Organized Crime, Local Politicians, and State Capacity

Seung-hun Lee*
(Job Market Paper)

Columbia University

October 29th, 2023

Click here for the latest version

Abstract

This paper investigates the effects of successful assassinations of mayors on the capacity of local governments. By leveraging the randomness in the outcomes of assassination attempts against mayors in Mexico in 2002-21, I find that the fiscal and personnel capacities of municipal governments that lose their mayors deteriorate. Municipal tax collection decreases by 29%. The share of public expenditure on construction projects increases by 6.3 percentage points at the expense of other primary services. Municipal workers in their 30s and 40s leave the position. The back-of-the-envelope calculation shows that wages should increase by 13% to retain them after assassinations. Organized criminal groups take advantage of the vacuum of power by increasing their presence in municipalities with successful assassinations. The results are not explained by non-political violence, levels of economic activities, or changes in population. The results speak to the significance of leaders in maintaining fiscal capacity and retaining capable personnel in the workforce even in a violent environment.

Keywords: State capacity, local government, mayors, organized crime, assassinations
JEL Codes: D74, H11, H71, O17

*Contact: sl4436@columbia.edu.

I am grateful for the continuous support and guidance from Michael Carlos Best, Suresh Naidu, Cristian Pop-Eleches, and Rodrigo Soares throughout the development of this project. I am thankful for the constructive and helpful feedback from Fabiola Alba-Vivar, Sujoy Bhattacharyya, Sandra Black, Matt Davis, Florian Grosset, Kyung Woong Koh, Tushar Kundu, John Marshall, Victoria Mooers, Micaela Sviatschi, Eric Verhoogen, Rose Camille Vincent, Jack Willis, and participants at PSE Summer School, Economics Graduate Student Conference at Washington University in St. Louis, Development Economics Colloquium, Political Economy Colloquium, and Applied Microeconomic Methods Colloquium at Columbia University. Umar Ali, Andrew Baran, Isabella Graham, and Katherine Wang provided excellent research assistance. Any remaining errors are mine.

1 Introduction

Political violence is a major barrier to establishing capable local governments in many developing countries. In violent environments, political assassination by organized criminals is a serious threat to establishing local state capacity (Blattman 2022). Competent individuals may be deterred from political careers and electoral processes may be corrupted by illegitimate actors (Acemoglu et al. 2013). Furthermore, political assassinations remove decision-makers overseeing the basic functions of local government, such as managing public finances and recruiting bureaucrats (Finan et al. 2017). These functions are pivotal in delivering public services, accounting for 24% of public expenditures and 35% of public employment globally (OECD 2016). While the political effects of assassinations are well-documented at the national level (Jones and Olken 2009), much less is known about the effects of assassinations on the capacity of local governments to perform their basic functions.

This paper investigates whether successful assassinations of leaders affect the capacity of local governments to maintain revenues, allocate public resources, and retain their personnel. I construct a dataset on local public finances, personnel, criminal presence, and political assassinations. The effects of assassinations are identified by comparing local state capacity in locations with successful assassination attempts against failed ones. The results provide new evidence that the presence of leaders affects disaggregated measures of fiscal and personnel capacity. The evidence speaks to the significance of leaders in establishing capable local governments in violent environments created by the presence of illegitimate external actors.

I study the effects of successful assassinations on local state capacity focusing on mayors in Mexico. Mayors have authority over the recruitment of personnel, provision of basic services, infrastructure projects, and tax collection (Dell 2015; Larreguy et al. 2020). Unfortunately, they are under constant threat of political violence. According to ACLED, Mexico has the highest number of attacks against local politicians in the world[1]. No fewer than 85 out of more than 15,000 mayors have been assassinated since 2000[2]. They are at least 9 times more likely to be murdered than the general population (Calderón et al. (2019) and Figure 1). According to data and anecdotal evidence, the perpetrators are usually organized criminal groups (Grillo 2011; Trejo and Ley 2021). They seek to gain political influence and exploit local resources such as fiscal revenues, construction projects, and

1. The statistics are obtained from the following online report: https://acleddata.com/2023/06/22/special-issue-violence-against-local-officials/ (Accessed on October 28th, 2023)
2. There are 2,471 municipalities in Mexico, each with 6-7 different mayors since 2000.

extortion (Trejo and Ley 2021)[3]. Data further reveals that non-political violence does not explain the incidence of assassination attempts against mayors.

My identification strategy isolates the effect of losing a mayor to an assassination on various local state capacity outcomes over time. I construct a novel panel dataset of assassination attempts, the presence of criminal groups, municipal public finance, and the local government workforce. Data on assassination attempts and their outcomes are obtained through text-scraping online newspaper articles. Using this data, I compare the state capacity of municipalities whose mayors were killed to those whose mayors survived an attempt unharmed, employing an event-study design. Excluding municipalities without assassination attempts minimizes the selection bias that arises from differences between locations with and without such attempts (Brodeur 2018; Jones and Olken 2009). The regression design nets out the effects of confounders such as political violence by making comparisons conditional on the occurrence of assassination attempts in both treated and control groups. I control for municipality and year fixed effects, as well as time-varying demographic and criminal characteristics. Thus, the treatment effects are identified by changes to the local state capacity among municipalities with successful and failed assassination attempts.

The first set of results addresses the effects of successful assassinations on the capacity of local governments to collect taxes and allocate resources. Municipalities with mayor assassinations lose their capacity to raise revenues. Total tax revenue decreases by 29.9% over the 6 years after assassinations. Per capita tax revenue falls by 102 Mexican Pesos and shows a similar rate of decline to total tax revenue. In addition, intergovernmental grants that partially depend on local tax revenues fall by 10% (Careaga and Weingast 2003). Revenues from other sources not linked to taxation remain unaffected. Overall, the capacity of affected municipalities to collect taxes declines. This carries over to other sources of income whose revenue is based on tax collection efforts.

Furthermore, public expenditures are diverted toward investment in construction at the expense of institutions providing health, education, and other essential operations and services. The volume and share of expenditure on construction increase by 29.4% and 6.3 percentage points, respectively. Conversely, the volume and share of expenditure on operating costs not related to infrastructural

3. There are numerous incidences reported on the news where organized criminal groups exploited local revenues and forced municipal governments to grant public works projects to companies with ties to criminals. For instance, see https://www.economist.com/the-americas/2023/05/11/mexicos-gangs-are-becoming-criminal-conglomerates and https://www.nytimes.com/2016/01/17/opinion/sunday/why-cartels-are-killing-mexicos-mayors.html (accessed on September 5th, 2023)

services each decrease by 42.8% and by 1.7 percentage points. Additionally, allowances to municipal institutions for education, health, and other welfare services decrease by 39% in amount and 1.7 percentage points in share. The results align with anecdotal evidence of government resources diverted toward construction projects implicitly sponsored by organized criminals (Grillo 2011)[4]. Moreover, the fiscal capacity to provide public services deteriorates through crowd-out of funds for primary services that promote economic development (Besley and Ghatak 2006; Parienté 2017).

The second set of results investigates whether successful assassinations affect the capacity of local governments to retain their personnel. First, I develop a simple framework that explores how assassinations affect the allocation of workers across different areas of local government operations. This framework implies that assassinations increase the cost of retaining workers, particularly those with better outside options. Then, I examine this hypothesis empirically. I focus on workers at the peak of private sector earnings capacity, as indicated by a national labor survey. The proportion of these workers in the affected municipal governments decreases by 15 percentage points. Using the wage elasticity of labor supply from Dal Bó et al. (2013), I show that a 13% increase in wages is required to retain these workers. These results show that assassinations negatively affect the capacity of local governments to retain the most productive workers in their workforce.

In the next part of the paper, I conduct several exercises to track the trend in the presence of organized criminal groups and rule out alternative mechanisms. First, I check whether organized criminal groups take advantage of the vacuum of leadership after assassinations. I find that they do so by increasing their presence in municipalities with successful assassinations. There is an increase in the number and the entry of new organized criminal groups. The results indicate that illegitimate external actors take advantage of the absence of formal leaders, which allows them to gain influence over the basic functions of the local government.

Next, I rule out potential alternative mechanisms. One of these factors is the increase in non-political violence. An upsurge in such violence may discourage economic activities and induce the population to flee from that location. These could affect tax collection, the makeup of the government workforce, and the allocation of public goods irrespective of assassinations. Thus, assessing the contemporaneous changes in non-political violence, economic activities, and changes in population post-attempts is important for ruling out possible alternate channels. I find no statistically significant

4. The data does not identify the recipient of the funds. Additionally, the data aggregates the funds at the municipal level. Thus, the exact recipient of the funds is not available.

changes to various measures that proxy for these factors. Thus, these alternative channels do not confound the effects of assassinations.

I further investigate how the inclusion of municipalities with mayors absent from duties due to non-fatal injuries after failed attempts or non-violent deaths affects the treatment effect. If the presence of mayors in the control group explains the size of the effects, then treatment effects should attenuate with the inclusion of absent mayors in the control group. The treatment effects decrease as the share of municipalities with absent mayors in the control group increases. This complements the claim that the presence of mayors is significant in explaining the estimated treatment effects and determining the local state capacity.

Overall, the results show that successful assassinations of mayors negatively affect the capacity of local governments beyond the political outcomes. Tax collection and allocation of public resources are negatively affected. Retaining efficient personnel becomes costlier. These are not linked to non-political violence, economic activity, or population changes. Rather, increased organized criminal group presence in inter-cartel war zones drives these outcomes. These results highlight how successful violence on politicians by criminal groups seeking political influence stunts the effectiveness of non-political bureaucratic tasks and personnel by eliminating a local political leader.

The findings in this research contribute to three strands of literature. First, this paper speaks to the literature on the formation of the state capacity of local governments. Origins of state capacity at the national level have been widely studied across many disciplines over time (Acemoglu 2005; Besley and Persson 2009; Besley et al. 2022; Finan et al. 2017; Tilly 1985). Recent strands of this literature began paying attention to the effectiveness of subnational public institutions (Best et al. 2023; Dal Bó et al. 2013; Fenizia 2022). There are several studies investigating the effects of exogenous shocks and monitoring mechanisms on the capabilities of the local politicians in leadership roles (Daniele 2019; De Feo and De Luca 2017; Larreguy et al. 2020; Vannutelli 2022). These works are silent on the measures of local state capacity beyond electoral outcomes and the characteristics of the local politicians. I use novel local-level data on public finance, government workers, and political violence to study how local governments develop the capacity to execute basic tasks like collecting taxes, allocating public goods, and recruiting personnel. In doing so, I fill in the gaps by examining the elements that shape local state capacity beyond political and electoral outcomes.

Second, this paper is related to the literature on the developmental costs of political violence. The consequences of violence to development are well-documented by previous works (Brodeur 2018;

Dell 2015; Pinotti 2015; Sviatschi 2022; Velásquez 2020). Political violence leads to situations in which formal authorities are being contested by non-state actors (Alesina et al. 2019; Acemoglu et al. 2013; Besley and Persson 2010; Blattman and Miguel 2010; Blattman et al. 2022; Sánchez de la Sierra 2020). These works use variation in the types of violence that occur at a national or regional level. I build on these works by leveraging the impacts of the direct attacks on politicians at a granular geographic level. Furthermore, I disentangle the influence of political and non-political violence using data that track the presence of organized criminal groups and other types of crimes across municipalities over long periods. The results highlight the negative impacts that political violence and organized crime have on institutional and economic development on top of factors related to non-political violence.

Last, this paper contributes to the literature on the influence of decision-making personnel on organizational performance. Past works have used changes in national leadership from unexpected transitions (Blakeslee 2018; Iqbal and Zorn 2008; Jones and Olken 2005, 2009; Rommel and Schaudt 2020). Similar approaches have been applied to investigate the role of decision-makers on firm performance (Bennedsen et al. 2020; Bertrand and Schoar 2003; Fahlenbrach et al. 2017; Fee et al. 2013; Jaravel et al. 2018). These works use aggregate outcome variables such as macroeconomic growth, firm profits, and institutional policy decisions. Focus on the performance of local public institutions rose with recent works using measures related to procurement (Best et al. 2023; Spenkuch et al. 2023). I expand this literature by using disaggregated measures of state capacity beyond procurement and leveraging variation in the presence of decision-makers induced by local political violence. Furthermore, I corroborate the significance of the individuals in decision-making positions at local public institutions by providing evidence that their absence hurts the capacity of these institutions.

The rest of the paper proceeds as follows. Section 2 provides an overview of the role of the municipal government and the political violence in Mexico. Section 3 describes the data and descriptive statistics. I provide explanations on the empirical strategy in Section 4. Section 5 reports key findings on the effects of losing leaders to successful assassinations on local fiscal capacity. In Section 6, I analyze whether local governments lose their capacity to retain productive personnel after successful assassinations. I establish the channel explaining the outcomes in Section 7. Section 8 concludes.

2 Background: Municipal governments and political violence in Mexico

Municipal governments in Mexico offer an ideal context to examine the impact of successful assassinations on local state capacity. Mayors lead municipal governments and have the final say on tax collection, public goods provision, and recruitment of personnel. Since the mid-2000s, they are increasingly vulnerable to assassinations. The culprits are usually organized criminal groups seeking political influence to extort local resources. Data show that mayors in municipalities with a high presence of organized crime are more likely to be retaliated against, irrespective of non-political violence. In this section, I provide an overview of municipal governments and organized crime in Mexico.

2.1 The authority and characteristics of municipal governments

Mayors are the heads of municipal governments with various responsibilities. There are 2,471 municipalities in 32 states, including the 16 boroughs in Mexico City. Each mayor serves a 3-year term and has been eligible for reelection since 2018[5]. Mayors are elected with the vice mayor (*alcalde suplente*), one or two attorney generals (*sindicos*), and several community representatives (*regidors*) as running mates. The municipal government is responsible for managing infrastructure and delivery of public goods and services (Larreguy et al. 2020). They are also responsible for recruiting key personnel and other bureaucrats (Dell 2015). In the case of a permanent vacancy by a mayor, an alternate mayor takes over until the next election[6].

Municipalities in Mexico collect taxes on local properties and funds from the central government to finance their operations. Municipal governments gained fiscal autonomy in the middle of the 1990s (Careaga and Weingast 2003; Larreguy et al. 2020). Since then, tax collection from their jurisdictions primarily through property tax increased (Careaga and Weingast 2003)[7]. However, grants from the central government still take up a significant share of the municipal government revenue (Careaga and Weingast 2003; INEGI 2016). Part of the funds are earmarked (*aportaciones*), and the others are non-earmarked portions (*participaciones*) (Ibarra Salazar 2017). The latter partly depends on the taxes collected at the municipal level and takes up roughly one-third of the municipal revenues (Timmons

5. Before 2018, mayors could not seek reelection (Larreguy et al. 2020). This ban was lifted as a result of an electoral reform in 2014, but only came into practice in 2018 due to the timing of election cycles (Enríquez 2022).

6. This is usually the vice mayors, but there are also exceptions (Esparza and Mancera 2018).

7. Article 115 in the Mexican Constitution states that it is the municipal government's responsibility to oversee taxes from properties. Other forms of taxation, such as income taxes, are levied by the federal or the state government.

and Broid 2013; INEGI 2016)[8]. Further details are in Appendix A.1.

Municipalities spend heavily on payments to their personnel, public investments, provision of public services, and transfers and allowances to internal institutions responsible for health and education (INEGI 2016). These spending are directed towards water, waste management, construction projects, health and educational services, and roads (Larreguy et al. 2020). Municipality governments mostly finance the majority of these services from local taxes and central government grants (Chong et al. 2015). As such, decreases in various sources of funds are expected to negatively impact the delivery of public goods and services (Careaga and Weingast 2003).

In financing and executing these operations, the personnel of the municipal government recruited by mayors play a crucial role. The heads of key institutions that execute policies are designated by mayors (Dell 2015; Grillo 2011). Mayors also have the final say in recruiting bureaucrats who carry out basic tasks (Dal Bó et al. 2013). Municipal bureaucrats represent about 21% of all public sector employment in Mexico and are responsible for deliveries of public goods and services, public security, local economic development, and public finance (INEGI 2022).

2.2 Organized criminals and the attacks on local officials

Mexico has a long history of organized crime, but they were not always in conflict with local politicians. Parts of Mexico, particularly the regions bordering the United States, have been a corridor for illicit drugs in the 1980s and 1990s (Grillo 2011). Organized criminal groups engaged in inter-cartel wars to win control over key trade routes (Dell 2015; Trejo and Ley 2021). They bribed corrupt local government officials for cooperation in securing routes and gaining an advantage over rival groups (Trejo and Ley 2019)[9]. There was less violence against local politicians at this time, as attacks against politicians would risk losing cooperation from corrupt officials (Lessing 2015; Trejo and Ley 2019).

However, organized criminals in Mexico have increasingly targeted high-profile local officials since the mid-2000s, shown in Figure 1. This is driven in part by the increasing involvement of

8. The nonconditional portion of the funds from the higher levels of government is a function of the population, poverty levels, municipal tax collection, and previous *participaciones* (Timmons and Broid 2013). Part of the rationale for incorporating tax collection into the intergovernmental transfers is to incentivize the subnational governments to internalize local economic prosperity and to allow them to retain a higher share of revenues raised from growth (Oates 2005; Weingast 2009). Further discussion will be included in the Appendix A.1.

9. There were many incidences of local police and even politicians being arrested for corruption and/or having an illegal connection with organized criminals, particularly in the years of President Salinas (1988-1994) (Grillo 2011)

the federal government and the military following the “War on Drugs" since 2006. The military employed aggressive tactics such as targeting kingpins and breaking up major organized criminal groups (Grillo 2011)[10]. Rising crackdowns on drugs and the splintering of major criminal groups increased the intensity of inter-cartel wars and made it difficult for remaining criminals to sustain control of the drug trade (Trejo and Ley 2019).

The changes in the political environment incentivized organized criminal groups to target local politicians. The difficulty of maintaining drug trafficking led these groups to seek alternative sources of revenue such as ransoms, extortions, local fiscal revenues, and construction projects (Grillo 2011). Organized criminal groups often threaten mayors to gain access to property tax registry and knowledge on construction projects, attacking those who are not cooperative (Lessing 2015; Trejo and Ley 2019). In other cases, criminals attack mayors to influence the electoral process to facilitate access to this information (Magaloni et al. 2020).

This anecdotal evidence is supported by the data on assassination attempts and the presence of organized criminal groups. The timing and the geographical distribution of assassination attempts, from the data explained further in Section 3, are aligned with the narratives. Mayors are the most vulnerable at the beginning and the end of their terms, coinciding with the election cycle (Figure 2). As attacks around elections facilitate involvement in politics by illegitimate groups, this evidence shows that attackers seek influence over municipal politics (Enríquez 2022). In addition, mayors in locations with heavy criminal group presence are retaliated for failing to cooperate or siding with rival criminal groups (Lessing 2015). I explore this in the next section.

2.3 Which municipalities are more vulnerable?

This section studies whether the level of criminal group presence is associated with assassinations, rather than non-political violence. If municipalities with assassinations also have high non-political crime rates, the effects of assassinations can be entangled with high rates of non-political violence. This makes it difficult to attribute the effects of successful assassinations solely to the political violence by organized criminal groups. Thus, I use the following descriptive regression to

10. The “War on Drugs", declared by President Felipe Calderón to combat organized crime, involved the deployment of the federal military throughout Mexico’s most contested regions. The strategies utilized by the military involved confrontation with the organized criminals and targeting their leadership (Magaloni et al. 2020; Trejo and Ley 2021). Despite some success in breaking down notable organized criminals such as the Beltrán-Leyva organization, others such as La Familia expanded their influence by retaliating against local politicians (Trejo and Ley 2019, 2021)

estimate the correlation of assassination to organized crime (β_{OCG}) and non-political violence (β_{hom}).

$$y_{mt} = \alpha + \beta_{\text{OCG}}\text{OCG}_{mt} + \beta_{\text{hom}}\text{Homicide}_{mt} + \phi X_{mt} + \gamma_m + \delta_t + \epsilon_{mt} \quad (1)$$

The goal is to see if the presence of organized criminal groups is related to assassinations and not the non-political violence ($\beta_{\text{OCG}} > 0, \beta_{\text{hom}} = 0$). y_{mt} is the dummy variable for assassinations obtained from newspaper articles. OCG_{mt} refers to the organized criminal presence from Coscia and Rios (2012), Osorio and Beltran (2020), and ACLED. Homicide_{mt} is the homicide rate proxying for non-political violence from the National Institute of Statistics and Geography (INEGI[11])[12]. X_{mt} is the set of municipal-level demographic and socioeconomic characteristics correlated with violence. I include municipality (γ_m) and year fixed effects (δ_t). The error term is clustered at the municipal level. Further explanations of the data are found in Section 3.

The results in Table 1 show that assassinations are correlated with the presence of criminal groups, not non-political violence[13]. When considering all of Mexico, the presence of an additional criminal group is associated with a 0.2%-0.3% increase in the likelihood of assassinations. A new criminal group is associated with a 0.3 percentage point increase in assassinations. These relationship remains qualitatively the same when the sample is narrowed to municipalities with assassination attempts. Homicide rates are unrelated to mayoral assassinations throughout. Thus, selection into treatment (assassination) is correlated with criminal group presence and not non-political violence.

3 Data

I construct a novel municipality-level panel dataset on assassination attempts against mayors and municipality-level state capacity indicators. I collect cases of assassination attempts by gathering information from online newspaper archives using text-scraping methods. I combine this with municipal fiscal indicators, personnel in the local government, and other economic, criminal, and demographic variables gathered from various sources. These features allow me to leverage variation in the outcome of assassination attempts and measure local government effectiveness across

11. *Instituto Nacional de Estadística y Geografía*
12. Executive Secretariat of the National Public Security System (SESNSP) include other non-political violence from 2011 onwards. Thus, I choose homicide rates as a proxy for non-political violence since they provide more statistical power.
13. Conclusions are similar if I use the incidence of attacks for an outcome variable instead of assassinations. The results are in Appendix Table B1.

municipalities over time. I provide a detailed explanation of the steps of constructing the dataset.

3.1 Assassination attempts against mayors: Sources and collection procedure

I use two types of sources for assassination attempts against mayors. First, I collect relevant newspaper articles documenting attacks against mayors found in online newspaper archives such as *Newsbank* and *Proquest*. Second, I complement these articles with existing databases of events such as the Global Database of Events, Language, and Tone (GDELT) and the Armed Conflict Location and Event Data (ACLED). I gather the information on the name of the mayor, the municipality that the victim represents, and the date and the result of the attack from these sources.

The collection procedure using online newspaper archives can be summarized as follows. I create a program script that inputs specific key phrases into the search box of the news archives and executes an online search. Then, I filter the articles that appear in the results based on timeframe and publisher[14]. The script then gathers the name of the publisher, date, title, and the full text of each article that remains after filtering. Afterward, I discard articles that do not address attacks on mayors based on the contents of each article. Last, I extract information on the name of the attacked mayor, the municipality that the mayor represents, the date of the incident, and the outcome of the assassination attempt. Further technical explanations will be included in Appendix A.2.

I also refer to some other databases that document events highlighted in various news sources and previously published reports to complement the results from the online newspaper archives. The databases used for this are GDELT and ACLED. I also refer to reports written by Magar (2018) and Esparza and Mancera (2018), which include a list of mayors who passed away due to assassinations and non-violent reasons.

I categorize the outcome of the assassination attempts on mayors as follows. A successful attack is defined as one that leads to the death of a mayor immediately or within days and is part of the treatment group. An attack on the mayor is considered a failed one if the mayor, municipal office, or mayoral residence is targeted without killing the mayor. Failed attempts can be disaggregated into the cases where the mayor was unharmed and injured. I classify the assassination attempt into the former if the article explicitly states that the mayor was not at the site of the attack or unharmed. If the article mentions injuries or hospitalizations, I classify such cases in the latter category. I include

14. I include articles from nationwide sources such as *El Universal*, *La Jornada* and *Reforma* but also regional newspapers.

unharmed cases in the control group, with injured cases included as a robustness check in Section 7. I explain the rationale for this design in Section 4.

There are other types of political violence targeting mayors that are not included in the regression. For instance, kidnappings that do not lead to the death of a mayor and death threats are excluded. I discard them since these types of violence may seek to frighten, but not necessarily eliminate the presence of the mayors by murder. The same logic can be applied to attacks targeting family members of mayors. Dropping these cases ensures that the treatment assignment exploits variations in the success of assassination attempts seeking to violently and permanently eliminate mayors.

There are a total of 163 assassination attempts from these sources, with the earliest incident dating back to 2002. Out of these, 85 were successful attempts and 78 were failed attempts. The failed attempts can be disaggregated into 25 cases with injuries and 53 with no injuries. These occurred in 147 municipalities[15]. Figure 3 shows the geographical and temporal distribution of these events. The full lists of mayors targeted by assassination attempts are in Appendix A.3.

3.2 Data on municipal fiscal effectiveness and local government personnel

To capture various measures of fiscal capacity and the composition of the municipal government personnel, I utilize various datasets from INEGI. I use the yearly panel of municipal fiscal revenues and expenditures (EPIFEM[16]) to quantify the fiscal capacity of each municipality. As for the data on personnel, I draw on the biennial census on municipal governments (CNGMD) and quarterly National Survey of Occupation and Employment (ENOE)[17].

The EPIFEM data contains data on the amounts received from various categories of revenues and those spent on different types of expenditures. I use tax revenues to capture the fiscal capacity of municipal governments, reflecting standard practice in state capacity literature (Besley and Persson 2009, 2011). I also use intergovernmental funds, revenues from the provision of public services, and receipts from legal functions such as fines. The data also includes public expenditure on the provision of basic public goods, investment in construction projects, and transfers and allowances to municipal institutions and the local population. I use these to trace how the provision of various services by the

15. There are also no less than 23 failed kidnapping attempts, 64 incidences of family members attacked, and 50 threatening messages directed at municipality presidents. These are excluded from the regression but included in Figure 1.
16. Estadística de Finanzas Públicas Estatales y Municipales
17. CNGMD and ENOE stands for *Censo Nacional de Gobiernos Municipales y Demarcaciones Terrotoriales de la Ciudad de México* and *Encuesta Nacional de Ocupación y Empleo*.

municipal governments is affected. I use the data from 1995 and onwards, when local governments gained more fiscal authority (Larreguy et al. 2020)[18]. Detailed explanations on these variables are in Appendix A.4. Summary statistics for different categories of municipalities are in Panels A and B of Table 2, with detailed information on the analysis sample in Appendix Table A4.

The data on public and private sector employees come from two sources. CNGMD has information on the personnel of the municipal government, including the total size of each municipal government workforce and the number of workers for each age group. The data is available biennially starting from 2010 and onwards. To estimate what local government workers can earn in other labor markets, I use nationally representative earnings data for workers in all major industries in Mexico from ENOE. This data captures what the outside option looks like for different types of workers in local government. This also serves as a crucial building block for analyzing the effects of successful assassinations on the ability to retain municipal workers in Section 6. Summary statistics for the age distribution of the municipal workers are in Panel C of Table 2 and Appendix Table A4.

3.3 Data sources for outcome variables used in falsification tests

I also obtain variables that may confound the effects of assassinations such as non-political crimes, economic activities, and measures of population. Any differential changes in these variables in municipalities with assassinations indicate that there may be factors other than assassinations that affect local state capacity. If true, the effects of assassination could be inaccurately estimated. Thus, it is necessary to test whether there are also changes in these variables in the same sample.

I gather the relevant data from multiple sources to test these alternative mechanisms. The municipal statistics on criminal activities are from INEGI and the Executive Secretariat of the National Public Security System (SESNSP). To proxy for the measure of economic activities, I use the nightlight data from DMSP for periods before 2012 and VIIRS for 2012 and after to test whether changes in economic activities affect the results (Donaldson and Storeygard 2016; Henderson et al. 2012)[19]. To capture changes in municipal population, I gather variables from the Mexican Census and yearly population estimates based on satellite methods from WorldPop. I also use outmigration patterns to the United States from each Mexican municipality. This is measured by the number of Consular

18. The raw data for EPIFEM dates as far back as 1989. Results are robust if all available EPIFEM data are used.
19. DMSP is available up until 2013 and is discontinued after. VIIRS data is only available from the year 2012. I generate a harmonized measure of nightlight data with a procedure detailed in Appendix A.5.

ID Cards (MCAS) issued to Mexicans residing in the United States, available from the Institute of Mexicans Abroad (IME)[20] [21].

3.4 Data sources for control variables

To address omitted variable bias, I include variables on the presence of criminal groups, general criminal activities, and demographic and geographic characteristics. The data on organized criminal groups is identical to those used in Section 2 - Coscia and Rios (2012) for periods before 2000, Osorio and Beltran (2020) for 2000-2018, and ACLED for 2019 and after. I include municipality-level homicide statistics from INEGI to account for general criminal activities. Covariates for general crime also account for other factors associated with the lack of state presence (Dal Bó et al. 2013).

As for other variables on demographic and geographic characteristics at the municipal level, I use data from the Mexican Census. From there, I use the average years of schooling and the share of the indigenous population at the municipal level. These variables partially capture the determinants of marginalization and underdevelopment, which are correlated with lack of state presence (Dal Bó et al. 2013). I include time-variant geographic variables such as the endowment of various resources as a robustness test. This is obtained from the Mineral Resources Council and Mining Metallurgical Industry Survey from INEGI. Further details are in Appendix A.4.

4 Empirical strategy

I compare municipalities with successful assassinations to those with failed attempts that did not injure the mayors using event-study specifications. The treatment effect is identified by differences in the changes in the measures of local government capacity across the two groups of municipalities. This design addresses selection bias and nets out confounding factors such as political violence. Furthermore, I identify how treatment effects change over time. I discuss the formation of the analysis sample and the main specification in this section.

20. MCAS and IME each stands for *Matrica Consular de Alta Seguridad* and *Instituto de los Mexicanos en el Exterior*.

21. The data on outmigration to other destinations within Mexico are found on household surveys administered by INEGI. These surveys are carried over select municipalities in Mexico and do not cover all the municipalities included in this research. Thus, I choose MCAS as an alternative.

4.1 Constitution of the treatment and control group municipalities

To isolate the effects of successful assassinations that eliminate mayors, I construct a counterfactual of the municipalities that lost their mayors to assassination with those whose mayors were unharmed after the attacks. The former group of municipalities is the treatment group while the latter is the control group (*near-miss*). I leave out municipalities whose mayors were injured. These mayors are also unable to serve for some periods, similar to those in the treatment group. I study the implication of including these cases to the treatment effect in section 7. Municipalities whose mayors were never targeted are excluded from the analysis to ensure that the comparison of changes to outcome variables is made conditional on an assassination attempt. Thus, I compare the effects of losing a leader to assassinations in places with similar degrees of political violence.

This research design addresses potential biases due to selection into treatment that may occur if municipalities with no assassination attempts are included. Perpetrators target certain municipalities over others based on the potential for strategic gains (Dell 2015; Enríquez 2022; Grillo 2011). This would lead to differences in unobserved and observed attributes such as economic, demographical, and criminal characteristics across targeted and nontargeted areas. These imbalances lead to contaminated estimation of the treatment effects. Thus, limiting the sample to municipalities with attacks is essential for the identification of the treatment effects.

In particular, it nets out confounding factors and leverages local-level outcomes by comparing municipalities that share similar characteristics except for the treatment. All comparisons in this setup are made conditional on an assassination attempt (Brodeur 2018; Jones and Olken 2009). Thus, treated municipalities are compared with near-miss ones that are similar in observable traits such as political violence. This nets out the influence of these confounders. Furthermore, I can leverage the variation in the outcome variables disaggregated to the municipal level. This allows me to investigate how losing a leader to successful assassinations affects local indicators of state capacity, which is not possible in a more aggregated setup such as country-level regressions.

