territories that already have COs operating there, meaning we would observe no new territories with COs following crackdowns. This is clearly not the case.

The other argument suggests a geographically limited expansion to territories that are contiguous to those where organized crime was already present. Moran I's test does show spatial interference. This dynamic is accounted for in the main DiD by incorporating spatial interference into the main DiD model.

10.11 Cartel Expansion: Alternative Outcome

This section presents the main DiD results on cartel expansion using the alternative outcome measure: number of catels per municipality.

Table A6: Table shows main DiD results using the number of cartels in a municipality as the outcome measure. Models 1 and 2 estimate the DiD using TWFE, models 3 and 4 use the method proposed by Sun and Abraham (2021), and model 5 uses the estimation method proposed by Callaway and Sant'Anna (2021).

	Number of Cartels				
	TWFE		SADID		CADID
	(i)	(ii)	(iii)	(iv)	(v)
Crackdown*Pipeline	0.372***	0.278***	0.326***	0.228***	0.325***
	(0.053)	(0.051)	(0.051)	(0.051)	(0.051)
Spatial Spillover		0.449***		0.434***	
		(0.032)		(0.033)	
Covariates	Yes	Yes	Yes	Yes	No
Municipality fixed effects	✓	✓	✓	✓	
Year fixed effects	✓	✓	✓	✓	
Observations	43,974	41,531	43,974	41,531	44,208
R^2	0.468	0.514	0.475	0.518	

*p<0.1; **p<0.05; ***p<0.01

Robust standard errors are clustered at the municipality level.

10.12 Cartel Expansion: Threats to Inference

10.12.1 Placement of Pipelines

One threat to inference is that some covariate related to territories with pipelines, but not pipelines themselves, prompted COs to move to these territories, and COs only started stealing these resources once they were already there. To address this concern I conduct a placebo test using crude oil pipelines as a placebo. This placebo tests whether omitted factors correlated with underground pipelines explain the main results. While product pipelines, as explained earlier, transport refined products like diesel and gasoline that are ready to sell as is, crude oil pipelines transport crude oil, which cannot be used unless refined.

While a handful of clandestine refineries that process crude oil into refined products have been uncovered in Colombia, Ecuador, Peru, and Argentina, none have been found or reported in Mexico. Therefore, crude oil pipelines are worthless to organized crime in Mexico. Yet, both crude oil and product pipelines run underground, transport hydrocarbons, and, at times, even run parallel to each other. The expectation, therefore, is that crude oil pipelines should not have any effect on the presence of organized crime.

It should be clear, however, that COs have been found to steal crude oil in Mexico, though these thefts are reported to be from storage centers close to the northern border (Perez 2012), not pipelines,[30] and sold primarily to US companies in Texas.

Categorizing municipalities by whether they have each type of pipeline results in four groups of municipalities: Those without any pipeline, those with only product pipelines, those with only crude oil pipelines, and those with both product and crude oil pipelines. The table below shows the breakdown of municipalities by group.

[30]While a few news reports have claimed that certain fuel theft incidents include COs stealing crude oil from pipelines, the author has found that reporters tend to confuse or not know the difference between the types of pipelines. For example, following the detection of an oil theft incident along a pipeline, reports sometimes claim that gasoline and diesel were stolen from an "oleoducto" (crude oil pipeline)—products that crude oil pipelines do not transport.

	Product Pipelines	No Product Pipelines
Crude Oil Pipelines	143	81
No Crude Oil Pipelines	170	2062

Given the overlap, running a DiD with the treatment groups assigned according to whether they have crude oil pipelines might result in positive and statistically significant results, but this could be driven by the units in the treatment group that also have product pipelines. To tease out the actual treatment effects from that of the placebo, I run a difference-in-difference-in-differences (DiDiD). This identification strategy compares municipalities without any pipelines to those with either or both product and crude oil pipelines before and after the treatment. In this case, the control group are municipalities without either product or crude oil pipelines, the placebo group is composed of municipalities with crude oil pipelines, and the treatment group includes municipalities with product pipelines.

Figures A3 and A4 show the trends through time for the average CO presence in each type of municipality depending on whether and which pipelines they have. These trends suggest that municipalities with product pipelines saw the largest increase in CO presence following the crackdown. However, I test this hypothesis more formally.

