Gangs, Truce and their Effects on Firms

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Abstract

Can a decline in violence hinder economic activity? We combined administrative data and a novel victimization survey to evaluate the effects of a truce between the major gangs in El Salvador on firms' behavior. Using firms' exposure to gang activity, we found that firms more exposed to the truce reduced their number of employees by 2%, with the impact concentrated in micro and medium-sized firms. We did not find any effects on entry and exit. We argue that the truce increased gangs' expected punishment more than the benefits generated from the reduction in violence

1 Introduction

Crime is one of the major constraints that firms face in developing countries. In Latin America, 25% of business reported crime, and theft as a major constraint for conducting businesses, and 23% experienced losses due to theft and vandalism (World Bank, 2016). Crime imposes direct and indirect costs to firms, hindering their performance. For instance, companies in Latin America lost 4% of their revenues due to criminal activities. Further, the distortions can increase due to the misallocation of resources. For example, Besley and Mueller (2018) estimate losses of 10% in the aggregate production, due to firms hiring private security.

El Salvador is an example of this. Firms conduct their operations in an environment plagued by insecurity. Between 2015 and 2018, El Salvador was the most violent country in the world (World Bank, 2020). It had a homicide rate of over a hundred deaths per 100,000 thousand individuals, a rate 21 times higher than the US, and four times the one of other violent countries such as Colombia and Brazil. Moreover, businesses are constantly extorted by gangs. According to Papadovassilakis and Dudley (2020), in 2014, Salvadorean firms paid approximately 786 million dollars in extortion (approximately 3% of the country's GDP).

This paper studies how a peace agreement among El Salvador's major gangs affected firms' behavior. At the beginning of 2016, the three major gangs in El Salvador (MS13, and two factions of 18th Street) agreed to stop the war between each other. The week after the pact, the number of homicides in the country declined by 60% (C. Martínez, 2016). We explore how the reduction in violence impacted firms' size, entry, and exit decisions, and the behavior of gangs towards firms.

Contrary to intuition, our main results suggest that the truce impacted negatively on firms. Companies with higher exposition to the agreement reduced their number of employees by 2%. The truce agreement could affects firms' decision through two mechanisms. First, there is a demand channel, which captures the positive shock generated by the reduction in homicides. The violence decline decreases household's constraints, fostering demand (Rozo, 2018). The second mechanism, measures the gangs' reaction towards firms after the truce. By having higher control of their territories, gangs could increase the extraction of firms' resources (Brown, Montero, Schmidt-Padilla, & Sviatschi, 2023). Thus, the effect on firms outcomes will depend on the interaction of both channels.

To formalize the idea, we present a model of the interaction between firms and gangs. The model is a multi-stage static game in which companies select the number of workers, and gangs extort them according to their size. The original model comes from Konrad and Skaperdas (1998). The model provides two insights. First, since extortion is costly, gangs will not extract money from large firms. Second, the effects of moving from an equilibrium of violence to one of peace depend on the relative change of the expected punishment, and the demand shock. If the increase in the expected punishment is larger than the improvement generated by the violence decrease, firms will reduce their size.

To test this prediction we use administrative records on all the firms constituted in El Salvador, between 2009 and 2018. The data is published by the Salvadorean statistical agency (DIGESTYC). We focus on three outcomes, the number of employees, the probability of entering, and exiting the market. We complement this information with municipal level information on the rates of homicides. Finally, to shed light on the mechanisms we run a victimization survey on a representative sample of micro and small size firms in El Salvador. We collected information about the crimes faced by the firms and its security expenses. We follow a panel of firms annually, before and after the truce.

The empirical strategy rely on the exogenous shock to violence, appearing after the non-aggression pact. The appearance of the truce was not related with firms' performance, and it was an unexpected event for the general population. There was no way in which companies could foresee the agreement. However, the deal has a problem for the empirical implementation, in that it occurred over the whole country simultaneously. Therefore, there is not a defined treatment and control group. To solve this issue, I used a two-way fixed effects (firm and year) model with continuous treatment. The treatment is the level of violence before the pact. I used the homicide rate at the municipality level to capture this. Municipalities with higher murder rates are more likely to have competing gangs, than those with lower level of homicides. Therefore, these should be the ones where the pact had a greater effect. On the other side, municipalities with low homicides do not have maras, or have a group that control the whole territory, making the truce ineffective in such regions.

The paper shows that firms located in municipalities with higher homicides rates before the truce reduced their number of employees after the non-aggression pact. The effect is statistically significant starting the year after the truce, 2017. There is not a statistically significant effect in the probability of entering or exiting the market. In general, these results suggest a detrimental effect of the truce on the average Salvadorean firm.

Micro (less than 10 employees) and medium (between 50 and 100 employees) firms are the ones driving the reduction in the number of workers. On average, the non-aggression pact reduced the number of employees in micro enterprises by 2%, and in medium firms by

8%. There is not a statistically significant effect on large firms. These results suggests that the expected punishment increased more than the demand shock. Thus, obtaining negative effects on firms. Further, gangs' increasing cost of extortion can explain the lack of significant effects on large companies. If gangs find to costly to extract money from them, extortion will not occur.

Moreover, the sector of the firm only matters for medium companies. The effects on micro enterprises do not come from any specific industry. For medium business the effects are concentrated in the retail sector. There is no statistically significant effect for medium firms in manufacture, construction, transport, or agronomy. It was expected to find effects on the retail sector. Firms operating in the retail industry require a physical store for costumers to come and purchase their merchandise. The existence of a physical store, with direct contact to the employees or owner, facilitates the extortion. Consider the case of a large manufacturer, or bank. It is harder for gangs to go and request money from these types of businesses.

The victimization survey allows to check the possible mechanisms behind the fall in the number of workers. The survey follows a sample of micro and small firms one year before the truce and two periods after. On the extensive margin, the probability of extortion, robbery, or fraud did not change after the truce. But the likelihood of suffering damages to the property increased. The findings on robbery, and fraud are expected. Usually, those are crimes committed by offenders not associated with a criminal organization. Then, the truce should not affect their behavior.

Damages to property are often used as a retaliation mechanism by gangs. The results suggest that the rise in this crime is due to an increase in the gangs' control of the territory. After a firm denies paying a extortion, gangs are more likely to punish them. I found that conditional on being requested money, firms reduced their probability of paying the extortion by 6 percentage points. Moreover, firms' losses due to property damages increased by 10% after the truce.

Overall, the results suggest that micro and medium firms got negatively affected by the non-aggression pact. These types of firms reduced their size. The change in the severity of the reprimands, and a higher control of the territories, increased the expected punishment. Leading to negative outcomes for the firms.

The literature on the detrimental effects of violent crime in development outcomes is large.[1] However, there is little evidence about the impacts of criminal activity on firms' behavior. Two studies stand out in this specific area. Rozo (2018) studies how homicides influence prices and businesses' size in Colombia. She instrumented the homicide rate in a municipality by the share of votes that the president received in the last election. She founds negative effects of homicides on firms' size. Similarly, Brown et al. (2023) study how the non-aggression pact in El Salvador changed extortions to a major pharmaceutical company. They found that extortions to this company increased, and the firm passed the losses to retailers in the downstream market by increasing its prices. I expand this literature by combining the strategic response of criminal organizations with information on overall firms' victimization.

[1]Some papers research aggregate effects, for example, in production (Pinotti, 2015), and misallocation of resources (Besley & Mueller, 2018). And there is a lot of evidence on microeconomic outcomes, such as education (Koppensteiner & Menezes, 2021; Michaelsen & Salardi, 2020), labor supply (Velásquez, 2020) or health (Mansour & Rees, 2012).

Related to this literature is the study of the impacts of conflict on firms. Klapper, Richmond, and Tran (2013) use a structural model to estimate the effects of civil conflict in Côte D'Ivore. They find a reduction between 16 and 23 percent in the total factor productivity of firms. Camacho and Rodriguez (2013) estimate that the armed conflict in Colombia increases the probability of companies exiting the market by 5.5 percentage points. Similarly, Collier and Duponchel (2013) identifies a negative effect of conflict in Sierra Leone on firms' participation in the market.

Moreover, the project will add to the understanding of gangs' behavior. The literature about gangs fits under into the stationary bandits one. This concept positions criminal organizations as a monopoly of violence and, sometimes, providers of public goods (Olson, 1993; de la Sierra, 2020). For instance, Blattman, Duncan, Lessing, and Tobon (2021) study gangs in Medellín. The authors find that gangs operate as a side government in poor neighborhoods, collecting taxes, and providing various public services, such as crime regulation, resolving family issues, or organization of public events. However, the criminal organizations' behavior is highly heterogeneous, both within and across groups. Magaloni, Franco-Vivanco, and Melo (2020) characterize organized criminal groups based on their territorial control, relationship with the state, and relationship with the community. The authors use this categorization to explore a police intervention that tried to reduce the gang territorial control of Rio de Janeiro's favelas. They found that when there is a monopoly in criminal territorial control, government inherence induces more violence. Similarly, Magaloni, Robles, Matanock, Diaz-Cayeros, and Romero (2019) study why some drug trafficking organizations in Mexico assist its community while others predate it. They found that organizations that are a monopoly over their territory provide more assistance than those located in contested areas.

Finally, this paper will add to the understanding of the Maras in Central America. Two papers study their impact on children's education. Sviatschi, Schmidt, and Melkinov (2020) find that MS13 and 18th Street have negative effects on schooling and labor outcomes in San Salvador. The authors use an RD design using the border of a gang-controlled territory as the discontinuous change. Kalsi (2018) also studies the effect of gang exposure on children's education and finds a negative relationship. She uses a difference-in-difference model exploiting the timing of the appearance of gangs and their location. She argues that Maras are more likely to establish in areas with higher business density. She combines this with the timing of criminal deportations from the U.S. to El Salvador in the early 2000s.

2 Gangs and The Non-Aggression Pact

El Salvador is one of the most violent countries in the world. In March 2016, it hit a record of three daily homicides per 100.000 people. At that moment, that was the highest murder rate in the world (World Bank, 2020). The main cause of El Salvador's violence are gangs. In particular, the war between them, which began in the early 2000s with the arrival of these groups to El Salvador (Sviatschi, 2022).

Gangs are violent criminal organizations. El Salvador has three major gangs, MS13 and two factions of 18th Street. Gangs are involved in different types of criminal activities. However, their main source of revenue are extortions to firms. According to Papadovassilakis

and Dudley (2020), in 2014, Salvadorean firms paid around 786 million dollars in extortion to gangs (approximately 3% of the country's GDP). Gangs fight between each other to control territory, as it allows them to ease the extortion of business located within it. The fight for territory is what drives violence in the country.

Since 2010 there have been two truces between the gangs. In the first one, March 2012, the government negotiated with the Maras. They agreed to stop the attacks on each other, police officers, and the general population. In exchange, the government transferred the leaders of the Maras out of the maximum-security prisons, to less secure ones. The transfers were meant to improve the life of the leaders. In the maximum-security prison, inmates only had a couple of hours a day to go outside their cell, and the visits were prohibited. In their new jail, prisoners enjoyed more freedom and could meet with their relatives and friends more regularly.

The truce had an immediate effect on homicides. The number of assassinations fell by 60% in the week following the pact (O. Martínez, Martínez, Arauz, & Lemus, 2012). Figure 1 shows the evolution of the monthly homicide rate in El Salvador. It displays a sharp decrease in the homicides after the announcement of the truce.

The agreement did not last long. By July 2013, the level of homicides was back to the levels before the pact. Several reasons influenced its short life. For instance, most people did not approve the negotiation between the government and the criminal organizations. Therefore, the government itself denied they were part of the agreement. They argue that the inmate transfers were part of a security policy. Furthermore, the gangs' leaders (who were in prison) carried out the negotiation with limited consultation to the members outside the jail. All these factors facilitated the dissolution of the truce.

After the truce failed, a new government came to office in El Salvador. The new administration took a harsher approach with the gangs. Since then, the level of violence in the country increased, reaching its peak in March 2016. At this point is where the second truce appears, the non-aggression pact. The Maras realized that they could not keep both a war with the government and between themselves. Therefore, the Maras agreed to stop all the homicides and attacks to rival territories (C. Martínez, 2016). This new peace agreement did not involve any intervention from the government. It was an effort conducted solely by the gang's members. Similarly, Figure 1 shows a rapid decrease in the homicides rate after March, 2016. Moreover, Figure 2 plots the geographic distribution of homicides by municipality, before and after the non-aggression pact. A visual inspection of it shows the decrease in the number of murders.