The research design is further validated if the observable characteristics across treated and near-miss municipalities are balanced. I conduct a balance test in Table 3 by regressing observable characteristics one year before assassinations (the year of assassinations for political affiliations) onto the treatment status[22]. For municipalities experiencing multiple assassination attempts, I include the

22. The rationale for setting the timing differently for political affiliations is that for some municipalities, the political party of the mayor may differ between the year of assassinations and the year before. This is true for some cases where the

first case of successful assassination and drop the others, leaving me with 82 municipalities in the treatment and 45 in the control group[23]. Overall, I find that the two types of municipalities are similar across many dimensions, especially regarding the presence of organized criminals and political affiliation of mayors[24]. These results show that those with attacks against mayors are largely similar in observables except for treatment assignments.

4.2 Model specifications: Measuring the effects of assassinations over time

To estimate the dynamic treatment effects, I use an event-study regression which allows me to leverage temporal and geographical variation of assassination attempts. The regression includes indicators for time passed since assassinations, municipality and year fixed effects, and time-varying characteristics at the municipal level. The regression takes the following form

$$y_{mt} = \alpha + \sum_{\substack{h=-6 \\ h\neq -1}}^{6} \tau_h I[t - \text{assassination} = h]_{mt} + \tau_{7^+} I[t - \text{assassination} \geq 7]_{mt} + \beta X_{mt} + \gamma_m + \delta_t + \varepsilon_{mt} \tag{2}$$

m and t index municipality and time, respectively. The unit of time is in years for most regressions except for those on municipal personnel, which is in biennial units. γ_m and δ_t are municipality and year fixed effects respectively. The standard errors are clustered at the municipality level.

y_{mt} is the outcome variable of interest. For outcomes related to local fiscal capacity, this represents expenditure and revenues for the municipal governments. For models measuring effects on municipal personnel, y_{mt} refers to the variables on the share of different groups of municipal workforce. In models testing for mechanisms, y_{mt} represents potential confounding variables such as nightlights, population, and crime statistics at the municipal level.

$I[t - \text{assassination} = h]_{mt}$ is the treatment assignment variable for municipality m in year t. It equals 1 if municipality m had a mayor assassinated h years ago at year t. For near-miss municipalities, $I[t - \text{assassination} = h]_{mt}$ is always 0 for every t and h. Parameter τ_h captures the dynamic effect

attacked mayor is in the first year of the term and is a member of a different party compared to the predecessor. I choose this timing to make sure that the party affiliation of the attacked mayor is accurately reflected.

23. This follows a general setup of event study regressions where treatment status is nondecreasing over time (Sun and Abraham 2021; Callaway and Sant'Anna 2021). Estimation is robust if I discard municipalities with multiple assassination attempts.

24. The large absolute differences in the total homicides are driven by the inclusion of municipalities with a large population (over 200,000) with larger reported homicides. Excluding such municipalities does improve the balance without affecting the results.

of assassinations on y_{mt} h years after such event by comparing treatment municipalities h years since assassination against near-miss municipalities[25]. I also include these indicators to account for timing before assassinations to check for pre-trends. I control for 6 leads and lags since this corresponds to two separate terms for mayoral positions before and after the event[26]. For normalization purposes, the year before the assassination ($h = -1$) is omitted (Schmidheiny and Siegloch 2023).

Furthermore, I group the municipality-year observations that experienced an assassination 7 or more years ago into the $I[t - \text{assassination} \geq 7]_{mt}$ variable. This is necessary in the case where long-run effects of an event may differ from short-run effects (Borusyak et al. 2021; Schmidheiny and Siegloch 2023). Therefore, τ_{7+} could be understood as the long-run effect of an assassination.

X_{mt} is the set of time-variant municipality-level characteristics. These variables address omitted variable bias originating from criminal, demographic, and political characteristics that may determine outcome variables irrespective of assassinations. I include homicides per 100,000 persons, the log of total homicides, the log of the number of organized criminal groups, the share of the indigenous population, the average years of schooling of the municipal population, and the years passed since the most recent election (in levels and squares).

The identifying assumption for the Equation (2) is the parallel trends. This is violated if the estimates of τ_h for periods before the assassinations $(h \leq -1)$ are statistically different from zero. For most outcome variables, these are estimated to be statistically indifferent from zero.

Furthermore, there may be a concern about the bias of the basic two-way fixed effects estimates arising from the temporal heterogeneity of treatment effects (Borusyak et al. 2021; Sun and Abraham 2021). To address this, I complement the results with recent modifications to the event-study estimators such as Gardner (2021) and Sun and Abraham (2021).

Last, I complement the event-study setup with the following simple difference-in-differences regression.

$$y_{mt} = \alpha + \tau I[\text{assassination}]_{mt} + \beta X_{mt} + \gamma_m + \delta_t + \varepsilon_{mt} \tag{3}$$

$I[\text{assassination}]_{mt}$ is an indicator variable that equals 1 if municipality m in year t experienced an assassination at any period before or on year t. τ represents the causal effect of assassination for all post-assassination periods. Other variables and features are the same as in Equation (2).

25. The treatment period for municipalities with multiple assassination attempts begins from the first successful assassination, following the nondecreasing treatment assignment setup over time (Sun and Abraham 2021; Callaway and Sant'Anna 2021).

26. The signs and estimators remain similar if I include different numbers of leads and lags

5 Effects on local fiscal capacity

In this section, I empirically test the predictions on the fiscal capacity of local governments after successful assassinations and discuss the results. Local governments lose mayors who oversee tax collection and public goods provision to successful assassinations. This may lead to ineffective local government operations, reducing tax revenues and shifts in the allocation of resources and expenditures for public goods. I report the estimation results along with some robustness tests to validate the findings. Overall, the findings indicate that affected local governments lose their capacity to maintain revenues and allocate public resources.

5.1 Negative effects on the municipal revenues

First, I estimate whether tax collection is impacted by the assassination of mayors. To capture changes in tax collection, I use the log of the total tax revenues as well as property taxes. I complement these measures with the per capita total and property tax revenues collected. To check whether other sources of revenue are affected, I include log of non-earmarked intergovernmental funds (*fondos participaciones*) and earmarked funds (*aportaciones*), revenues from provision of public services (*derecho*) and legal functions (*aprovechamientos*)[27][28]. Non-earmarked funds are determined at a state level based partially on tax revenue at the municipal level while others are independent of taxation (Careaga and Weingast 2003; Timmons and Broid 2013). Thus, a decrease in the capacity to collect taxes may also reduce non-earmarked funds but not others.

Municipalities affected by assassinations lose their capacity to gain revenues through taxation. Figure 4 reports the point estimates and the 95 percent confidence interval for the τ_h coefficients in Equation (2) for tax variables. I also report the average of the post-assassination estimates and its 95 percent confidence interval as a shaded gray region in the figure. Panel (a) shows that tax revenues in the affected municipalities decline immediately, with negative effects persisting in the 6 years. On average, tax collection declines by 29.9% in the affected municipalities. Per capita tax revenue falls by 102 pesos. Based on the control mean in Table 4, the rate of decline is similar to that of total tax revenues ($\frac{102.505}{364.883} = 0.281$). Total and per capita property tax revenue fall by 21.7% and 56 pesos

27. Non-earmarked funds are comprised of General participation fund (FGP) and Municipal Development Fund (FFM). While equity across regions is the main objective, the latter also takes into account local taxation efforts (OECD 2016).

28. Earmarked funds are broken down into Municipal Fund for Social Infrastructure (FISM) and Funds for Municipal Development (FORTAMUN). Both are granted conditional on infrastructural and development projects within the municipalities while taking poverty levels and demographic factors into account (Larreguy et al. 2020).

per person, respectively. Both decline at similar rates when using control mean in Table 4 ($\frac{56.184}{238.386} = 0.236$)[29]. Thus, fiscal capacity diminishes among municipalities experiencing assassinations.

This effect carries over to other sources of revenue determined by local taxation. The results are reported in Figure 5. For the non-earmarked funds, there is a decline in these funds by roughly 10%, as evidenced by Panel (a) in Figure 5. This outcome can be seen as an extension of the fall in tax-collecting capacity since the amount of this fund is partially determined by municipal tax revenue. Other revenue sources that are determined by demographic factors, usage of public service, and legal functions are unaffected. The estimated treatment effects for earmarked funds, revenue from public services, and legal charges are statistically indistinguishable from zero. The results highlight that the loss of capacity to maintain tax collection can extend to other sources of revenue.

I also conduct various robustness tests to validate the results. I first run a difference-in-difference specification in Equation (3), with estimated treatment effects reported in Table 4. The estimates are similar to the event-study results. In addition, I run various specification tests using Equation (2). I first drop all control variables. Second, I include controls related to resource endowment on top of baseline control variables as resource rents may contribute to fiscal revenues (Dube and Vargas 2013). Last, I run the event-study estimates with methods from Gardner (2021) and Sun and Abraham (2021) to account for potential treatment effect heterogeneity across groups and time. The results are reported in Appendix Figures B1 - B2. All estimates in this exercise are similar to the main specification, making the results in Figures 4 and 5 credible.

These results indicate that municipalities whose mayors were assassinated fail to maintain the level of tax collection relative to the near-miss municipalities. This also decreases the receipt of funds from the federal government determined by local taxation efforts. Thus, the loss of leaders to assassinations hampers the capacity of local governments to maintain their sources of revenues.

5.2 Diversion of government resources to select sectors

I investigate whether the provision of public goods and services is affected by the assassination of mayors. First, I include public investments in construction projects on the infrastructure meant to support the municipal population (*Inversión pública*). I also include the compensation to the mu-

29. 73% of municipal tax revenues are from property taxes (OECD 2016). However, property taxes account for just 2% of all taxes paid by individuals in Mexico (World Bank 2016). Furthermore, the share of own-source tax on total revenues is small and has high variation across small and large municipalities (World Bank 2016). Thus, changes in tax revenue for municipal governments are large whereas per capita changes are small.

nicipal personnel (*servicios personales*), spending on expenses to the provision of basic public goods such as water and electricity (*servicios basicos*), and expenses on other general operations including rents, maintenance, and travel expenses. Last, I look at total transfers and allowances to municipal entities (*Transferencias, asignaciones, subsidios y otras ayudas*), and transfers to internal public institutions overseeing educational, health, and cultural services (*Transferencias internas y asignaciones al sector publico*)[30]. I measure these outcomes in log amounts to capture changes in the volume and proportion relative to the total municipal expenditure to represent allocations.

The results of the changes in the volume of expenditure for different categories are reported in Figure 6. There is a significant increase in the amount of expenditure on public investment in construction projects. Since assassinations, the expenditure on public investment in affected municipalities increase by 29.4%. Expenditure on other categories not relevant to basic infrastructure decreases. Spending on other general operations, total transfers, and allowances to municipal institutions decline by 42.8%, 39%, and 45.1%, respectively. Expenditure on basic services and personnel compensation do not change significantly. The findings are consistent with other cases of increased resources diverted to construction after infiltration by criminal organizations (De Feo and De Luca 2017). The findings also indicate crowding out of resources for basic services that promote growth and poverty alleviation (Besley and Ghatak 2006; Parienté 2017).

The outcomes using proportion relative to total municipal expenditures speak to a similar message. Estimated treatment effects in Figure 7 show a 6.3 percentage point increase in the allocation of municipal expenditure towards public investment in construction. This is slightly larger than the 4.9-5.8 percentage point increase of similar expenses after the Mafia infiltration in Italian municipalities (Di Cataldo and Mastrorocco 2022). Allocation to the basic service rise by 0.8 percentage points and that for other general services decrease by 1.7 percentage points. Total transfers and those allocated to internal institutions decrease by 1.8 and 1.7 percentage points respectively. There are no changes in personnel compensation. The findings indicate that resources are diverted towards construction, leaving fewer funds available for other operations of the local government that foster economic development (Besley and Ghatak 2006; De Feo and De Luca 2017).

The estimated results are robust to various validation exercises used in Section 5.1. The difference in differences specification gives similar results, as shown in Table 5. Furthermore, estimates from

30. *Transferencias internas y asignaciones al sector publico* is a subcategory of *Transferencias, asignaciones, subsidios y otras ayudas* in the EPIFEM data.

the validation exercise on the event-study specification are not different. The results are reported in Appendix Figures B3 and B4.

To sum up, the provision of public resources in municipalities that suffered assassinations is shifted to the sectors that may benefit criminal organizations, sacrificing primary services. More resources are allocated to investments in construction, leaving little for other public services that matter for poverty reduction and economic development. The diversion of funds to construction sectors is consistent with previous evidence on the Italian Mafia and anecdotal evidence from Mexican criminal groups (De Feo and De Luca 2017; Di Cataldo and Mastrorocco 2022; Calderón et al. 2019). Furthermore, the crowd-out of funds from primary services indicates that the local fiscal capacity to provide resources for essential services is hampered by successful assassinations.

5.3 Summary of findings

Overall, municipalities with successful assassinations of mayors fail to maintain their fiscal capacity. Affected local governments are incapable of keeping the level of tax collection and other sources of revenues to finance their operation. The provision of resources and public goods is shifted towards investment in construction at the expense of essential operations and services such as education and health. Thus, successful assassinations negatively affect the capacity of local governments to collect and allocate resources for providing public services that are important for economic development. The results speak to the importance of the presence of leaders in maintaining local fiscal capacity in light of political violence.

6 Costs to the personnel capacity of local governments

This section investigates the effects of successful assassinations of mayors on the personnel capacity of local governments. First, I establish a framework outlining the allocation of personnel across various local government operations and derive insights into how assassinations affect the capacity to retain workers. Then, I analyze the effect of successful assassinations on departures and retention costs of the local government workers. I find that the younger workers, who have better outside options, are more likely to leave and the cost of retaining these workers rises.

6.1 Framework for local state capacity

Consider an economy comprised of individuals, whose population is normalized to 1, and the local government. Individuals earn income from working at the local government (public) or taking an outside option. Local government collects taxes and provides public goods to maximize social utility using public labor as input. Assassinations affect their choices by discouraging individuals from the public and hampering the productivity of local government tasks. The insights from this framework rationalize the main findings above and are used to generate hypotheses on the personnel of the local governments.

Individuals choose the public sector if the returns outweigh outside options. The gain from the public sector is the sum of the wage w and nonpecuniary amenity π. v represents gains from outside options. Individuals work for the public sector if $w + \pi \geq v$ and take the outside option if otherwise. Thus, the supply of labor for the public sector can be written as a function of wages, amenities, and outside options. $L = L(w, \pi, v)$. The supply is increasing and concave in w and π while it decreases in v. The labor choice is modeled with a more rigorous structure in Appendix Section C.1.1.

The local government collects taxes and provides public goods to maximize social utility. Each individual consumes private goods with her income net of taxes T and values public good G by α. Public sector workers earn w while those accepting outside options earn $E[v|v > w + \pi]$ on average. Local government pays for public workers L out of tax and other revenue R. The social utility aggregating all individual utilities and the budget constraint each have the following form.

$$\alpha G + Lw + (1 - L)E[v|v > w + \pi] - T \tag{4}$$

$$R + T \geq wL \tag{5}$$

The capacity of the local government is represented by how much public goods are produced and taxes are collected. This can be modeled similarly to a production function with labor L_j and productivity A_j for each $j \in \{T, G\}$. T and G each refer to tax collection and public goods provision. Production functions for each operation are represented by $t(\cdot)$ and $g(\cdot)$, respectively. Each function is increasing and concave in labor. I also assume that labor in the public sector is allocated to either one of the two areas. The production functions and labor allocation constraints are expressed as follows, with a detailed explanation in Appendix Section C.1.2

$$T = A_T t(L_T), \;\; G = A_G g(L_G) \;\; (t' > 0,\, t'' < 0,\, g' > 0,\, g'' < 0) \tag{6}$$

$$L_T + L_G = L \tag{7}$$

The local government allocates labor to maximize social welfare (4) subject to constraints (5)-(7). In the absence of exogenous shocks, labor is allocated to equate the marginal costs of taxation to the marginal benefits of public goods (Appendix Section C.1.3). Successful assassination changes the allocation of labor, tax collection, and public goods provision through productivity and amenity shocks. The following proposition summarizes the comparative statics of successful assassinations

Proposition 1. The effects of successful assassination on local state capacity

1. A productivity shock ($\Delta A_T(A_G) < 0$) decreases L_T (L_G), leading to a fall in T (G). If wages are flexible, w decreases due to decreased labor demand.

2. An amenity shock ($\Delta \pi < 0$) decreases overall labor supply, pushing L_T and L_G downwards. This decreases T and G. If wages are flexible, w increases due to contracting supply.

Proof: Appendix Section C.1.4.

The framework yields three important insights. First, it rationalizes channels in which tax revenues and public goods provision decrease after successful assassinations. Second, it prompts a hypothesis that workers with higher productivity and outside options are more likely to leave local governments than others after assassinations. Last, the possible rise in wages from the amenity shock motivates the exercise to calculate the cost of retaining workers in the local government. I test the departure rates and retention costs of different types of workers in the next section.

6.2 Loss of the productive municipal personnel and subsequent costs

Based on the insights above, I test whether treated municipalities lose productive workers and uncover the cost required to retain them. I proxy the productivity of the workers with age. To justify this approach, I obtain the wage profile by age using the individual-level earnings data from ENOE. I use hourly wage and monthly earnings to capture returns from the outside options for each age

group, thus capturing the productivity of each age group on the labor market in general[31].

I show the differences in earnings by age in two ways. First, I obtain simple group-wise average earnings for each age group. The average earnings are the highest for those in their 30s and 40s, as in Panels (a) and (b) in Figure 8. Second, I obtain the relationship between earnings and age net of the unobserved municipality, time, and industry characteristics using the following regression

$$y_{imjt} = \alpha + \sum_{G} \beta_G I[i \in G] + \phi_j + \gamma_m + \delta_t + \epsilon_{imjt} \quad (G \in \{20\text{s}, 30\text{s}, 40\text{s}, 50\text{s}, 60\text{s}, 70\text{s}\}) \tag{8}$$

$I[i \in G]$ is an indicator for individual i belonging in age group G. Fixed effects for industries (ϕ_j), time (δ_t), and municipalities (γ_m) are included. Thus, β_G coefficients capture the relationship between earnings and age net of unobserved industry, municipality, and time characteristics. They are reported in Panels (c) and (d) in Figure 8. Again, those in their 30s and 40s have the highest outside options, suggesting that they are the most productive group in the labor market at large.

Based on this finding, I investigate whether those in their 30s and 40s are more likely to leave. I use the proportion of workers per age group relative to the total number of workers obtained from CNGMD. I use the 20s, 30s, 40s, and 50s or above[32]. In the regression, I reduce the number of leads and lags and measure time in biennial units in Equation (2) to account for shorter availability and larger time intervals used in the data. The regression preserves other features of Equation (2).

The results show that the proportion of workers in their 30s and 40s combined falls by 15.3 percentage points, as in Figure 9 and the first row of Panel A in Table 6. The proportion of workers in their 30s and 40s fall by 8.5 and 6.8 percentage points each. Considering the pre-assassination proportion of workers in their 30s and 40s (32.9% and 23.3% respectively), this represents a 25.8% and 29.2% drop in the size of these workers respectively. Changes in other age groups are not statistically significant. The findings confirm the higher likelihood of departure for those in their 30s and 40s[33].

With these estimates, I calculate the retention cost of these workers by estimating the necessary increase in wages. I use the labor supply function $L = L(w, \pi)$ from the framework to obtain the estimates, with v abstracted away by assuming that outside options are not affected by political assassinations. The retention cost is defined as an increase in w in response to a decrease in amenities

31. In addition, the data on the educational attainment of the municipal workers in CNGMD are only available from the 4th wave of the CNGMD, thus limiting the statistical power.

32. The first two waves of the data do not include distinct categories for the 60s and 70s

33. Results are similar if the log of the total workers in each age group is used as a dependent variable, although dummy variables for municipality-time observations with 0 should be included. They are in Appendix Figure C1 and Table C1

π after assassinations to keep the labor supply constant. This trade-off in wages and amenities can be calculated using total derivatives and has the following form

$$\frac{dw}{d\pi} = \frac{-\frac{\partial L(w,\pi)}{\partial \pi}}{\frac{\partial L(w,\pi)}{\partial w}} \tag{9}$$

To obtain retention costs, I use my estimates on the departure of workers and labor supply elasticity estimates from Dal Bó et al. (2013). The numerator of the right-hand side of Equation (9) represents changes in the supply of workers in response to assassinations. This can be obtained from the rate of departure by age groups after assassinations in Panel A of Table 6. The denominator represents the elasticity of labor supply with respect to wages. For this, I use the estimated labor supply elasticity from a field experiment on Mexican municipal workers: 2.15 (Dal Bó et al. 2013)[34].

Overall, the wage increases required to retain workers in their 30s and 40s are approximately 13%, reported in Panel B of Table 6. The same cost for other age groups is lower. Although hypothetical, these estimates quantify the cost of fear of political violence on public employees induced by the assassinations of mayors. Furthermore, they confirm that the cost of retaining productive workers is higher than that of other workers after the successful assassinations of mayors.

6.3 Takeaway: Loss of personnel and increased retention costs

This section highlights how successful assassinations affect the capacity of local governments to retain their workers. The framework shows that assassinations induce costs to the personnel capacity by increasing worker departures and retention costs. The data confirms that workers in age groups with high outside values and productivity are more likely to leave. In addition, the cost of retaining these workers is higher than that for others. Thus, successful assassinations of mayors hurt the capacity of local governments to retain productive personnel in their workforce.

7 Discussion on organized criminal groups and potential confounders

I conduct exercises to track the presence of criminal groups and rule out alternative channels. First, I check whether the presence of organized criminals in the treated municipalities increases.

34. The municipalities studied in Dal Bó et al. (2013) and mine differ. Using a different indicator of violence, Dal Bó et al. (2013) finds that labor supply elasticity could be lower in violent municipalities. Thus, the wage cost estimates presented here may be a lower bound of the true cost.

Then, I test whether there are alternative channels that confound the effects of successful assassinations. Last, I discuss the implications of using alternative control groups with mayors injured after failed attempts. There are increases in the presence of criminal groups in the treated municipalities. There are no significant differences in confounders across the municipalities. Additionally, the size of the effects is explained by the variation in the presence of mayors after assassinations.

7.1 Presence of organized criminals increase

I test whether the presence of organized criminals increases after successful assassinations. I use the log(the number of organized criminal groups+1) and separate dummies for any, new, and multiple criminal groups in the municipality as outcome variables. Equation (2) without control variables is used for regression[35]. By comparing municipalities with similar extent of political violence and different outcomes of assassination attempts, the results speak to the effect of the loss of mayors on the presence of illegitimate external actors.

Results presented in Figure 10 suggest an increase in the number of criminal groups and new entrants in the treated municipalities in the year of assassinations. The number of criminal groups increase by roughly 15% in the year of assassinations. New criminal groups are more likely to enter by more than 10 percentage points in the treated municipalities. The differences across treated and near-miss municipalities dissipate over time. The results are robust to similar validation exercises applied in Section 5 (Appendix Figure D1).

These results suggest that the loss of mayors leads to heightened organized criminal group presence in treated municipalities relative to near-miss municipalities. Illegitimate external actors are more prevalent in areas with a vacuum of leadership, even when compared to near-miss municipalities with similar levels of criminal organization presence before assassination attempts. Therefore, successful assassinations create an environment where local state capacity can be hampered by heightened activities of illegitimate external actors.

7.2 Ruling out other mechanisms irrelevant to loss of leaderships

Forces that may confound the effects of assassination include non-political violence, economic activities, and population changes. If non-political violence rates are high in treated areas, it implies

35. The omission of control variables is necessary for estimation as they include outcome variables used in this exercise.

that factors other than organized criminal group presence contribute to the treatment effects. Furthermore, an increase in such crime could lead to a decrease in economic activities and population. Decreases in these variables shrink the tax base, alter demands for public goods, and decrease the size of the available workers for municipal governments. Thus, it is necessary to disentangle these forces from the effects of assassinations.

To conduct a test that unpacks these forces, I use Equation (2) on outcomes relevant to non-political crime, economic activities, and population. For indicators of non-political violence, I use homicide rates per 100,000 people, log(homicides+1), log(robberies+1), and log(threats+1). The homicide variables are recalculated by subtracting the assassinated mayors and include data from 1995 and onwards. The remaining variables are available from 2011. For economic activities, I use the log and the inverse hyperbolic sine of the average nightlight intensity per municipality. For population, I use the total working-age population,15 to 64-year-olds, available from 1995 and onwards[36]. I also use outmigration to the United States from each municipality measured from 2008 and onwards.

The results reported in Figures 11 and 12 demonstrate that these alternative mechanisms can be ruled out. None of the crime indicators in Figure 11 display statistically significant trends[37]. Both measures of nightlight intensities show little differences between the treated and near-miss municipalities. The volume and the share of the working-age population and outmigration to the United States show limited changes as well. These findings are robust to the same verification exercises applied in Section 5 (Appendix Figures D2 and D3). Thus, non-political crimes, the extent of economic activities, and population changes are unlikely to influence the treatment effects.

7.3 Presence of mayors matters: Results using alternative control groups

Here, I use different types of control group to investigate how much the presence of mayors after the assassinations drive the effects of assassinations. The control group in the main specification is composed of municipalities whose mayors were unhurt by the attacks and continued with their duties. I now include data from municipalities whose mayors had to be absent in any way to check the role of the presence of mayors in explaining the effects of assassinations.

I use three types of control groups and replicate Equation (2) using the same treatment group and

36. The total population includes those aged below 15 and above 65 who are less likely than those aged 15-64 to participate in the local economy. As such, I use this group of population in this exercise.

37. Results are similar if the log of robberies and threats are reported with the total incident per 100,000 persons.

key outcomes as in Section 5. First, I include the municipalities whose mayors were injured due to the attacks *in addition to* unhurt mayors in the control group. Second, I *only* use municipalities with injured mayors as the control group. Third, I use a separate sample of municipalities whose mayors died during the term for non-violent reasons such as health reasons and accidents. These cases are from Magar (2018) and similar text-scraping procedures and reported in Appendix Section A.3 [38].

I check if the treatment effects are estimated downward compared to the main specification in these alternative control groups. In this exercise, I use the same treatment group as in Section 5 with the alternative control groups. These groups include mayors absent from duties, as is the case with the treatment groups. If the (lack of) presence of mayors contributes to the size of the effects, comparison with alternative control groups likely attenuates the effect as these groups are similar to the treatment group in terms of mayors not being present after the event. I hypothesize that the degree of attenuation would increase with the share of absent mayors in the control group.

The estimated treatment effects from these exercises attenuate, as shown in Appendix Figure D4. The degree of attenuation is larger with an increase in absent mayors in the control group. This confirms that the size of the effects is explained by the variation in the presence of mayors across treatment and control groups.

7.4 Takeaway on the forces driving the effects

I track the presence of criminal groups after assassination attempts and rule out confounding mechanisms. The presence of organized criminal groups increases after successful assassinations. Non-political violence, economic activities, and population changes are unlikely to influence the outcomes. The size of the effects is explained by variations in the presence of mayors after assassinations across treated and control groups. Overall, the results confirm the significance of the presence of leaders in violent environments in determining the effectiveness of local governments.

8 Conclusion

This paper provides evidence on the effects of successful assassinations of mayors on the capacity of local governments to conduct basic functions. I exploit the variation in the presence of these

38. 50 mayors have passed away due to COVID-19 in 2020-2021. I exclude them from the exercise since there is not enough observation to capture post-death changes in outcome.

leaders induced by the success and failures of assassination attempts. Local governments that lose mayors to assassinations fail to maintain tax collection, allocate expenditures to construction at the expense of others, and face difficulties retaining productive workers. In addition, there is an increase in the presence of organized criminal groups in these municipalities. These outcomes are not attributable to non-political violence, changes in population, and economic activities.

These findings highlight the broader impact of political violence and the significance of local politicians for an effective local government. Tax collection, public goods provision, and recruitment of personnel are basic tasks that determine local state capacity besides local politicians. By showing that basic tasks are hampered by assassinations, I demonstrate that the negative effects of political violence reach beyond political and electoral processes (Daniele 2019; Jones and Olken 2009). This shows that the dangers of political violence are more extensive than previously understood. Furthermore, the results show that the absence of mayors explains the effects, complementing studies documenting the role of individuals in public organizations (Best et al. 2023).

These results have important policy implications on the threats of political violence against local governments. I show that local governments can become inefficient due to successful assassinations. I highlight that these dangers are more serious in areas with an active presence of criminal groups. These highlight the difficulties of developing local state capacity in areas with illegitimate external actors. This is relevant for many developing countries with histories of internal conflict and organized criminal groups (Blattman 2022).

There are further avenues for research on this topic. The results in this paper could motivate future works to provide additional perspectives on the discussion on the trade-off between decentralization and centralization in regions with violence and local capture (Bardhan 2002). While decentralization has promising aspects, my results show how they can be vulnerable in the face of illegitimate actors. Advances in text and geographical data are opening up access to information on state capacity and illegitimate actors at a local level. Future works can utilize these to provide more evidence to this discussion.

References

Acemoglu, Daron. 2005. "Politics and economics in weak and strong states." *Journal of Monetary Economics* 52 (7): 1199–1226.

Acemoglu, Daron, James A. Robinson, and Rafael J. Santos. 2013. "The Monopoly of Violence: Evidence from Colombia." *Journal of the European Economic Association* 11:5–44.

Alesina, Alberto, Salvatore Piccolo, and Paolo Pinotti. 2019. "Organized Crime, Violence, and Politics." *The Review of Economic Studies* 86 (2): 457–499.

Bardhan, Pranab. 2002. "Decentralization of Governance and Development." *Journal of Economic Perspectives* 16 (4): 185–205.

Bennedsen, Morten, Francisco Pérez-González, and Daniel Wolfenzon. 2020. "Do CEOs Matter? Evidence from Hospitalization Events." *The Journal of Finance* 75 (4): 1877–1911.

Bertrand, Marianne, and Antoinette Schoar. 2003. "Managing with Style: The Effect of Managers on Firm Policies." *The Quarterly Journal of Economics* 118 (4): 1169–1208.

Besley, Timothy, Robin Burgess, Adnan Khan, and Guo Xu. 2022. "Bureaucracy and Development." *Annual Review of Economics* 14:397–424.

Besley, Timothy, and Maitreesh Ghatak. 2006. "Public Goods and Economic Development." In *Understanding Poverty*, 1st ed., 285–302. Oxford University PressNew York, May.

Besley, Timothy, and Torsten Persson. 2009. "The Origins of State Capacity: Property Rights, Taxation, and Politics." *American Economic Review* 99 (4): 1218–1244.

———. 2010. "State Capacity, Conflict, and Development." *Econometrica* 78 (1): 1–34.

———. 2011. *Pillars of Prosperity: The Political Economics of Development Clusters.* Princeton University Press.

Best, Michael Carlos, Jonas Hjort, and David Szakonyi. 2023. "Individuals and Organizations as Sources of State Effectiveness." *American Economic Review* 113 (8): 2121–2167.

Blakeslee, David S. 2018. "Politics and public goods in developing countries: Evidence from the assassination of Rajiv Gandhi." *Journal of Public Economics* 163:1–19.

Blattman, Christopher. 2022. *Why We Fight: The Roots of War and the Paths to Peace.* New York: Viking.

Blattman, Christopher, Gustavo Duncan, Benjamin Lessing, and Santiago Tobón. 2022. *State-building on the Margin: An Urban Experiment in Medellín.* NBER Working Paper 29692. Cambridge, MA: National Bureau of Economic Research.

Blattman, Christopher, and Edward Miguel. 2010. "Civil War." *Journal of Economic Literature* 48 (1): 3–57.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess. 2021. *Revisiting Event Study Designs: Robust and Efficient Estimation.* ARXIV 2108.12419.