The regression equation follows the form:

$$\begin{aligned} CO_{it} =& \rho CO_{\Phi(t-1)} + \gamma_1(product_i * crackdown_t) + \gamma_2(crude_i * crackdown_t) \\ &+ \gamma_3(product_i * crude_i * crackdown_t) + \delta X_{it} + \psi_i + \tau_t + e_{it} \end{aligned} \tag{5}$$

Under this specification, γ_1 estimates the causal effect of only product pipelines, γ_2 estimates the effect of only crude oil pipelines, and γ_3 estimates the effect of having both product and crude oil pipelines. The main coefficients of interest are thus γ_1 and γ_2, with the expectation

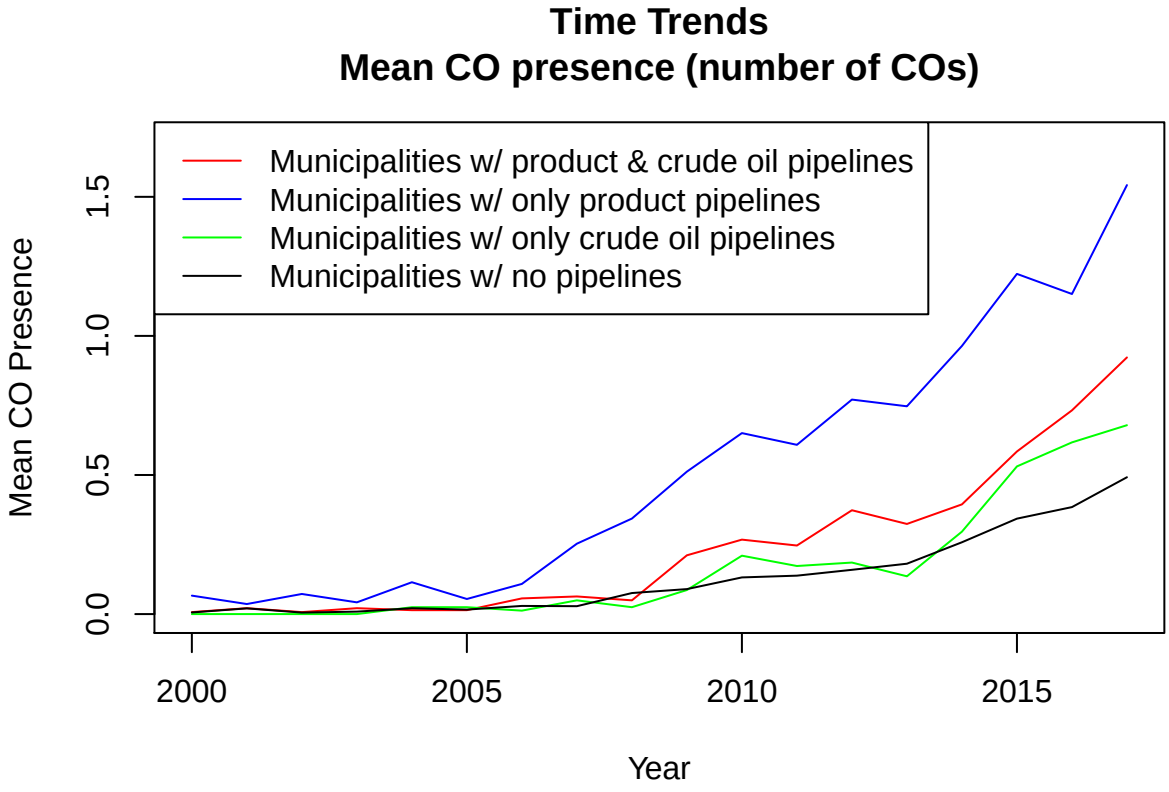

Figure A3: Mean of the CO number and CO dummy variables from 2000-2017 for municipalities with no pipelines, with only product pipelines, only crude oil pipelines, and both pipelines.