In this paper I study the non-aggression pact (second truce). I focus on this one because of data availability purposes. The data on the firms' relationship with gangs starts from 2015. I do not have information on crime victimization prior to that year. For the purpose of this research, three factors are crucial about the non-aggression pact. First, the gangs only committed to reducing homicides. They did not agree to stop any other of their illegal business. Second, the rules of the agreements did not have any relationship with the current performance of the firms. They responded to a rise in violence and the situation with the government. Third, the agreement was unexpected from the side of the firms. There was no way in which the firms could foresee the agreement.

3 Conceptual Framework

This section presents a model to formalize the effects of the truce. The model is an extension from the one in (Konrad & Skaperdas, 1998). They propose a multi-stage game to study the extortion from criminal organizations to firms. we extended it to include firms' decision on number of workers, and changes from peace and war states.

The objective of the model is to understand how the selection of workers, and the extortion change when moving from a violent equilibrium to one without gang competition. It proposes two channels. First, a direct and positive effect associated with the reduction in the homicide rate. Second, an indirect effect through gang's extortions, and punishments.

3.1 Set-up

The economy has two agents: firms and gangs. They live in a state of war or peace, denoted by γ. Changes is gamma are exogenous to both firms and gangs. Gangs get revenue by extorting firms for a certain amount, X. The cost of extortion, $e(s, \gamma)$, depends on the level of private security, s, and the state of the world, γ. Firms decide on the number of workers, l, to hire and on the level of security, s, to invest. Firms pay wages, w, to their workers and and each unit of security has a cost, c. The production function is $Y(l, \theta_i, \gamma)$, where θ_i represents a firm's idiosyncratic technology factor.

In the interaction with gangs, firms can choose whether or not to pay the extortion. If they do not pay, the gang retaliates by extracting a fraction, $1 - \beta(s, \gamma)$, of the firm's production, where $\beta(\cdot)$ is the protection provided by private security. We provide three assumptions about the behavior of the functions:

Assumption 1 *Characteristics of the functions:*

a. Production function: $\frac{\partial Y}{\partial l} > 0$, *and* $\frac{\partial^2 Y}{\partial l^2} < 0$

b. Protection function: $\beta : S \to [0, 1]$, *with* $\frac{\partial \beta}{\partial s} > 0$

c. Costs of extortion: $\frac{\partial e(s)}{\partial s} > 0$, *and* $\frac{\partial^2 e(s)}{\partial s^2} > 0$

The production function exhibits decreasing marginal returns to labor. The assumption on $\beta(\cdot)$ shows how hiring extra security reduces the predation share. Finally, the assumption about the costs reflects that firms with more security are harder to extort.

We summarize the interaction between gangs and firms in the following multi-stage game:

- Stage 1: The state of the world, γ, is revealed.
- Stage 2: Firms choose $l \geq 0$ and $s \geq 0$.
- Stage 3: Gangs ask for $X \geq 0$.
- Stage 4: Firms decide whether or not to pay the extortion.

The firm's payoff function is:

$$\pi_f = \begin{cases} Y(l, \theta_i, \gamma) - wl - c(s) - X & \text{if pay} \\ Y(l, \theta_i, \gamma) - wl - c(s) - (1 - \beta(s, \gamma))Y(l, \theta_i, \gamma) & \text{if does not pay} \end{cases} \tag{1}$$

And the gang's utility is:

$$\pi_g = \begin{cases} X - e(s, g, \gamma) & \text{if extortion is successful} \\ -e(s, g, \gamma) & \text{if extortion is not successful} \end{cases} \tag{2}$$

We need to make two important remarks. First, we have not included a participation constraint on the side of the firm. If gang horizons are short, they may prefer to set $X = Y$, leading to firm exit. Horizons may be short because inter-gang competition threatens their ability to extort in the future or because less profitable firms may not survive to be extorted in the future. To the extent that horizons change under the truce, we would expect to see effects on firms' entry or exit. However, because neither gangs nor firms were confident in the duration of the truce, we do not expect such horizon effects, and indeed, the data reveal no changes in entry and exit.

Second, in the model, we are abstracting from the endogenous relationship between gang competition and the level of extortion. We treat the state of the world γ as exogenous. Certainly, though, the larger X is, the greater the returns of conflict. However, the focus of the paper is to understand the changes that came about because of the truce. If the truce froze gangs in place, X under the truce cannot be influenced by potential gang entry. Moreover, our results will speak to the change from an equilibrium of war to one of peace. We take the truce as an exogenous shock. Thus, we do not make any predictions about the underlying relationship between extortion and inter-gang competition.

3.2 Equilibrium

There are two equilibria in the model, one for each state of the world. This subsection characterizes the equilibria for a particular state γ. Consider the last stage of the game: the firm pays the extortion X if $(1 - \beta(s, \gamma))Y(l, \theta_i, \gamma) \geq X$. The company will agree to the extortion if the expected retaliation is greater than the amount requested.

In the third stage, since the gang's utility is increasing with extortion, they should charge the maximum possible, $X = (1 - \beta(s, \gamma))Y(l, \theta_i, \gamma)$. However, since extortion is costly, the gang will choose this rate only if $(1 - \beta(s, \gamma))Y(l, \theta_i, \gamma) \geq e(s, \gamma)$. That is, the gang will extract all resources only if it is profitable for them.

Proposition 1 *If $\beta(0)Y(l, \theta_i) > e(0)$, then there exists a $\underline{s}$ such that for all $s \geq \underline{s}$, $X = 0$.*

Proposition 1 is a result of the characteristics of the predation and the cost of extortion functions. It states that there exists a level of private security spending at which it is no longer profitable to extort. We will denote such value as $\underline{s} \equiv g(l, \gamma)$. For $\underline{s}$ to exists, it requires that in the absence of private security gangs find profitable to extort. Appendix A1 proves the existence of $\underline{s}$ and shows $\frac{\partial \underline{s}}{\partial l} > 0$.

In the second stage, the firm selects l and s to maximize:

$$\begin{aligned} \max_{l,s} \quad & \beta(s, \gamma)Y(l, \theta_i, \gamma) - wl - cs \\ \text{s.t.} \quad & s \leq g(l) \end{aligned} \tag{3}$$

Thus, the optimal choice of l^* and s^* have to satisfy the first order conditions

$$\begin{aligned} \beta(s^*,\gamma)Y_l(l^*,\theta_i,\gamma) - w + \lambda g_l(l^*) = 0 \\ \beta_s(s^*,\gamma))Y(l^*,\theta_i,\gamma) - c - \lambda = 0 \end{aligned} \tag{4}$$

and with complementary slackness $\lambda(s \leq g(l))$.

Equilibrium: In any state $\gamma \in \{\gamma_W, \gamma_P\}$, the firm chooses l^* workers, and invest s^* in security. The gang imposes an extortion payment of $X = \beta(s^*,\gamma)Y(l^*,\theta_i,\gamma)$ and the firm pays the extortion. If $s^* > \underline{s}$, the gang does not extort the company.

3.3 Moving from War to Peace

The objective of the model is to observe the dynamics when moving from the state of war γ_W to the state of peace γ_P. In particular, we are interested in understanding the direction of the change in the number of workers, $l^(\gamma_P) - l^(\gamma_W)$. The following statement provides the assumptions required about the relationship between the parameters in the two states.

Assumption 2 *Relationships between the war and peace parameters:*

a. *Demand shifter: For any ϵ_i, and $l > 0$, $Y(l,\epsilon_i,\theta_P) > Y(l,\epsilon_i,\theta_W)$.*

b. *Coercive power: $\beta_W > \beta_P$*

c. *Ability to punish: $q_W < q_P$*

Part a) states that in a state of peace, the demand is greater than in a state of war. The argument follows the work by Rozo (2018). Part b) indicates that during war, the punishments from gangs to firms are higher. The assumption reflects that during war, gangs are more short-sighted and can resort to extreme measures to coerce payments with less repercussion.

The direction of the change in l^* depends on the relative changes of θ_s, β_s, and q_s. To see this, first notice that $\frac{\partial l^*}{\partial \theta} > 0$, $\frac{\partial l^*}{\partial \beta} < 0$, and $\frac{\partial l^*}{\partial q} < 0$. These results follow from the concavity of the production function. Further, a shift from a war state to a peace equilibrium implies an increase in θ_s, and q_s, but a decrease in β_s. Then, without further assumptions, it is not possible to compute the direction of the effect.

To provide a more concrete example, consider the following functional forms:

Production function: $Y(l,\epsilon_i,\theta_s) = (\theta_s + \epsilon_i)l^\alpha$, for $\alpha \in [0,1]$

Cost of extortion: $c(l) = l^2$

In this case, the optimum level of workers is $l^* = \left(\frac{\alpha(1-\beta_s q_s)(\theta_s+\epsilon_i)}{w}\right)^{\frac{1}{1-\alpha}}$.

The difference $l_P^* - l_W^*$ captures the change from war to peace. The following relationship captures the sign of the difference.

$$l_P^* > l_W^* \iff (1-\beta_P q_P)(\theta_P + \epsilon_i) - (1-\beta_W q_W)(\theta_W + \epsilon_i)$$

It is hard to observe the direction even when using a functional form. To provide some intuition, note that the change in the number of workers will be positive if there is a fall

in the expected punishment ($\beta_P q_P - \beta_W q_W$) larger than the increase in the demand shifter ($\theta_P - \theta_W$).

To illustrate the possible scenarios, Figure 3 plots simulations of $l_P^* - l_W^*$. All the cases use 20 percentage points increase of the demand shifter ($\theta_P - \theta_W = 0.2$) but vary the relative change of the expected punishment. The specific parameters are in Table 1. In each plot, the y-axis shows the change in the number of workers, and the x-axis measures the relative change from a war state to truce. Panel a) considers the unambiguous case, a decrease in the expected punishment of 10 p.p., which generates an increase in the number of workers. Panel b) lots the case of a smaller increase of the punishment (10 p.p.) than the increase in θ. In this scenario, the number of workers also increases after the truce. Finally, Panel c) employs a larger increase in the expected punishment (30 p.p.) than the change in θ. In this case, the number of workers after the truce declines.

The model and the simulations shed light on the possible effects of the truce on the number of workers. The direction of the effect will vary with the relative change in gangs' coercive power with respect to the improvement of violence. If gangs' control over their territory increases significantly, this can lead to a negative impact on firms. However, if the reduction in the severity of the punishments is larger, firms will benefit from the truce.

4 Data

This paper explores the effect of the non-aggression pact (second truce) on firms' decisions. Ideally, this requires data on firms' outcomes and information about the victimization of firms by gangs. Detailed panel data on firms' choices are limited in developing countries. El Salvador is not the exception. This paper uses administrative records of all the firms legally constituted in El Salvador, made public by the Salvadorean Statistical Agency *Direccion General de Estadísticas y Censos de El Salvador* (DIGESTYC). It contains information on the number of employees, the location at a municipal level, and the industry code in which the firms operate. The information is available yearly from 2009 until 2018. Unfortunately, there is no information on profits or revenues.

We complement the administrative information of firms with novel survey data about crime victimization. We collected information about firms, gangs, and policing in El Salvador in three years (2015, 2017, and 2019). It has general information about the companies, but importantly collects data on whether they are targeted by gangs or other criminals. The first round was carried by the think thank FUSADES, interviewing almost 4,000 small companies across 70 municipalities. We conducted the second and third round with financial support from the Inter-American Development Bank.

The data on homicides is also collected by the DIGESTYC. It contains the number of victims, the address, motive and whether the homicide is related or not to a gang. The dataset is available since 2003 until 2018. Table 2 shows the summary stats of the main variables used in the paper.

The average firm in the main sample has around 30 employees. Also, the probability of entry the market for a firm is 19% and 14% of exiting the market. The size of firms collected in the survey is significantly smaller. In the survey sample the average company has four employees. Additionally, 40% of these firms had experience at least one crime, and 17%

suffered from extortion.

5 Results

5.1 Empirical Strategy

The primary estimations in the paper use a difference-in-difference model with variation in the intensity of treatment. A difficulty with the setting is that the truce happened simultaneously over El Salvador. Thus, there is no distinction between treatment and control groups. Nevertheless, the strength of the conflict between gangs differed across regions. we used this fact to estimates the effects of the non-aggression pact. In practice, we estimated equation 5,

$$y_{imt} = \beta Homicides_{m(i),2015} \times Truce_t + \alpha Homicides_{m(i),2015} + D_i + \delta_t + \mu_{imt} \tag{5}$$

where, y_{imt} is the outcome of firm i located in municipality m in year t, $Homicides_m$ is the homicide rate per thousand inhabitants in municipality m the year before the truce, $Truce_t$ is an indicator variable that takes value one if the year is after the second truce, D_i, and δ_t are firm, and year fixed effects, respectively.