Brodeur, Abel. 2018. "The Effect of Terrorism on Employment and Consumer Sentiment: Evidence from Successful and Failed Terror Attacks." *American Economic Journal: Applied Economics* 10 (4): 246–282.

Calderón, Laura Y., Kimberly Heinle, Octavio Rodriguez Ferreira, and David A. Shirk. 2019. *Organized Crime and Violence in Mexico.* Technical Report. Justice in Mexico, Department of Political Science & International Relations, University of San Diego.

Callaway, Brantly, and Pedro H.C. Sant'Anna. 2021. "Difference-in-Differences with multiple time periods." *Journal of Econometrics* 225 (2): 200–230.

Careaga, Maite, and Barry R. Weingast. 2003. "Chapter 13. Fiscal Federalism, Good Governance, and Economic Growth in Mexico." In *In Search of Prosperity,* edited by **Dani Rodrik,** 399–436. Princeton University Press, December.

Chong, Alberto, Ana L. De La O, Dean Karlan, and Leonard Wantchekon. 2015. "Does Corruption Information Inspire the Fight or Quash the Hope? A Field Experiment in Mexico on Voter Turnout, Choice, and Party Identification." *The Journal of Politics* 77 (1): 55–71.

Coscia, Michele, and Viridiana Rios. 2012. "Knowing where and how criminal organizations operate using web content." In *Proceedings of the 21st ACM international conference on Information and knowledge management,* 1412–1421. Maui Hawaii USA: ACM, October.

Dal Bó, Ernesto, Frederico Finan, and Martín A. Rossi. 2013. "Strengthening State Capabilities: The Role of Financial Incentives in the Call to Public Service*." *The Quarterly Journal of Economics* 128 (3): 1169–1218.

Daniele, Gianmarco. 2019. "Strike one to educate one hundred: Organized crime, political selection and politicians' ability." *Journal of Economic Behavior & Organization* 159:650–662.

Daniele, Gianmarco, and Gemma Dipoppa. 2017. "Mafia, elections and violence against politicians." *Journal of Public Economics* 154:10–33.

De Feo, Giuseppe, and Giacomo Davide De Luca. 2017. "Mafia in the Ballot Box." *American Economic Journal: Economic Policy* 9 (3): 134–167.

Dell, Melissa. 2015. "Trafficking Networks and the Mexican Drug War." *American Economic Review* 105 (6): 1738–1779.

Di Cataldo, Marco, and Nicola Mastrorocco. 2022. "Organized Crime, Captured Politicians, and the Allocation of Public Resources." *The Journal of Law, Economics, and Organization* 38 (3): 774–839.

Donaldson, Dave, and Adam Storeygard. 2016. "The View from Above: Applications of Satellite Data in Economics." *Journal of Economic Perspectives* 30 (4): 171–198.

Dube, O., and J. F. Vargas. 2013. "Commodity Price Shocks and Civil Conflict: Evidence from Colombia." *The Review of Economic Studies* 80 (4): 1384–1421.

Enríquez, José Ramón. 2022. *Democracy under Assault: Electoral Reform and Political Violence.* Technical report.

Esparza, David Pérez, and Helden De Paz Mancera. 2018. *Mayoral Homicide in Mexico: A Situational Analysis on the Victims, Perpetrators, and Locations of Attacks.* Technical Report. Baker Institue for Public Policy, Rice University.

Fahlenbrach, Rüdiger, Angie Low, and René M. Stulz. 2017. "Do Independent Director Departures Predict Future Bad Events?" *The Review of Financial Studies* 30 (7): 2313–2358.

Fee, C. Edward, Charles J. Hadlock, and Joshua R. Pierce. 2013. "Managers With and Without Style: Evidence Using Exogenous Variation." *The Review of Financial Studies* 26 (3): 567–601.

Fenizia, Alessandra. 2022. "Managers and Productivity in the Public Sector." *Econometrica* 90 (3): 1063–1084.

Finan, F., B.A. Olken, and R. Pande. 2017. "The Personnel Economics of the Developing State." In *Handbook of Economic Field Experiments*, 2:467–514. Elsevier.

Gardner, John. 2021. *Two-stage differences in differences.* ArXiv:2207.05943 [econ].

Grillo, Ioan. 2011. *El Narco: Inside Mexico's Criminal Insurgency.* London, UK: Bloomsbury Press.

Henderson, J. Vernon, Adam Storeygard, and David N Weil. 2012. "Measuring Economic Growth from Outer Space." *American Economic Review* 102 (2): 994–1028.

Ibarra Salazar, Jorge. 2017. "Fundamentos de la nueva fórmula de asignación del Fondo de Aportaciones para la Infraestructura Social en México." *El Trimestre Económico* 85 (337): 195–218.

INEGI. 2016. *Síntesis metodológica de la estadística de finanzas públicas estatales y municipales julio, 2016.* Technical Report. Instituto Nacional de Estadística y Geografía.

———. 2022. *Censo Nacional de Gobiernos Municipales y Demarcaciones Territoriales de la Ciudad de México 2021: Presentación de resultados generales.* Technical Report. Instituto Nacional de Estadística y Geografía.

Iqbal, Zaryab, and Christopher Zorn. 2008. "The Political Consequences of Assassination." *Journal of Conflict Resolution* 52 (3): 385–400.

Jaravel, Xavier, Neviana Petkova, and Alex Bell. 2018. "Team-Specific Capital and Innovation." *American Economic Review* 108 (4-5): 1034–1073.

Jones, Benjamin F, and Benjamin A Olken. 2005. "Do Leaders Matter? National Leadership and Growth since World War II." *Quarterly Journal of Economics* 120 (3): 835–864.

———. 2009. "Hit or Miss? The Effect of Assassinations on Institutions and War." *American Economic Journal: Macroeconomics* 1 (2): 55–87.

Larreguy, Horacio, John Marshall, and James M Snyder. 2020. "Publicising Malfeasance: When the Local Media Structure Facilitates Electoral Accountability in Mexico." *The Economic Journal* 130 (631): 2291–2327.

Lessing, Benjamin. 2015. "Logics of Violence in Criminal War." *Journal of Conflict Resolution* 59 (8): 1486–1516.

Magaloni, Beatriz, Gustavo Robles, Aila M. Matanock, Alberto Diaz-Cayeros, and Vidal Romero. 2020. "Living in Fear: The Dynamics of Extortion in Mexico's Drug War." *Comparative Political Studies* 53 (7): 1124–1174.

Magar, Eric. 2018. *Recent Mexican election vote returns repository.*

Oates, Wallace E. 2005. "Toward A Second-Generation Theory of Fiscal Federalism." *International Tax and Public Finance* 12 (4): 349–373.

OECD. 2016. *Subnational Government around the World: Structure and Finance.* Report. Paris.

Osorio, Javier, and Alejandro Beltran. 2020. "Enhancing the Detection of Criminal Organizations in Mexico using ML and NLP." In *2020 International Joint Conference on Neural Networks (IJCNN),* 1–7. Glasgow, United Kingdom: IEEE, July.

Parienté, William. 2017. "URBANIZATION IN SUB-SAHARAN AFRICA AND THE CHALLENGE OF ACCESS TO BASIC SERVICES." *Journal of Demographic Economics* 83 (1): 31–39.

Pinotti, Paolo. 2015. "The Causes and Consequences of Organised Crime: Preliminary Evidence Across Countries." *The Economic Journal* 125 (586): F158–F174.

Rommel, Tobias, and Paul Schaudt. 2020. "First impressions: How leader changes affect bilateral aid." *Journal of Public Economics* 185:104107.

Sánchez de la Sierra, Raúl. 2020. "On the Origins of the State: Stationary Bandits and Taxation in Eastern Congo." *Journal of Political Economy* 128 (1): 32–74.

Schmidheiny, Kurt, and Sebastian Siegloch. 2023. "On event studies and distributed-lags in two-way fixed effects models: Identification, equivalence, and generalization." *Journal of Applied Econometrics:* jae.2971.

Spenkuch, Jörg L., Edoardo Teso, and Guo Xu. 2023. "Ideology and Performance in Public Organizations." *Econometrica* 91 (4): 1171–1203.

Sun, Liyang, and Sarah Abraham. 2021. "Estimating dynamic treatment effects in event studies with heterogeneous treatment effects." *Journal of Econometrics* 225 (2): 175–199.

Sviatschi, Maria Micaela. 2022. "Making a Narco : Childhood Exposure to Illegal Labor Markets and Criminal Life Paths." *Econometrica* 90 (4): 1835–1878.

Tilly, Charles. 1985. "War Making and State Making as Organized Crime." In *Bringing the State Back In,* edited by **Evans, Peter B. and Rueschemeyer, Dietrich,** 169–191. Cambridge, UK: Cambridge University Press.

Timmons, Jeffrey F., and Daniel Broid. 2013. "The Political Economy of Municipal Transfers: Evidence from Mexico." *Publius: The Journal of Federalism* 43 (4): 551–579.

Trejo, Guillermo, and Sandra Ley. 2019. "Multilevel Partisan Conflict and Drug Violence in Mexico: When Do Criminal Organizations Attack Subnational Elected Officials?" In *Inside Countries,* 1st ed., edited by **Agustina Giraudy, Eduardo Moncada, and Richard Snyder,** 181–213. Cambridge University Press, June.

———. 2021. "High-Profile Criminal Violence: Why Drug Cartels Murder Government Officials and Party Candidates in Mexico." *British Journal of Political Science* 51 (1): 203–229.

Vannutelli, Silvia. 2022. *From Lapdogs to Watchdogs: Random Auditor Assignment and Municipal Fiscal Performance.* NBER Working Paper w30644. Cambridge, MA: National Bureau of Economic Research.

Velásquez, Andrea. 2020. "The Economic Burden of Crime: Evidence from Mexico." *Journal of Human Resources* 55 (4): 1287–1318.

Weingast, Barry R. 2009. "Second generation fiscal federalism: The implications of fiscal incentives." *Journal of Urban Economics* 65 (3): 279–293.

World Bank. 2016. *Mexico Public Expenditure Review.* Technical report. Washington, DC: World Bank.

Tables

Table 1: Determinants of assassinations on mayors in a given year, since 1995

	All of Mexico (Coeff × 100)				Assassination and Near-miss			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Exclude unidentified groups								
log(# groups + 1)	0.224**			0.061	0.015			-0.005
	(0.093)			(0.103)	(0.010)			(0.013)
I(New group)		0.350***		0.303**		0.032**		0.036**
		(0.126)		(0.146)		(0.013)		(0.017)
Homicide rate	0.001	0.001	0.001	0.0001	0.004	0.004	0.004	0.004
(× 100, rounded)	(0.001)	(0.001)	(0.001)	(0.001)	(0.013)	(0.013)	(0.013)	(0.013)
Panel B. Include unidentified groups								
log(# groups + 1)	0.335**			0.200**	0.031***			0.011
	(0.078)			(0.080)	(0.009)			(0.010)
I(New group)		0.397***		0.288**		0.045***		0.039***
		(0.107)		(0.114)		(0.012)		(0.014)
Homicide rate	0.001	0.001	0.001	0.001	0.003	0.003	0.003	0.003
(× 100, rounded)	(0.001)	(0.001)	(0.001)	(0.001)	(0.014)	(0.014)	(0.014)	(0.014)
N	57076	57076	57076	57076	3244	3244	3244	3244
Municipalities	2198	2198	2198	2198	125	125	125	125
Municipal FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓

* $p < .10$, ** $p < .05$, *** $p < .01$

The table shows the coefficient estimates from the regression of the incidence of assassinations on mayors on variables relevant to gang presence and crime at the municipality-year level. For the sample using all of Mexico, coefficients are multiplied by 100 for convenience. All coefficients on homicide rates in all sample restrictions have been multiplied by 100 and rounded up for convenience. All regressions include municipality, year fixed effects, and controls. Control variables included are the average schooling of the municipal population, the share of the indigenous population, the log of the total population, and the year since the election (level and squared). log(# group + 1) is the log of the number of criminal groups in the municipality, adjusted by adding 1 to account for municipalities with no presence of organized criminal groups. New group refers to the dummy variable for the existence of a criminal organization that newly began its activities within the municipalities. Homicide rate refers to homicides per 100,000 persons and has been recalculated without mayor assassinations. Standard errors are clustered at the municipal level.

Table 2: Summary statistics for outcome variables, per category of municipalities

	(1) Near-miss			(2) Assassination			(3) Rest of Mexico		
Variable (unit)	N	Mean	St. dev	N	Mean	St. dev	N	Mean	St. dev
Panel A. Outcome variables for municipal government revenues									
Total income (th. Pesos)	1,147	451,430	1,059,344	1,928	71,268	126,669	55,409	108,604	366,104
Tax (th. Pesos)	1,122	66,429	198,304	1,823	3,948	14,770	52,128	13,777	86,779
Tax per capita (Pesos)	1,080	249	466	1,756	101	245	49,543	102	251
Property tax (th. Pesos)	1,031	41,660	128,592	1,634	2,379	7,742	45,562	8,391	48,947
Property tax per capita (pesos)	995	152	270	1,580	65	130	43,371	65	137
Nonearmarked fund (th. Pesos)	1,027	138,861	352,198	1,698	24,126	41,433	48,475	37,185	114,779
Earmarked fund (th. Pesos)	941	100,107	188,499	1,537	32,460	50,504	43,820	35,123	79,181
Service Revenue (th. Pesos)	1,112	13,871	41,913	1,715	1,121	2,719	48,009	3,429	22,721
Legal functions (th. Pesos)	1,121	30,670	97,425	1,838	2,387	6,430	52,043	6,257	31,025
Panel B. Outcome variables for municipal government expenditures									
Total expenditure (th. Pesos)	1,147	451,430	1,059,344	1,928	71,268	126,669	55,409	108,604	366,104
Personnel expenditure (th. Pesos)	1,144	154,827	431,175	1,922	21,327	48,155	55,114	36,521	144,337
Public Investment (th. Pesos)	1,124	81,629	161,780	1,882	25,864	45,711	53,969	27,415	73,280
Basic Infrastructure (th. Pesos)	1,069	18,813	43,206	1,778	2,690	4,960	50,702	4,974	18,716
Other general service (th. Pesos)	1,069	57,195	153,799	1,778	5,095	9,732	50,702	11,040	49,621
Transfer/allowances (th. Pesos)	1,130	56,331	170,973	1,884	5,222	11,638	54,078	10,527	48,176
Internal transfers (th. Pesos)	948	34,374	112,402	1,504	3,167	7,554	44,572	7,042	33,490
Panel C. Outcome variables for municipal workers									
Total (persons)	266	1,292	2,404	481	259	425	13,722	396	1,000
20s (persons)	266	204	340	481	49.8	76.3	13,722	71.2	159
30s (persons)	266	333	657	481	74.9	119	13,722	111	269
40s (persons)	266	315	735	481	60.8	111	13,722	99.1	276
$\geq$50s (persons)	266	292	692	480	47.2	101	13,680	95	333
Panel D. Outcome variables for alternative mechanisms									
Fitted nightlights (DNs)	1,215	13.1	14.9	2,214	7.14	7.55	62,910	8.99	10.7
Total outmigration (persons)	630	1,140	2,895	1,148	336	444	32,777	333	986
Total population (persons)	1,166	162,726	333,094	2,128	27,413	44,532	59,616	43,804	126,909
Population aged 15-64 (persons)	1,166	103,554	221,533	2,128	16,112	28,960	59,616	27,375	84,407
# Criminal groups (groups)	1,215	0.59	1.37	2,214	0.346	0.923	62,964	0.222	0.773
Total homicides (cases)	1,188	26.5	85.9	2,187	5.88	14.9	56,511	8.56	76
Homicide per 100k (rate)	1,188	11.7	18.4	2,187	20.3	50.9	56,403	10.9	36.6
Robbery (cases)	461	1,635	5,358	768	113	424	21,094	349	1,561
Threat (cases)	461	127	371	768	12.4	36	21,094	39.9	187

The table lists the summary statistics for the variables in Section 3 at the municipal level, broken down into three categories. The categories are defined depending on whether there were assassinations that failed to kill and injure a mayor (Column (1)), those that killed a mayor (Column (2)), and the rest of Mexico (Column(3)). The number of municipality-year observations, mean, and standard deviation are presented. For the units, “th. Pesos" refers to a thousand Pesos. The number of observations for each municipality is counted from 2011 for outcome variables in Panel C (biennially), and robbery and threat cases in Panel D (annually). Outmigration is counted from 2008 in Panel D (yearly). Other variables are included from 1995 (yearly). The most recent observations for all outcomes are from 2021.

Table 3: Balance table for covariates

	(1) Near-miss			(2) Assassination			(2)-(1) Test for difference		
Variable	N	Mean	(SE)	N	Mean	(SE)	N	Difference	[p-value]
Panel A. Municipality level control variables									
Total homicides	44	45.886	(23.419)	81	6.210	(1.701)	125	-39.676*	[0.093]
log(Total homicides)	44	1.492	(0.284)	81	1.003	(0.135)	125	-0.489	[0.121]
Homicides per 100k	44	14.986	(3.945)	81	34.640	(17.310)	125	19.654	[0.271]
Tenure at attack (mths)	45	18.756	(2.084)	82	19.793	(1.463)	127	1.037	[0.684]
Avg Schooling	44	7.972	(0.245)	81	6.411	(0.160)	125	-1.561***	[0.000]
Share of indigenous pop.	44	10.486	(3.294)	81	17.787	(2.866)	125	7.301*	[0.097]
Pop. density	45	751.724	(319.015)	82	197.933	(101.144)	127	-553.791*	[0.100]
Area	45	1961.978	(576.510)	82	1448.328	(272.448)	127	-513.650	[0.421]
Mean Altitude	45	1216.089	(125.605)	82	1359.061	(87.171)	127	142.972	[0.351]
Panel B. Organized criminal groups									
# identified crime groups	45	1.133	(0.226)	82	0.524	(0.114)	127	-0.609*	[0.072]
log(# identified crime groups)	45	0.456	(0.104)	82	0.278	(0.053)	127	-0.178	[0.129]
I(New Group)	45	0.244	(0.065)	82	0.146	(0.039)	127	-0.098	[0.197]
Beltran Leyva	45	0.133	(0.051)	82	0.000	(0.000)	127	-0.133***	[0.010]
CJNG	45	0.111	(0.047)	82	0.037	(0.021)	127	-0.075	[0.151]
Huachicoleros	45	0.044	(0.031)	82	0.024	(0.017)	127	-0.020	[0.572]
Barbies	45	0.067	(0.038)	82	0.061	(0.027)	127	-0.006	[0.902]
Familia	45	0.133	(0.051)	82	0.073	(0.029)	127	-0.060	[0.308]
Gulf	45	0.111	(0.047)	82	0.085	(0.031)	127	-0.026	[0.650]
Juarez	45	0.067	(0.038)	82	0.024	(0.017)	127	-0.042	[0.307]
Sinaloa	45	0.133	(0.051)	82	0.073	(0.029)	127	-0.060	[0.308]
Tijuana Cartel	45	0.111	(0.047)	82	0.037	(0.021)	127	-0.075	[0.151]
Zetas	45	0.200	(0.060)	82	0.073	(0.029)	127	-0.127*	[0.060]
Other Cartels	45	0.022	(0.022)	82	0.037	(0.021)	127	0.014	[0.638]
Panel C. Political affiliation of mayors									
Partido Acción Nacional	45	0.200	(0.060)	82	0.171	(0.042)	127	-0.029	[0.690]
Partido de la Revolucion Democrática	45	0.200	(0.060)	82	0.146	(0.039)	127	-0.054	[0.456]
Partido Revolucionario Institucional	45	0.311	(0.070)	82	0.390	(0.054)	127	0.079	[0.372]
Movimiento Regeneración Nacional	45	0.111	(0.047)	82	0.049	(0.024)	127	-0.062	[0.241]
Compromiso Por Puebla	45	0.022	(0.022)	82	0.000	(0.000)	127	-0.022	[0.318]
Movimiento Antorchista en Puebla	45	0.000	(0.000)	82	0.012	(0.012)	127	0.012	[0.320]
Movimiento Ciudadano	45	0.000	(0.000)	82	0.061	(0.027)	127	0.061**	[0.024]
Partido Nueva Alianza	45	0.022	(0.022)	82	0.000	(0.000)	127	-0.022	[0.318]
Partido del Trabajo	45	0.044	(0.031)	82	0.024	(0.017)	127	-0.020	[0.572]
Partido Verde Ecologista de México	45	0.067	(0.038)	82	0.024	(0.017)	127	-0.042	[0.307]
Uso y Costumbres	45	0.022	(0.022)	82	0.110	(0.035)	127	0.088**	[0.036]

***<0.01, **<0.05, *<0.1

All variables except the area and altitude are time-variant. Variables in Panel A and B are based on the reported values from the year before the failed/successful assassinations. Political affiliations are measured in the year of the assassination attempt. Robust standard errors are reported. The final column reports the difference in group means between the near-miss and assassinated municipalities, with p-values reported in brackets.

Table 4: Changes in municipal fiscal capacity post assassinations

	Taxes				Non-taxes			
	(1) ln (tax)	(2) tax pc	(3) ln (prop.)	(4) prop. pc	(5) ln (non-mark)	(6) ln (mark)	(7) ln (serv.)	(8) ln (legal)
Assassination	-0.235***	-80.81**	-0.179**	-43.60**	-0.090**	-0.009	0.111	-0.047
	(0.080)	(36.402)	(0.078)	(20.450)	(0.040)	(0.057)	(0.102)	(0.189)
Control mean	16.271	364.883	15.929	238.386	17.967	17.935	15.815	14.540
N	2897	2797	2618	2537	2686	2445	2911	2780
Municipalities	125	125	125	125	125	125	125	125
Municipality FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Control	✓	✓	✓	✓	✓	✓	✓	✓

* $p < .10$, ** $p < .05$, *** $p < .01$

The table reports the simple difference in difference regression in Equation (3) using the same fiscal capacity outcome variables from Section 5.1. The outcome variables used in each regression are the log of total tax revenue, per capita tax revenue, log of total property tax, per capita property tax, log of non-earmarked grants, log of earmarked grants, log of service revenues, and log of revenues from legal affairs. Control mean reports the average of the outcome variables for the near-miss municipalities one period before the assassination attempts. The regression includes log(number of criminal organizations + 1), homicide rates, log(total homicides + 1), average years of schooling for the municipal population, the share of the indigenous population, and years since the most recent election (level and squared). Each regression includes fixed effects for years and municipalities. Standard errors are reported in parenthesis and clustered at the municipality level.

Table 5: Changes in municipal expenditure post assassinations, log of expenditures

	Infrastructure and personnel			Non-infrastructural expenses		
	(1)	(2)	(3)	(4)	(5)	(6)
	Investment	Basic service	Compensation	Non-infra.	Allowances	Internal inst.
Panel A. Outcome variable: ln (Total expenditure per category)						
Assassination	0.323***	0.120	0.002	-0.340**	-0.361***	-0.457**
	(0.108)	(0.086)	(0.055)	(0.159)	(0.111)	(0.175)
Control mean	17.757	15.792	18.039	16.650	16.606	16.058
Panel B. Outcome variable: (Expenditure per category/Total municipal expenditure)						
Assassination	0.068***	0.007**	-0.004	-0.016***	-0.019**	-0.018**
	(0.016)	(0.003)	(0.010)	(0.006)	(0.008)	(0.007)
Control mean	0.285	0.046	0.325	0.090	0.092	0.065
N	2961	2802	3018	2802	2966	2410
Municipalities	125	125	125	125	125	125
Municipality FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Control	✓	✓	✓	✓	✓	✓

* $p < .10$, ** $p < .05$, *** $p < .01$

The table reports the simple difference in difference regression in Equation (3) using the same expenditure outcome variables from Section 5.2. They are the public investment in construction projects, expenditure on infrastructure-related basic services, total compensation to public workers, general services not related to infrastructure, allowances and transfers to municipal entities, and allowances for internal public institutions. Outcomes in Panel A are measured in logs whereas those in Panel B are the proportion of each spending relative to the total municipal expenditure. Control mean reports the average of the outcome variables for the near-miss municipalities one period before the assassination attempts. The regression includes controls for log(number of criminal organizations + 1), homicide rates, log(total homicides + 1), average years of schooling for the municipal population, share of indigenous population, and years since the most recent election (level and squared). Each regression includes fixed effects for years and municipalities. Standard errors are reported in parenthesis and clustered at the municipality level.

Table 6: Hypothetical wage costs of retaining departing employees by age group, using shares

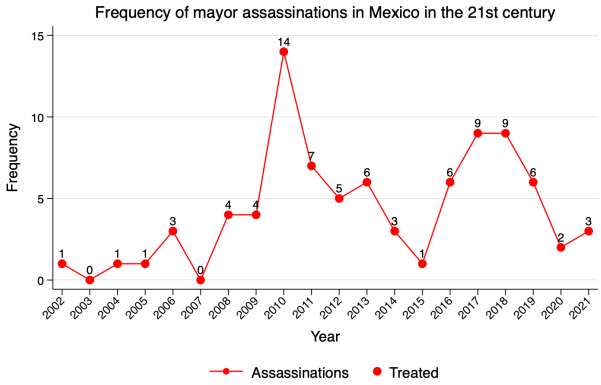
	(1) 20s	(2) 30s	(3) 40s	(4) 50s	(5) 30-40s
Panel A. Change in proportion of workers by age					
Change in share	−0.001	−0.085***	−0.068**	0.024	−0.153***
	(0.0029)	(0.031)	(0.031)	(0.024)	(0.041)
Pre-event share (1=100%)	0.215	0.329	0.233	0.146	0.561
% change in size due to π (1=100%)	−0.004	−0.258	−0.292	0.164	−0.273
Panel B. Wage-amenity tradeoff with Dal Bó et al. (2013) elasticity estimate (2.15)					
Trade-off rate	−0.002	−0.120	−0.136	0.076	−0.127
N	723	723	723	723	723
Municipalities	125	125	125	125	125
Municipality FE	✓	✓	✓	✓	✓
Survey FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓

* $p < .10$, ** $p < .05$, *** $p < .01$

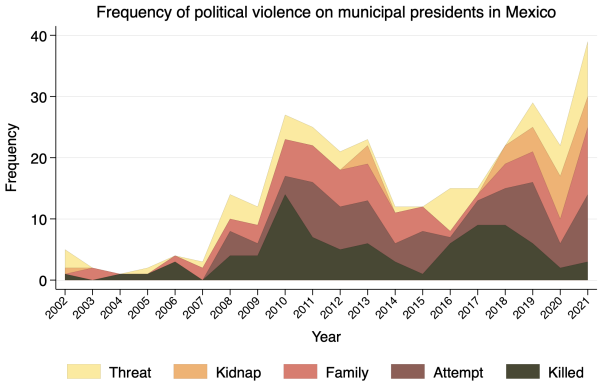
This table reports the estimates of the rate of increase in wages required to retain different types of municipal workers, as explained in Section 6.2. The first row in Panel A reports the point estimates and the standard errors of the average post-assassination treatment effects for the proportion of each age group within municipal governments specified in the header of each column. The estimates are from the regression used in Section 6.2 that include control variables. Standard errors are clustered at the municipal level and reported in parentheses. The second row is obtained from taking the average of the proportion of these workers one period before the assassination attempt took place. Numbers in the third row are obtained by dividing the point estimates in the first row by the same in the second row. This represents the change in the number of workers in each category before and after the assassination attempts. In Panel B, the wage-amenity trade-off rate is calculated by dividing the percent change in size of workers obtained from Panel A with changes in labor supply with respect to wages from Dal Bó et al. (2013), 2.15. This represents the increase in wages needed to keep workers employed. Given that this cost arises from a decrease in amenities due to assassinations and the fear of political violence that follows it, it quantifies the cost of political violence to the local government.

Figures

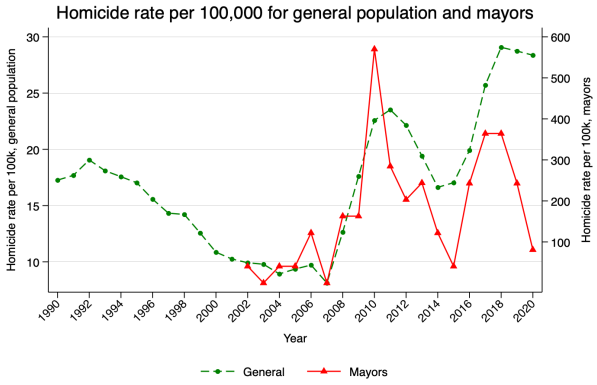
Figure 1: Assassination against mayors, in total numbers and murder rate



(a) Assassination against mayors, 2002-2021



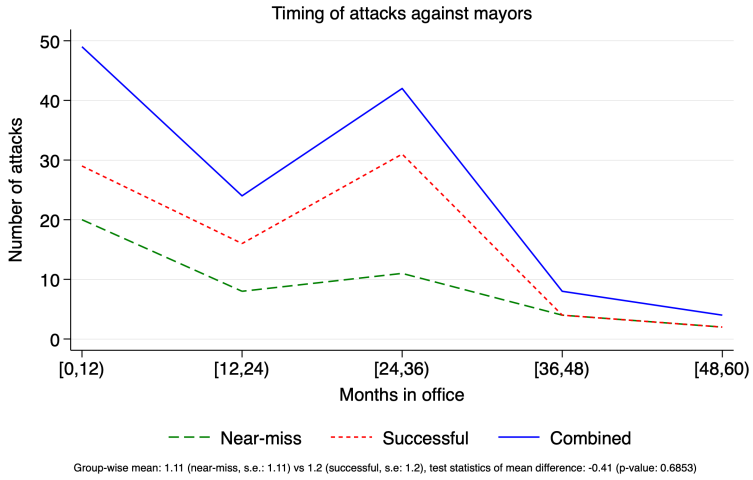
(b) Violence against mayors, 2002-2021



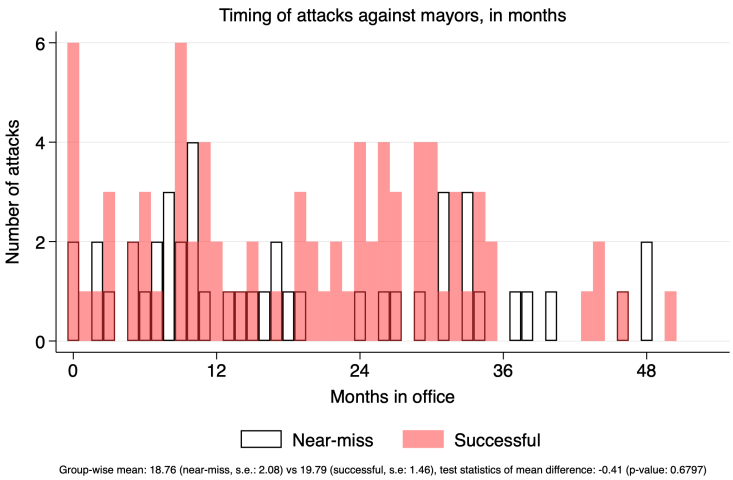
(c) Homicide rate per 100,000, general population and the mayors

Note: Figures above show the variation in the incidence of assassinations and murder rates across different years and municipalities. The figures in the top panel describe the number of assassinations against mayors from 2002-2021, based on the data collected by the author. The figures in the bottom panel present murder rates calculated as homicides per 100,000 people for mayors and all population. The numbers for the general population are represented by the left axis and the green dashed lines. The numbers are obtained from the World Development Indicators in the World Bank. The same for the mayors is displayed on the right axis and in a red solid line. This is calculated by dividing the annual number of mayors assassinated by the total number of municipalities and then multiplying by 100,000.