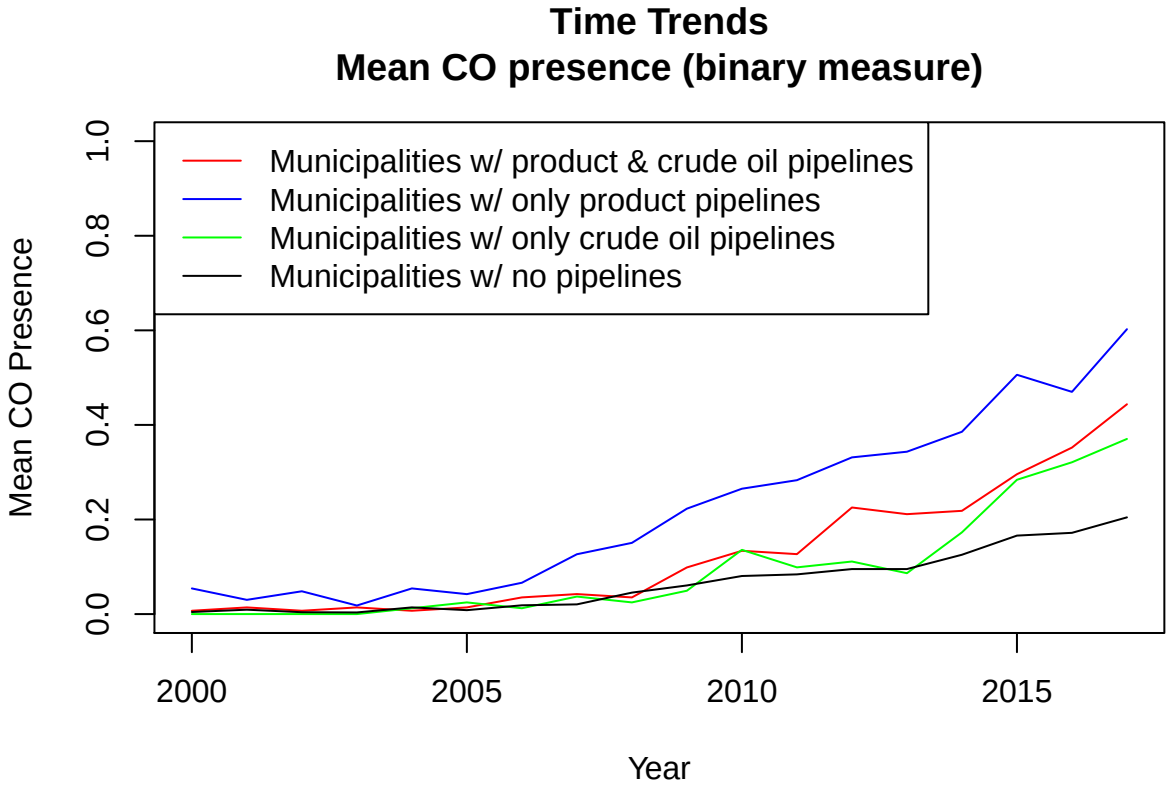

Figure A4: Mean of the CO number and CO dummy variables from 2000-2017 for municipalities with no pipelines, with only product pipelines, only crude oil pipelines, and both pipelines.

that γ_1 is positive and statistically significant while γ_2 is not statistically significant.

DiDiD strategies can be challenging to conceptualize, but with this estimation strategy γ_1 and γ_2 are the equivalent of running two independent DiDs, one where the treatment group is composed of municipalities with only product pipelines and the control group includes municipalities without any pipeline and the other where the treatment group is composed of municipalities with only crude oil pipelines and the control group includes municipalities without any pipeline, respectively. The main coefficients of interest in these two independent DiDs would be near identical to γ_1 and γ_2 in this DiDiD. However, the DiDiD also takes into consideration the municipalities that have both product and crude oil pipelines, which is why it's preferred here.

Table A8: Table shows main DiD results using the number of COs in a municipality as the outcome measure. Models 1 and 2 estimate the DiD using TWFE, models 3 and 4 use the method proposed by Sun and Abraham (2021), and model 5 uses the estimation method proposed by Callaway and Sant'Anna (2021).

	CO Number	CO Dummy
	TWFE	
	(i)	(ii)
Spatial Spillover	0.442***	0.366***
	(0.058)	(0.046)
Crackdown*Product Pipeline	0.396***	0.153***
	(0.094)	(0.027)
Crackdown*Crude Oil Pipeline	0.046	0.041
	(0.060)	(0.028)
Crackdown*Both Pipelines	-0.296**	-0.111**
	(0.117)	(0.040)
Covariates	Yes	Yes
Observations	41,531	41,531
R^2	0.515	0.447
Municipality fixed effects	✓	✓
Year fixed effects	✓	✓

Two-way cluster-robust standard errors.

Table A8 shows the results of this placebo test. Results show that the effect is driven entirely

by product pipelines, with crude oil pipelines having no effect on CO expansion after the crackdown. This builds confidence that it is not some third factor associated with pipelines other than oil theft that is driving the effect.