In this specification, the homicide rate before measures the intensity of the conflict between gangs. Municipalities with high levels of murder rates are associated with greater gang competition. Therefore, the truce should have a larger impact on the most violent places, with limited or no effect on places with lower homicides. However, it is possible that regions show a high level of violence for a reason different than the maras' war. For instance, it can capture the endemic violence of a region, or presence of other criminal organizations.

To test the argument that the most violent places are a product of the war between gangs, we estimated equation 5 at the municipal level, using the homicide rate as the outcome. The truce should only affect municipalities with gang competition. If a region is violent for any other reason than gangs, its homicide rate should not decrease after the truce. Therefore, the homicide rate before the non-aggression pact would be a good measure for the intensity of the war between gangs, if the coefficients of the estimation are negative.

Table 3 presents the results of the estimation. we run the model at monthly (columns 1, and 2) and annual (columns 3, and 4) level. For the measure of the treatment intensity, we tested two variables: the homicide rate in 2015, and the homicide rate between 2014-2015. In all the scenarios the homicide rate has a statistically significant decrease. The most violent municipalities before the truce are the ones with the larger reduction in murders. Before the non-aggression pact, the territories with the largest homicide rate were in fact where the fight between gangs was the worst.

5.2 Aggregate Effects

The paper studies the effect of the non-aggression pact on three firm's outcomes, number of workers, entry, and exit from the market. The number of workers is the total number of employees that a firm reported in a year. The workers are a combination of paid and unpaid people. Entry is an indicator variable that takes the value one in t if the number of employees in t is greater than zero, and the firm did not report any worker in $t-1$. Exit is an indicator

which takes the value one if number of employees in t is zero, and has a positive number of employees in $t-1$.

Table 4 shows the estimates of equation 5. The sample for this table is restricted from 2014 until 2018. we did not include any information prior to 2014 because between 2012 and 2013 there was another peace agreement in place. The inclusion of periods of peace before the treatment could bias the effects, since the coefficient of the regression will not be capturing the change from a state of violence to one of peace.

The coefficients in Table 4 show that the truce did not have a statistically significant effect on any of the studied outcomes. On average, firms located in more violent places before the non-aggression pact did not perform any different than those in not so violent regions.

To check the robustness of the results, we computed an event study design. we estimated a similar model as the one in equation 5. we run the outcome variable on an interaction of the intensity variable with dummies for each year, using 2015 as the base year (the year before the truce). Figure 4 plots the coefficients of the interaction terms. The confidence intervals are at a 95% and 90% level.

If well the diff-diff estimate for the number of workers is undistinguishable for zero, the event study analysis shows statistically significant effects for this outcome starting the year after the truce (Panel a of Figure 4). During the first year, 2016, the estimates are not statistically significant. There is a delay in the emergence of the effects. Several reasons can explain this. For instance, confidence in the duration and effectiveness of the agreement, or administrative difficulties with the process of hiring or firing employees. Still, there is only evidence of impacts on the number of workers. The coefficients on entry and exit from the market are not statistically significant (see Panel b and Panel c).

Additionally, Figure 4 allows to test for the existence of common trends before the truce. The parallel trends assumption can only be tested using information from 2014. During 2012 and 2013 there was another peace agreement. It can be the case that firm's outcomes are different from those in the war periods. Nevertheless, for all three outcomes, the coefficients in the years prior to the non-aggression pact (2009-2014) are undistinguishable from zero. The size, entry and exit likelihood of the firms located in violent regions had the same tendency as those located in not violent areas, before the truce.

To check the robustness of the results we estimated the same specification, changing the intensity of the treatment. Figure B1, from Appendix B1 shows the event study plots, using three different intensity measures: 1) yearly average homicide rate between 2014, and 2015, 2) monthly average homicide rate in 2015, and 3) monthly average homicide rate between 2014, and 2015. In all the scenarios, there is a negative effect of the truce on the number of workers, in 2017 and 2019.

The direction of the effects on firm's size suggests the prevalence of a negative effect of the truce. The theoretical framework suggests that the expected punishment increased more than the demand shock. Section 6 explores these dynamics in more detail. The rest of this section investigates which firms were affected by the truce. It explores two dimensions: relative size and industry.

5.3 Which firms got smaller?

Firms' size may affect how the truce and gangs influence their activities. Small firms are more vulnerable to exogenous shocks. They have less access to credit and resources to deter gangs' influence. Whereas large firms may be better prepared to face crime. They are more likely to hire private security and have a higher negotiation power with the gangs. Further, gangs may target firms differently according to their size. They can extract more from large firms than small ones, but it may be easier to extort the latter.

To explore how the truce affected each type of firm, we estimated equation 5 on subsamples by size. To define the samples, we used the classification of the Salvadorean statistical agency. They group companies into four categories (micro, small, medium, and large) based on their number of employees. Micro enterprises have less than 10 workers, small firms have between 10 and 49 employees, medium firms have between 50 and 99 employees, and large firms have 100 or more workers. we assigned each firm to a category based on their number of employees in 2015, before the truce. Table 5 shows the estimates for each group.

The truce had different impact on each type of firm. Micro enterprises (< 10 employees) had a statistically significant reduction in their number of workers, starting the year after the truce. On average, firms located in places with higher gang competition suffered a 2% reduction in their number of workers after the truce, compared to firms in municipalities with low level of gang competition. There is no effect in the probability of entering or exiting the market for these companies.

For small firms ($10 \leq$ employees < 49), we found a statistically significant reduction in the probability of exiting the market. The effect is different from zero in 2016, and 2018. There is no effect on the number of workers, or the likelihood of entering the market.

Similarly, medium-sized firms experienced an 8% reduction in their number of employees. As in the case of micro businesses, the effect is statistically significant in the years after the truce (2017, and 2018). Further, the estimates on Table 5 suggest a positive effect in the probability of entering and exiting the market. However, the coefficients before the shock for these two variables are different from zero (see Figure 6). Thus, it is not possible to be conclusive about these latter results. Finally, there are no statistically significant effect for large firms in any of the outcomes.

To check the robustness of the results, Figure 5 plots the event study coefficients for the number of workers divided by firm size. The plots confirm that micro and medium sized firms had a decrease in the number of workers. The results become significant in 2017, and 2018. There is no effect in the year of the start of the non-aggression pact, 2016. Moreover, for both cases, the coefficients before the truce are undistinguishable from zero. In the case of small companies, there is no statistically significant effects, and there is no evidence of pre-trends before 2014. Lastly, in the case of large firms the coefficients before the non-aggression pact are all different from zero. It is not possible to take any conclusion for this last group.

Moreover, Appendix B1 shows that the results hold using different measures of the intensity of the gang competition. Specifically, micro and medium sized firms are affected negatively by the non-aggression pact. There is no effect on small firms. The parallel trend assumption holds in all subsamples, except for the large firms.

I also explore whether firms operating in different industries have a distinct response to the non-aggression pact. The Salvadorean statistical agency classifies firms into six activities:

manufacture, retail, services, construction, transport, and agriculture. To explore possible heterogeneities across industries, we estimated equation 5 on subsamples defined by the industry and relative size of the firm. Table 6 shows the results for the number of workers.

In the case of micro firms, the coefficients across all sectors are negative. However, they are not statistically significant. we interpret these results as that the effects found before cannot be explained by a single sector. In contrast, they come from a combination from all the sectors. For small companies, there is a negative and statistically significant effect for firms operating in the retail industry of 2.6%. The coefficients in all the other industries are statistically insignificant. The effect of medium sized firms comes from four distinct sectors: manufacture, retail, services, and construction. The variation of the effects is quite large, going from 3% on the service sector to 20% for construction. There is no effect on large companies.

As before, Figure 7 plots the event study plots of each industry-size subsample. The results on micro enterprises are null. The effect found in small firms in the retail sector does not hold. There is no evidence of the existence of parallel trends. For medium sized companies, out of the four industries, there is evidence of negative effects only in the firms operating in the retail sector. In all the other scenarios the coefficients are not statistically significant.

Moreover, Appendix B2 presents the same analysis for the probability of entering or exiting the market. For these two variables, we did not find any statistically significant effect in any of the subsamples analyzed.

To summarize, we found statistically significant effects of the truce on firms' size. The non-aggression pact reduced the number of workers. The effect localizes in micro and medium firms, with larger effects on medium companies. Micro firms lowered their number of employees by 1.2%, and medium in 8.5%. The impact on micro companies does not come from a specific industry. However, the effects on medium enterprises are driven by firms on the retail sector. we did not find any statistically significant effect on the probability of entering or exiting the market.

6 Mechanisms

The truce had a direct impact in the reduction of homicides. However, it is not clear whether it altered other criminal activities of the gangs. On one side, gangs have more control over their territories. This facilitates the collection of extortion revenues. On the other side, the non-aggression pact limited the severity of the punishments that maras can impose. Before the truce, maras could threat to murder the business owners or its employees. After the non-aggression pact, this is no longer an option. Then gangs must use other forms or retaliation, such as damage to property.

To investigate these possible channels, we used a firms victimization survey conducted by the Inter-American Development Bank (IDB). The IDB interviewed a panel of three thousand micro, and small firms in El Salvador, between 2015, 2017 and 2019. The survey contains information on firms' characteristics and data on their relationship with gangs. For instance, whether the firm was victim of a crime, whether the perpetrator was member of a gang, and its associated loss.

First, we explore crimes against business, not the people that own it or operates them. The survey contains information on four types of felonies: extortion, vandalism, robbery, and fraud. Extortions are a frequent request of money by the means of threats. They are the main source of revenue for gangs. Vandalism involves damage to the companies' premises. It is usually used by gangs as a form of retaliation against firms who refuse to comply with their requests. Robbery includes all the thefts made to the business, and fraud consist in the reception of fake money or people not paying back their loans. Usually, extortion and vandalism are crimes perpetrated by gangs. Whereas robbery and fraud are committed by normal criminals not associated with a criminal organization.

To estimate the effects, we estimated equation 6

$$y_{imt} = \beta Homicides_{m(i),2015} \times Truce_t + \alpha Homicides_{m(i),2015} + D_i + \delta_t + X'_{it}\gamma + \mu_{imt} \quad (6)$$

the only difference with the main equation 5 is the inclusion of controls. we added the gender of the owner of the business, activity of the business, and type of establishment. The type of establishment includes characteristics of the business, such as whether it is in a commercial mall, or if it is street vendor. The survey only has information on micro, and small firms. we reported the results in subsamples by each category.

Panel A of Table 7 shows the results for firms with less than 10 workers. There are several things to notice. First, there is no variation in the probability of suffering a robbery or fraud. These crimes are often associated with criminals not affiliated with a gang. Thus, they should not change as a result of the gangs' agreement. Second, the probability of being requested an extortion payment does not change after the truce. Gangs did not change their likelihood of extorting a micro enterprise. Third, there is an increase in the probability of suffering damages to the property after the truce. On average, a firm is 10 percentage points more likely of suffering this type of crime after the non-aggression pact. Thus, the truce shifted the behavior of gangs to increase damage on firms' properties. Panel B shows that the victimization of small firms (for any crime) did not change after the non-aggression pact.

How to make sense of the results? Overall, we found that micro enterprises reduced their number of workers. Further, they are more likely of being target of crimes against their premises, but not of extortion. The results are coherent with an increase in the expected value of the punishment. Probably, the worst punishment that a gang can inflict into a business is murder their owner or employees. This was a real threat before the truce. If a firm refused to pay extortion, the life of the proprietor was in danger. The truce change this. After the truce, the threat of murder was no longer credible. This caused two things. First, companies' opportunity cost of refusing to pay the extortion decreased. Thus, the probability of paying it decreased. However, gangs have a stronger control of their territories. They are not worried of rival maras interfering in their regions. This gives them more flexibility to punish companies not paying extortion. Overall, the latter effect is larger. Gangs increased the amount of retaliation via strikes on firms' properties, which if well are not as bad as murder are still costly to firms. This tougher presence reduced the size of the business.

Table 8 shows evidence in support of the theory. The first column reports the likelihood of being asked to pay extortion. This is the same estimate as the extortion column in Table 7. The second column shows whether a firm actually paid the extortion, given that it was approached by gang. The estimate on paying the extortion is negative, and statistically

significant. On average, a micro enterprise is 6 percentage points less likely to pay extortion after the non-aggression pact. This explains why gangs increase the vandalism against firms.

Another possible explanation for the decrease in the probability of paying the extortion is that gangs increased the amount they request. If a mara asks for more money, keeping constant the punishment, then the probability of paying the extortion decreases. To rule out this channel, the third column of Table 8 estimates the change in the amount requested by gangs. The coefficient is not statistically significant. Thus, there was no change in the amount of money demanded by gangs.