Figure 2: Timing of the attacks on mayors



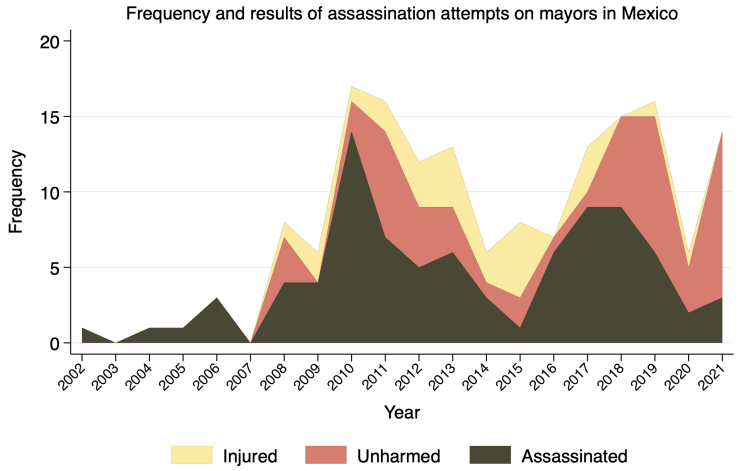
(a) Timing of attack, in terms of year in office



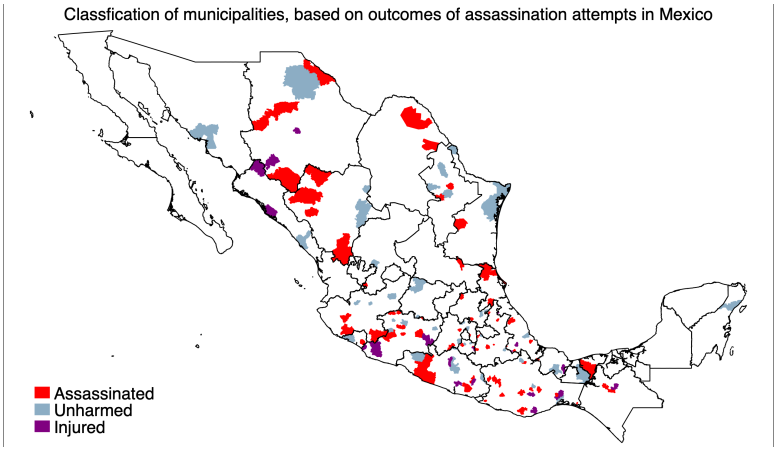
(b) Timing of attacks, in terms of months in office

Note: The graphs in this figure trace the timing of attacks that target mayors in terms of year and months in office for both cases where the assassination attempt succeeded and failed. Panel (a) traces the number of assassination attempts in terms of years while Panel (b) does so for each month in office. The notes in each paragraph show the t-test result of the difference in group-wise means. In both cases, there are no meaningful differences in the timing of the attacks against the mayors across cases where the assassinations were successful or not. The sources of the data used are based on the data collected by the authors, among others. A detailed explanation of the data is found in Section 3.

Figure 3: Temporal and Geographical variation in successful mayor assassinations vs near-misses



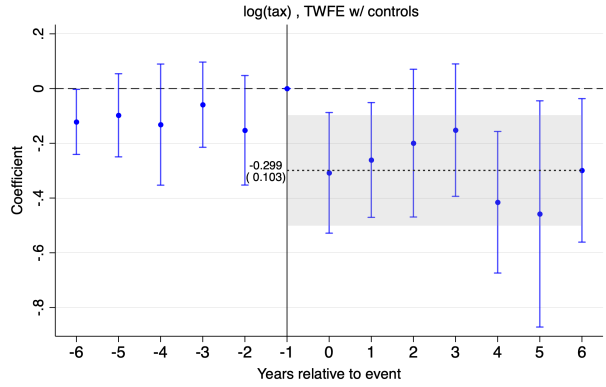
(a) Frequency of successful attacks and near-misses on mayors



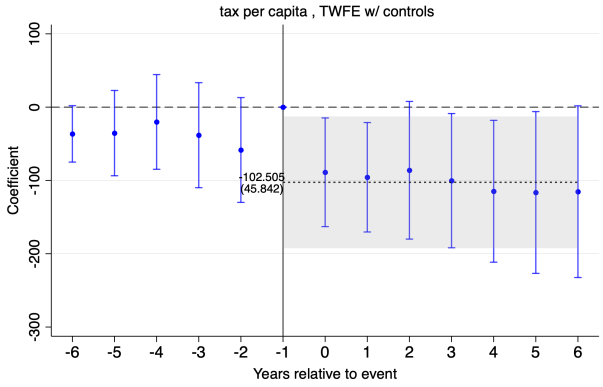
(b) Geographical distribution of the outcome of attacks on mayors

Note: Panel (a) shows the variation of the results of attacks against mayors across time. Categories include successful attacks resulting in the death of a a mayor (treatment), mayors who escaped unharmed (control), and those who were injured, but not killed. Panel (b) shows the results of these attacks at a geographical level. Municipalities in which both failed attacks and successful assassination has occurred is classified as a treatment group and appears as 'Assassinated' on the map. The data used for creating the figures are from various sources and the author's collection is based on the method described in Section 3. A full list of mayors who were victims of the attack and sources are in Appendix A.3.

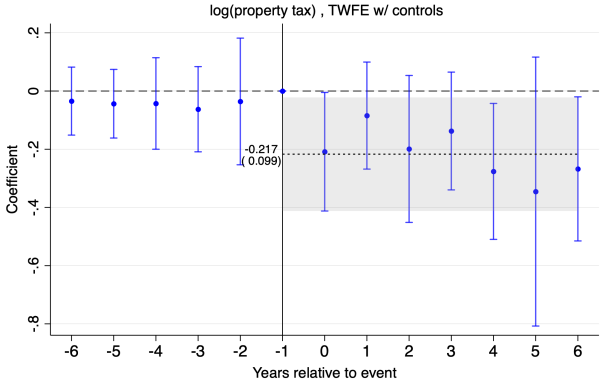
Figure 4: Decreases in tax revenues after assassinations



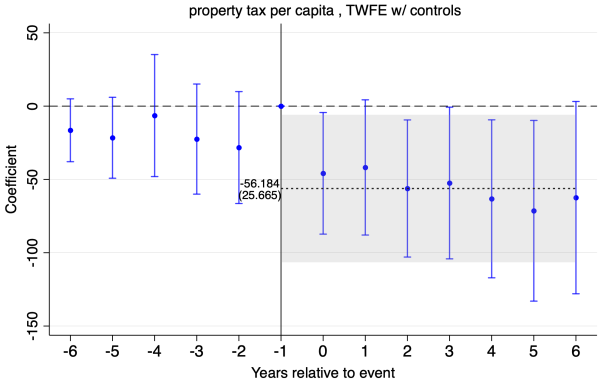
(a) log(Total tax revenue)



(b) Total tax revenue per capita



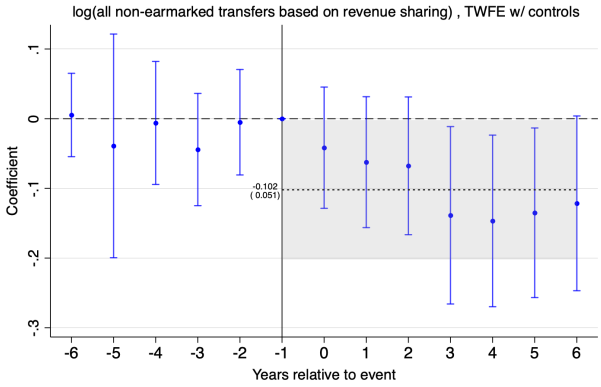
(c) log(Total property tax revenue)



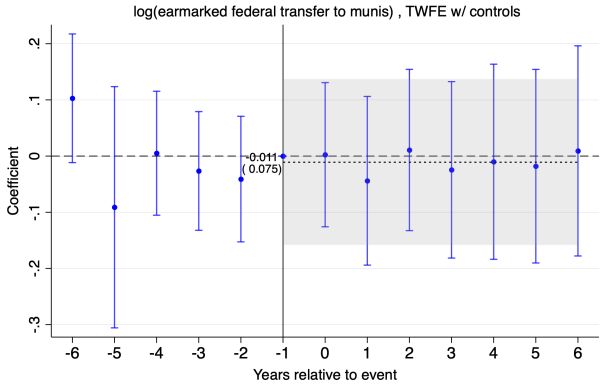
(d) Property tax revenue per capita

Note: The figures report the event study regression on the different measures of tax revenues. The outcome variables used in each regression are specified in the captions. The regression includes controls for a binned indicator for municipalities experiencing assassinations 7 or more years ago, log(number of criminal organizations + 1), homicide rates, log(total homicides + 1), average years of schooling for the municipal population, share of indigenous population, and years since the most recent election (level and squared). Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

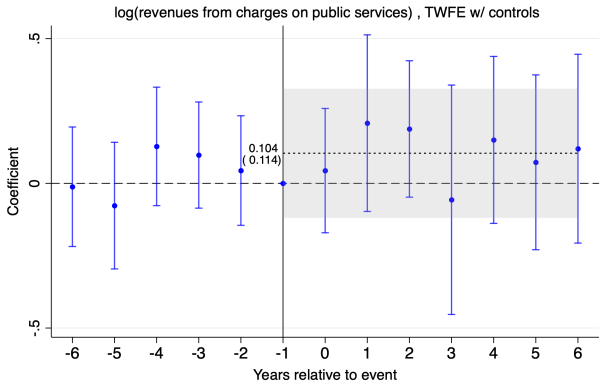
Figure 5: Changes in revenues from other sources for the municipalities



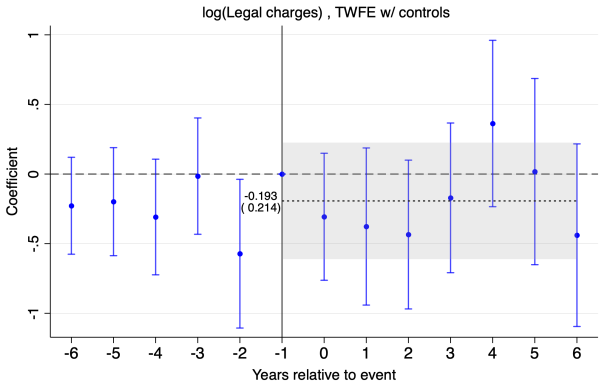
(a) Non-earmarked funds to municipalities



(b) Overall earmarked funds to municipalities



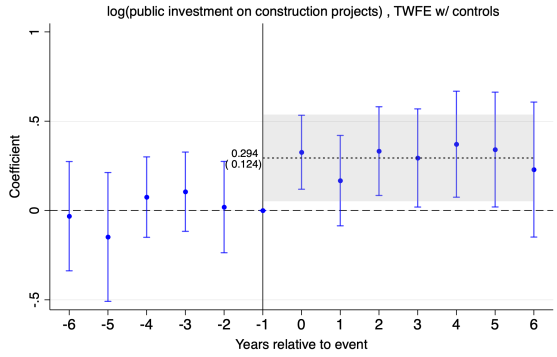
(c) Revenues from charge on public services



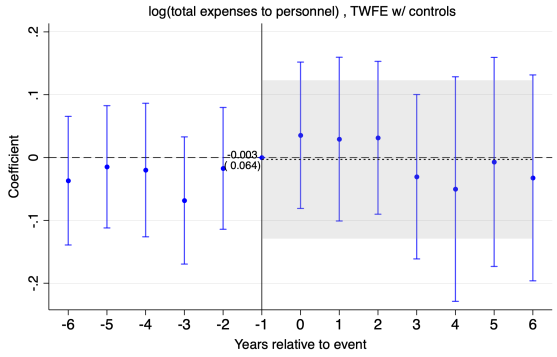
(d) Revenues from legal services

Note: The figures report the event study regression on the different sources of revenues for the municipal government. The outcome variables used in each regression are the logged value of the amount specified in the captions. The regression includes controls for a binned indicator for municipalities experiencing assassinations 7 or more years ago, log(number of criminal organizations + 1), homicide rates, log(total homicides + 1), average years of schooling for the municipal population, share of indigenous population, and years since the most recent election (level and squared). Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

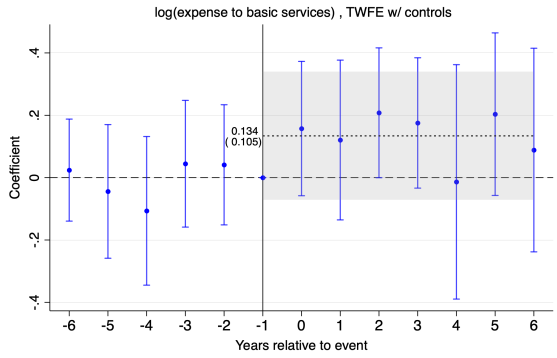
Figure 6: Volume of expenditures across different categories



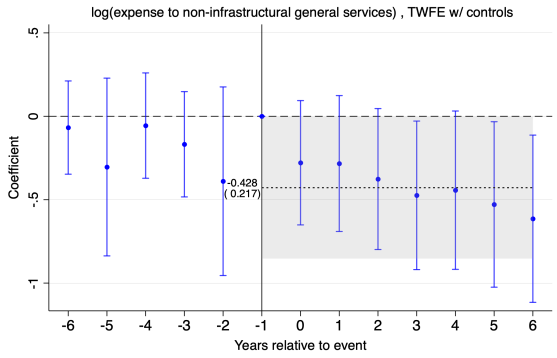
(a) Public investments on construction



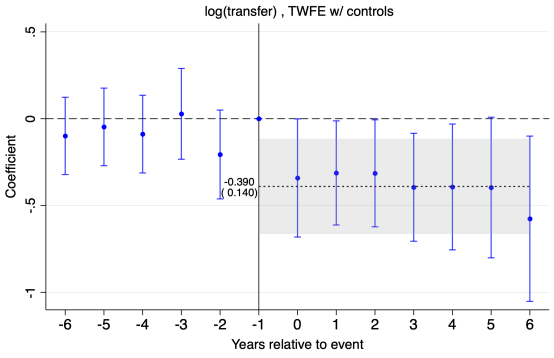
(b) Personnel compensation



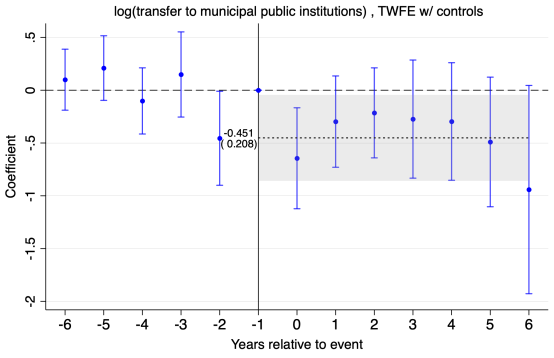
(c) Basic service expenses



(d) Other general operations



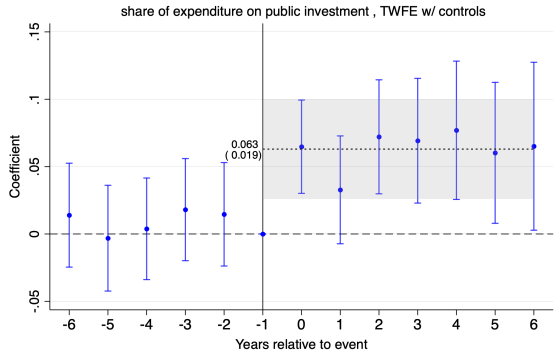
(e) Transfers/Allowances to municipal entities



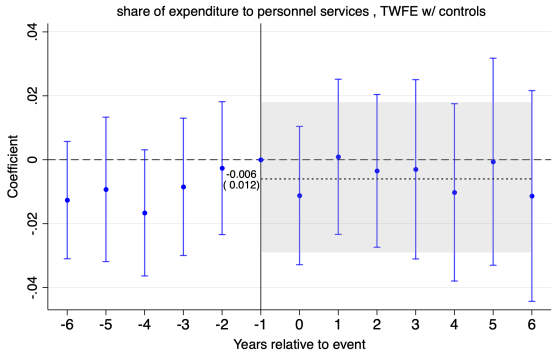
(f) Allowances to internal institutions

Note: The figures report the event study regression on the different measures of expenditures of the municipal government. The outcome variables used in each regression str the logged value of the amount specified in the captions. The regression includes controls for a binned indicator for municipalities experiencing assassinations 7 or more years ago, log(number of criminal organizations + 1), homicide rates, log(total homicides + 1), average years of schooling for the municipal population, share of indigenous population, and years since the most recent election (level and squared). For the regression on spending on educational institutions, a dummy variable for zero expenditure spent is included to control for multiple instances where municipalities report zero total spending. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

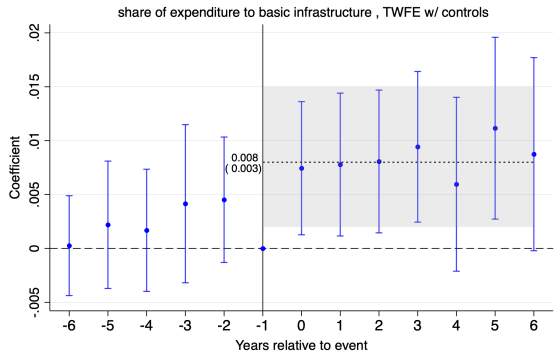
Figure 7: Shares of various expenditures across different categories



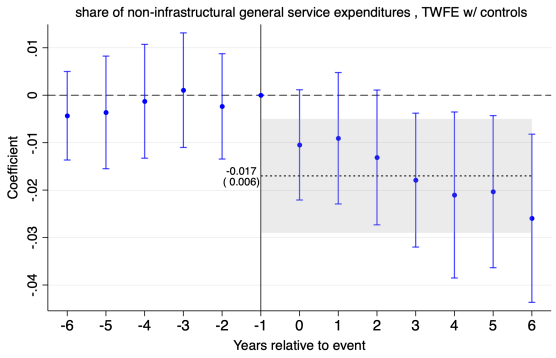
(a) Public investments on construction



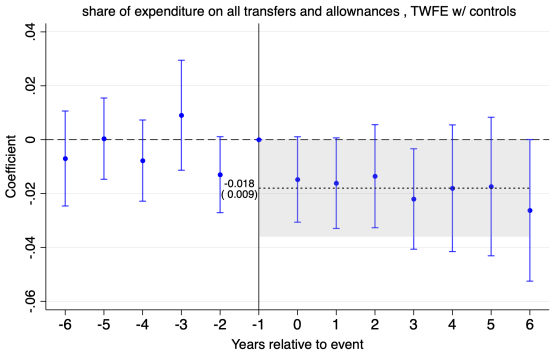
(b) Personnel compensation



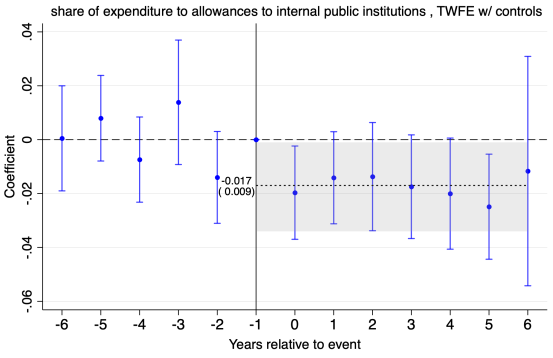
(c) Basic service expenses



(d) Other general operations



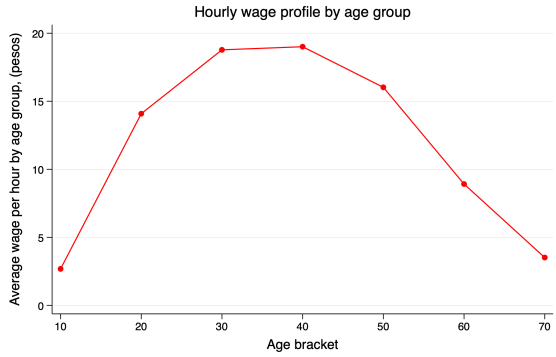
(e) Transfers/Allowances to municipal entities



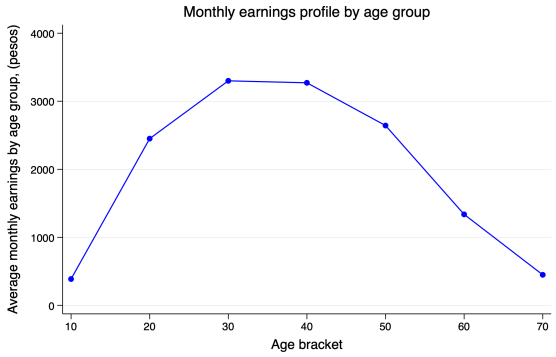
(f) Allowances to internal institutions

Note: The figures report the event study regression on the different measures of expenditures of the municipal government. Outcome variables used in each regression are the proportion of expenditures on each specified category relative to the total expenditure of the municipality. The regression includes controls for a binned indicator for municipalities experiencing assassinations 7 or more years ago, log(number of criminal organizations + 1), homicide rates, log(total homicides + 1), average years of schooling for the municipal population, share of indigenous population, and years since the most recent election (level and squared). Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

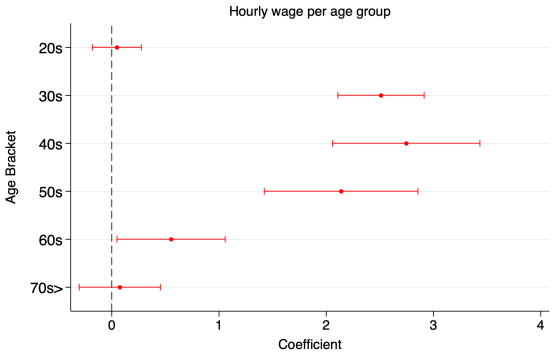
Figure 8: Outside opportunities peak for those in 30s and 40s



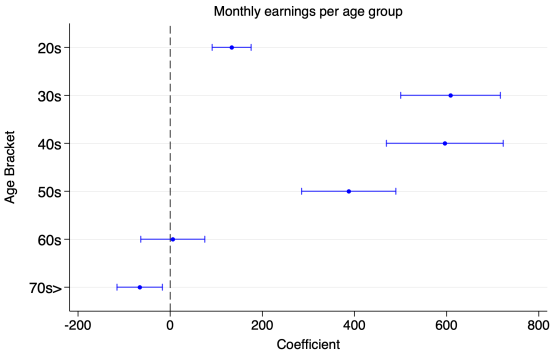
(a) Average hourly wage per age group



(b) Average monthly earnings per wage group



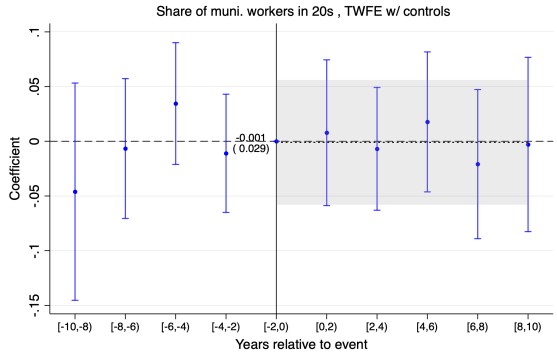
(c) Age premium net of industry, time, municipality FE for hourly wage



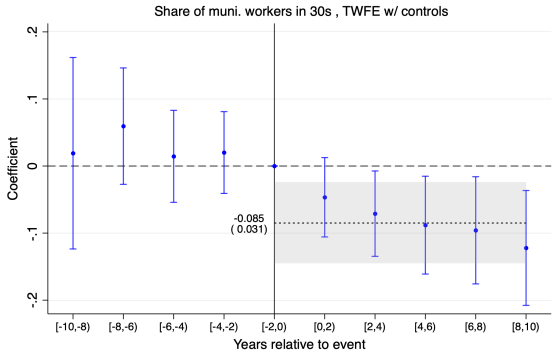
(d) Age premium net of industry, time, municipality FE for monthly earnings

Note: The figure depicts the summary statistics for labor earnings by each age group, sourced from the National Survey on Occupation and Employment (ENOE) from INEGI. Panels (a) and (b) report the average hourly wage and monthly earnings per age group whose municipality of residence is included in the same group of municipalities in the regressions. Panels (c) and (d) report the regression coefficients for the dummies in the age group from the regression that uses each labor earnings as an outcome and includes fixed effects for industry, year, quarter of survey, and municipality. Respondents in their 10s were used as a benchmark group. The figures in Panels (c) and (d) also include a 95% confidence interval with standard errors clustered at the municipal level.

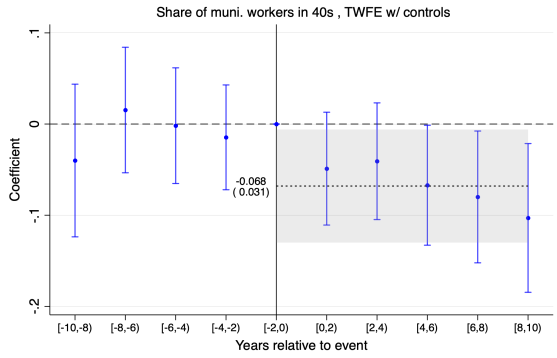
Figure 9: Changes in the size and age composition of municipal workers



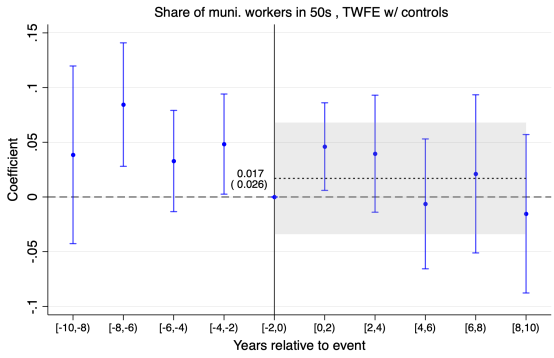
(a) Share of municipality workers in 20s



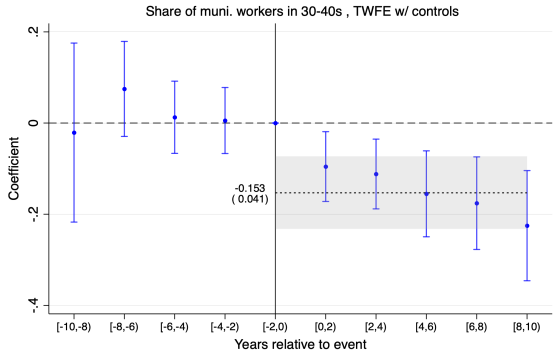
(b) Share of municipality workers in 30s



(c) Share of municipality workers in 40s



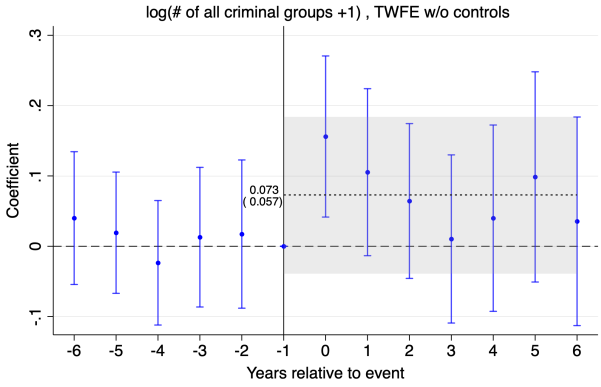
(d) Share of municipality workers in 50s



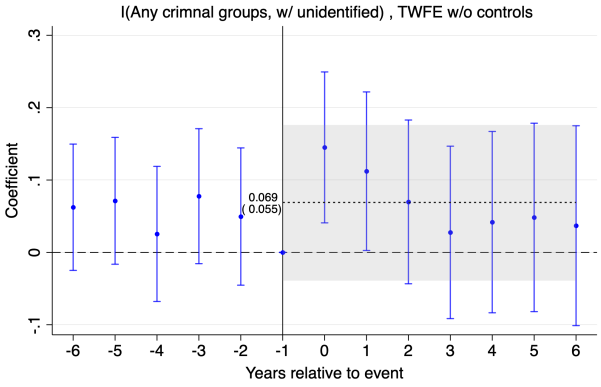
(e) Share of municipality workers in 30s-40s

Note: The figures report the event study regression on the size of the municipal workforce overall and the composition of workers by age group. The outcome variables used in each regression are specified in the captions. The proportions are calculated relative to the total municipal workers. The regression includes controls a for binned indicator for municipalities experiencing assassinations beyond the event timing window, log(number of criminal organizations + 1), homicide rates, log(total homicides + 1), average years of schooling for the municipal population, the share of indigenous population, and years since the most recent election (level and squared). Each regression includes fixed effects for survey years and municipality. Standard errors are clustered at the municipality level.