10.12.2 Simulating Organized Crime Expansion

Another potential threat to inference is that organized crime might, by chance, have expanded to municipalities with pipelines more than other municipalities. To determine whether this is a plausible concern, I use a Monte Carlo simulation to test the likelihood of observing the main DiD result due to chance.

The process is the following: Given that there are 313 municipalities with product pipelines, I draw 313 municipalities without replacement and assign them as the treatment group and the rest of the municipalities as the control group. To draw these municipalities I create a uniform probability distribution over municipalities without any CO presence between 2000 and 2006 (pre-treatment). In other words, municipalities without CO presence between 2000 and 2006 are assigned an equal probability of being drawn into the treatment group. I then run a DiD using the same specification as the main results (equation 1) except for replacing the pipeline dummy with the new simulated treatment group, and save the DiD estimate. I repeat this process 1,000 times. I then plot the distribution of the DiD estimates of the Monte Carlo simulation. In this histogram I also plot the estimate and confidence intervals from the main product pipeline model to see how likely it is that the main results from the baseline DiD are due to chance. I conduct this simulation using the dummy variable denoting whether a municipality has CO presence or not as well as the variable measuring the number of criminal organizations in a municipality. As the plots show, this test provides very strong additional evidence that CO expansion to municipalities with product pipelines was not due to chance, but rather strategic and targeted.

Figures A5 and A6 show the results. As can be seen, the likelihood of observing the main estimates by chance are extremely rare—no simulated estimate is as large as the main estimate. This test provides very strong additional evidence that CO expansion to municipalities with product pipelines was not due to chance, but rather strategic and targeted.

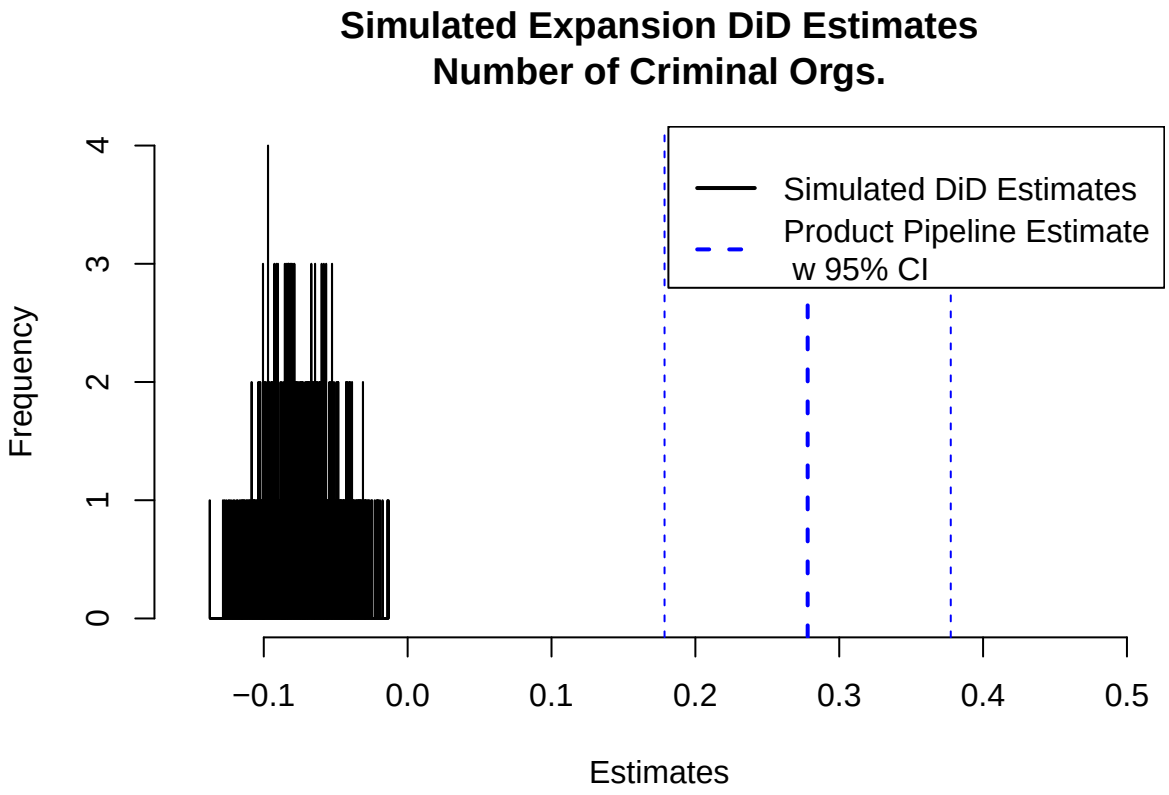

Figure A5: Plot shows the distribuion of simulated coefficients (black lines) and estimate of main results (blue dashed line) with 95% confidence intervals (blue dotted lines).