Further, to explore whether the changes in the probability of extortion can affect the number of workers, we computed the losses associated with each crime. The survey includes data on how much each firm lost due to a specific felony. Table 9 presents the estimates. For micro firms, the average loss due to property damages increased in 10% after the truce. There is no change in the losses for extortion, robbery, or fraud. The increase in vandalism is costly for firms.

Overall, micro firms are less likely to pay extortion. Gangs have the same probability of requesting money, but they increased the property damages against firms. This latter increase is costly for firms. Thus, firms are negatively affected by the change in gangs' behavior.

7 Conclusions

This paper studies the effect that the non-aggression pact had on firms' size, entry, and exit decisions. we found that the truce had a negative impact on firms' size, but it did not change their probability of entering, or exiting the market. Moreover, the effect localizes in micro and medium firms, with larger effects on medium companies. Micro firms lowered their number of employees by 1.2%, and medium in 8.5%. The impact on micro companies does not come from a specific industry. However, the effects on medium enterprises are driven by firms on the retail sector.

A theoretical model suggests two possible mechanisms to understand the effects. There is a positive demand shock coming from the decrease in the homicide rate, and a negative shock from the gangs' behavior towards firms. The model suggests that if the increase in the expected punishment is larger than the variation in the demand shock, firms will hire less workers.

To explore the mechanism, the paper presents evidence that after the truce the control of gangs increasing. Gangs are more likely to punish firms with less violent methods, such as damage to property. The gangs' strikes on firms are costly for companies. Businesses experienced an increase in 10% in their losses due to property damage. It still needs a proof that the crimes against the owners or employees of firms decreased.

References

Besley, T., & Mueller, H. (2018, 4). Predation, protection, and productivity: A firm-level perspective. *American Economic Journal: Macroeconomics*, *10*, 184-221. Retrieved from https://www.aeaweb.org/articles?id=10.1257/mac.20160120 doi: 10.1257/mac.20160120

Blattman, C., Duncan, G., Lessing, B., & Tobon, S. (2021). Gangs of medellin: How organized crime is organized. *Working Paper*.

Brown, Z. Y., Montero, E., Schmidt-Padilla, C., & Sviatschi, M. M. (2023, 12). Market structure and extortion:evidence from 50,000 extortion payments. *Working Paper*. Retrieved from http://www.nber.org/papers/w28299 doi: 10.3386/w28299

Camacho, A., & Rodriguez, C. (2013). Firm exit and armed conflict in colombia. *The Journal of Conflict Resolution*, *57*, 89-116. Retrieved from http://www.jstor.org/stable/23415256

Collier, P., & Duponchel, M. (2013). The economic legacy of civil war: firm-level evidence from sierra leone. *Journal of Conflict Resolution*, *57*, 65-88.

de la Sierra, R. S. (2020). On the origins of the state: Stationary bandits and taxation in eastern congo. *Journal of Political Economy*, *128*, 32-74. Retrieved from https://doi.org/10.1086/703989 doi: 10.1086/703989

Kalsi, P. (2018). The impact of u.s. deportation of criminals on gang development and education in el salvador. *Journal of Development Economics*, *135*, 433 - 448. Retrieved from http://www.sciencedirect.com/science/article/pii/S0304387818311477 doi: https://doi.org/10.1016/j.jdeveco.2018.08.010

Klapper, L., Richmond, C., & Tran, T. (2013). *Civil conflict and firm performance: Evidence from côte d'ivoire*. The World Bank. Retrieved from https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-6640 doi: 10.1596/1813-9450-6640

Konrad, K. I., & Skaperdas, S. (1998). Extortion. *Economica*, *65*, 461-477. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/1468-0335.00141 doi: https://doi.org/10.1111/1468-0335.00141

Koppensteiner, M. F., & Menezes, L. (2021). Violence and human capital investments. *Journal of Labor Economics*, *39*, 0.

Magaloni, B., Franco-Vivanco, E., & Melo, V. (2020). Killing in the slums: Social order, criminal governance, and police violence in rio de janeiro. *American Political Science Review*, *114*, 552-572. doi: 10.1017/S0003055419000856

Magaloni, B., Robles, G., Matanock, A. M., Diaz-Cayeros, A., & Romero, V. (2019). Living in fear: The dynamics of extortion in mexico's drug war. *Comparative Political Studies*, *53*, 1124-1174. Retrieved from https://doi.org/10.1177/0010414019879958 doi: 10.1177/0010414019879958

Mansour, H., & Rees, D. I. (2012). Armed conflict and birth weight: Evidence from the al-aqsa intifada. *Journal of development Economics*, *99*, 190-199.

Martínez, C. (2016, 7). Pandillas caminan hacia un frente común ante medidas extraordinarias. *El Faro*. Retrieved from https://www.elfaro.net/es/201607/salanegra/18899/Pandillas-caminan-hac

Martínez, O., Martínez, C., Arauz, S., & Lemus, E. (2012, 3). Gobierno negoció con pandillas reducción de homicidios. *El Faro*. Re-

trieved from https://elfaro.net/es/201203/noticias/7985/Gobierno-negoci%C3%B3-con-pandillas-reducci%C3%B3n-de-homicidios.htm

Michaelsen, M. M., & Salardi, P. (2020). Violence, psychological stress and educational performance during the "war on drugs" in mexico. *Journal of Development Economics*, *143*, 102387.

Olson, M. (1993). Dictatorship, democracy, and development. *The American Political Science Review*, *87*, 567-576. Retrieved from http://www.jstor.org/stable/2938736

Papadovassilakis, A., & Dudley, S. (2020). *Gangs vendors and political capital in downtown san salvador.* Retrieved from https://www.insightcrime.org/investigations/predators-partners-gangs-san-salvador/

Pinotti, P. (2015). The economic costs of organised crime: Evidence from southern italy. *The Economic Journal*, *125*, F203-F232. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/ecoj.12235 doi: https://doi.org/10.1111/ecoj.12235

Rozo, S. (2018). Is murder bad for business? evidence from colombia. *The Review of Economics and Statistics*, *100*, 769-782. Retrieved from https://doi.org/10.1162/rest_a_00735 doi: 10.1162/rest_a_00735

Sviatschi, M. (2022, 6). Spreading gangs: Exporting us criminal capital to el salvador. *American Economic Review*, *112*, 1985-2024. doi: 10.1257/AER.20201540

Sviatschi, M., Schmidt, C., & Melkinov, N. (2020). Gangs, labor mobility and development. *Working Paper*.

Velásquez, A. (2020). The economic burden of crime evidence from mexico. *Journal of Human Resources*, *55*, 1287-1318.

World Bank. (2016). *World bank enterprise surveys.* Retrieved from http://www.enterprisesurveys.org

World Bank. (2020). *Intentional homicides (per 100,000 people).* Retrieved from https://data.worldbank.org/indicator/VC.IHR.PSRC.P5

Tables

Table 1: Simulation Parameters

	War	Peace		
		Case 1	Case 2	Case 3
α	0.3	0.3	0.3	0.3
w	1.0	1.0	1.0	1.0
θ	0.5	0.7	0.7	0.7
βq	0.4	0.3	0.5	0.7

Note: The table shows the parameters of the simulation.

Table 2: Summary Statistics

	Mean	SD	Min	Max	N
Panel A: Administrative Data (2009-2018)					
Total Workers	29.752	154.454	1	6824	189,287
Entry	0.188	0.391	0	1	174,547
Exit	0.142	0.349	0	1	203,327
Panel B: Survey Data (2015, 2017, 2019)					
Workers	4.046	9.127	1	250	12,664
Crime	0.406	0.491	0	1	12,671
Extortion	0.168	0.374	0	1	12,671
Theft	0.107	0.309	0	1	12,671
Property	0.036	0.186	0	1	12,671
Fraud	0.217	0.412	0	1	12,671
Panel C: Homicide Rate (2009m1-2018m12)					
All Homicides	4.483	9.331	0	302	31,440
Gang Homicides	1.166	5.292	0	302	31,440
Non-Gang Homicides	3.317	7.237	0	177	31,440

Note: The table shows the summary statistics of the main variables used in the paper.

Table 3: Change in Homicide Rate

	Monthly		Annual	
	(1)	(2)	(3)	(4)
Homicides (2015)	-0.040		-0.416	
	(0.003)		(0.052)	
Homicides (2014-2015)		-0.030		-0.336
		(0.002)		(0.029)
Observations	18,864	18,864	1,572	1,572
Mean Dep. Var.	5.102	5.102	61.013	61.013
Municipality FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes: The table shows the coefficients of the regression of the homicide rate on the interaction of the truce dummy and the measure of exposition to the truce. The first two columns use the monthly homicide rate as dependent variable, and the last two the annual homicide rate.
Robust standard errors clustered by municipality in parenthesis.

Table 4: Effect of the Truce on Firms

	Workers (log)		Exit		Entry	
	(1)	(2)	(3)	(4)	(5)	(6)
Homicides x Truce	-0.0128	-0.0117	-0.0080	-0.0079	0.0044	0.0054
	(0.0099)	(0.0090)	(0.0061)	(0.0063)	(0.0052)	(0.0056)
	[0.195]	[0.194]	[0.189]	[0.213]	[0.397]	[0.335]
Observations	90,466	90,466	118,775	118,775	90,466	90,466
Mean Dep. Var.	1.874	1.874	0.179	0.179	0.142	0.142
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	No	Yes	No	Yes	No	Yes

Notes: The table shows the main effects of the regression of each dependent variable on the interaction of the homicide rate in 2015 with a dummy for the years of truce. $Workers$ is the number of employees that a firm has measured in logs. $Exit$ is an indicator variable that takes the value one in t if the firm had a positive number of employees in $t-1$ and zero in t. $Entry$ is defined analogously. The sample contains information from 2014 until 2018.
Robust standard errors clustered by municipality in parenthesis, and $p-value$ in square brackets.

Table 5: Effect by Firm's Size

	Subsamples:				
	All	Micro	Small	Medium	Large
Panel A: Workers					
Main Effects	-0.0129	-0.0117	-0.0059	-0.0906	-0.0138
	(0.0095)	(0.0095)	(0.0123)	(0.0302)	(0.0192)
Observations	88,550	47,004	17,620	2,908	3,329
Mean Dep. Var.	1.867	1.172	2.846	4.086	5.459
Panel B: Exit					
Main Effects	-0.0079	-0.0021	-0.0087	0.0164	-0.0061
	(0.0063)	(0.0079)	(0.0030)	(0.0056)	(0.0090)
Observations	118,775	54,315	20,519	4,014	4,284
Mean Dep. Var.	0.179	0.100	0.065	0.050	0.039
Panel C: Entry					
Main Effects	0.0054	-0.0014	0.0116	0.0239	-0.0097
	(0.0056)	(0.0078)	(0.0069)	(0.0060)	(0.0109)
Observations	90,466	48,622	19,166	3,810	4,115
Mean Dep. Var.	0.142	0.088	0.048	0.031	0.026
Firms FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes

Notes: The table shows main effects of the truce on the dependent variable defined on each panel. Each columns shows a different subsample. *Micro* contains firms with less than 10 employees. *Small* has firms with employees between 10 and 49. *Medium* are firms with 50 to 99 workers, and *Large* are firms with 100 or more employees. Standard errors clustered by municipality in parenthesis.

Table 6: Effects on number of workers, by size and industry

	Dep. Var: Number of Workers (log)					
	Manufacture	Retail	Services	Construction	Transport	Agriculture
Panel A: Micro						
Main Effects	-0.0178	-0.0037	-0.0137	-0.0479	-0.0228	-0.0338
	(0.0255)	(0.0109)	(0.0108)	(0.0423)	(0.0236)	(0.0498)
Observations	2,287	19,360	20,382	2,082	2,585	1,403
Mean Dep. Var.	1.481	1.165	1.096	1.370	1.292	1.496
Panel B: Small						
Main Effects	0.0148	-0.0262	-0.0009	-0.0099	0.0175	0.0601
	(0.0207)	(0.0125)	(0.0185)	(0.0454)	(0.0374)	(0.0647)
Observations	2,365	6,795	6,601	1,021	1,275	908
Mean Dep. Var.	2.962	2.828	2.855	2.785	2.794	2.809
Panel C: Medium						
Main Effects	-0.0837	-0.0849	-0.0389	-0.1946	-0.0431	-0.1197
	(0.0352)	(0.0326)	(0.0186)	(0.0851)	(0.0565)	(0.1851)
Observations	661	1,026	1,330	267	244	252
Mean Dep. Var.	4.204	4.134	4.102	3.910	4.079	3.786
Panel D: Large						
Main Effects	-0.0122	0.0462	0.0944	-0.2030	-0.1325	-0.0392
	(0.0200)	(0.0269)	(0.0763)	(0.0824)	(0.0816)	(0.1278)
Observations	1,300	775	1,361	201	152	300
Mean Dep. Var.	5.691	5.317	5.467	4.985	5.166	4.929
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the coefficients of the regression of the interaction of the intensity of war with a dummy for truce on the number of workers. Each coefficient shows the estimate of a different subsample defined by firms' size and industry.
Standard errors clustered by municipality on parenthesis.