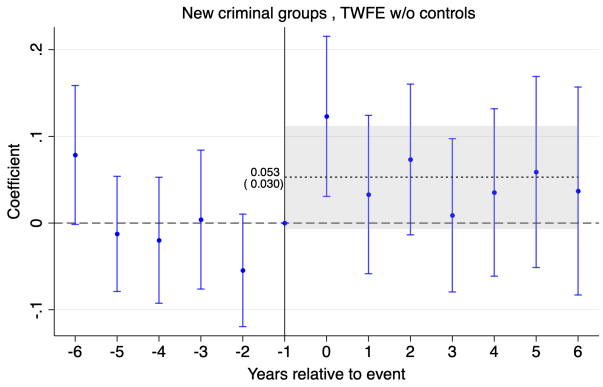
Figure 10: Further criminal organization presence in treated municipalities



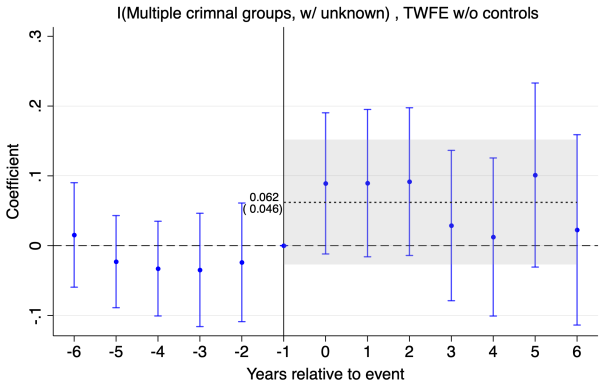
(a) log(number of criminal groups +1)



(b) Indicator for any criminal group presence



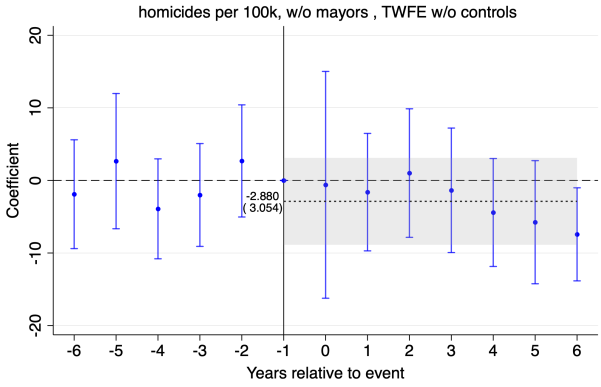
(c) Indicator for entry of new criminals



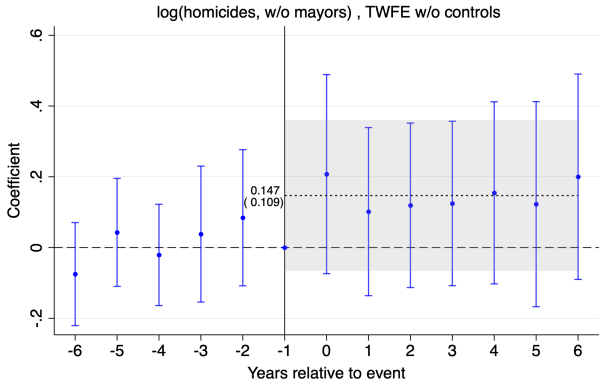
(d) Indicator for multiple criminal group presence

Note: The figures report the event study regression on the different measures of gang presence. The outcome variables used in each regression are specified in the sub-caption for each figure. Outcomes in Panels (a), (b), and (d) include unidentified armed groups, while new entry is calculated solely with identified criminal groups. The regression equation is similar to the ones used in the main results, without using controls. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

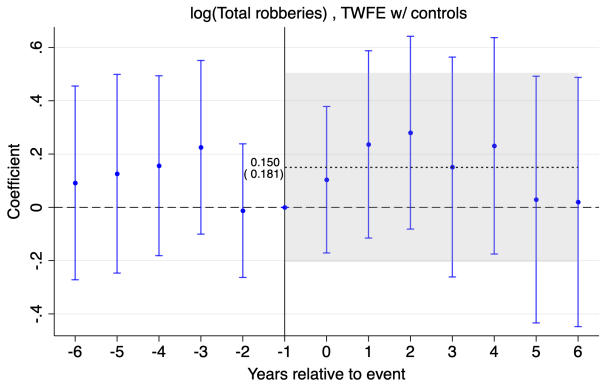
Figure 11: Insignificant changes in non-political violence across treated and control municipalities



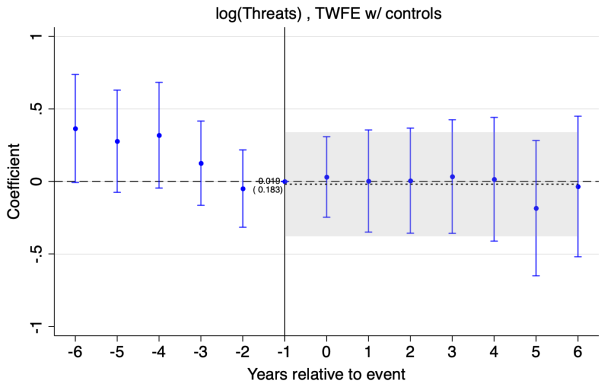
(a) Homicide rates per 100,000k w/o mayors



(b) log(total reported homicides) w/o mayors



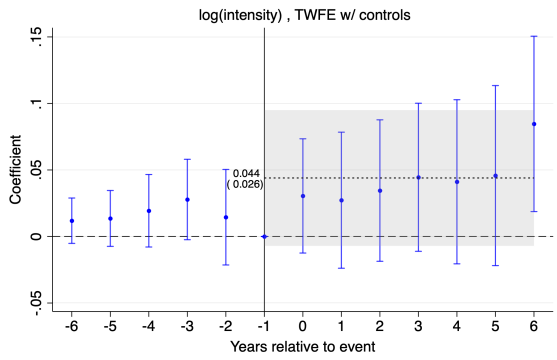
(c) log(robberies)



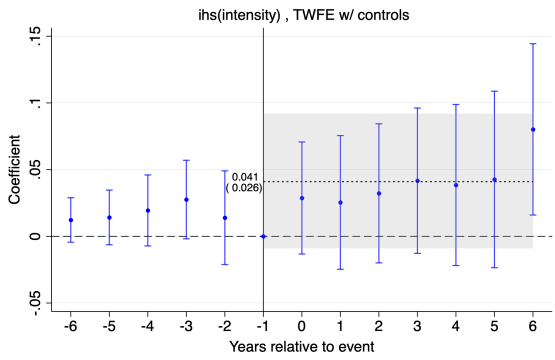
(d) log(threats)

Note: The figures report the event study regression on the type of crime specified in the captions for each figure. The measures of homicides in Panels (a) and (b) are recalculated by omitting the assassination of a mayor. The data for homicides date from 1995, while robbery and threats data starts from 2011. The regression equation is similar to the ones used in the main results, without using controls. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

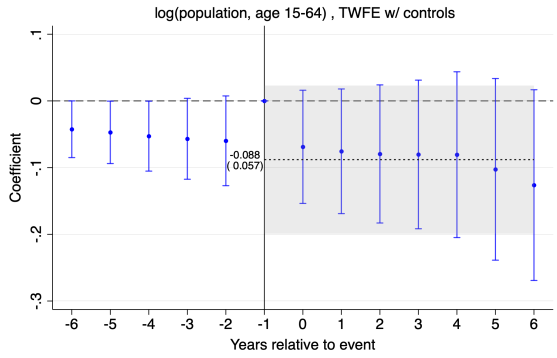
Figure 12: No significant differentials in nightlights, and population measures



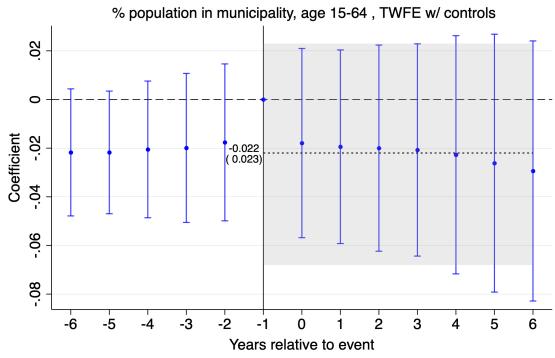
(a) log(nightlights intensity)



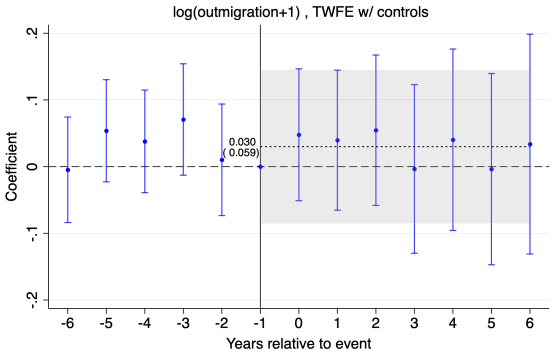
(b) ihs(nightlights intensity)



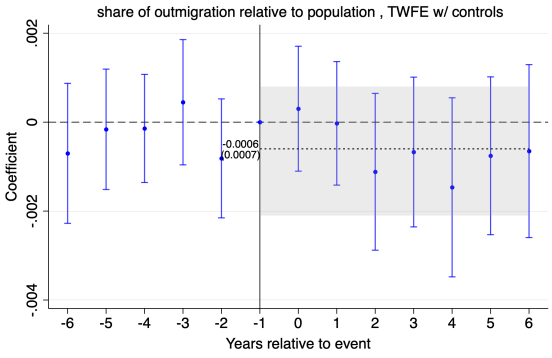
(c) log(municipal population aged 15-64)



(d) Share of municipal population aged 15-64



(e) log(outmigrants to the US)



(f) Share of municipal outmigrants to the US

Note: The figures report the event study regression on the log and inverse hyperbolic sine of the nightlight intensities, as well as population variables. Nightlight variables are sourced from DMSP (1995-2013) and VIIRS (2014-2021). The unit of nightlight intensity is measured by the harmonized measure that was calculated in the process of merging the two datasets. Detailed procedure is found in Appendix Section A.5. The working age population is from the WorldPop (2000 and after) and the Mexican Census (pre-2000). Outmigration data is from the MCAS public data in the Institute of Mexicans Abroad (IME) and is available from 2008 and onwards. The regression equation is the same as Equation (2), with an identical set of control variables being used. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

Appendix A Further explanation on the background and the data

In this section, I will provide an additional explanation of the details of municipal finance in Mexico, the full procedure of collecting data on mayors who are victims of assassination attempts and the complete list, a further definition of key variables used in the research, and a detailed explanation on the composition of the nightlight dataset.

A.1 Additional details on municipal finance in Mexico

Municipalities in Mexico shoulder the work of providing key public goods to Mexico. The revenue required comes mainly from three sources - property taxes, non-earmarked funds (*particpaciones*) and earmarked funds (*aportaciones*). Property taxes are purely determined by the tax collection at the municipal level, but they take up only about 15-20% of the municipal revenues (INEGI 2016). Others are from the two funds from the federal government, with the design following the principles of fiscal federalism (Oates 2005; Weingast 2009). Earmarked funds are designed to correct for equity, while non-earmarked funds include components that emphasize fiscal incentives and efficiency of subnational governments(Oates 2005; Weingast 2009; World Bank 2016).

- **Property taxation**: Municipalities are responsible for collection and keeping records of property owners and values (World Bank 2016). This takes up 70% of the total tax revenues (World Bank 2016; INEGI 2016). However, tax rates are subject to approval from the state legislature (OECD 2016).

- **Non-earmarked funds**: These are composed of General Participation Funds (FGP) and Municipal Development Funds (FFM), as well as transfers from taxes received by the federal governments (Timmons and Broid 2013). Each of these categories includes proportions determined by past receipt of the same funds, demographics, and tax revenues generated within municipalities (Timmons and Broid 2013). Specific formulas and shares are determined at the state legislature (SEGOB 2011).

- **Earmarked funds**: These include Funds for infrastructural development (FISM) and Funds supporting municipal development (FORTAMUN). The former is conditioned primarily for infrastructural development while the other can be more general in purpose (SEGOB 2011). In

both, the amount of funds primarily depends on population and poverty indices (SEGOB 2011; World Bank 2016)

A.2 Data collection procedure for identifying mayors who are attacked

The collection of the information on mayors who are the victims of successful and failed assassination attempts is based on a semi-automated program written in Python and primarily uses `selenium` package. The `selenium` package is a collection of codes that automate the human interaction with the web interface[1]. Actions that can be performed with this package include clicking links, typing designated phrases, and storing blocks of text. However, for getting through some security features such as two-way authentication, automation is complicated and needs human intervention. Thus, the program I have devised is semi-automated.

The workflow designed in the program is as follows. First, the program accesses the online newspaper archives (*Newsbank* and *ProQuest*) using log-in credentials provided by the school library[2]. In using the school login credentials, I follow the default security settings for the school and use two-way authentication. Then, The program types in key phrases on the search box and filters search results based on newspaper source and date. Afterwards, the program collects the name of the publisher, date, title, and the full text of the article. Finally, I discard the unnecessary articles and categorize assassination attempts into successful and failed ones based on the texts in the article. This last step is not based on `selenium`, but done through reviewing the articles. The following diagram summarizes the process.

The key phrases used for the search are as follows

- Assassinated: *presidente municipal fue asesinado*, and *matan/asesinan/ejecutan a presidente municipal*
- Failed: *presidente municipal fue atacado/atentado* and *atentan/atacan a presidente municipal*

1. Alternatives to scraping texts include `scrapy` and `beautlfulsoup` packages. While they provide better performance in terms of speed, they are also likely to be subject to anti-scraping measures implemented by each website. Thus, I chose `selenium` as the primary package for this program.
2. Access to these online newspaper archives are mostly provided to libraries in many educational institutions in the US and other countries.

- Kidnapped: *presidente municipal fue secuestrado* and *secuestran a presidente municipal*
- Threats: *presidente municipal fue amenazado* and *amenazan/narcomensaje a presidente municipal*
- Famliy members targeted: Include the terms *esposo/esposa* (husband/wife), *hermano/hermana* (brother/sister), *hijo/hija* (son/daughter), *padre/madre* (father/mother), *primo/prima* (cousins), *tío/tía* (uncle/aunt), and *sobrino/sobrina* (nephews) to the key phrases used above
- Non-violent deaths: *presidente municipal fallecio/murio* and *fallece/muere presidente municipal*

Once the key phrases are entered, the program filters the articles based on the date of publication and source. Specifically, I select the dates up to Dec 31st, 2021 since I do not include cases from the year 2022 and onwards for the analysis due to the lack of data on key variables for this period. In addition, I limit the results to show just the newspaper articles, which rules out other types of sources stored in the online news archives such as books, and scholarly articles on the topic.

After filtering, the program collects information on the publisher, title, date, and text content of the article. The publishers used in this stage include *Reforma, El Universal, El Norte,* and *El Economista*, among others. The newspaper sources used to identify each case are contained in the list of mayors who are part of the study. Other information is used to identify whether the article is about attacks on mayors, as well as to pinpoint the date and location of the attacks.

Then, I discard the unrelated articles and categorize assassination attempts into successful and failed ones based on the information in the article text. Unrelated articles include all words in the key phrases but are not relevant to attacks on mayors, such as the article about a municipal president criticizing an assassination of other individuals. Based on the manual review and topic categorization using Latent Dirichlet Allocation, I narrow down the collection to relevant articles and determine the type of attacks carried out against a mayor. To distinguish between injured and unharmed mayors, I check for words such as *herido/lesionado/se translado al hopital* (injured) and *sale ileso/ilesa* (unharmed)[3].

A.3 List of mayors included in the study

The table below is a list of mayors who are included in the study. The list includes information on the names, municipalities, and political parties that they represented at the time of the attack, the date of the attack, and whether this was a successful or failed assassination attempt.

3. Any cases which mention that the mayor was not present at the attacks on the office/residence is categorized as unharmed. Also, I check for similar verbs for female mayors, with *o*'s in the end replaced with *a*'s.

Table A1: List of mayors who were assassinated

	Name	Municipality and state	Date	Sources
1	Jaime Valencia Santiago	San Agustín Loxicha-Oaxaca	2002/01/13	Imparcial Oaxaca, La Jornada, El Universal
2	Mario Sostenes Lozano Camacho	San Sebastián Tecomaxtlahuaca-Oaxaca	2004/07/14	Proceso, Wradio, El Universal
3	Fernando Chavez Lopez	Buenavista-Michoacan	2005/07/09	Esparza et al. (2018), El Universal, La Jornada
4	Neguib Tadeo Manriquez Madriaga	Ciudad Ixtepec-Oaxaca	2006/01/13	Esparza et al. (2018), El Universal, La Jornada
5	Raul Delgado Benavides	Cuautitlán de García Barragán-Jalisco	2006/07/15	Esparza et al. (2018), El Universal, Colima Noticias
6	Walter Herrera Ramirez	Huimanguillo-Tabasco	2006/11/15	Esparza et al. (2018), El Universal, El Heraldo de Tabasco
7	Juan Marcelo Ibarra Villa	Madero-Michoacan	2008/06/01	Esparza et al. (2018), El Universal, La Jornada
8	Manuel Angulo Torres	Topia-Durango	2008/06/03	Esparza et al. (2018), El Universal, Proceso
9	Homero Lorenzo Rios	Ayutla de los Libres-Guerrero	2008/09/25	Esparza et al. (2018), El Universal, La Jornada
10	Salvador Christopher Vergara Cruz	Ixtapan de la Sal-Edomex	2008/10/03	Esparza et al. (2018), El Universal, La Jornada
11	Claudio Reyes Nunez	Otáez-Durango	2009/02/04	Esparza et al. (2018), El Universal, La Jornada
12	Octavio Manuel Carrillo Castellanos	Vista Hermosa-Michoacan	2009/02/24	Esparza et al. (2018), El Universal, Vanguardia
13	Luis Carlos Ramirez Lopez	Ocampo-Durango	2009/06/01	Esparza et al. (2018), El Universal, Vanguardia
14	Hector Ariel Meixueiro Muñoz	Namiquipa-Chihuahua	2009/07/14	Esparza et al. (2018), El Universal, La Jornada
15	Ramon Mendivil Sotelo	Guadalupe y Calvo-Chihuahua	2010/02/17	Esparza et al. (2018), El Universal, Milenio
16	Manuel Estrada Escalante	Mezquital-Durango	2010/02/22	Esparza et al. (2018), El Universal, La Jornada
17	Vidal Olivera Cruz	San Lorenzo Albarradas-Oaxaca	2010/04/01	Esparza et al. (2018), Excelsior, AALMAC
18	Jose Santiago Agustin	Zapotitlán Tablas-Guerrero	2010/04/28	Esparza et al. (2018), El Universal, El Economista
19	Jesus Manuel Lara Rodriguez	Guadalupe-Chihuahua	2010/06/19	Esparza et al. (2018), El Universal, El Mañana
20	Oscar Venancio Martinez Rivera	San José del Progreso-Oaxaca	2010/06/20	Esparza et al. (2018), El Universal, La Jornada
21	Nicolas Garcia Ambrosio	Santo Domingo de Morelos-Oaxaca	2010/06/30	Esparza et al. (2018), El Universal, Expansion
22	Alfonso Pena Pena	Tepehuanes-Durango	2010/07/26	Esparza et al. (2018), El Universal, Expansion
23	Edelmiro Cavazos Leal	Santiago-Nuevo León	2010/08/18	Esparza et al. (2018), El Universal, LA Times
24	Marco Antonio Leal Garcia	Hidalgo-Tamaulipas	2010/08/30	Esparza et al. (2018), El Universal, LA Times
25	Alexander Lopez Garcia	El Naranjo-San Luis Potosí	2010/09/09	Esparza et al. (2018), El Universal, Expansion
26	Prisciliano Rodriguez Salinas	Doctor González-Nuevo León	2010/09/24	Esparza et al. (2018), El Universal, Vanguardia
27	Gustavo Sanchez Cervantes	Tancítaro-Michoacan	2010/09/27	Esparza et al. (2018), El Universal, Informador
28	Jaime Lozoya Avila	San Bernardo-Durango	2010/11/05	Esparza et al. (2018), El Universal, La Jornada
29	Saúl Vara Rivera	Zaragoza-Coahuila	2011/01/05	Esparza et al. (2018), El Universal, Excelsior
30	Abraham Ortiz Rosales	Temoac-Morelos	2011/01/10	Esparza et al. (2018), El Universal, Excelsior

31	Pedro Luis Jiminez Mata	Santiago Amoltepec-Oaxaca	2011/01/13	Esparza et al. (2018), El Universal, Excelsior
32	Saturnino Valdes Llanos	Tampico Alto-Veracruz	2011/02/23	Esparza et al. (2018), El Universal, Expansion
33	Fortino Cortes Sandoval	Benito Juárez-Zacatecas	2011/07/28	Esparza et al. (2018), El Universal, Vanguardia
34	Jose Eduviges Nava Altamirano	Zacualpan-Edomex	2011/08/19	Esparza et al. (2018), El Universal, Expansion
35	Ricardo Guzman Romero	La Piedad-Michoacan	2011/11/03	Esparza et al. (2018), El Universal, El Pais
36	Rafael Landa Fernandez	Atzalan-Veracruz	2012/04/18	El Universal, Alcalorpolitico, Vanguardia
37	Marisol Mora Cuevas	Tlacojalpan-Veracruz	2012/06/29	Esparza et al. (2018), El Universal, La Jornada
38	Pedro Filemon Luis Hernandez	San Miguel Tilquiápam-Oaxaca	2012/08/02	Esparza et al. (2018), El Universal, Libertad Oaxaca
39	Nadin Torralba Mejia	Técpan de Galeana-Guerrero	2012/08/05	Esparza et al. (2018), El Universal, Vanguardia
40	Himeldo Rayon de Jesus	San Juan Juquila Mixes-Oaxaca	2012/08/24	Esparza et al. (2018), El Universal, Diario Despertar de Oaxaca
41	Wilfrido Flores Villa	Nahuatzen-Michoacan	2013/02/04	El Universal, Justice in Mexico, La Jornada
42	Feliciano Martinez Bautista	San Juan Mixtepec Distrito 08-Oaxaca	2013/03/24	Esparza et al. (2018), El Universal, La Jornada
43	Jose Rene Garrido Rocha	San Salvador el Verde-Puebla	2013/04/21	Esparza et al. (2018), El Universal, Ell Siglio de Torreon
44	Celestino Felix Vazquez Luis	San Miguel Tilquiápam-Oaxaca	2013/06/04	Esparza et al. (2018), El Universal, Proceso
45	Geronimo Manuel Garcia Rosas	Aquila-Veracruz	2013/07/23	Esparza et al. (2018), El Universal, La Jornada
46	Ygnacio Lopez Mendoza	Santa Ana Maya-Michoacan	2013/11/07	El Pais, El Universal, Aristegui Noticias
47	Gustavo Garibay Garcia	Tanhuato-Michoacan	2014/03/22	Esparza et al. (2018), El Universal, Justice in Mexico
48	Teodulo Gea Dominguez	Pánuco-Veracruz	2014/07/14	Esparza et al. (2018), El Universal, Alcalorpolitico
49	Manuel Gomez Torres	Ayutla-Jalisco	2014/08/03	Esparza et al. (2018), El Universal, Expansion
50	Mario Sanchez Cuevas	San Miguel el Grande-Oaxaca	2015/10/07	Esparza et al. (2018), El Universal, Presencia
51	Gisela Mota Ocampo	Temixco-Morelos	2016/01/02	Esparza et al. (2018), El Universal, NY Times
52	Juan Antonio Mayen Saucedo	Jilotzingo-Edomex	2016/04/22	Esparza et al. (2018), Aristegui Noticias, Mexico News Daily
53	Domingo López González	Chamula-Chiapas	2016/07/23	Esparza et al. (2018), El Pais, El Financiero
54	Ambrosio Soto Duarte	Pungarabato-Guerrero	2016/07/24	Esparza et al. (2018), El Financiero, The Yucatan Times
55	Jose Santa Maria Zavala	Huehuetlán el Grande-Puebla	2016/08/01	Esparza et al. (2018), Expansion, El Economista
56	Jose Villanueva Rodriguez	Ocotlán de Morelos-Oaxaca	2016/12/17	Esparza et al. (2018), AALMAC, El Imparcial
57	Antolin Vidal Martinez	Tepexco-Puebla	2017/01/24	Esparza et al. (2018), La Jornada, El Mineral
58	Alejandro Hernandez Santos	San Bartolomé Loxicha-Oaxaca	2017/04/28	Esparza et al. (2018), Imagen del Golfo, Proceso
59	Stalin Sanchez Gonzalez	Paracho-Michoacan	2017/10/06	Esparza et al. (2018), El Financiero, El Universal
60	Manuel Hernandez Pasion	Huitzilan de Serdán-Puebla	2017/10/10	Esparza et al. (2018), Animal Politico, Cronica de Chihuahua
61	Crispin Gutierrez Moreno	Ixtlahuacán-Colima	2017/10/20	Esparza et al. (2018), La Jornada, El Universal Queretaro
62	Victor Manuel Espinoza Tolentino	Ixhuatlán de Madero-Veracruz	2017/11/25	Esparza et al. (2018), Noroeste, El Financiero
63	Jose Santos Hernandez	San Pedro el Alto-Oaxaca	2017/12/09	Esparza et al. (2018), Telesur TV, AALMAC
64	Sergio Antonio Zenteno Albores	Bochil-Chiapas	2017/12/18	Esparza et al. (2018), Zeta Tijiana, Sin Embargo

65	Arturo Gómez Pérez	Petatlán-Guerrero	2017/12/28	Esparza et al. (2018), Mexico News Daily, Noroeste
66	Jose Efrain Garcia Garcia	Tlanepantla-Puebla	2018/04/12	Esparza et al. (2018), El Pais, Noticieros Televisa
67	Juan Carlos Andrade Magana	Jilotlán de los Dolores-Jalisco	2018/04/15	Esparza et al. (2018), Telesur TV, La Jornada
68	Alejandro Gonzalez Ramos	Pacula-Hidalgo	2018/05/03	Esparza et al. (2018), Proceso, El Piñero
69	Abel Montufar Mendoza	Coyuca de Catalan-Guerrero	2018/05/08	Esparza et al. (2018), Aristegui Noticias, Alcaldes de Mexico
70	Alejandro Chavez Zavala	Taretan-Michoacan	2018/06/14	El Universal, NPR, Dallas News
71	Javier Urena Gonzalez	Buenavista-Michoacan	2018/06/27	ACLED, El Norte, Noroeste
72	Victor Jose Guadalupe Diaz Contreras	Tecalitlán-Jalisco	2018/07/02	ACLED, El Financiero, El Economista
73	Genaro Negrete Urbano	Naupan-Puebla	2018/08/06	ACLED, El Financiero, Milenio
74	Olga Gabriela Kobel Lara	Juárez-Coahuila	2018/12/16	ACLED, El Universal, Milenio
75	Alejandro Aparicio Santiago	Heroica Ciudad de Tlaxiao-Oaxaca	2019/01/01	ACLED, El Universal, Milenio
76	David Eduardo Otlica Aviles	Nahuatzen-Michoacan	2019/04/23	ACLED, Mexico News Daily, Milenio
77	Maricela Vallejo Orea	Mixtla de Altamirano-Veracruz	2019/04/24	ACLED, Infobae, El Universal
78	Carmela Parral Santos	San Jose Estancia Grande-Oaxaca	2019/08/17	ACLED, El Pais, Reporte Indigo
79	Francisco Tenorio Contreras	Valle de Chalco Solidaridad-Edomex	2019/10/29	ACLED, La Jornada, El Universal
80	Arturo Garcia Velazquez	San Felipe Jalapa de Díaz-Oaxaca	2019/12/23	ACLED, Milenio, La Jornada
81	Carlos Ignaio Beltran Bencomo	Temósachic-Chihuahua	2020/09/29	ACLED, Infobae, El Financiero
82	Florisel Rio Delfin	Jamapa-Veracruz	2020/11/11	ACLED, e-Veraceruz, Proceso
83	Leobardo Ramos Lazaro	Chahuites-Oaxaca	2021/02/04	ACLED, El Pais, El Economista
84	Alfredo Sevilla Cuevas	Casimiro Castillo-Jalisco	2021/03/11	ACLED, Infobae, 24horas
85	Manuel Aguilar Garcia	Zapotlán de Juárez-Hidalgo	2021/06/09	ACLED, La Jornada Hidalgo, Noroeste

Note: The above list includes mayors who were assassinated. 3 Municipalities were subject to multiple assassinations against their mayors (San Miguel Tilquiápam-Oaxaca in 2012 and 2013; Buenavista-Michoacan in 2005 and 2018; Nahuatzen-Michoacan in 2013 and 2018). Thus, there are 82 unique municipalities that experienced at least one assassination. Full link to the articles are stored in the separate data file.

Table A2: List of mayors subject to failed attacks

	Name	Municipality, State	Date	Time away	Sources
1	Antonio Pouchoulen Cardeas	Las Choapas-Veracruz	2008/03/29		Alcalor Politico, Wradio, Proceso
2	Catalino Duarte Orduno	Zirandaro-Guerrero	2008/09/28		La Jornada, Proceso,
3	Jesus Fernando Garcia Hernandez	Navolato-Sinaloa	2008/11/05	✓	La Jornada, El Siglio de Torreon, El Universal
4	Luis Carlos Ramirez Lopez	Ocampo-Durango	2008/11/18		El Siglo de Torreon, Wradio, El Universal
5	Arturo Bonilla Morales	Tlacoapa-Guerrero	2009/10/14	✓	El Siglo de Torreon, El Universal,
6	Maria Santos Gorrostietta	Tiquicheo de Nicolás Romero-Michoacan	2009/10/15	✓	Insight Crime, El Universal, Expansion
7	Maria Santos Gorrostietta	Tiquicheo de Nicolás Romero-Michoacan	2010/01/23	✓	Insight Crime, El Universal, Expansion
8	Raul Mario Mireles Garza	Sabinas Hidalgo-Nuevo León	2010/10/11		Expansion, Wradio, El Economista
9	Jose Eligi Moreno Martinez	Cuencame-Durango	2010/10/20		Reforma, El Siglio de Durango,
10	Jaime Heliodoro Rodriguez Calderon	Garcia-Nuevo León	2011/02/25		Expansion, La Jornada, Proceso
11	Ricardo Solis Manriquez	Gran Morelos-Chihuahua	2011/03/23	✓	El Mañana, Reforma,
12	Jaime Heliodoro Rodriguez Calderon	García-Nuevo León	2011/03/29		Expansion, La Jornada, Proceso
13	Clara Luz Flores Carrales	General Escobedo-Nuevo León	2011/07/03		Expansion, La Jornada, El Economista
14	Eleazar Palacios Rojas	San Pedro Totolápam-Oaxaca	2011/07/08	✓	Quadratin Oaxaca, La Radio del Siglo XXI,
15	Julio Cesar Salmeron Salazar	Alcozauca-Guerrero	2011/08/04		Vanguardia, Informador,
16	Filiberto Martinez	Solidaridad-Quintana Roo	2011/09/14		Proceso, Noticaribe, EFE News
17	Alejandro Higuera Osuna	Mazatlan-Sinaloa	2011/11/08		Chicago Tribune, Wradio, El Universal
18	Miguel Hernandez Anaya	San Miguel el Alto-Jalisco	2011/12/18		Informador, Proceso,
19	Andres Cardenas Guerrero	Coahuayana-Michoacan	2012/03/09	✓	Arestegui Noticias, Quadratin Michoacan,
20	Benjamin Galvan Gomez	Nuevo Laredo-Tamaulipas	2012/06/29		El Universal, CNN Mexico, Sin Embargo
21	Francisco de Jesus Ayon Lopez	Guadalajara-Jalisco	2012/07/09		Informador, 24horas, El Economista
22	Francisco Omar Corza Gallegos	Vista Hermosa-Michoacan	2012/07/23		El Universal, Arestegui Noticias,
23	Alejandro Tejeda Lopez	Zacapu-Michoacan	2012/10/05		El Universal, Arestegui Noticias,
24	Gustavo Garibay Garcia	Tanhuato-Michoacan	2012/10/12	✓	El Pais, Excelsior, El Economista
25	Miguel Entzin Cruz	Pantelho-chiapas	2012/12/18	✓	Reforma, SDP Noticias, Proceso
26	Rocio Rebello Mendoza	Gomez Palacio-Durango	2013/02/05		Vanguardia, El Siglo de Torreon, Excelsior
27	Feliciano Alvarez Mesino	Cuetzala del Progreso-Guerrero	2013/04/09	✓	Proceso, Diario,
28	Pedro Luis Jiminez Hernandez	Santiago Amoltepec-Oaxaca	2013/05/13	✓	Excelsior, La Jornada, Animal Politico
29	Cesar Miguel Penaloza Santana	Cocula-Guerrero	2013/06/06		La Silla Rota, Imagen Radio, Proceso
30	Pablo Rodriguez Santiago	San Miguel del Puerto-Oaxaca	2013/06/24	✓	Excelsior, Vanguardia, La Jornada