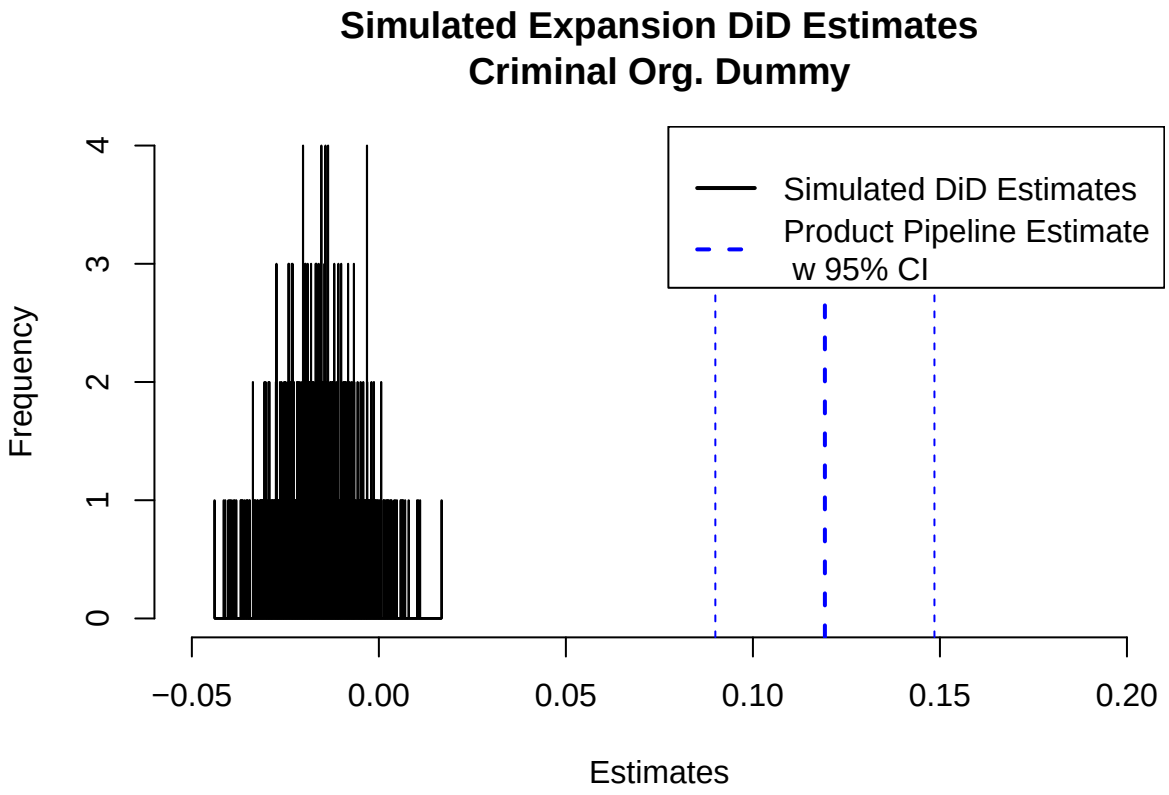

Figure A6: Plot shows the distribuion of simulated coefficients (black lines) and estimate of main results (blue dashed line) with 95% confidence intervals (blue dotted lines).

10.13 Cartel Expansion: Alternative Explanations

10.13.1 Oil Price Shock

To show that shocks to oil prices is not driving diversification and expansion, Figure A7 plots domestic gasoline prices in Mexico. Specifically, I plot the price of low octane gasoline (Magna)[31] at the pump in constant 2015 pesos per liter. As can be seen, there is no increase that coincides with the timing of CO diversification to oil theft.