Table 7: Crime Victimization, by size

	Any Crime	Extortion	Robbery	Property	Fraud
Panel A: Micro					
Truce x Homicides	-0.0087	-0.0181	-0.0072	0.0135	-0.0400
	(0.0277)	(0.0135)	(0.0122)	(0.0064)	(0.0324)
	[0.754]	[0.186]	[0.556]	[0.039]	[0.222]
Observations	6,311	6,311	6,311	6,311	6,311
Mean Dep. Var.	0.400	0.171	0.097	0.033	0.219
Panel B: Small					
Truce x Homicides	-0.2449	-0.0486	-0.0190	-0.0018	-0.1203
	(0.1376)	(0.1006)	(0.0865)	(0.0608)	(0.1824)
	[0.084]	[0.632]	[0.827]	[0.976]	[0.514]
Observations	231	231	231	231	231
Mean Dep. Var.	0.494	0.251	0.186	0.039	0.229
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the coefficients of the regression of homicide rate interacted with the truce dummy on crime victimization. Panel A uses a sample of firms with less than 10 workers. Panel B has a sample of firms with 10 to 50 employees.
Standard errors clustered by municipality in parenthesis. $p - value$ in square brackets.

Table 8: Extortion, by size

	Dep. Var: Forms of Extortion		
	Attempt	Effective	Cost (log+1)
Panel A: Micro			
Truce x Homicides	-0.0181	-0.0663	-0.4049
	(0.0135)	(0.0321)	(0.4118)
	[0.186]	[0.044]	[0.330]
Observations	6,311	606	606
Mean Dep. Var.	0.171	0.913	4.779
Panel B: Small			
Truce x Homicides	-0.0486	-0.2488	-1.9225
	(0.1006)	(0.2019)	(3.4591)
	[0.632]	[0.246]	[0.591]
Observations	231	38	38
Mean Dep. Var.	0.251	0.974	5.271
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes: The table shows the coefficients of the regression of homicide rate interacted with the truce dummy on measures of extortion. Standard errors clustered by municipality in parenthesis. $p-value$ in square brackets.

Table 9: Losses Due to Crime

	Dep. Var: Losses due to:				
	All crimes	Extortion	Robbery	Property	Fraud
Panel A: Micro					
Main Effects	-0.0788	-0.0201	-0.0523	0.1067	-0.1478
	(0.1239)	(0.0847)	(0.0752)	(0.0353)	(0.1051)
	[0.527]	[0.813]	[0.489]	[0.003]	[0.164]
Observations	6,311	6,311	6,311	6,311	6,253
Mean Dep. Var.	1.761	0.721	0.500	0.114	0.801
Panel B: Small					
Main Effects	-1.7622	-0.6871	-0.0877	0.0666	-0.9939
	(0.7284)	(0.4378)	(0.4792)	(0.2458)	(0.9201)
	[0.021]	[0.126]	[0.856]	[0.788]	[0.288]
Observations	231	231	231	231	222
Mean Dep. Var.	2.522	1.174	0.959	0.147	1.012
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the coefficients of the regression of homicide rate interacted with the truce dummy on the loss due to each crime. The losses are measured in logarithms. we used a log+1 transformation to take care of the zeros.
Standard errors clustered by municipality in parenthesis. $p - value$ in square brackets.

Figures

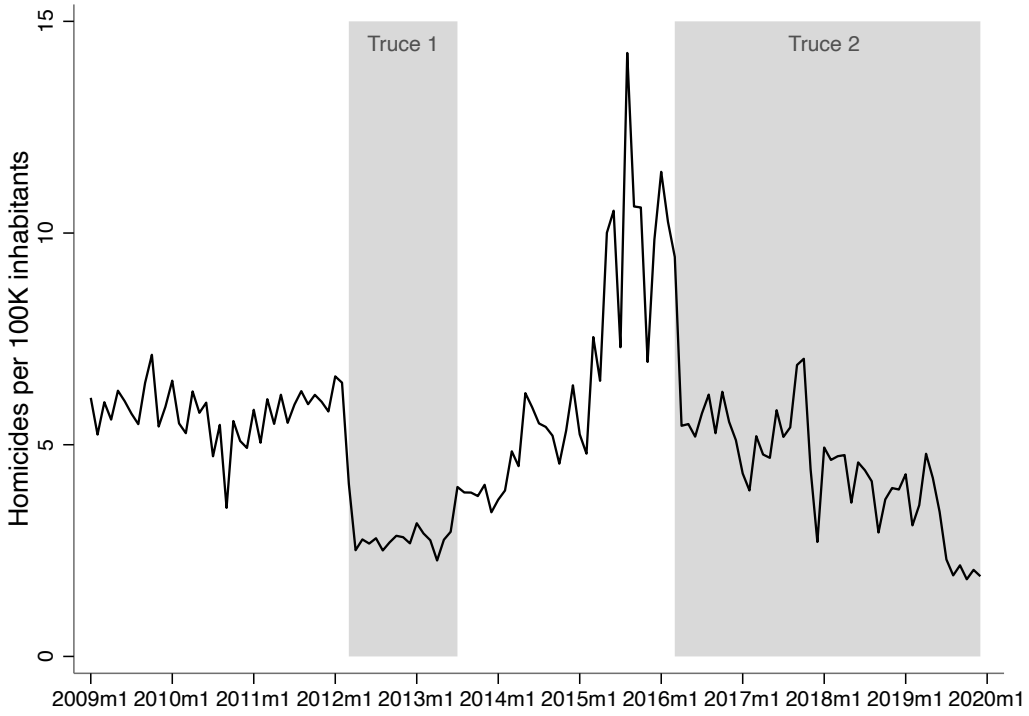


Figure 1: Monthly Homicide Rate, 2009m1 - 2019m12

Note: The graph shows the evolution of the monthly homicide rate per 100.000 inhabitants in El Salvador. The shaded area shows the truce periods. The monthly population was obtained from a linear interpolation of the yearly rates.

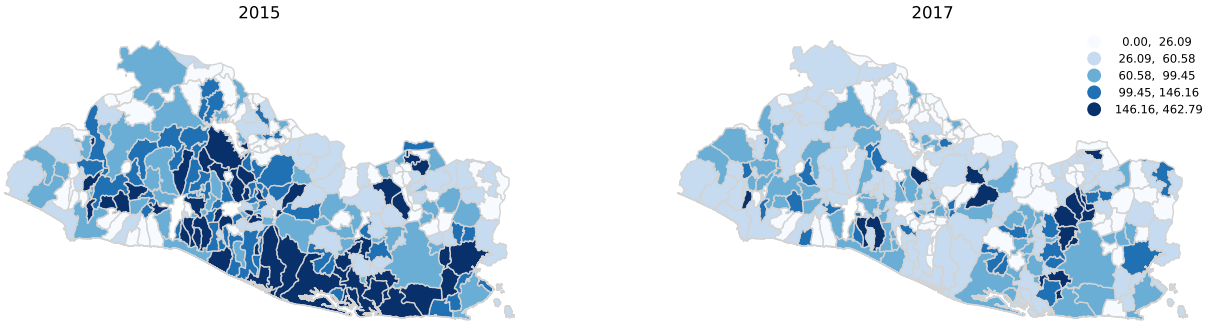
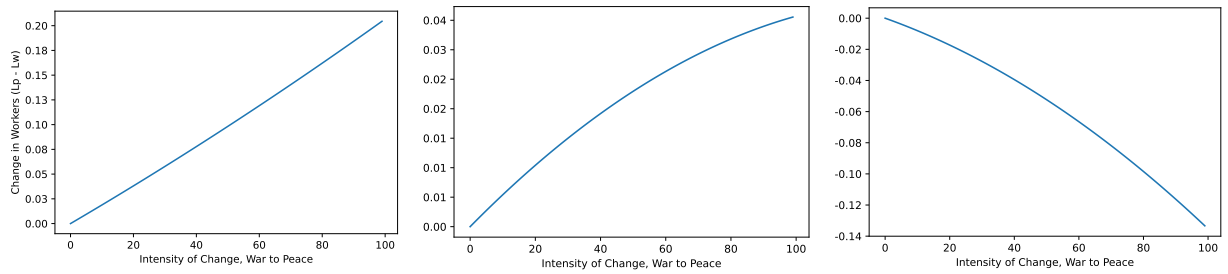


Figure 2: Homicide Rate by Municipality

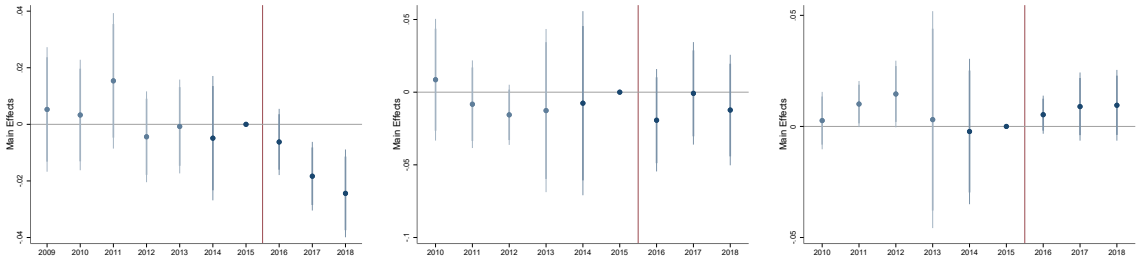
Note: The figures shows the homicide rate per 100,000 inhabitants in each municipality, before and after the non-aggression pact.



(a) Decrease (b) Smaller Increase (c) Larger Increase

Figure 3: Variation of Workers, by changes in the Expected Punishment

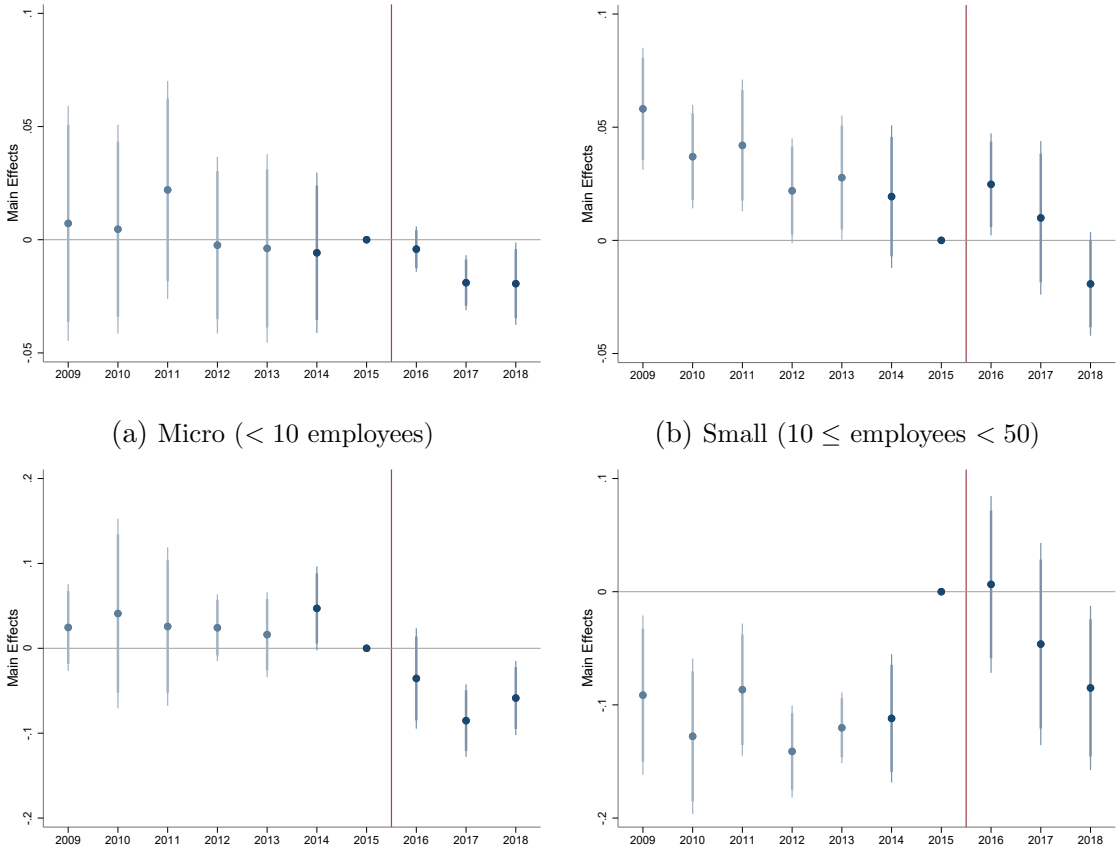
Note: The figure plots simulations of the change in the number of workers from a war to a peace state, with different variations in the expected punishment ($\beta_s q_s$). All simulations use a 20 p.p. increase in the demand shifter (θ). Panel a) considers a 10 p.p. decrease in the punishment. Panel b) uses a 10 p.p. increase in the punishment. Panel c) uses a 30 p.p. increment in the punishment. The x-axis measures the relative change of going from a war state to truce.