31	Feliciano Alvarez Mesino	Cuetzala del Progreso-Guerrero	2013/08/26	✓	Proceso, Diario,
32	Benito Jimenez Martinez	Huehuetoca-Edomex	2013/11/03		Reforma, La Jornada,
33	Enrique Antonio Paul	Texistepec-Veracruz	2014/04/01	✓	El Universal, Reforma, El Economista
34	Elizabeth Gutierrez Paz	Juan R. Escudero-Guerrero	2014/05/19	✓	La Jornada, El Financiero, Notigodinez
35	Leopoldo Molina Corral	Guadalupe y Calvo-Chihuahua	2014/09/08		Milenio, Debate, Noroeste
36	Juan Raúl Acosta Salas	Choix-Sinaloa	2015/03/06	✓	The Guardian, Debate, Expansion
37	Leticia Salazar	Matamoros-Tamaulipas	2015/03/09		Expansion, Colima Noticias, Telesur TV
38	Miguel Antonio Castillo	Coahuitlan-Veracruz	2015/03/13	✓	Costa Veracruz, El Heraldo de Poza Rica, Marcha
39	Mario de la Garza Garza	San Fernando-Tamaulipas	2015/05/30		El Siglio de Torreon, Aristegui Noticias, Reforma
40	Miguel Angel Castro Rosas	Amatlan de los Reyes-Veracruz	2015/07/19	✓	Quadratin Veracruz, El Siglio de Torreon
41	Romualdo Fuentes Galicia	Jantetelco-Morelos	2015/08/13	✓	Zona Centro Noticias, El Financiero, Reforma
42	Jose Santa Maria Zavala	Huehuetlán el Grande-Puebla	2015/09/01	✓	Expansion, El Pais, El Universal
43	Víctor Eduardo Castañeda Luquín.	Ahualulco de Mercado-Jalisco	2016/03/01		Excelsior, La Vanguardia, Alcaldes de Mexico
44	Israel Varela Ordóñez	Batopilas-Chihuahua	2017/01/17	✓	La Jornada, AM, Sin Embargo
45	Jose Manuel Aguero Tovar	Jiutepec-Morelos	2017/02/09		La Silla Rota, Milenio, Diario de Morelos
46	Oscar Toral Rios	Asuncion Ixtaltepec-Oaxaca	2017/06/01	✓	El Universal, Corta Mortraja, ABC Radio
47	Jose Misael Gonzalez	Coalcomán de Vázquez Pallares-Michoacan	2017/10/20	✓	El Universal, Reforma, Aristegui Noticias
48	Andres Valencia Rios	San Juan Evangelista-Veracruz	2018/01/08		ACLED, Enlace Veracruz, El Sol de Puebla
49	Enrique Rivas Cuellar	Nuevo Laredo-Tamaulipas	2018/01/24		ACLED, Soy502, Enlace Digital
50	Jose Rafael Nunez Ramirez	San Martín Texmelucan-Puebla	2018/02/01		ACLED, Milenio, Angulo7
51	Hugo Garcia Rios	San José Tenango-Oaxaca	2018/04/28		La Silla Rota, Vanguardia, El Sol de Mexico
52	Pablo Higuera Fuentes	Eduardo Neri-Guerrero	2018/06/26		ACLED, El Universal, El Financiero
53	Abel Ramirez Coria	Paso de Ovejas-Veracruz	2018/08/06		ACLED, Aristegui Noticias, El Financiero
54	Antonio Ramirez Itehua	Astacinga-Veracruz	2019/02/04	✓	ACLED, El Universal, El Economista
55	Emilio Montero Perez	Juchitan de Zaragoza -Oaxaca	2019/03/09		El Imparcial, Noticieros Televisa, Debate
56	Ernesto Quintanilla Villareal	Cadereyta Jiménez-Nuevo León	2019/03/10		ACLED, El Universal, Linea Directa
57	Domingo Cordoba Martinez	Chapulco-Puebla	2019/06/04		ACLED, El Popular, Milenio
58	Felix Alberto Linares Gonzalez	Ocuilan-Edomex	2019/07/03		Debate, De Paso Yucatan, La Jornada
59	Griselda Martinez Martinez	Manzanillo-Colima	2019/07/27		ACLED, Infobae, El Universal
60	Benito Olvera Munoz	Acatlan-Hidalgo	2019/07/31		El Sol de Hidalgo, El Reportero, AM
61	Eduardo Maldonado Garcia	San Felipe-Guanajuato	2019/08/22		ACLED, Milenio, El Siglo de Durango
62	Sara Valle Dessens	Guaymas-Sonora	2019/10/10		ACLED, El Imparcial, La jornada
63	Fernando Vilchis Contreras	Ecatepec-Edomex	2019/11/05		El Sol de Mexico, Noticias CD
64	Juan de Dios Valle Camacho	Ahumada-Chihuahua	2020/03/04		El Sol de Mexico, Reforma, El Norte

65	Abraham Cruz Gomez	Chenalho-Chiapas	2020/07/07	✓	ACLED, Excelsior, La Verdad Noticias
66	Aldo Molina Santos	Tenango de Doria-Hidalgo	2020/09/04		ACLED, Milenio, Quadratin Hidalgo
67	Ponciano Gomez Gomez	Chamula-Chiapas	2020/12/05		El Siglio Coahuila, Proceso, La Jornada
68	Sinforiano Armenta Garcia	Tepetongo-Zacatecas	2021/04/08		La Jornada
69	Adriana Campos Huirache	Jacona-Michoacan	2021/04/22		Atiempo, El Sol de Morelia, Sin Embargo
70	Jorge Ortiz Ortega	Moroleon-Guanajuato	2021/07/07		ACLED, El Otro Enfoque, El Financiero
71	Sandra Velazquez Lara	Pilcaya-Guerrero	2021/08/11		ACLED, Milenio, La Jornada
72	Alfredo Arroyo Arroyo	Peribán-Michoacan	2021/09/05		ACLED, Debate, Red Michoacan
73	Jesus Galvan Rojas	San Pedro y San Pablo Ayutla-Oaxaca	2021/09/19		El Universal Oaxaca, Tiempo, 24horas
74	Carlos Alberto Paredes Correa	Tuxpan-Michoacan	2021/10/07		ACLED, Proceso, El Sol de Morelia
75	Geminiano Hernandez	Chiconamel-Veracruz	2021/11/19		ACLED, Milenio, Avi Veracruz
76	Calixto Urbano Lagunas	Atlatlahucan-Morelos	2021/11/19		ACLED, Diario de Morelos
77	Sinforiano Armenta Garcia	Tepetongo-Zacatecas	2021/11/24		Proceso, Excelsior, El Norte
78	Karla Cordova Gonzalez	Guaymas-Sonora	2021/11/25		El Economista, SDP Noticias, 24-horas

Note: The above list includes mayors who were subject to failed attacks. 6 Municipalities were subject to multiple failed attacks against their mayors (Tiquicheo de Nicolás Romero-Michocan in 2009 and 2010; García-Nuevo Leon 2011 Feb and March; Cuetzala del Progreso-Guerrero in 2013 Apr and Aug; Nuevo Laredo in 2012 and 2018; Tepetongo-Zacatecas in 2021 Apr and Nov; Guayamas-Sonora in 2019 and 2021). In 7 of the municipalities listed here, a mayor was assassinated either before or after the failed attacks occurred (Ocampo-Durango in 2009; Vista Hermosa-Michoacan in 2009; Tanhuato-Michoacan in 2014; Santiago Amoltepec-Oaxaca in 2011; Guadalupe y Calvo-Chihuahua in 2010; Huehuetlán el Grande-Puebla in 2016; Chamula-Chiapas in 2016). Thus, 65 unique municipalities experienced failed attacks only. These cases were separated into mayor spending time away from office due to being injured (*herido(a), lesionado(a), se translasdo(a) al hospital*) and returning due to being unharmed (*sale ileso(a)*). These cases were categorized based on expressions appearing in the articles mentioned in the source column. In one case, a mayor (Ricardo Solís Manríquez) was unharmed from attacks but had to spend time away due to injuries he suffered during the election. Full links to the articles are stored in a separate data file.

Table A3: List of mayors who passed away in a non-violent manner

	Name	Municipality, State	Date	Reason of death	Sources
1	Oscar Zúñiga Quiroz	Mier y Noriega-Nuevo León	2002/03/15	car accident	Magar (2018), Proceso, Vlex
2	Carlos Filemón Kuk y Can	Motul-Yucatan	2003/07/28	car accident	Magar (2018), Proceso
3	Cecilio Amador Cuauhtle	Contla de Juarez Cuamatzi-Tlaxcala	2004/02/14	car accident	Magar (2018), El Siglo de Torreon, Proceso
4	Pedro Rojas Pérez	Santa Cruz Quilehtla-Tlaxcala	2004/02/14	car accident	Magar (2018), Proceso, Vlex
5	Delia Garza Gutiérrez	San Fernando-Tamaulipas	2007/07/20	cancer	Magar (2018), La Jornada, Cimac Noticias
6	Miguel Ángel Nicolás Mata	San Pedro Totolapan-Oaxaca	2009/08/06	car accident	Magar (2018) Panorama del Pacifico
7	José Manuel Maldonado	Piedras Negras-Coahuila	2010/07/07	plane crash	Magar (2018), El Economista, Plano Informativo
8	Rogelio Pérez Arrambide	Pesquería-Nuevo León	2010/07/25	heart attack	Magar (2018), Vlex, Presencia
9	Ignacio Rodríguez Villa	Nahuatzen-Michoacan	2012/09/29	respiratory disease	Magar (2018), Quadratin Michocan, TVNotas
10	Salomón Domínguez Jiménez	San Juan Lajarcia-Oaxaca	2012/11/19	car accident	Magar (2018), Libertad Oaxaca, Quadratin Oaxaca
11	Félix San Juan Rebollar	San Baltazar Chichicapam-Oaxaca	2013/01/06	unspecified illness	Magar (2018), Quadratin Oaxaca,
12	Leobardo Díaz Estrada	Urique-Chihuahua	2013/02/07	car accident	Magar (2018), Vanguardia, La Jornada
13	Joel Cebada Bernal	Nogales-Veracruz	2013/04/14	kidney failure	Magar (2018), Alcalor Politico, Orizaba en Red
14	Ernesto Rodríguez Rodríguez	Juchipila-Zacatecas	2013/08/16	heart attack	Magar (2018), Zacatacas Online, Vanguadia
15	Filimón Carlos Robles Díaz	Tepetongo-Zacatecas	2013/09/30	suicide	Magar (2018), Zacatacas Online, La Jornada
16	Eliud Cervantes Ramírez	Catemaco-Veracruz	2013/11/02	heart attack	Magar (2018), El Economista, Quadratin Mexico
17	Juan Ángel Castañeda Lizardo	Sombrerete-Zacatecas	2014/02/10	car accident	Magar (2018), Milenio, La Jornada
18	Sadot Bello García	Copala-Guerrero	2015/06/19	respiratory disease	Magar (2018), Expansion, Excelsior
19	Jesús Alvarado Hernández	San Pedro Sochiapam-Oaxaca	2015/11/03	Car accident	Magar (2018), El Universal, Excelsior
20	Alfredo Vizcarra Díaz	Concordia-Sinaloa	2016/09/20	stroke	Magar (2018), Noroeste, Proceso
21	Martha Elvia Fernández Sánchez	Cuautitlán-Edomex	2017/03/05	cancer	Magar (2018), MVS Noticias, Infobae
22	Fernando Álvaro Gómez	Tianguistenco-Edomex	2017/03/25	heart attack	Magar (2018), Proceso, El Sol de Mexico
23	Aurelio Cortez Aguirre	Santa Maria la Asuncion-Oaxaca	2017/05/17	gastric ulcer	Magar (2018), Legislador43, Tvbus
24	Irma Camacho García	Temixco-Morelos	2017/07/19	unspecified illness	Magar (2018), Proceso, Sinembargo
25	Edgar Gil Yoguez	Venustiano Carranza-Michoacan	2017/08/26	heart attack	Magar (2018), Notivideo, Mi Morelia
26	Salvador Aguilar García	Cohetzala-Puebla	2018/01/29	car accident	Magar (2018), Contrastes de Puebla
27	Jorge Luis García Vera	Villanueva-Zacatecas	2018/08/11	car accident	Magar (2018), El Universal, El Sol de Zacatecas
28	Zótico Gómez Bautista	Santiago Tetepec-Oaxaca	2018/09/20	car accident	Magar (2018), Debate, Excelsior
29	Jesús Bernardo Torres García	Santiago Suchiquitongo-Oaxaca	2018/10/30	pneumonia	Magar (2018), El Pinero, Imparcial Oaxaca
30	Raymunda Che Pech	Kantunil-Yucatan	2019/10/06	fainted at home	Magar (2018), El Financiero, El Universal

31	Félix Alberto Linares	Ocuilan-Edomex	2020/01/04	plane accident	Magar (2018), El Economista, Infobae
32	Óscar Gurría Penagos	Tapachula-Chiapas	2020/02/20	heart attack	Magar (2018), El Sol de Mexico, Milenio
33	Armando Portuguez Fuentes	Tultepec-Edomex	2020/05/23	heart attack	Magar (2018), Infobae, Excelsior
34	Sergio Anguiano Meléndez	Coyotepec-Edomex	2020/06/08	covid	Magar (2018), El Financiero, El Economista
35	Javier Santiago Ruiz	Reyes Etla-Oaxaca	2020/06/15	covid	Magar (2018), El Economista, El Universal Oaxaca
36	Rigoberto González Pacheco	Bacoachi-Sonora	2020/06/16	covid	Magar (2018), El Economista, Reforma
37	José Humberto Arellano	Acaponeta-Nayarit	2020/06/17	covid	Magar (2018), El Economista, Infobae
38	Florencio San Germán Santiago	San Baltazar Chichicapam-Oaxaca	2020/06/28	covid	Magar (2018), La Razon, Central Municipal
39	Gerardo Tirso Acahua Apale	Coetzala-Veracruz	2020/06/28	covid	Magar (2018), El Economista, El Universal
40	Josué Antonio García Rodríguez	Vanegas-San Luis Potosí	2020/07/08	covid	Magar (2018), El Economista, El Sol de San Luis
41	Reyna Marlene de los Ángeles Catzín Cih	Maxcanú-Yucatan	2020/07/09	covid	Magar (2018), El Economista, El Universal
42	Faustino Carín Molina Castillo	Amaxac-Tlaxcala	2020/07/13	covid	Magar (2018), El Economista, La Jornada
43	Fernando Bautista Dávila	San Juan Bautista Tuxtepec-Oaxaca	2020/07/16	covid	Magar (2018), El Economista, El Universal Oaxaca
44	Irma Delia Bárcena Villa	Miahuatlan-Veracruz	2020/07/16	covid	Magar (2018), El Sol de Mexico, Imagen del Golfo
45	Rigoberto Javier Tun Salas	Samahil-Yucatan	2020/07/19	covid	Magar (2018), El Economista, El Universal
46	Artemio Ortiz Ricárdez	Tamazulapan del Espiritu Santo-Oaxaca	2020/08/05	covid	Magar (2018), El Economista, El Universal Oaxaca
47	Victoria Rasgado Perez	Moloacan-Veracruz	2020/08/09	covid	Magar (2018), El Economista, Milenio
48	Alfredo Juarez Diaz	Matias Romero-Oaxaca	2020/08/18	covid	Magar (2018), El Economista, Excelsior
49	Pedro Escárcega Pérez	Santiago Jocotepec-Oaxaca	2020/08/21	covid	Magar (2018), El Economista, Infobae
50	Miguel Ángel Antonio Vázquez	General Felipe Ángeles-Puebla	2020/08/24	covid	Magar (2018), El Economista, Milenio
51	Victorino Gómez Martínez	San Bartolomé Quialana-Oaxaca	2020/08/25	covid	Magar (2018), El Economista, Milenio
52	Simón Ursino Barzán	San Simón Zahuatlán-Oaxaca	2020/08/26	car accident	Magar (2018), SDP Noticias, Milenio
53	Tomás Primo Negrete	Tonanitla-Edomex	2020/08/30	covid	Magar (2018), El Economista, El Universal
54	Daniel Efren Hernández Hernández	San Miguel del Rio-Oaxaca	2020/09/13	covid	Magar (2018), El Economista, Quadratin Oaxaca
55	Pedro Modesto Santos	Santa Cruz Xitla-Oaxaca	2020/09/24	covid	Magar (2018), El Economista, Sopitas
56	Héctor Carrasco Márquez	Venustiano Carranza-Puebla	2020/10/03	covid	Magar (2018), El Economista, Milenio
57	Roberto Arriaga Colín	Ocampo-Michoacan	2020/10/05	covid	Magar (2018), El Economista, El Universal Oaxaca
58	Carlos Mario Ortiz Sánchez	Salvador Alvarado-Sinaloa	2020/10/07	covid	Magar (2018), El Economista, El Universal
59	Juan Manuel Rodríguez Rodríguez	Tulcingo del Valle-Puebla	2020/10/26	covid	Magar (2018), El Economista, Heraldo de Mexico
60	Carmen Prieto Mortera	Moloacan-Veracruz	2020/11/08	covid	Magar (2018), El Economista, Milenio
61	Rubén Díaz Espinoza	Santo Domingo-San Luis Potosí	2020/11/09	covid	El Sol de San Luis, Quadratin Queretaro
62	Jorge Luis Peña Peña	Los Aldamas -Nuevo León	2020/12/14	heart attack	Magar (2018), El Norte, Reforma
63	José Rosario Romero Lugo	Jaltenco-Edomex	2020/12/17	covid	Magar (2018), El Economista, El Universal
64	Juan José Losoya Ponce	San Francisco de los Romo-Aguascalientes	2021/01/05	heart attack	El Universal, El Sol de Centro, La Razon

65	Efraín Lázaro	San Juan Tamazola-Oaxaca	2021/01/23	covid	Magar (2018), El Universal, Reforma
66	José Yolando Jarquín Bustamante	Xitlapehua-Oaxaca	2021/01/25	covid	Magar (2018), Proceso, Milenio
67	Filogonia Adorno Aragon	San Bartolo Cohuecan-Puebla	2021/01/27	covid	El Economista, El Sol de Puebla, Milenio
68	María de Jesús Chávez	Tasquillo-Hidalgo	2021/01/30	covid	Magar (2018), Excelsior, La Silla Rota
69	Aparicio Reyes Rojas	Santos Reyes Tepejillo-Oaxaca	2021/01/30	covid	Magar (2018), Excelsior, Proceso
70	Leonilo Ruiz Martínez	Santa Catarina Loxicha-Oaxaca	2021/02/02	covid	Magar (2018), Quadratin Oaxaca, Milenio
71	Fernando Raymundo Valeriano Rodriguez	San Simon Zahuatlán-Oaxaca	2021/02/05	covid	Nvinoticias, La Silla Rota
72	Misael Lorenzo Morales	Atzacan-Veracruz	2021/02/08	covid	Magar (2018), Infobae, Milenio
73	Jan Cruz Idiaquez	San Francisco Sola de Vega-Oaxaca	2021/02/08	unspecified illness	La Silla Rota, El Universa Oaxaca
74	Patricia González	Villa Tezontepec-Hidalgo	2021/02/18	covid	Magar (2018), La Jornada, Excelsior
75	Juvenal Garcia Hernandez	San Sebastian Rio Hondo-Oaxaca	2021/02/19	covid	El Economista, El Universal, El Imparcial Oaxaca
76	Amado Vasquez	San Pedro Mixtepec - Distrito 26–Oaxaca	2021/02/22	covid	El Economista, El Universal Oaxaca
77	Filadelfo Vergara Tapia	Petlalcingo-Puebla	2021/02/23	covid	El Economista, Reforma, El Sol de Puebla
78	Nicolas Galindo Marquez	Jalpan-Puebla	2021/02/25	covid	El Economista, La Jornada de Oriente, Milenio
79	Hugo García Ríos	San Jose Tenango-Oaxaca	2021/02/28	covid	El Economista, SDP Noticias, El Universal Oaxaca
80	Baltazar Gaona Sánchez	Tarimbaro-Michoacan	2021/03/05	covid	El Economista, La Jornada, El Sol de Morelia
81	Leobardo Aguilar Flores	Soltepec-Puebla	2021/03/31	covid	El Economista, Milenio, La Jornada de Oriente
82	Rogelio Torres Ortega	Tepoztlan-Morelos	2021/04/13	covid	El Economista, Infobae, Milenio
83	Jose Dolores Jimenez Lopez	Santa Maria Nativitas-Oaxaca	2021/06/09	covid	El Economista, El Universal Oaxaca
84	Trinidad Perez Coria	Mazatepec-Morelos	2021/07/20	heart attack	Milenio, El Sol de Cuernacava, La Jornada
85	Evergisto Gamboa Diaz	Santiago Choapam-Oaxaca	2021/07/31	covid	El Norte, La Razon, Nvinoticias
86	Jorge Humberto Aguilar Perera	Kaua-Yucatan	2021/08/10	covid	Grillo de Yucatan, Diario de Yucatan
87	Carlos Manuel Calvo Martinez	Jiquipilas-Chiapas	2021/09/08	covid	La Jornada, Vanguardia Veracruz, Excelsior
88	Antonio Francisco Perez	Hermenegildo Galeana-Puebla	2021/09/15	covid	Municipios Puebla, Angulo7, El Sol de Puebla
89	Abel Sanchez Campos	San Antonino Castillo Velasco-Oaxaca	2021/12/28	natural	Meganoticias, El Universal Oaxaca

Note: The above list includes mayors who were subject to non-violent deaths. 3 municipalities experienced multiple non-violent deaths of their mayors (Moloacan-Veracruz in Aug and Nov of 2020; San Baltazar Chichicapam-Oaxaca in 2013 and 2020; San Simon Zahuatlán-Oaxaca in 2020 and 2021). In 2 municipalities, a mayor was also assassinated (Nahuatzen-Michoacan in 2013; Temixco-Morelos in 2016). Thus, 84 unique municipalities experienced non-violent deaths of the mayors without assassinations.

A.4 Definition of key variables from other datasets

A.4.1 Fiscal indicators: Revenues to municipal government

Following are the definitions of the fiscal variables used in the research. The definition and the categorization come from the INEGI's database (INEGI 2016).

- Tax revenues (*impuestos*): These are revenue that is paid by legal and natural persons under the relevant taxation law. At the municipal level, the following taxes are collected
  - Property taxes (*impuesto predial*)
  - Land tax revenues (*impuestos al patrimonio*): Summation of property taxes and sale tax on real estate. In some cases, this is translated as wealth tax
  - Other taxes include additional taxes on education (*impuestos adicionales para educación*) and public works (*impuestos adicionales para obras de públicas*)
- Non-earmarked funds from the federal government (*participaciones*): These are funds and resources given to the municipal governments, with no conditions specifically defined. The funds in this category depend both on demographic traits and local revenue-generating activities (SEGOB 2011)
  - General Participation Funds (*Fondo General de Participaciones*): This is also shared with the state governments, who must also share 20% of the amount they receive from this fund to municipalities according to the Financial Coordination Law (*Ley de Coordinación fiscal*)
  - Municipal Development Funds (*Fondo de Fomento Municipal*): There are more components determined by taxation in this category in general. This fund is exclusively destined to the municipalities and not the states (SEGOB 2011)
  - Other categories include transfers based on taxes collected at the federal or state level, such as vehicle taxes, gasoline taxes, and payroll taxes
- Earmarked funds from the federal government (*aportaciones*): These are funds and resources given to the municipal governments, with conditions on where these funds could be spent according to the Financial Coordination Law

  - Municipal Fund for Social Infrastructure (*Fondo de Aportaciones para la Infraestructura Social Municipal*): Conditioned for the public projects and infrastructure development that benefits municipal population
  - Funds for Municipal Development (*Fondo de Aportaciones para el Fortalecimiento de los Municipios*): Conditioned for supporting municipal treasuries and other requirements of the municipalities, such as public security. Generally, the conditions on this fund are weaker than those of FISM (SEGOB 2011).

- Revenues from provision of public service (*derechos*): These are contributions to the municipal revenue through receipt of fees from servicing a public goods and services. The following are included
  - Registration services (*registro civil, registro público de la propiedad y del comercio*)
  - Certification and recording services (*certificaciones y constancias diversas*)
  - Licenses (*icencias al comercio ambulante, licensias de construcción*)
  - Water (*agua potable*)
  - Services related to urban development (*Servicios de desarrollo urbano y obras públicas*)
- Revenues from legal functions (*aprovechamientos*): Income received from public law functions.
  - Surcharges for interest payments (*recargos*), Fines (*multas*), Penalties for late payments of fees (*Rezagos*)

A.4.2 Fiscal indicators: Municipal government expenditures

Like the revenue variables, the definition and categorizations are from the INEGI (2016)

- Total payments to personnel (*Servicios personales*): Expenses towards the remuneration of personnel at the service of public entities. This includes wages, bonuses, and social security benefits.
  - General remunerations (*remuneraciones al personal*)
  - Others: Additional pay (*Remuneraciones adicionales y especiales*), Social security quotas (*cuotas de seguridad social y seguros*)

- Expenditures on general services (*Servicios generales*): Expenses designed to cover the costs of the services provided by the municipal government
  - Basic services (*servicios basico*): Includes expenses to water, electricity, telephone, and internet services
  - Those that are counted as other general expenditures include leases (*arrendamientos*), financial services (*servicios financieros, bancarios, y comerciales*), expenses on maintenance services including waste management (*servicios de instalación, reparación, mantenimiento y conservación*) and travel expenses for municipal personnel (*servicios de translado y viáticos*)
- Public investment (*Inversíon pública*): Expenses on public projects and contracts on works related to municipal development and infrastructure.
  - Includes construction of residential and nonresidential buildings, schools, hospitals, and energy infrastructures on public and private domains
- Transfers and allowances to municipal institutions (*Transferencia, Asignaciones, subsidios y otra ayuda*): Allowances destined directly or indirectly to various entities to support economic and social policy, following the strategies for development and maintenance of the performance of the recipient entities
  - Transfers and allowances to internal public organizations (*ransferencias internas y asignaciones al sector público*)
  - Subsidies to private entities (*Subsidios*)
  - Social assistance to individuals (*Ayudas*)

A.4.3 Variables on municipal personnel

- Committees mentioned in the Census of Municipal Governments: Among many others, the primary ones are treasury, internal control, public security, social development, and economic development. Other minor ones include committees for culture, municipal presidents, and others. (The categorization has changed in the 6th wave of the Census of Municipal Governments, published in 2021)

A.4.4 Further definition of the control variables used in the main specification

- Number of organized criminal groups: Calculated based on the number of organized criminal groups appearing in Coscia and Rios (2012) and Osorio and Beltran (2020) and ACLED. While Osorio and Beltran (2020) and ACLED also identifies subdivision of the major organized criminal groups, this is not the case for Coscia and Rios (2012). Thus, I use the number of major organized criminal groups and not their subdivisions for consistency.

- Homicide indicators: The total count of homicides is generated from the homicide records in INEGI, accessible with this link https://www.inegi.org.mx/sistemas/olap/proyectos/bd/continuas/mortalidad/defuncioneshom.asp?s=est. As for the homicide rate per 100,000 people, this is generated by dividing this with population measure

- Average level of schooling: Calculated based on response to year of schooling questions from the Mexican Census, with intercensal years calculated based on interpolation

- Share of indigenous population: Calculated based on response to year of schooling questions from the Mexican Census and population from census and WorldPop, with intercensal years calculated based on interpolation[4]

- Years since election: Number of calendar years passed since the most recent election

- Resource endowment: Amount of gold, silver, iron, copper, and zinc extracted in each municipality measured in tons. Data from 2000 and after uses a Mining-metallurgical industry survey from INEGI. Earlier data are from the mineral yearbook of the Council of Mineral Resources.

A.5 Creation of harmonized nightlight measures from DMSP and VIIRS

The two sources of the nightlight data primarily available for research purposes are the Defense Meteorological Satellite Program (DMSP) and Visible and Infrared Imaging Suite (VIIRS)[5]. DMSP is available from 1992 to 2013, with multiple different satellites (F10, F12, F14, F15, F16, F18) covering

4. Results for homicides rates and share of population are robust to using either the Census of the combination of Census and WorldPop as population measures

5. Both datasets can be downloaded from the website for the Payne Institute for Public Policy under the Colorado School of Mines: https://eogdata.mines.edu/products/dmsp/ (DMSP) and https://eogdata.mines.edu/products/vnl/ (VIIRS)

different time periods[6]. F10 satellite was operated from 1992-1994. F12 covers 1994-1999. F14 is available from 1997-2003. F15 is used from 2000-2007. F16 runs from 2004-2009. For 2010-2013, F18 is used. VIIRS, on the other hand, is available publicly from 2012 and onwards, using a single satellite. The timeframe of this research spans from 1995 and 2021. With no single dataset having a time coverage that spans this period on its own, it is necessary to combine the two datasets to utilize the nightlight variables

However, two other differences complicate the combination of the two datasets. First, each pixel in the two datasets is measured in different geographic units. Each pixel of nightlight intensities in DMSP is measured in a 1km-by-1km unit, whereas the same for VIIRS is 500m-by-500m. Thus, I need to match the pixel units by aggregating the observations in the VIIRS to match the same unit of distance in DMSP.

More importantly, the measure of light intensity used in the two datasets is different. In DMSP, nightlight intensity is measured using 'digital numbers' (DNs), which is an arbitrary unit generated with a 6-bit quantization radiometric resolution over the nightlights (Yuan et al. 2022). The range for the DNs is 0 to 63, with extremely bright (dark) nightlights being topcoded (bottomcoded). For VIIRS, the nightlight intensities are measured in terms of the actual radiance and capture a wider range of nightlight intensities than DMSP. Furthermore, 1 value of DNs in DMSP can correspond to multiple values of nightlight intensities in the VIIRS dataset (Li et al. 2022; Yuan et al. 2022). Therefore, I create a unified light intensity measure by translating the VIIRS nightlight intensities to the corresponding DMSP DN values.

I take the following steps to create a combined dataset with an identical geographic pixel unit and consistent light intensity measure, based on the methods suggested by Li et al. (2022) and Yuan et al. (2022). I first create consistent nightlight intensity measures across all the different satellites in the DMSP sample. For years with multiple satellites, I averaged the different intensity values to represent the nightlight for each pixel. Then I generate a regression with the DN of each year t for each pixel i as an outcome variable, with the constant, DN, and DN-squared of the base year (2010)

6. As individual satellites were degrading in quality of measurements over time, multiple satellites were employed to make up for the shortcomings. (Yuan et al. 2022)

for the same pixel as an input (Yuan et al. 2022)[7].

$$DN_{i,t} = \beta_0 + \beta_1 DN_{i.2010} + \beta_2 DN^2_{i.2010} + u_i \tag{A1}$$

After the regression, I generate the fitted nightlight values for each year by fitting the estimated coefficients $\hat{\beta}_0, \hat{\beta}_1$ and $\hat{\beta}_2$ in the following manner

$$\widehat{DN}_{i,t} = \hat{\beta}_0 + \hat{\beta}_1 DN_{i,t} + \hat{\beta}_2 DN^2_{i,t} \tag{A2}$$

I apply this to all for $t \leq 2013$. This generates a consistent nightlight measure for all DMSP samples.

Then, I generate a DMSP-like measure for the VIIRS data. For this, I use the two years for which both DMSP and VIIRS are available as references - 2012 and 2013. I start by aggregating the pixels in VIIRS resolution from the 500m-by-500m level to the 1km-by-1km level by taking averages across the 4 pixels making up the 1km-by-1km space. I denote the newly aggregated pixel values as $x_{i,t}$ for year t at point i. Then, I take the inverse hyperbolic sine on the aggregated pixel values to optimize the fitting procedure (Li et al. 2022) [8]. Then, I fit this measure with the nonlinear regression using the following sigmoid function to follow the idea that the DMSP is bottom-coded and top-coded [9]. This step generates the DMSP-like nightlight values in DNs for all the VIIRS samples.

$$DN_{i,t} = \gamma_0 + \frac{\gamma_1}{1 + \exp(-\gamma_2(ihs(x_{i,t}) - \gamma_3))} + e_i \quad (2014 \leq t \leq 2021) \tag{A3}$$

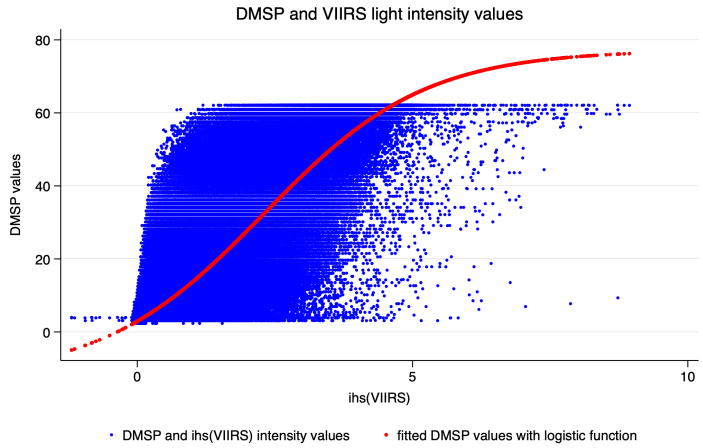
The resulting nightlight measures are summarized by Figure at follows. The top panel reports the degree of fit between the DMSP and VIIRS nightlight intensities. The bottom panel shows the nightlight intensity measures across different satellites in the two datasets. The blue and red line represents the DMSP nightlight intensity values that fit across different satellites in the DMSP sample and the generated DMSP values for the VIIRS dataset. For the research, these two lines were used as the nightlight intensity measures.

7. Base year of 2010 is suggested by Yuan et al. (2022) on the basis that the DN values for that year had the highest total and thus, a sufficient variation to be used as a reference year.