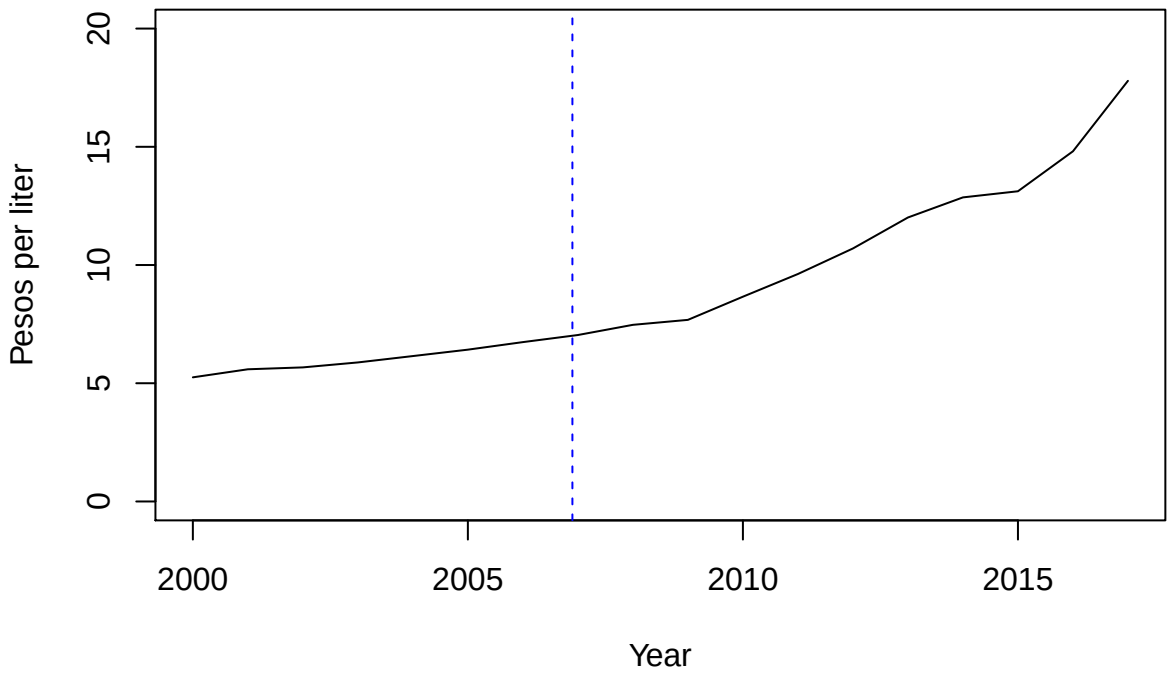

Figure A7: Gasoline prices at the pump in Mexico in constant 2015 pesos per liter. Vertical dotted line denotes the begining of the government crackdown. Data from Secretariat of Energy.

[31] In the United States this would be comparable to regular gasoline.

10.13.2 Expansion Versus Displacement

An alternative explanation follows from the metaphor widely used in policy circles related to drug trafficking: the balloon effect. This phrase is used as a metaphor for the argument that if you squeeze COs in one place through strong enforcement, they will simply move to another place, with no net impact on CO activities (Windle and Farrell 2012). This widely accepted concept stems from three different but related arguments. First, that increasing drug crop eradication efforts in one place does not decrease cultivation, but rather displaces it to other places (Cornelius 2006). Second, that increasing drug interdiction efforts along existing trafficking routes will cause COs to move to new routes (Bagley 2013). And third, that cracking down on COs in one place will displace these groups to new places (Bagley 2013). This last one is also sometimes referred to as the cockroach effect.

If government crackdowns do cause COs to migrate rather than expand, and this displacement leads COs to move to territories with new lucrative markets, we could observe CO presence increase in territories with lucrative new markets. If this is the case, we would risk misinterpreting empirical tests showing increased CO presence in territories with new lucrative markets following the crackdown as expansion rather than displacement.

First, anecdotal accounts place doubts that this was the case in Mexico. Historical strongholds for COs continue to be so: Tierra Caliente in Michoacan and Guerrero, Tamaulipas, Sinaloa, Baja California Sur, and Ciudad Juarez, Chihuahua, among others. However, to show more systematically examine the possibility, I calculate the percent of municipalities with CO presence between 2000 and 2006 that also had CO presence between 2006 and 2012. I find that 91.51% of municipalities that had CO presence between 2000 and 2006 continued to have CO presence between 2006 and 2012.