(a) Number of Workers (Log) (b) Exit (c) Entry

Figure 4: Main Effects by Year

Notes: The graph shows the coefficients of the regressions of each dependent variable on the interaction of the intensity of the truce with dummies for each year. The confidence intervals are at 90% and 95%.



(a) Micro (< 10 employees)

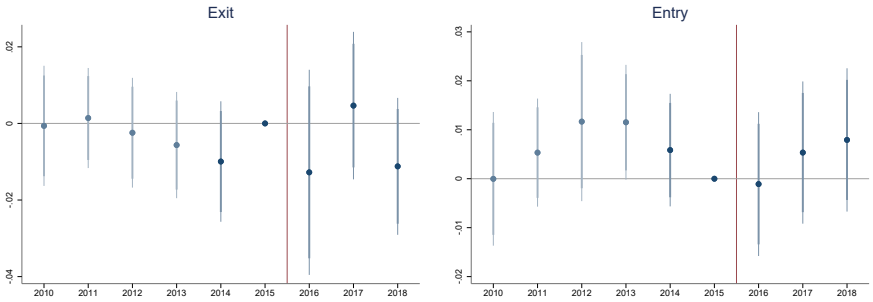
(b) Small ($10 \leq$ employees < 50)

(c) Medium ($50 \leq$ employees < 100)

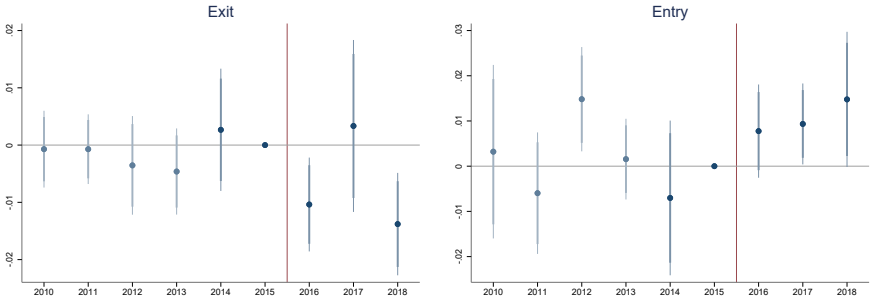
(d) Large ($100 \leq$ employees)

Figure 5: Event Study - Number of Workers (log)

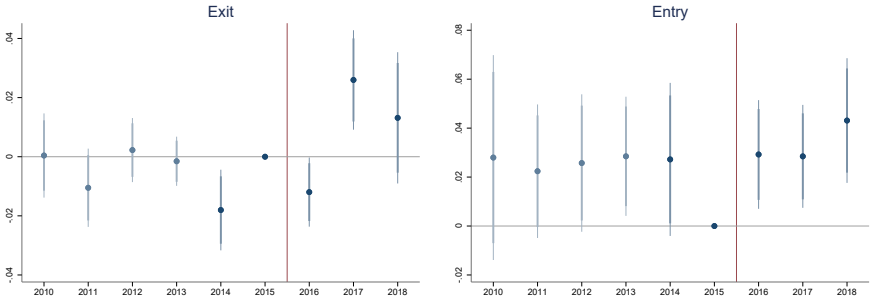
Notes: The graph shows the coefficients of the event study model using the number of workers (log) as dependent variable. Each subfigure shows the estimates on a different subsample by size. The confidence intervals are at 90% and 95%



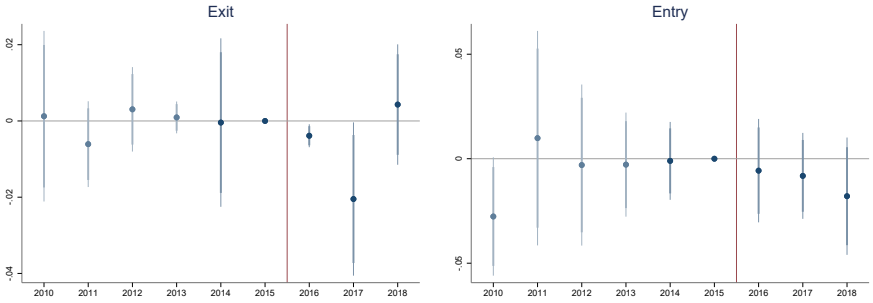
(a) Micro (< 10 employees)



(b) Small (10 ≤ employees < 50)



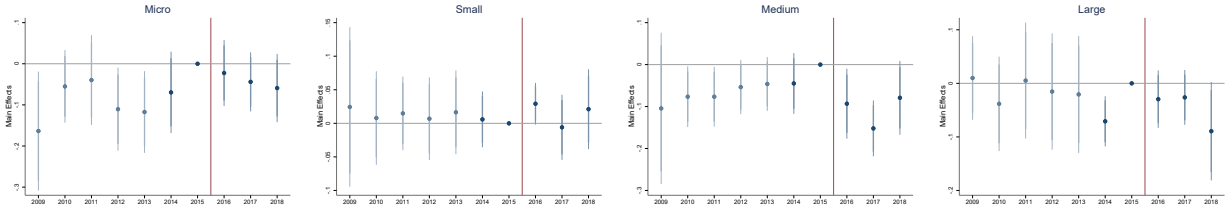
(c) Medium (50 ≤ employees < 100)



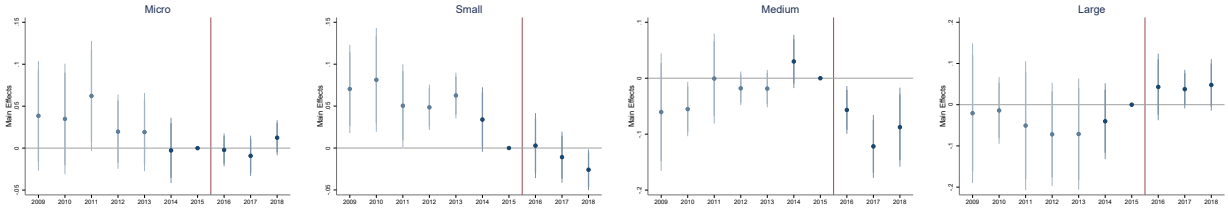
(d) Large (100 ≤ employees)

Figure 6: Effects by Relative Firms' Size

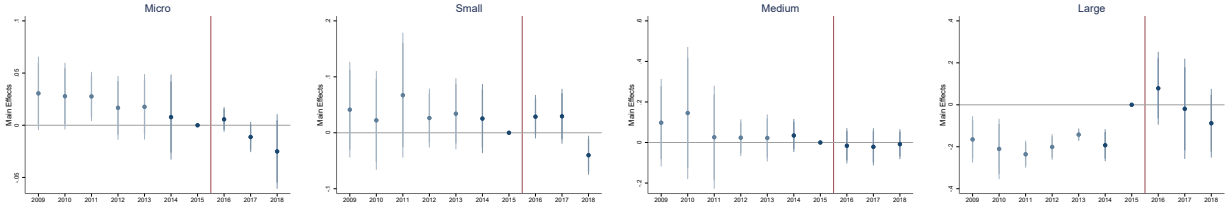
Notes: The graph shows the coefficients of the regressions of each dependent variable on the interaction of the homicide rate in the year before the truce with dummies for each year. Each row shows a different subsample. Each column a different dependent variable. The confidence intervals are at 90% and 95%



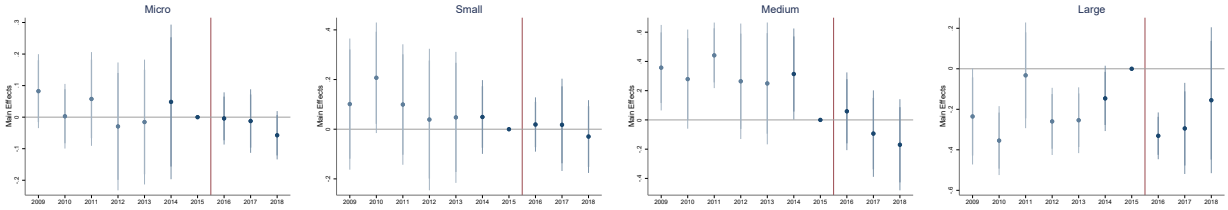
(a) Manufacture



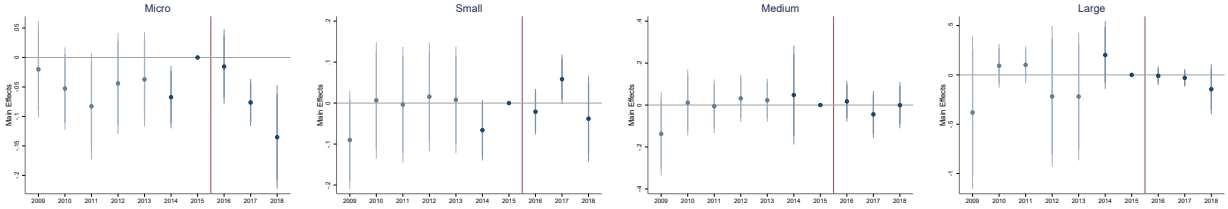
(b) Retail



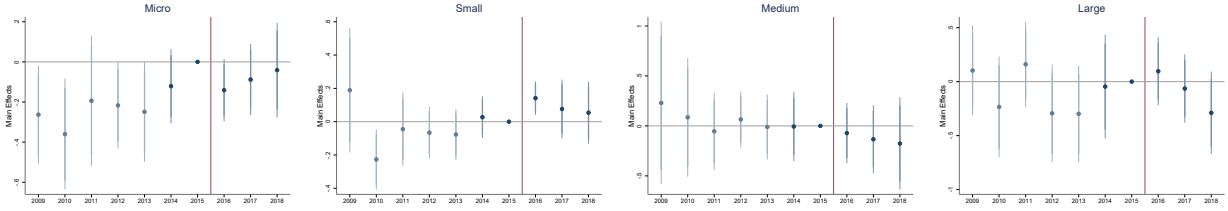
(c) Services



(d) Construction



(e) Transport



(f) Agriculture

Figure 7: Effects on number of workers, by industry-size

Notes: The figure shows the event study results on the number of workers (logs), by firms size and industry. Confidence intervals at the 95% level.

Appendix

A1 Model

Proposition 1: If $\beta(0)Y(l_i) > e(0)$, then there exists a $\underline{s}$ such that for all $s \geq \underline{s}$, $X = 0$.