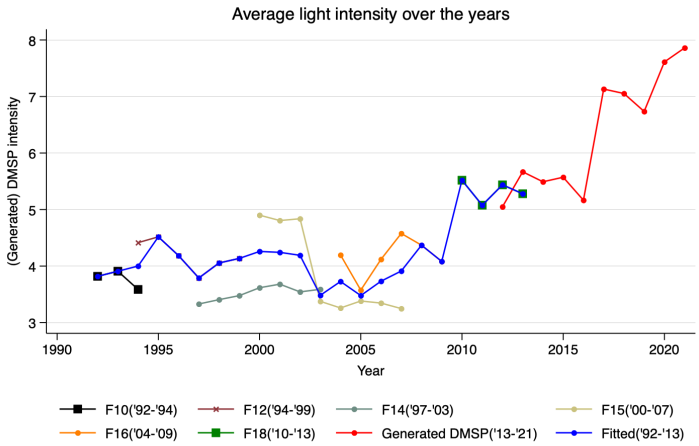
8. This step is carried out to smooth out the coarse values that are calculated as a result of aggregating from 500m-by-500m level to the 1km-by-1km level. Further technical details are found in Li et al. (2022).

9. For this, I use the `nl` command in Stata with `log4` option, which fits the outcome and independent variables with a logistic function

Figure A1: Harmonizing nightlight intensity variables across DMSP and VIIRS



(a) Fitting VIIRS and DMSP for 2013 and 2013



(b) Measure of nightlight intensity variables in the two datasets

Note: The top panel describes the fit between DMSP and VIIRS nightlights matched with the logistic function in Equation (A3). The bottom panel maps out the nightlight values for all satellites in the data as well as the fitted DMSP values for all the DMSP datasets (in blue) and VIIRS dataset (in red).

A.6 Full summary statistics and balance tables

Table A4 provides the summary statistics for outcome variables for all municipality-year observations included in the analysis sample.

Table A4: Summary statistics for outcome variables at municipality-year level

Variable (unit)	N	Mean	St. dev.	10th pct.	Median	90th pct.
Panel A. Outcome variables for municipal government revenues						
Total income (th. Pesos)	3,075	213,072	679,872	4,710	47,984	397,070
Tax revenues (th. Pesos)	2,945	27,752	126,609	39	1,093	48,246
Tax per capita (Pesos)	2,836	157	354	3	51	349
Property Tax (th. Pesos)	2,665	17,576	82,440	36	799	31,207
Property Tax per capita (Pesos)	2,575	98	201	3	37	220
Non-earmarked Fund (th.Pesos)	2,725	67,367	225,573	3,312	17,413	117,106
Earmarked Fund (th. Pesos)	2,478	58,148	127,059	4,261	21,290	128,929
Usage Fee (th. Pesos)	2,959	13,102	61,707	42	1,144	20,194
Legal Service (th. Pesos)	2,827	6,136	27,091	11	395	10,089
Panel B. Outcome variables for municipal government expenditures						
Total expenditure (th. Pesos)	3,075	213,072	679,872	4,710	47,984	397,070
Personnel expenditure (th. Pesos)	3,066	71,139	273,777	962	11,712	125,340
Public Investment (th. Pesos)	3,006	46,715	108,707	534	14,952	105,224
Basic Infrastructure (th. Pesos)	2,847	8,744	27,872	122	1,666	15,384
Other General Services (th. Pesos)	2,847	24,657	97,838	339	3,077	35,364
Transfer/allowance (th. Pesos)	3,014	24,383	107,937	250	3,000	30,041
Internal transfers (th. Pesos)	2,452	15,232	71,746	125	1,722	18,841
Panel C. Outcome variables for municipal workers						
Total (Persons)	747	627	1,554	35	209	1,317
20s (Persons)	746	105	225	1	38	204
30s (Persons)	746	167	422	3	59	317
40s (Persons)	746	152	464	2	40	273
$\geq$50s (Persons)	746	134	437	0	24	264
Panel D. Outcome variables for alternative mechanisms						
Fitted nightlights (DNs)	3,429	0.778	1.36	0	0	2
Total Outmigration (Persons)	1,778	621	1,800	24	264	1,113
Total population (Persons)	3,294	75,311	211,475	4,589	20,694	139,336
Population age 15-64 (Persons)	3,294	47,065	140,190	2,332	11,120	84,182
# Organized Criminal (Groups)	3,429	0.432	1.11	0	0	1
Total homicides (Cases)	3,375	13.1	53.2	0	1	22
Homicide per 100k (Rate)	3,375	17.2	42.6	0	5.72	43.8
Robbery (Cases)	1,229	684	3,378	2	29	1,128
Threat (Cases)	1,229	55.4	236	0	4	122

The table lists the summary statistics for the variables in Section 3 at the municipal level. The statistics presented here are mean, standard deviation, 10th percentile, median, and 90th percentile. For the units, "th. Pesos " refers to a thousand Pesos. The number of observations for each municipality is counted from 2011 for outcome variables in Panel C (biennially), and robbery and threat cases in Panel D (annually). Outmigration is counted from 2008 in Panel D (yearly). Other variables are included from 1995 (yearly). The most recent observations for all outcomes are from 2021.

Appendix B Supplementary regression results for Section 5

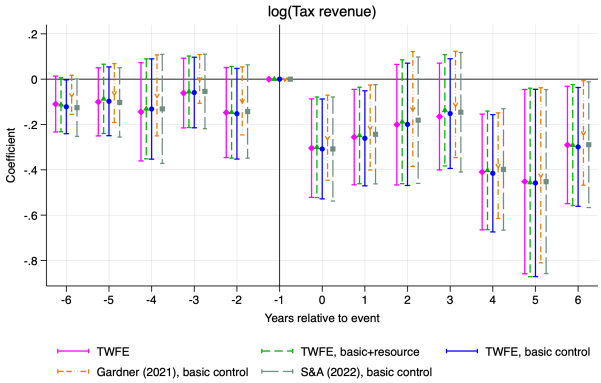
Table B1: Incidence of attacks on mayors in a given year, since 1995

	All of Mexico (Coeff × 100)				Assassination and Near-miss			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Exclude unidentified groups								
log(# groups + 1)	0.276**			0.174	0.020*			0.007
	(0.122)			(0.156)	(0.011)			(0.016)
I(New group)		0.324**		0.189		0.028*		0.023
		(0.165)		(0.211)		(0.017)		(0.024)
Homicide rate	0.001	0.001	0.001	0.001	0.016	0.016	0.017*	0.016
(× 100, rounded)	(0.001)	(0.001)	(0.001)	(0.001)	(0.009)	(0.009)	(0.009)	(0.009)
Panel B. Include unidentified groups								
log(# groups + 1)	0.495***			0.378***	0.044***			0.028**
	(0.102)			(0.080)	(0.012)			(0.013)
I(New group)		0.455***		0.248		0.046***		0.031
		(0.139)		(0.160)		(0.016)		(0.020)
Homicide rate	0.001	0.001	0.001	0.001	0.015	0.016	0.017*	0.015
(× 100, rounded)	(0.001)	(0.001)	(0.001)	(0.001)	(0.010)	(0.010)	(0.010)	(0.010)
N	57076	57076	57076	57076	3244	3244	3244	3244
Municipalities	2198	2198	2198	2198	125	125	125	125
Municipal FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓

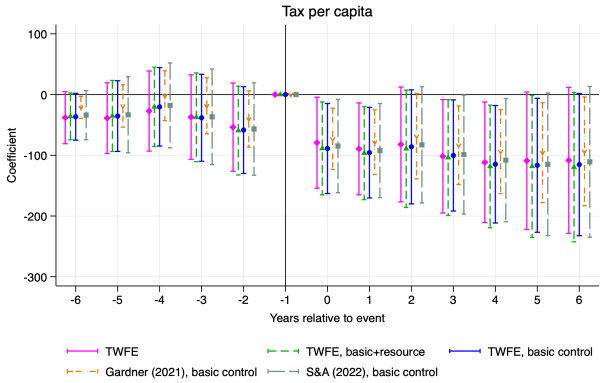
* $p < .10$, ** $p < .05$, *** $p < .01$

The table shows the coefficient estimates from the regression of the incidence of attacks on mayors on variables relevant to gang presence and crime at the municipality-year level. For the sample using all of Mexico, coefficients are multiplied by 100 for convenience. All coefficients on homicide rates in all sample restrictions have been multiplied by 100 and rounded up for convenience. All regressions include municipality, year fixed effects, and controls. Control variables included are the average schooling of the municipal population, the share of the indigenous population, the log of the total population, and the year since the election (level and squared). log(# group + 1) is the log of the number of criminal groups in the municipality, adjusted by adding 1 to account for municipalities with no presence of organized criminal groups. New group refers to the dummy variable for the existence of a criminal organization that newly began its activities within the municipalities. Homicide rate refers to homicides per 100,000 persons and has been recalculated without mayor assassinations. Standard errors are clustered at the municipal level. They are also multiplied by 100 for convenience.

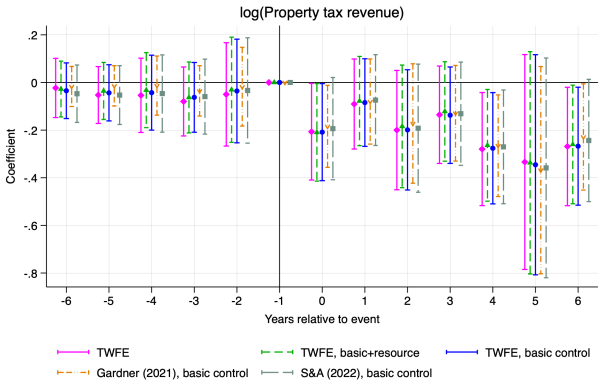
Figure B1: Decreases in tax revenues after assassinations, Robustness checks



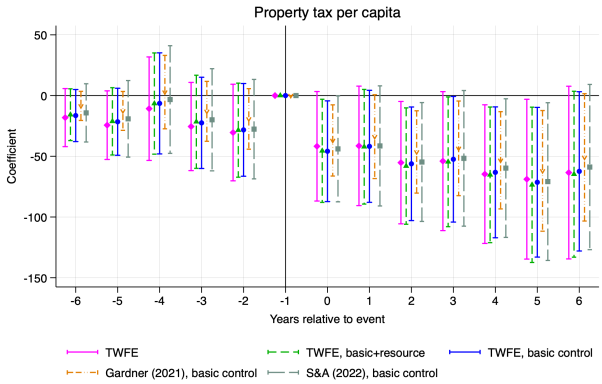
(a) log(Total tax revenue)



(b) Total tax revenue per capita



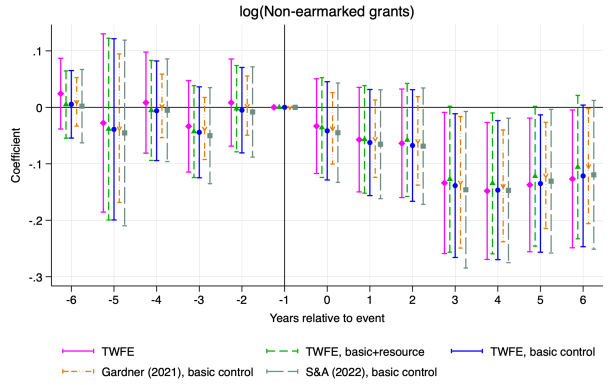
(c) log(Total property tax revenue)



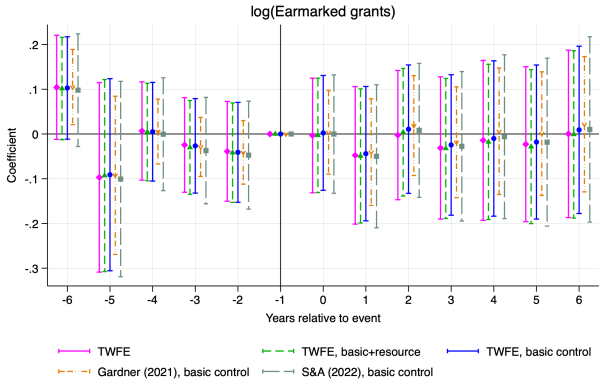
(d) Property tax revenue per capita

Note: The figures report the event study regression on the different measures of tax revenues, using various specification checks listed in the legends of each figure. The outcome variables used in each regression are specified in the captions. The regression equation is similar to the ones used in the main results. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

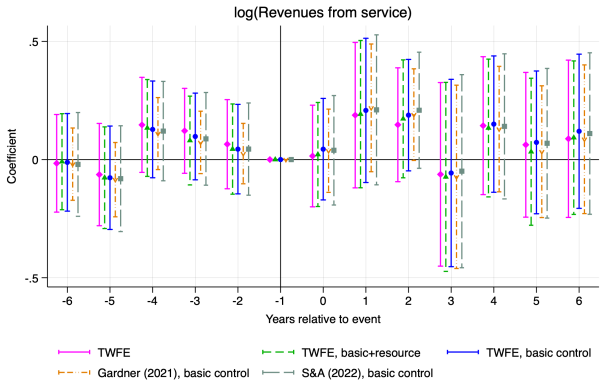
Figure B2: Changes in other sources of revenue, Robustness checks



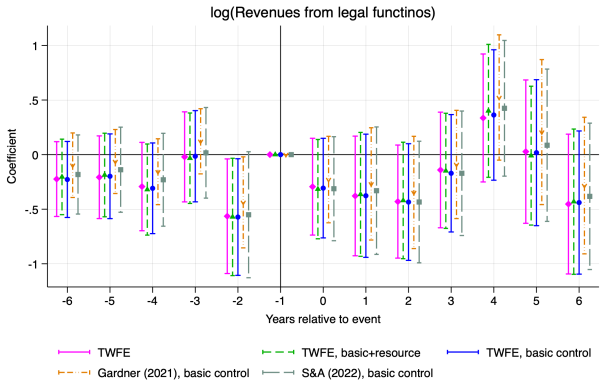
(a) Non-earmarked funds to municipalities



(b) Overall earmarked funds to municipalities



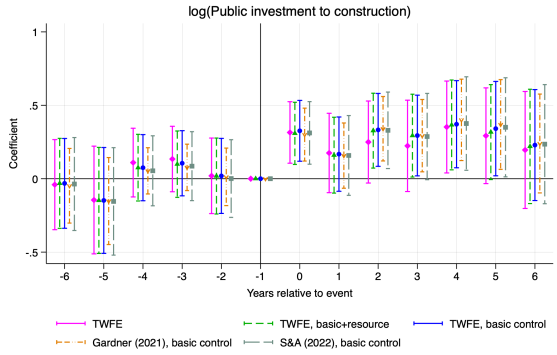
(c) Revenues from charge on public services



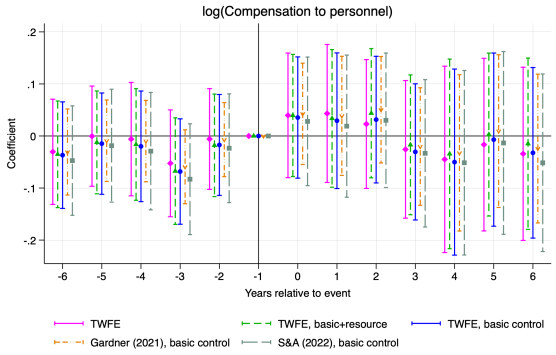
(d) Revenues from legal services

Note: The figures report the event study regression on the different sources of revenues for the municipal government, using various specification checks listed in the legends of each figure. The outcome variables used in each regression are the logged value of the amount specified in the captions. The regression equation is similar to the ones used in the main results. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

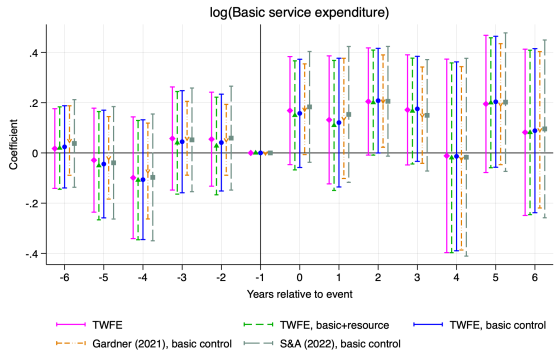
Figure B3: Volume of expenditures across different categories, Robustness checks



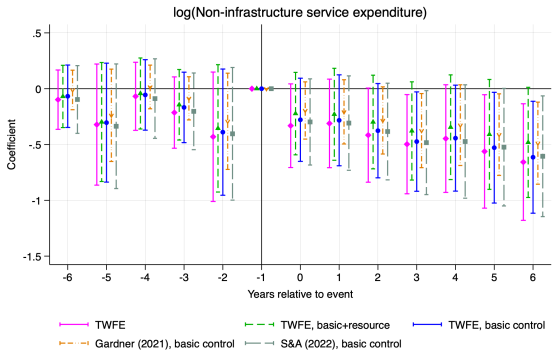
(a) Public investments on construction



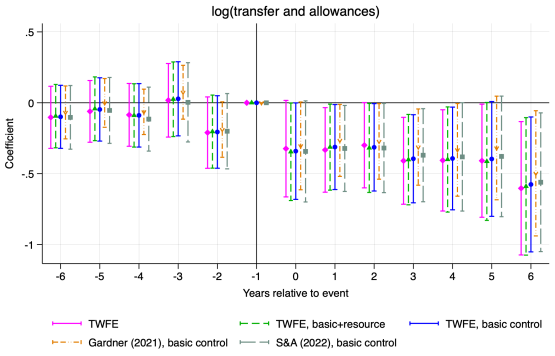
(b) Personnel compensation



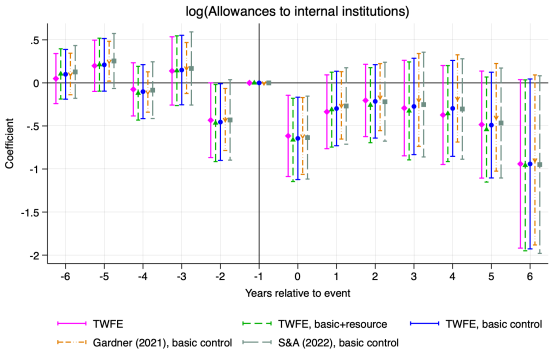
(c) Basic service expenses



(d) Other general operations



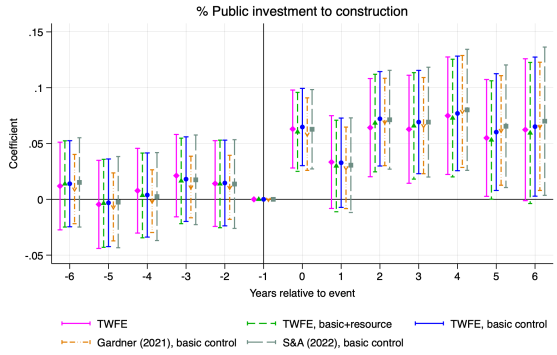
(e) Transfers/Allowances to municipal entities



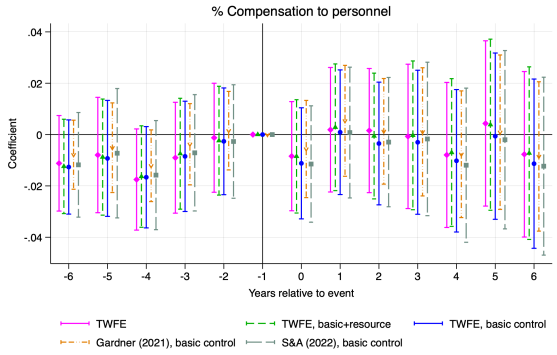
(f) Allowances to internal institutions

Note: The figures report the event study regression on the different measures of expenditures of the municipal government, using various specification checks listed in the legends of each figure. The outcome variables used in each regression are the logged value of the amount specified in the captions. The regression equation is similar to the ones used in the main results. Each regression includes fixed effects for survey years and municipality. Standard errors are clustered at the municipality level.

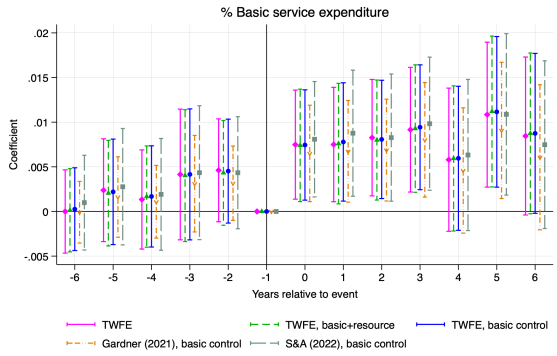
Figure B4: Share of expenditures across different categories, Robustness checks



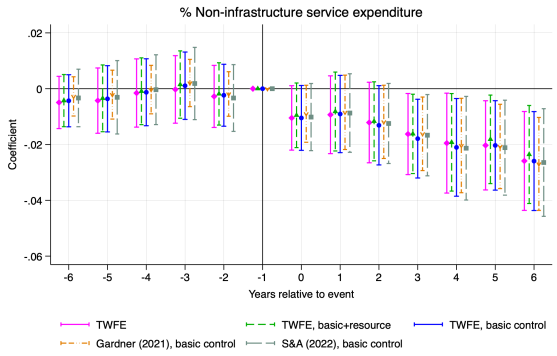
(a) Public investments on construction



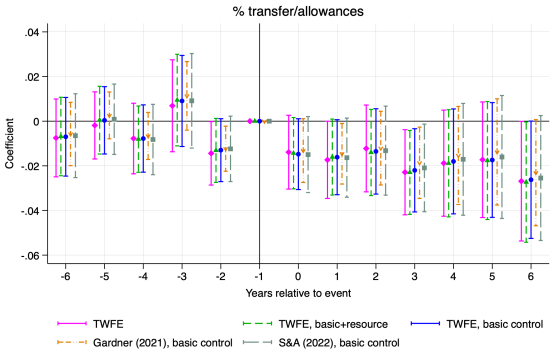
(b) Personnel compensation



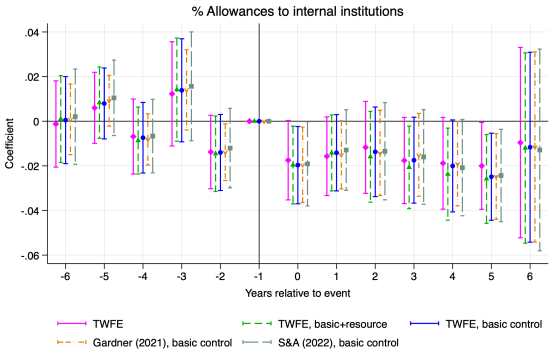
(c) Basic service expenses



(d) Other general operations



(e) Transfers/Allowances to municipal entities



(f) Allowances to internal institutions

Note: The figures report the event study regression on the different measures of expenditures of the municipal government, using various specification checks listed in the legends of each figure. Outcome variables used in each regression are the proportion of expenditures on each specified category relative to the total expenditure of the municipality. The regression equation is similar to the ones used in the main results. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

Appendix C Framework and supplementary results for Section 6

C.1 Full conceptual framework

In this section, I will provide a detailed explanation of the derivation of the key conditions stated in Section 6. I first derive the first-order conditions for the demand for public sector labor and the socially optimal allocation of workers across tax collection and public goods provision. Then, I show the comparative statics involving changes in productivity, value of public goods, and amenities for working in the public sector.

C.1.1 Individual choices and utility

Individual choice of labor: Individuals can earn income from two different sources. They can take an outside option with a realized income of v. This is drawn from a known distribution $f(v)$ with cumulative distribution $F(v)$. They can choose to work in the public sector if the wage w and amenities of working for the government π outweigh v. Wages are determined by the government through cost minimization and are publicly posted. π can be interpreted as the pro-social sentiment that motivates individuals to serve in the government sector, as in Dal Bó et al. (2013). It can also represent nonpecuniary amenities provided by the government, such as a sense of security. Combined, the proportion of the population working in the government can be expressed as

$$w + \pi \geq v \implies \Pr(v \leq w + \pi) = F(w + \pi)$$

This setup captures the idea that any decrease in w or π leads to a decrease in the supply of public sector workers.

Individual utility: Individuals gain income Y from working in either one of the two sectors outlined above and pay T in lump sum taxes to the local government[1]. The individual utility is linear in private consumption X and public goods G which is valued at rate $\alpha > 0$. Thus, individual utility can be written as the following indirect utility form

$$\alpha G + X \text{ s.t. } X \leq Y - T$$

1. The choice of lump sum tax follows from the observation that local governments primarily levy property taxes. Income taxes are collected by state or national governments in many countries (Weingast 2009). Furthermore, this setup is sufficient to capture the idea that tax collection depends on the amount of labor allocated.

For workers in the public sector, their income is a fixed wage w. The expected income for those taking outside options over the public sector is written as $E[v|v > w + \pi]$. When aggregating to the population level, the individual incomes are weighted by the share of the population taking the public and the outside options.

C.1.2 Outlining the problem faced by the local government

Role of local government: The goal of the government is to provide public goods and collect taxes to maximize social utility while complying with the budget and labor constraints. The social utility is obtained by summing over all individual utility functions. Thus, I obtain the following social utility function for individuals taking jobs in both public and outside options.

$$\alpha G + F(w + \pi)w + (1 - F(w + \pi))E[v|v > w + \pi] - T$$

Government gains revenues from taxes T and other sources, written as R[2]. The government uses the revenues to finance workers in the public sector. This gives the following equation for the budget constraint

$$R + T \geq wF(w + \pi)$$

The local government is responsible for providing public goods and collecting taxes. In this framework, this is modeled in ways similar to the production function of a firm. Labor in the public sector is split into those collecting taxes (L_T) and providing public goods (L_G)[3]. Production for taxes and public goods are written in $A_T t(L_T)$ and $A_G g(L_G)$, where $t(\cdot)$ and $g(\cdot)$ are increasing and concave in L_T and L_G respectively. Parameters $A_T > 0$ and $A_G > 0$ capture the productivity in these operations. Combined, the production of taxes and public goods, along with labor constraints are written as

$$T = A_T t(L_T)$$

$$G = A_G g(L_G)$$

$$L_T + L_G = F(w + \pi)$$

2. In this framework, R captures the grants from the central government. This is exogenously given in the current setup for analytical convenience. However, this amount is determined by the central government based on the revenues generated within the municipalities for places complying with fiscal federalism (Careaga and Weingast 2003; Weingast 2009).

3. This is to ensure that every worker who prefers to work in the public sector gets assigned. Allowing non-assignment implies that there are unemployed workers in the model, which is the situation not addressed in this research.

C.1.3 Deriving the first order conditions

The problem of finding the allocation of labor across tax collection and public goods provision that maximizes social utility follows two steps. First, the local government determines the total amount of public labor that minimizes the cost of operations. In turn, wages w, which are assumed to be equal for both types of public workers, are determined. Then, the government maximizes the summation of individual utilities by optimally allocating workers across tax collection and public goods provision.

Cost minimization of the government: Here, the local government selects the total available labor for the public sector that minimizes its costs given its production function. In turn, this is where the wage w is determined. I use L to denote the total public sector labor, equivalent to $F(w + \pi)$. I assume that the wages across the tax collectors and the public goods providers are equal. Given this, the objective function and the production function are to minimize total expenditure on workers subject to the production function and labor allocation rule. This is written as

$$\min_{L} wL \text{ s.t. } T = A_T t(L_T).\ G = A_G g(L_G)$$

Here, the public sector is allocated to either one of L_T or L_G, so $L = L_G + L_T$. With this, the Lagrangian can be written as

$$wL + \lambda_T[T - A_T t(L - L_G)] + \lambda_G[G - A_G g(L - L_T)]$$

where λ_T and λ_G refer to the value of taxation and public goods to the government. Solving the first-order conditions with respect to L yields

- $[L]$: $w - \lambda_T A_T t'(L - L_G) - \lambda_G A_G g'(L - L_T) = 0$
- Complementary slackness: $\lambda_T[T - A_T t(L - L_G)] = 0, \lambda_G[G - A_G g(L - L_T)] = 0,\ \lambda_T, \lambda_G \geq 0$

Rearranging $[L]$ condition yields

$$w = \lambda_T A_T t'(L - L_G) + \lambda_G A_G g'(L - L_T)$$

In other words, public sector labor and wages are selected to satisfy the condition where the wage is equal to the weighted sum of marginal productivities across tax collection and public goods provision.

Allocating public labor to maximize social utility: Here, the local government maximizes the sum of individual utility. In the indirect utility form, this can be written as

$$\alpha G + Y - T$$

where Y is the labor income of the individual. This is equal to the public sector wage w for those who work in local government ($L = F(w + \pi)$) while others take the outside option.

The social utility is obtained by aggregating the individual utilities. Aggregating over public sector workers with income w and those accepting outside option with expected income $E[v|v > w + \pi]$, the social utility can be written as

$$\alpha G + F(w + \pi)w + (1 - F(w + \pi))E[v|v > w + \pi] - T$$

This is maximized subject to the production function and the government budget constraint.

$$\begin{aligned} R + T &\geq wL \text{ where } F(w + \pi) = L \\ L &= L_T + L_G \\ T &= A_T t(L_T) \\ G &= A_G g(L_G) \end{aligned}$$

With this setup, the Lagrangian can be written as

$$\max_{\{L_T, L_G\}} \alpha A_G g(L_G) + [F(w+\pi)w + (1 - F(w+\pi))E[v|v > w+\pi]] - A_T t(l_T) + \lambda[R + A_T t(L_T) - wF(w+\pi)]$$

Taking first-order conditions with respect to L_T and L_G yields

- $[L_T]$: $(\lambda - 1)A_T t'(L_T) - \alpha A_G g'(L_G) = 0$
- $[L_G]$: $\alpha A_G g'(L_G) - (\lambda - 1)A_T t'(L_T) = 0$
- Complementary slackness: $\lambda[R + A_T t(L_T) - wF(w + \pi)] = 0$ with $\lambda \geq 0$

Combining the two first-order conditions yields

$$\alpha A_G g'(L_G) = (\lambda - 1)A_T t'(L_T)$$

Here, α is the value of the public good to the society. λ is the value of taxation, with 1 subtracted to reflect that tax collection comes at a cost to private good consumption. This implies that the L_G and L_T are selected to equate the value of marginal productivity of public goods and taxation from the societal point of view. In addition, for a nonzero amount of tax collection, the condition implies that $\lambda > 1$.

C.1.4 Comparative Statics

Now I incorporate the assassination into the framework by addressing how the allocation of labor, tax collection, and public goods provision respond to the changes in the key parameters. Assassinations can negatively affect tax collection and public goods provision by introducing various inefficiencies in these operations. This is captured by the decrease in productivity A_T and A_G. In addition, assassinations can increase fear of exposure to political violence among the workers, decreasing the amenity π. The comparative statics of the changes in these parameters lead to the following proposition.

Proposition 1. The effects of successful assassination on local state capacity

1. A productivity shock ($\Delta A_T(A_G) < 0$) decreases L_T (L_G), leading to a fall in T (G). If wages are flexible, w decreases due to decreased labor demand.
2. An amenity shock ($\Delta\pi < 0$) decreases overall labor supply, pushing L_T and L_G downwards. This decreases T and G. If wages are flexible, w increases due to contracting supply.

Proof: Appendix Section C.1.4.