10.13.3 Cartel Fragmentation

Some existing accounts suggest that it was cartel fragments, not drug cartels themselves, that diversified into other activities as fragments could not compete against drug cartels in the drug trade once they fragmented and were thus forced to engage in other criminal activities.

First, Alcocer (2022) provides qualitative evidence that large drug cartels *did* diversify. Second, the evidence provided by this paper further shows that drug cartels expanded to places with oil pipelines as a result.

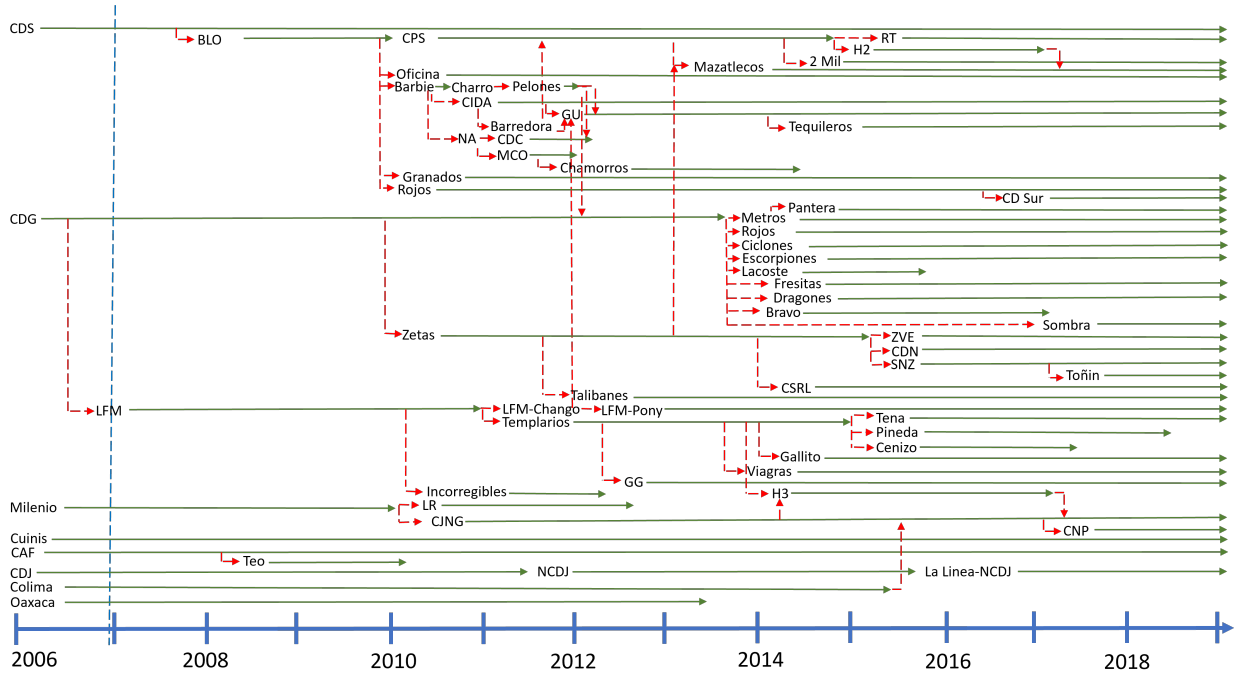

Figure A8: Cartel fragmentation, 2000-2006. Green arrows denote timeframe each CO is active. Red arrows denote cartel fragmentation into new COs. Blue dotted vertical line denotes begining of government crackdown.

Additionally, using data from the MCO Mexico that tracks CO fragmentation from 2000 to 2018, Figure A8 plots the temporal order of cartel fragmentation from 2006 to 2018. The figure shows that, with one important exception, cartel fragmentation and the proliferation of smaller COs began and accelerated *after* the crackdown and *after* drug cartels had diversified their portfolios, not the inverse.

10.14 Consequences of Cartel Expansion

10.14.1 Reduced Form

Tables A9 and A10 shows the reduced form results for the instrumental variables analysis following equation 3.

Table A9: Reduced form, oil pipelines and democratic accountability

	Dependent variable:	
	Winning margin	Number of candidates
	(1)	(2)
Product piplines	0.014^{***}	-0.314^{***}
	(0.004)	(0.055)
Controls	Yes	Yes
Year FE	Yes	Yes
Observations	6,952	6,952

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

Table A10: Reduced form, oil pipelines and crime

	Dependent variable:				
	CO-related homicide	Extortion	Kidnapping	Drug use	Theft
	(1)	(2)	(3)	(4)	(5)
Product piplines	3.046^{***}	0.300	0.153^{***}	0.932^{***}	0.257^{***}
	(0.750)	(0.208)	(0.050)	(0.208)	(0.050)
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	26,774	17,038	17,038	19,472	17,038

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

10.14.2 First Stage: Alternative CO Measure

Table A11 reports the results of the first stage using the alternative outcome measure: number of cartels.