Proof:

We need to show that for all $s > \underline{s}$, $\beta(s,\gamma)Y(l_i,\theta_i,\gamma) \leq e(s,g,\gamma)$. For simplicity of notation, we eliminate all constant from the functions to retain only security expenses. For instance, $\beta(s) \equiv \beta(s,\gamma)$ and $Y(l_i) \equiv Y(l_i,\theta_i,\gamma)$. Notice that, since β is a continuous concave function, and e is continuous convex, and since $\beta(0)Y(l_i) > e(0)$, then, there exists an unique $\underline{s}$ such that $\beta(\underline{s})Y(l_i) = e(\underline{s})$.
Further, the punishment function can be bounded by its first order Taylor expansion

$$\beta(s) \leq \beta(\underline{s}) + \beta'(\underline{s})[s - \underline{s}]$$

Similarly, the cost function can be bounded by:

$$e(s) \geq e(\underline{s}) + e'(\underline{s})[s - \underline{s}]$$

If follows,

$$\begin{aligned} \beta(\underline{s})Y(l_i) &= e(\underline{s}) \\ (\beta(s) - \beta'(\underline{s})[s - \underline{s}])Y(l_i) &\leq e(s) - e'(\underline{s})[s - \underline{s}] \\ \beta(s)Y(l_i) - e(s) &\leq (s - \underline{s})\left(\beta'(\underline{s})Y(l_i) - e'(\underline{s})\right) \end{aligned}$$

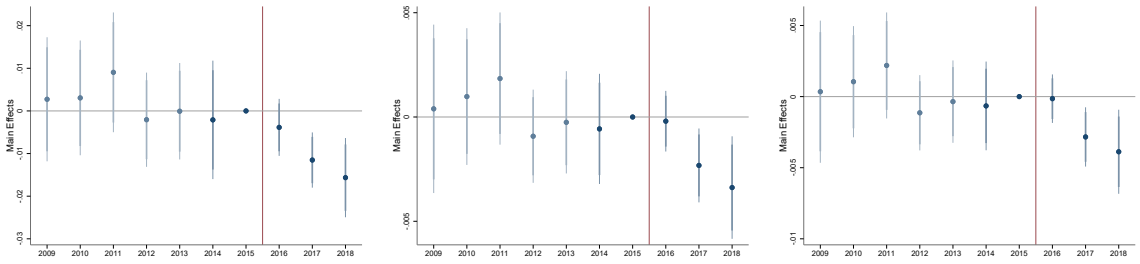
Note that the right hand side of the last inequality is bounded above by zero for all $s > \underline{s}$, since $\beta'(s) < 0$ and $e'(s) > 0$. Then, the results follows:

$$\beta(s)Y(l_i) \leq e(s), \text{ for all } s > \underline{s}$$

which implies that the gang does not extort the firm if their expenditure in security is high.

B1 Other Intensity Variables

The main results of the paper consider an intensity measure of the average homicide rate in 2015. Figure B1 plots the main specification of the paper, but changing the measure of the intensity of the treatment. we considered three alternatives: Average homicides rate in 2014, and 2015 (Panel a), average monthly homicide rate in 2015 (Panel b), and average monthly homicide rate between 2014 and 2015 (Panel c). The results are similar to those in the main specifications.

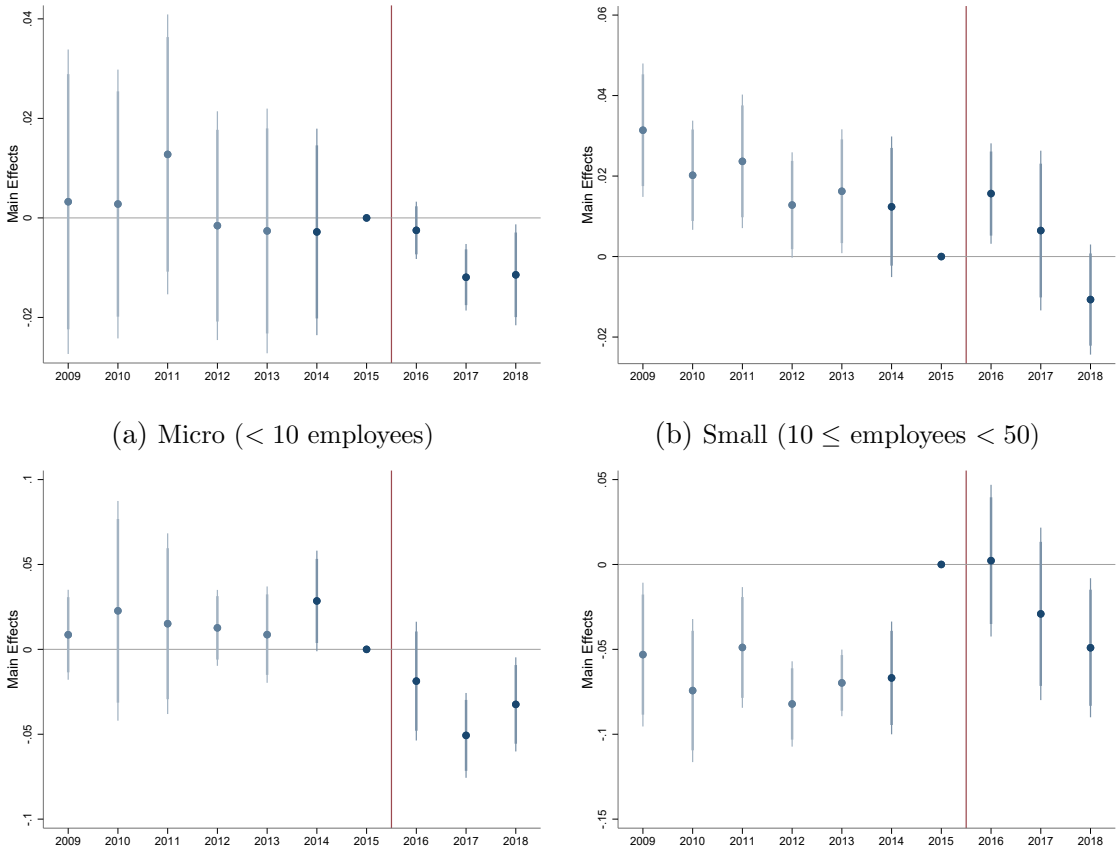


(a) Yearly, 2014-2015 (b) Monthly, 2015 (c) Yearly, 2014-2015

Figure B1: Variation in the Treatment Intensity, Number of Workers (Log)

Notes: The figure plots the event study coefficients of the effect of the non-aggression pact on the number of workers (log). It uses three different measures. Panel a) uses the average yearly homicide rate in 2014-15. Panel b) uses the average monthly homicide rate in 2015. And, Panel c) uses the average monthly homicide rate in 2014-2015.

Similarly, Figure B2, B3, and B4 plots the event study specification changing the measure of the intensity of the treatment. Figure B2 uses the average yearly in 2014-2015, Figure B3 the average monthly in 2015, and Figure B4 the average monthly between 2014, and 2015.



(a) Micro (< 10 employees)

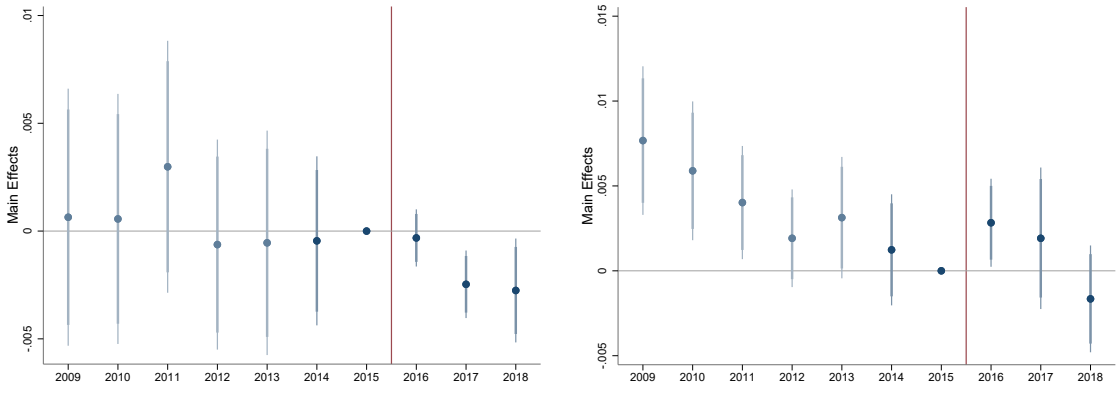
(b) Small (10 ≤ employees < 50)

(c) Medium (50 ≤ employees < 100)

(d) Large (100 ≤ employees)

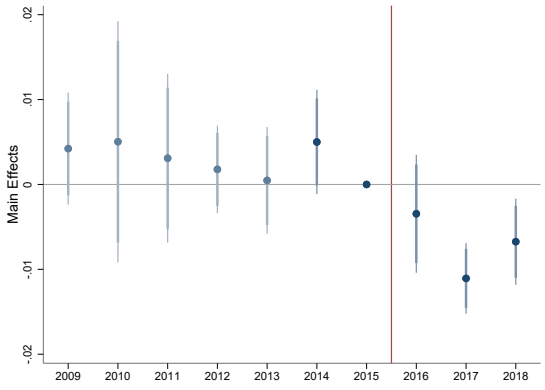
Figure B2: Number of Workers. Intensity period: yearly 2014-2015

Notes: The graph shows the coefficients of the event study model using the number of workers (log) as dependent variable, and the average yearly homicide rate between 2014, and 2015 as the intensity of the treatment. Each subfigure shows the estimates on a different subsample by size. The confidence intervals are at 90% and 95%

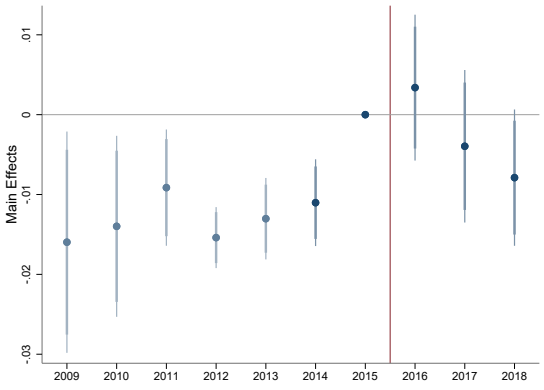


(a) Micro (< 10 employees)

(b) Small (10 ≤ employees < 50)



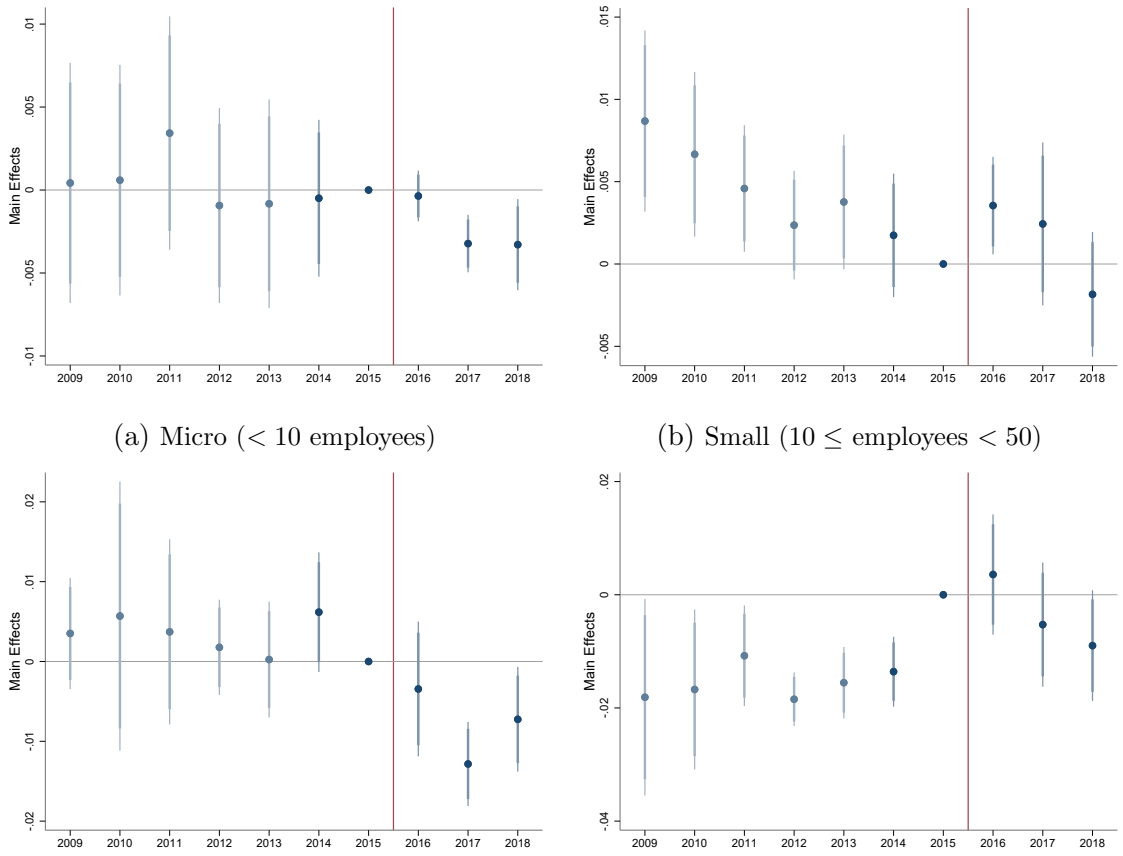
(c) Medium (50 ≤ employees < 100)



(d) Large (100 ≤ employees)

Figure B3: Number of Workers. Intensity period: monthly 2015

Notes: The graph shows the coefficients of the event study model using the number of workers (log) as dependent variable, and the average monthly homicide rate in 2015 as the intensity of the treatment. Each subfigure shows the estimates on a different subsample by size. The confidence intervals are at 90% and 95%



(a) Micro (< 10 employees)

(b) Small ($10 \leq$ employees < 50)

(c) Medium ($50 \leq$ employees < 100)

(d) Large ($100 \leq$ employees)

Figure B4: Number of Workers. Intensity period: monthly 2014-2015

Notes: The graph shows the coefficients of the event study model using the number of workers (log) as dependent variable, and the average monthly homicide rate between 2014, and 2015 as the intensity of the treatment. Each subfigure shows the estimates on a different subsample by size. The confidence intervals are at 90% and 95%

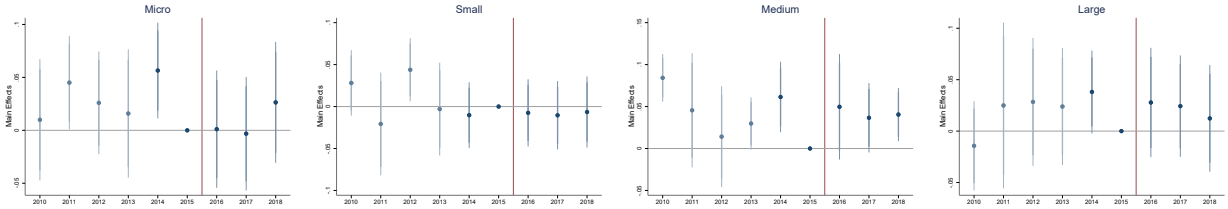
B2 Effects on Entry and Exit Likelihood

This section explores the effects of the non-aggression pact on the probability of entry and exit from the market. The section contains the fixed effects estimates, and the event study plot for each outcome. Table B1, and Figure B5 presents the result for entry. Table B2, and Figure B6 presents the result for exit.