Proof for part 1. To analyze how changes in A_T affect L_T and w, I start by applying the total derivatives to the two first-order conditions derived above.

$$w - \lambda_T A_T t'(L_T) - \lambda_G A_G g'(L - L_T) = 0$$
$$\alpha A_G g'(L - L_T) - (\lambda - 1) A_T t'(L_T) = 0$$

where I write L_G in terms of L_T by using the allocation restraint $L = L_T + L_G$. Taking total derivatives

with respect to changes in A_T yields

$$\begin{aligned}\frac{dw}{dA_T} - \lambda_T A_T t''(L_T)\frac{dL_T}{dA_T} + \lambda_G A_G g''(L - L_T)\frac{dL_T}{dA_T} &= \lambda_T t'(L_T) \\ -\alpha A_G g''(L_T)\frac{dL_T}{dA_T} - (\lambda - 1)A_T t''(L_T)\frac{dL_T}{dA_T} &= (\lambda - 1)t'(L_T)\end{aligned}$$

In matrix form, this can be written as

$$\underbrace{\begin{bmatrix}1 & -\lambda_T A_T t''(L_T) + \lambda_G A_G g''(L - L_T) \\ 0 & -\alpha A_G g''(L - L_T) - (\lambda - 1)A_T t''(L_T)\end{bmatrix}}_{=X}\begin{bmatrix}\frac{dw}{dA_T} \\ \frac{dL_T}{dA_T}\end{bmatrix} = \begin{bmatrix}\lambda_T t'(L_T) \\ (\lambda - 1)t'(L_T)\end{bmatrix}$$

From here, I invoke the implicit function theorem to get the solutions for $\frac{dw}{dA_T}$ and $\frac{dL_T}{dA_T}$. Obtaining the inverse function of X, I solve

$$\begin{bmatrix}\frac{dw}{dA_T} \\ \frac{dL_T}{dA_T}\end{bmatrix} = \frac{1}{\det(X)}\begin{bmatrix}-\alpha A_G g''(L - L_T) - (\lambda - 1)A_T t''(L_T) & \lambda_T A_T t''(L_T) - \lambda_G A_G g''(L - L_T) \\ 0 & 1\end{bmatrix}\begin{bmatrix}\lambda_T t'(L_T) \\ (\lambda - 1)t'(L_T)\end{bmatrix}$$

where $\det(X) = -(\alpha A_G g''(L - L_T) + (\lambda - 1)A_T t''(L_T)) > 0$ $(t''(\cdot) < 0, g''(\cdot) < 0)$. From these, we can obtain

$$\begin{aligned}\frac{dL_T}{dA_T} &= \frac{(\lambda - 1)t'(L_T)}{\det(X)} > 0 \\ \frac{dw}{dA_T} &= \frac{A_G(-g''(L - L_T))t'(L_T)[\alpha\lambda_T + (\lambda - 1)\lambda_G]}{\det(X)} > 0\end{aligned}$$

since $\lambda > 1, \alpha > 0$ for nonzero taxation and public goods and the complementary slackness conditions implies $\lambda_T \geq 0$, $\lambda_G \geq 0$. Thus, changes in A_T shift L_T and w in the same direction, implying that negative shocks to A_T after successful assassination decrease L_T and w. Consequentially, tax collection decreases relative to the pre-assassination equilibrium (marked with asterisk)

$$T = A_T t(L_T) < {A_T}^* t({L_T}^*) = T^*$$

Similar logic can be applied to identifying changes in L_G and w in response to exogenous changes

in A_G. Writing the total derivatives with respect to A_G for the first order conditions in matrix yields

$$\underbrace{\begin{bmatrix} 1 & \lambda_T A_T t''(L-L_G) - \lambda_G A_G g''(L_G) \\ 0 & \alpha A_G g''(L_G) + (\lambda-1) A_T t''(L-L_G) \end{bmatrix}}_{=W} \begin{bmatrix} \frac{dw}{dA_G} \\ \frac{dL_G}{dA_G} \end{bmatrix} = \begin{bmatrix} \lambda_G g'(L_G) \\ -\alpha g'(L_G) \end{bmatrix}$$

Invoking the implicit function theorem, I can write

$$\begin{bmatrix} \frac{dw}{dA_G} \\ \frac{dL_G}{dA_G} \end{bmatrix} = \frac{1}{\det(W)} \begin{bmatrix} \alpha A_G g''(L_G) + (\lambda-1) A_T t''(L-L_G) & -\lambda_T A_T t''(L-L_G) + \lambda_G A_G g''(L_G) \\ 0 & 1 \end{bmatrix} \begin{bmatrix} \lambda_G g'(L_G) \\ -\alpha g'(L_G) \end{bmatrix}$$

with $\det(W) = \alpha A_G g''(L_G) + (\lambda-1) A_T t''(L-L_G) < 0$. Given these,

$$\begin{aligned} \frac{dL_G}{dA_G} &= \frac{-\alpha g'(L_G)}{\det(W)} > 0 \\ \frac{dw}{dA_G} &= \frac{A_T t''(L-L_G) g'(L_G)[\alpha\lambda_T + (\lambda-1)\lambda_G]}{\det(W)} > 0 \end{aligned}$$

With changes in A_G shifting L_G and w in the same direction, negative shocks to A_G from successful assassinations decrease wages and L_G. As a result, public goods are under-provided compared to pre-assassination equilibrium (marked with asterisk)

$$G = A_G g(L_G) < {A_G}^* g({L_G}^*) = G^*$$

■

Proof for part 2. π enters the framework through the labor supply of the public sector. Specifically

$$L = F(w+\pi) = \Pr(v \leq w+\pi) = \int_{-\infty}^{w+\pi} f(v)dv$$

To differentiate this with respect to π, I use the fundamental theorem of calculus.

$$\begin{aligned} \frac{d}{d\pi} \int_{-\infty}^{w+\pi} f(v)dv &= \frac{d}{d\pi} \left[F(w+\pi) - F(-\infty)\right] \\ &= \frac{d}{d\pi} \left[F(w+\pi)\right] \\ &= f(w+\pi) > 0 \end{aligned}$$

This implies that public sector labor supply changes in the same direction as π. Thus, decreases in π due to successful assassinations decrease the labor supply.

To see how this changes the allocation of labor across L_T and L_G, I return to the first-order conditions from the social utility maximization problem

$$\alpha A_G g'(L_G) = (\lambda - 1) A_T t'(L_T)$$

By taking total derivatives with respect to π, I obtain

$$\alpha A_G g''(L_G) \frac{dL_G}{d\pi} - (\lambda - 1) A_T t''(L_T) \frac{dL_T}{d\pi} = 0$$

which can be written as

$$\frac{dL_G/d\pi}{dL_T/d\pi} = \frac{(\lambda - 1) A_T t''(L_T)}{\alpha A_G g''(L_G)} > 0$$

The last inequality is justified by the fact that $t''(\cdot) < 0, g''(\cdot) < 0$ from the concavity of the production functions and that $\alpha > 0, \lambda > 1$, a condition imposed for nonzero production of public goods and tax collection. This rules out the case where L_T and L_G changes in the opposite direction with respect to π without any productivity changes. Thus, in the case of a successful assassination that drives the public sector labor supply downward, both L_T and L_G face downward pressure.

With fewer L_T and L_G compared to the pre-assassination equilibrium (denoted with an asterisk), the total tax collected and the public goods supplied decrease.

$$T = A_T t(L_T) < A_T t(L_T^*) = T^*$$
$$G = A_G g(L_G) < A_G g(L_G^*) = G^*$$

As for wages, I return to the first-order condition on the cost minimization problem.

$$w = \lambda_T A_T t'(L_T) + \lambda_G A_G g'(L_G)$$

Taking total derivatives with respect to π yields

$$\frac{dw}{d\pi} = \lambda_T A_T t''(L_T) \frac{dL_T}{d\pi} + \lambda_G A_G g''(L_G) \frac{dL_G}{d\pi} < 0$$

where the last inequality comes from the fact that $\frac{dL_j}{d\pi} > 0$ for $j \in \{T, G\}$, $t''(\cdot) < 0$, $g''(\cdot) < 0$, and $\lambda_T \geq 0$, $\lambda_G \geq 0$ from the complementary slackness conditions in the first order conditions. Thus, w and π move in opposite directions, implying that a decrease of π from successful assassinations induces upward pressure on w. ■

Effectively, changes in A_T and A_G act similarly to labor demand shock, whereas changes to π mimics labor supply shock.

C.2 Supplementary results

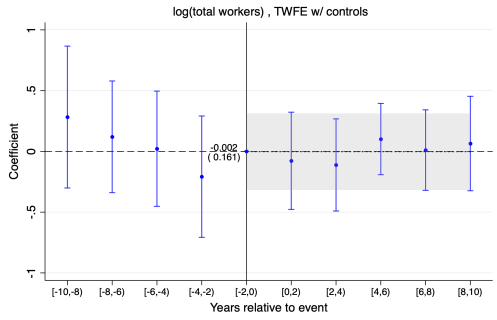
Table C1: Hypothetical wage costs of retaining departing employees by age group, using logs

	(1) 20s	(2) 30s	(3) 40s	(4) 50s	(5) 30-40s
Panel A. Change in size of workers by age					
Change in size due to π	0.036	-0.321^{**}	-0.280^{**}	0.071	-0.284^{**}
	(0.152)	(0.126)	(0.137)	(0.180)	(0.111)
Panel B. Wage-amenity tradeoff with Dal Bó et al. (2013) elasticity estimate (2.15)					
Trade-off rate	0.017	−0.149	−0.130	0.033	−0.132
N	723	723	723	723	723
Municipalities	125	125	125	125	125
Municipality FE	✓	✓	✓	✓	✓
Survey FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Dummy for 0 workers	✓	✓	✓	✓	✓

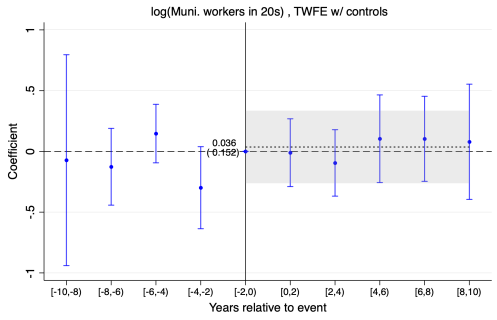
* $p < .10$, ** $p < .05$, *** $p < .01$

This table reports the estimates of the rate of increase in wages required to retain different types of municipal workers, as explained in Section 6.2. The first row in Panel A reports the point estimates and the standard errors of the average post-assassination treatment effects for the log of the total number of workers in each age group specified in the header of each column. The estimates are from the regression used in Section 6.2 that include control variables. Standard errors are clustered at the municipal level and reported in parentheses. In Panel B, the wage-amenity trade-off rate is calculated by dividing the percent change in size of workers obtained from Panel A with changes in labor supply with respect to wages from Section 6.2, 2.15. This represents the increase in wages needed to keep workers employed. Given that this cost arises from a decrease in amenities due to assassinations and the fear of political violence that follows it, it quantifies the cost of political violence to the local government.

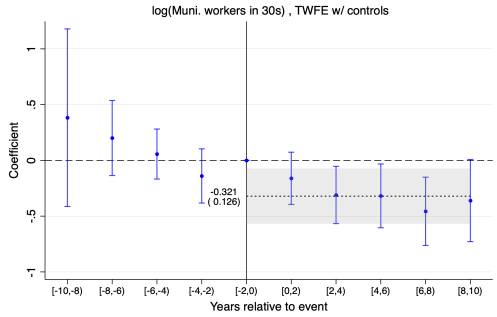
Figure C1: Changes in the age composition of municipal workers in logs



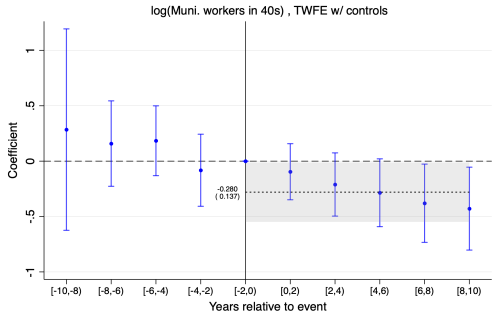
(a) Total municipal workers



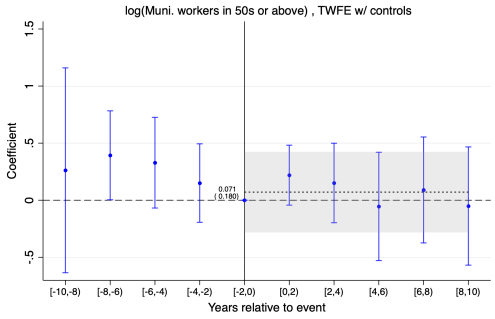
(b) Municipality workers in 20s



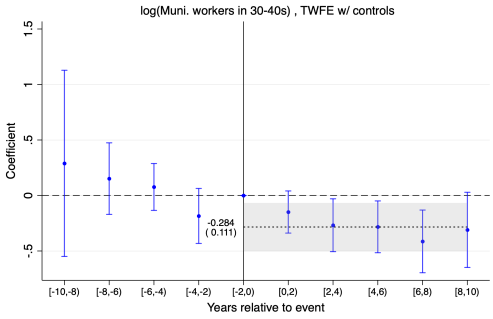
(c) Municipality workers in 30s



(d) Municipality workers in 40s



(e) Municipality workers in 50s

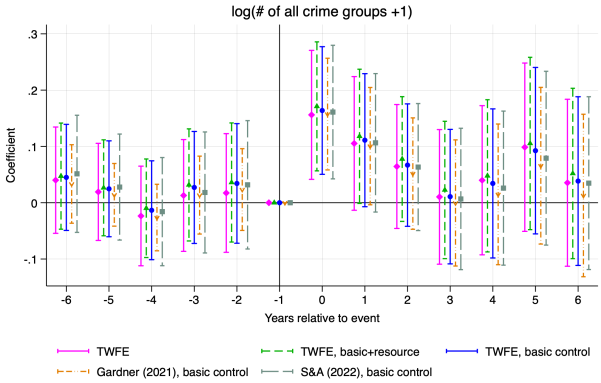


(f) Municipality workers in 30s-40s

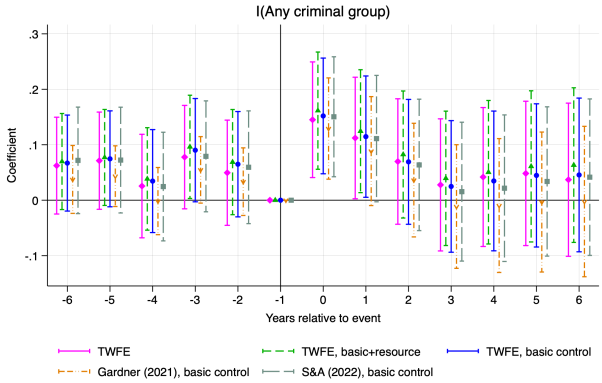
Note: The figures report the event study regression on the different measures of the log of the municipal workforce across different age groups, with one added to adjust for municipalities with 0 workers. The outcome variables used in each regression are specified in the captions. The regression includes dummies for zero or missing outcome for each observation, controls for log(number of criminal organizations + 1), homicide rates, log(total homicides + 1), average years of schooling for the municipal population, share of indigenous population, and years since the most recent election (level and squared). Each regression includes fixed effects for survey years and municipality. Standard errors are clustered at the municipality level.

Appendix D Supplementary regression results for Section 7

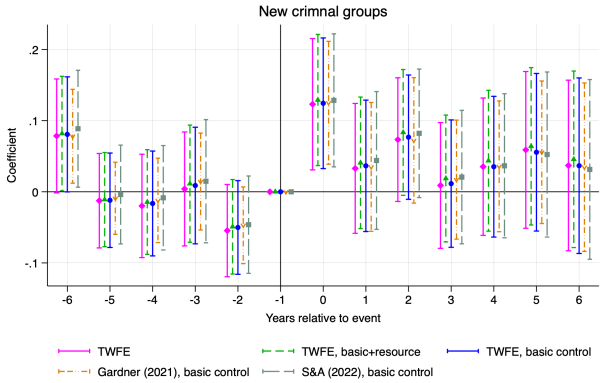
Figure D1: Organized criminal presence in treated municipalities, Robustness checks



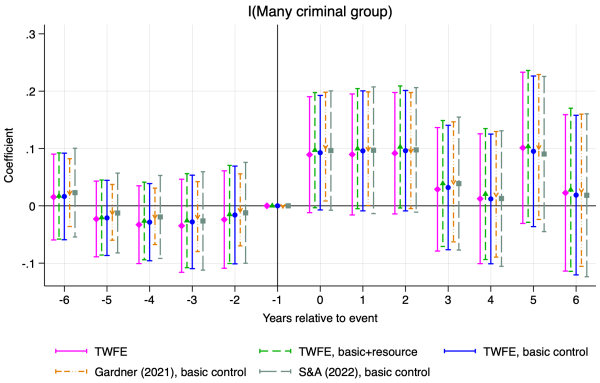
(a) log(number of criminal groups +1)



(b) Any criminal groups



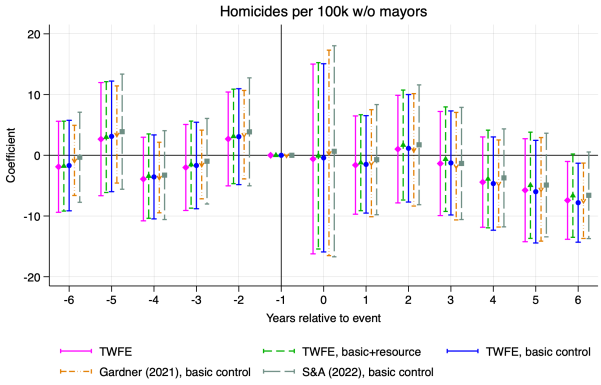
(c) New criminal groups



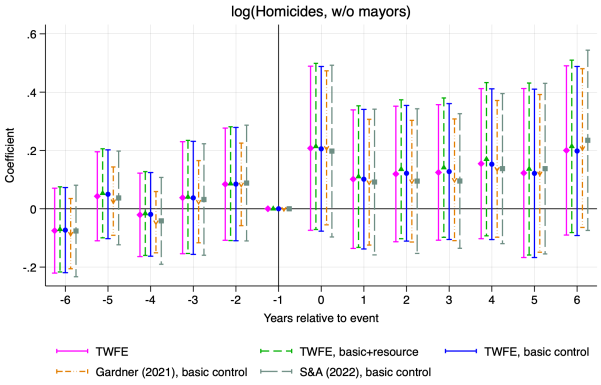
(d) Multiple criminal groups

Note: The figures report the event study regression using various specification checks listed in the legends of each figure on outcomes relevant to criminal group presence used in Section 7. Outcome variables use gang presence data mentioned in Section 3. All outcomes except for new entry outcomes include criminal groups whose affiliation is not identified. The regression equation is similar to the ones used in the main results. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

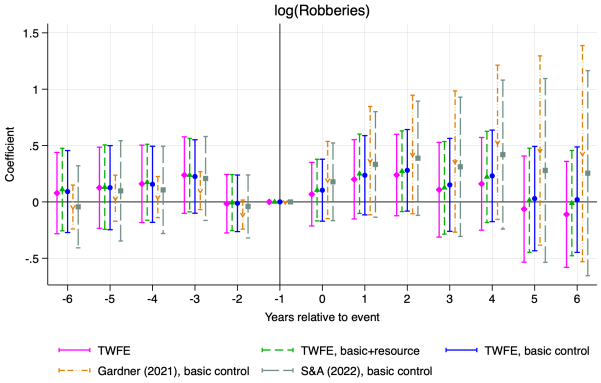
Figure D2: Non-political violence treated municipalities, Robustness checks



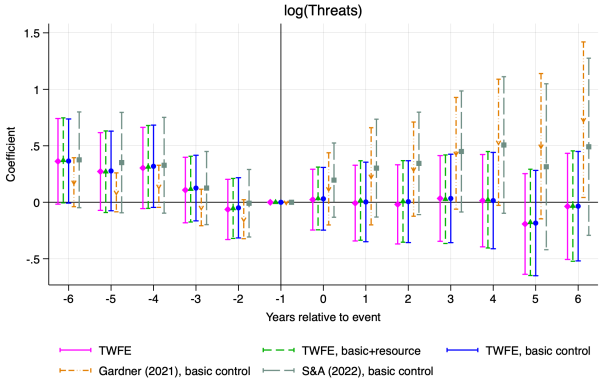
(a) Homicide rates per 100,000k w/o mayors



(b) log(total reported homicides) w/o mayors



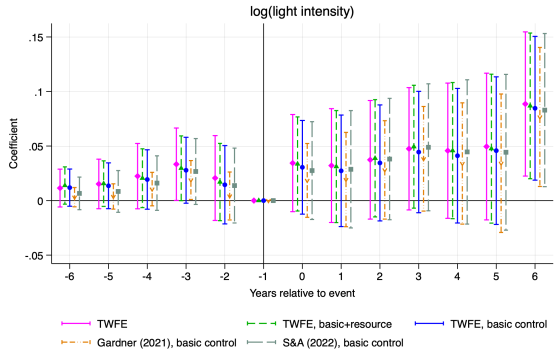
(c) log(robberies)



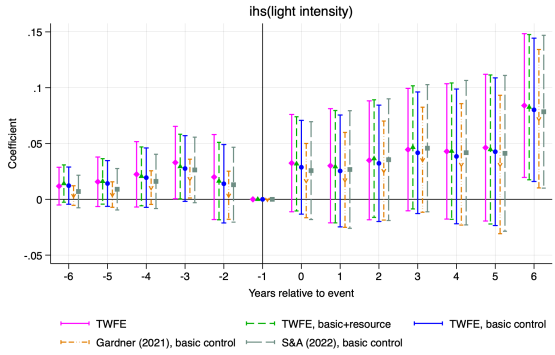
(d) log(threats)

Note: The figures report the event study regression using various specification checks listed in the legends of each figure on outcomes relevant to non-political violence used in Section 7. For non-political violence variables relevant to homicides, measures are recalculated by omitting the assassination of a mayor. Robberies and threats data are available from 2011 and onwards, while others are calculated from 1995 and onwards. The regression equation is similar to the ones used in the main results. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

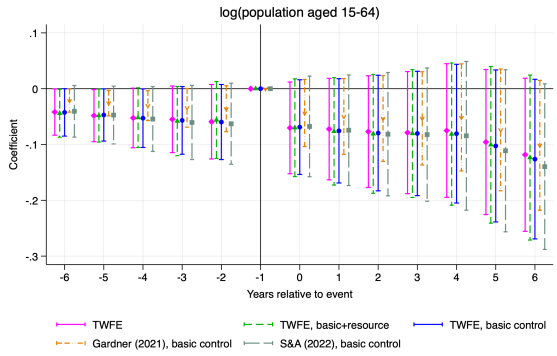
Figure D3: Regressions for alternative mechanism, Robustness checks



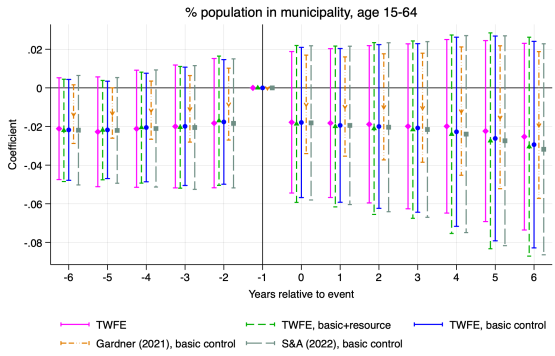
(a) log(nightlights intensity)



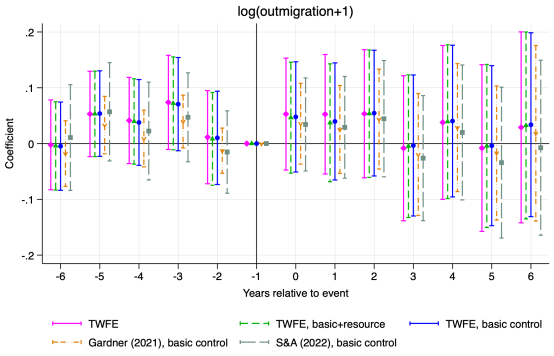
(b) ihs(nightlights intensity)



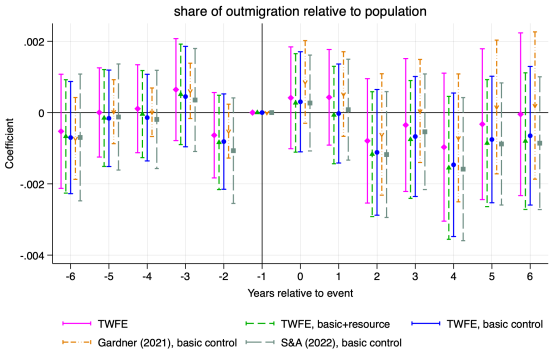
(c) log(municipal population aged 15-64)



(d) Share of municipal population aged 15-64



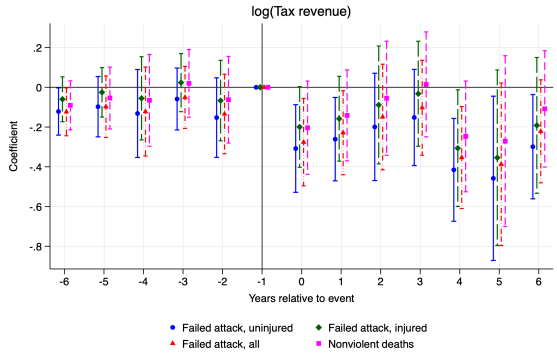
(e) log(outmigrants to the US)



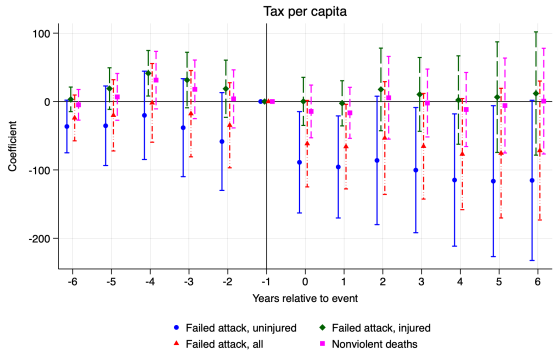
(f) Share of municipal outmigrants to the US

Note: The figures report the event study regression using various specification checks listed in the legends of each figure on outcomes relevant to economic activities and population measures in Section 7. Outmigration data is used from 2008 and onwards. Other data dates back to 1995 and onwards. Other explanations on the outcome variables are identical to those in Figures 12. The regression equation is similar to the ones used in the main results. Each regression includes fixed effects for years and municipalities. Standard errors are clustered at the municipality level.

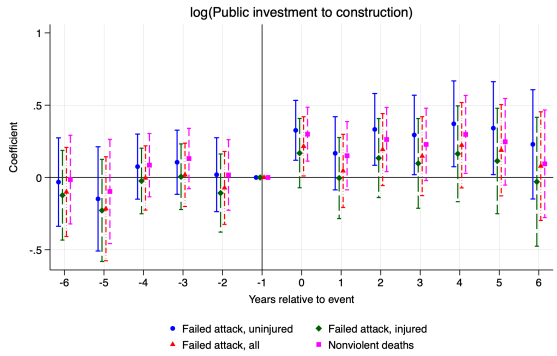
Figure D4: Regression using all municipalities with failed attacks on mayors as control group



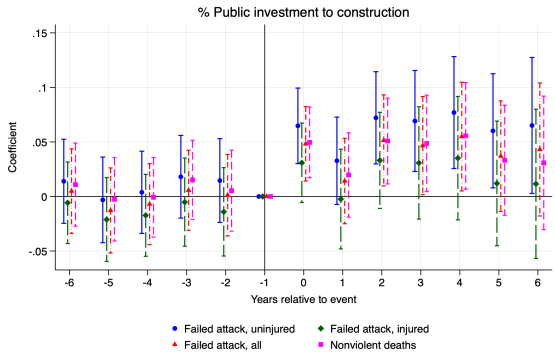
(a) log(tax revenue)



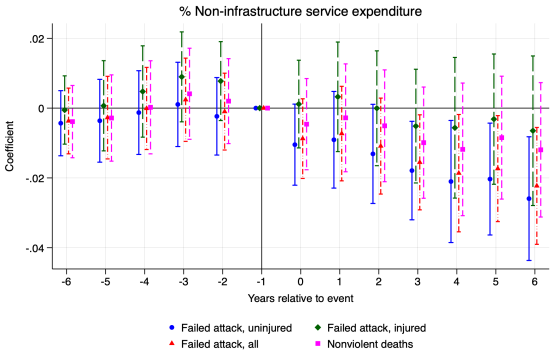
(b) tax per capita



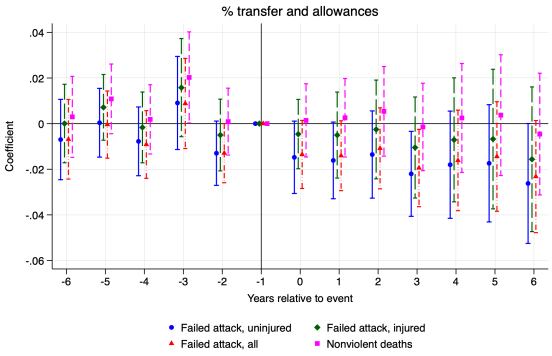
(c) log(investments in construction)



(d) Share of total expenditure on construction



(e) Share of non-infrastructure service expense



(f) Share of transfers and allowances

Note: The figures report the event study regression using Equation (2) but with different sets of control variables for some of the outcome variables used in Section 5. The outcome variables are specified as a caption for each picture. The control groups reported are 1) the same control group in the main results, 2) municipalities with all failed assassination attempts, with injured and unharmed mayors, 3) only the municipalities with failed attempts that injured the mayors, and 4) municipalities whose mayors passed away for nonviolent reasons. The treatment group is identical to the ones used in Section 5. Regression uses the same control variables and fixed effects as in Section 5. Standard errors are clustered at the municipality level.

Appendix References

Careaga, Maite, and Barry R. Weingast. 2003. "Chapter 13. Fiscal Federalism, Good Governance, and Economic Growth in Mexico." In *In Search of Prosperity*, edited by **Dani Rodrik,** 399–436. Princeton University Press, December.

Coscia, Michele, and Viridiana Rios. 2012. "Knowing where and how criminal organizations operate using web content." In *Proceedings of the 21st ACM international conference on Information and knowledge management*, 1412–1421. Maui Hawaii USA: ACM, October.

Dal Bó, Ernesto, Frederico Finan, and Martín A. Rossi. 2013. "Strengthening State Capabilities: The Role of Financial Incentives in the Call to Public Service*." *The Quarterly Journal of Economics* 128 (3): 1169–1218.

INEGI. 2016. *Síntesis metodológica de la estadística de finanzas públicas estatales y municipales julio, 2016.* Technical Report. Instituto Nacional de Estadística y Geografía.

Li, Xuecao, Yuyu Zhou, Min zhao, and Xia Zhao. 2022. *Harmonization of DMSP and VIIRS nighttime light data from 1992-2021 at the global scale.* Artwork Size: 1159598643 Bytes Pages: 1159598643 Bytes.

Oates, Wallace E. 2005. "Toward A Second-Generation Theory of Fiscal Federalism." *International Tax and Public Finance* 12 (4): 349–373.

OECD. 2016. *Subnational Government around the World: Structure and Finance.* Report. Paris.

Osorio, Javier, and Alejandro Beltran. 2020. "Enhancing the Detection of Criminal Organizations in Mexico using ML and NLP." In *2020 International Joint Conference on Neural Networks (IJCNN)*, 1–7. Glasgow, United Kingdom: IEEE, July.

SEGOB. 2011. *Manual de Transferencias Federales para Municipios.* Techinical Report. Mexico City: Secretaría de Gobernación, Instituto Nacional para el Federalismo y el Desarrollo Municipal.

Timmons, Jeffrey F., and Daniel Broid. 2013. "The Political Economy of Municipal Transfers: Evidence from Mexico." *Publius: The Journal of Federalism* 43 (4): 551–579.

Weingast, Barry R. 2009. "Second generation fiscal federalism: The implications of fiscal incentives." *Journal of Urban Economics* 65 (3): 279–293.

World Bank. 2016. *Mexico Public Expenditure Review.* Technical report. Washington, DC: World Bank.

Yuan, Xiaotian, Li Jia, Massimo Menenti, and Min Jiang. 2022. "Consistent nighttime light time series in 1992–2020 in Northern Africa by combining DMSP-OLS and NPP-VIIRS data." *Big Earth Data* 6 (4): 603–632.