Table A11: Cartel Presence and Oil Pipelines (First Stage). Column (1) shows placebo test using product pipelines prior to the government crackdown. Column (2) shows placebo test using crude oil pipelines after the crackdown. Column (3) shows the main results using product pipelines after the crackdown.

	Dependent variable:		
	Num. of cartels		
	Pre-Crackdown (Placebo)	Post-Crackdown (Placebo)	Post-Crackdown
	(1)	(2)	(3)
Product pipelines	0.007		0.086***
	(0.007)		(0.020)
Crude oil pipelines		−0.079***	
		(0.018)	
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	17,038	26,774	26,774

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

10.14.3 Second Stage: Alternative CO Measure

Tables A12 and A13 show the second stage of the instrumental variables analysis using equation 3 using the alternative outcome meaure, number of COs.

Table A12: Cartels and Local Electoral Outcomes (Second Stage)

	Dependent variable:	
	Winning Margin	Num. of Candidates
	(1)	(2)
Number of Cartels	0.200*	−4.361**
	(0.115)	(2.220)
Controls	Yes	Yes
Year FE	Yes	Yes
Outcome mean | Cartel = 1	0.134	5.867
Outcome SD | Cartel = 1	0.129	2.126
Observations	6,952	6,952

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

Table A13: COs and Crime (Second Stage). Outcome variable is number of COs.

	Dependent variable:				
	CO-Related Homicides	Extortion	Kidnapping	Drugs Use	Theft, in thousands
	(1)	(2)	(3)	(4)	(5)
Number of Cartels	35.585***	4.071	2.250*	11.456***	2.850***
	(10.072)		(1.347)	(4.366)	(1.032)
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Outcome mean | Cartel=1	17.312	9.193	1.772	1.901	1.113
Outcome SD | Cartel=1	62.455	25.387	5.939	11.482	3.032
Observations	26,774	17,038	17,038	19,472	17,038

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

10.14.4 Reduced Form: Crime and Homicide Rates

Tables A14 shows the reduced form results for the instrumental variables analysis following equation 3 but using the rates of homicides and crimes.

Table A14: Reduced form, oil pipelines and crime

	Dependent variable:				
	CO-related homicide rate	Extortion rate	Kidnapping rate	Drug use rate	Theft rate
	(1)	(2)	(3)	(4)	(5)
Product piplines	0.019***	0.0002	0.002	−0.001	0.960***
	(0.004)	(0.001)	(0.110)	(0.001)	(0.110)
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	26,774	17,038	17,038	19,472	17,038

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

10.14.5 Second Stage: Crime and Homicide Rates

Table A15 and A16 show the results of the second stage of the instrumental variable analysis following equation 3 but using crime and homicide rates per 1,000 for the independent variable instead of the count. Since population is used in the left-hand side to calculate rates, it is not used on the right-hand side.

Table A15: Second Stage, COs and Crime Rates

	Dependent variable:							
	Extortion Rate		Kidnapping Rate		Drugs Use Rate		Theft Rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Num. of COs	0.004		0.025**		−0.007		10.200***	
	(0.020)		(0.011)		(0.008)		(3.106)	
CO dummy		0.005		0.037***		−0.011		14.817***
		(0.029)		(0.013)		(0.013)		(2.679)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Outcome mean	0.021	0.021	0.007	0.007	0.005	0.005	1.859	1.859
Outcome SD	0.074	0.074	0.041	0.041	0.037	3.723	3.723	
Observations	17,038	17,038	17,038	17,038	19,472	19,472	17,038	17,038

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.

Table A16: Second Stage, COs and Homicide Rates

	Dependent variable:	
	CO-related homicide rate	
	(1)	(2)
Num. of COs	0.216***	
	(0.063)	
CO dummy		0.394***
		(0.096)
Controls	Yes	Yes
Year FE	Yes	Yes
Outcome mean	0.073	0.073
Outcome SD	0.206	0.206
Observations	26,774	26,774

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors are clustered at the municipality level.