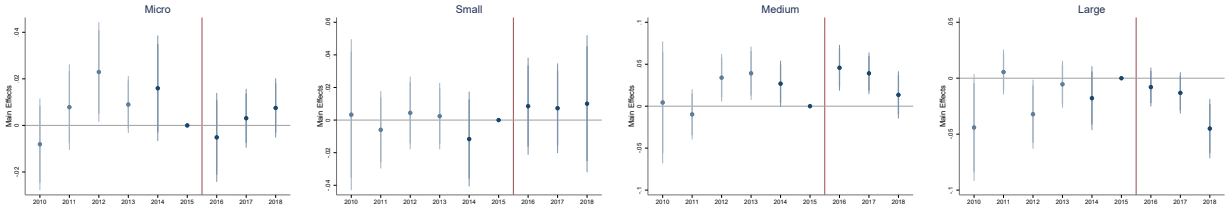
Table B1: Effects on firm entry, by size and industry

	Dep. Var: Number of Workers (log)					
	Manufacture	Retail	Services	Construction	Transport	Agriculture
Panel A: Micro						
Main Effects	-0.0164	-0.0084	0.0068	-0.0002	-0.0149	0.0079
	(0.0260)	(0.0100)	(0.0154)	(0.0237)	(0.0185)	(0.0197)
Observations	2,287	19,360	20,382	2,082	2,585	1,403
Mean Dep. Var.	0.084	0.081	0.090	0.107	0.094	0.094
Panel B: Small						
Main Effects	-0.0070	0.0114	0.0222	-0.0091	0.0315	-0.0005
	(0.0140)	(0.0150)	(0.0076)	(0.0161)	(0.0161)	(0.0250)
Observations	2,365	6,795	6,601	1,021	1,275	908
Mean Dep. Var.	0.039	0.042	0.052	0.060	0.051	0.067
Panel C: Medium						
Main Effects	0.0243	0.0222	0.0263	-0.0124	0.0534	0.0538
	(0.0175)	(0.0102)	(0.0233)	(0.0177)	(0.0283)	(0.0226)
Observations	661	1,026	1,330	267	244	252
Mean Dep. Var.	0.023	0.027	0.038	0.015	0.020	0.040
Panel D: Large						
Main Effects	0.0035	-0.0124	-0.0063	-0.0011	-0.0954	-0.0372
	(0.0185)	(0.0076)	(0.0192)	(0.0229)	(0.1155)	(0.0311)
Observations	1,300	775	1,361	201	152	300
Mean Dep. Var.	0.020	0.017	0.033	0.040	0.013	0.033
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

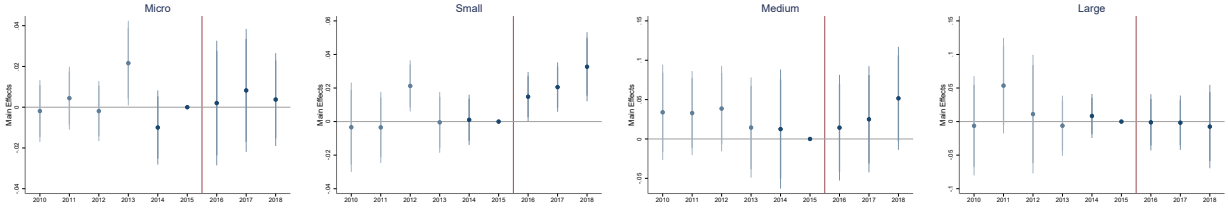
Notes: The table shows the coefficients of the regression of the interaction of the intensity of war with a dummy for truce on the number of workers. Each coefficient shows the estimate of a different subsample defined by firms' size and industry.
Standard errors clustered by municipality on parenthesis.



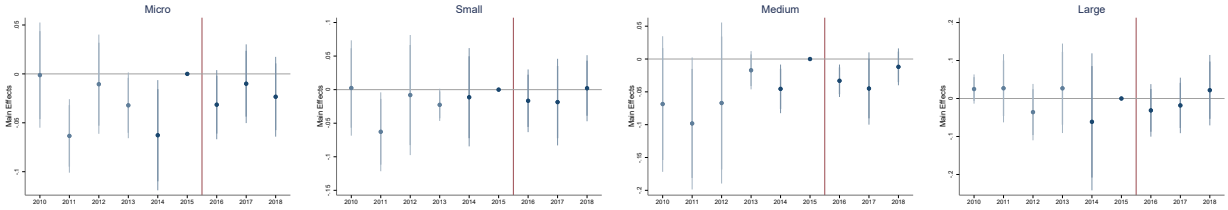
(a) Manufacture



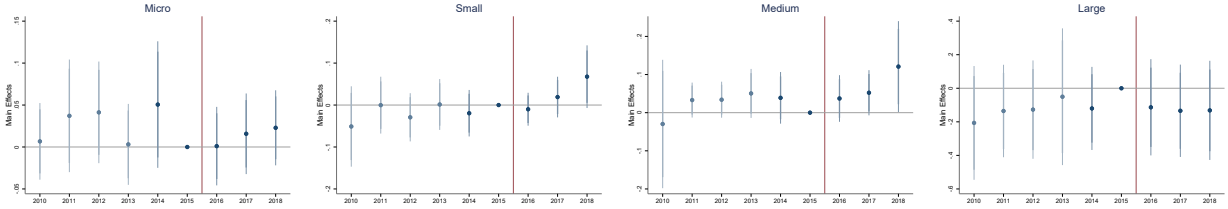
(b) Retail



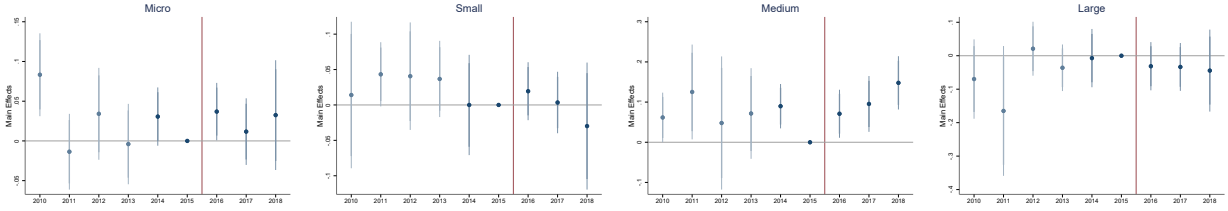
(c) Services



(d) Construction



(e) Transport



(f) Agriculture

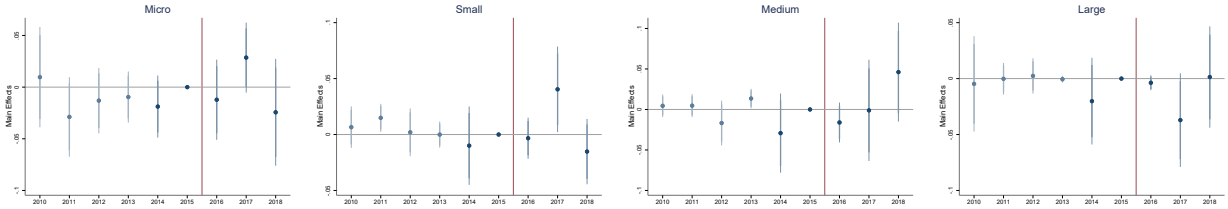
Figure B5: Effects on Entry, by industry-size

Notes: Each plot shows the effects of the truce on the probability of entry to the market. Each row shows a different industry, and each column a different firm size. Confidence intervals at the 95% level.

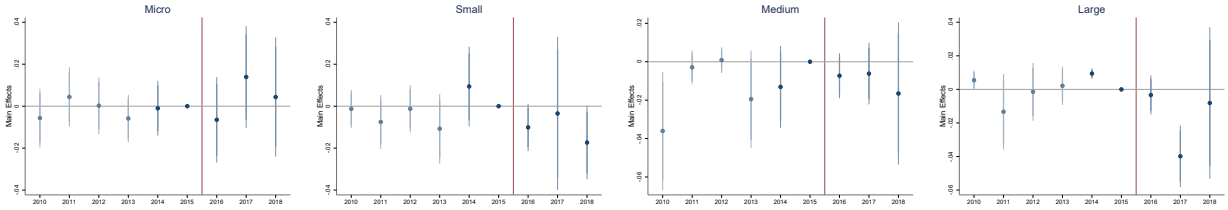
Table B2: Effects on firm exit, by size and industry

	Dep. Var: Number of Workers (log)					
	Manufacture	Retail	Services	Construction	Transport	Agriculture
Panel A: Micro						
Main Effects	0.0125	0.0047	-0.0071	-0.0128	0.0095	-0.0538
	(0.0178)	(0.0100)	(0.0093)	(0.0129)	(0.0182)	(0.0137)
Observations	2,591	21,522	22,842	2,406	2,900	1,611
Mean Dep. Var.	0.106	0.096	0.101	0.125	0.104	0.118
Panel B: Small						
Main Effects	0.0147	-0.0150	-0.0143	-0.0061	0.0319	-0.0410
	(0.0088)	(0.0076)	(0.0047)	(0.0244)	(0.0149)	(0.0232)
Observations	2,537	7,222	7,075	1,123	1,370	1,005
Mean Dep. Var.	0.065	0.056	0.066	0.089	0.069	0.093
Panel C: Medium						
Main Effects	0.0221	-0.0019	0.0088	0.0081	0.0750	0.0801
	(0.0195)	(0.0079)	(0.0088)	(0.0225)	(0.0140)	(0.0246)
Observations	696	1,072	1,406	282	256	273
Mean Dep. Var.	0.049	0.041	0.053	0.053	0.047	0.077
Panel D: Large						
Main Effects	-0.0041	-0.0215	0.0152	0.0371	-0.1012	-0.0805
	(0.0134)	(0.0106)	(0.0209)	(0.0105)	(0.0871)	(0.0370)
Observations	1,347	796	1,429	213	160	314
Mean Dep. Var.	0.034	0.026	0.048	0.052	0.050	0.045
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

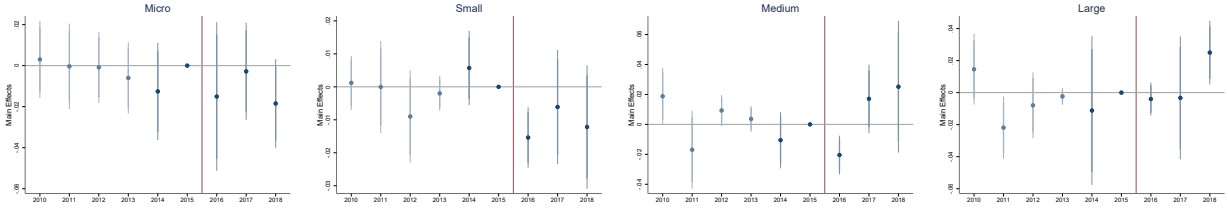
Notes: The table shows the coefficients of the regression of the interaction of the intensity of war with a dummy for truce on the number of workers. Each coefficient shows the estimate of a different subsample defined by firms' size and industry.
Standard errors clustered by municipality on parenthesis.



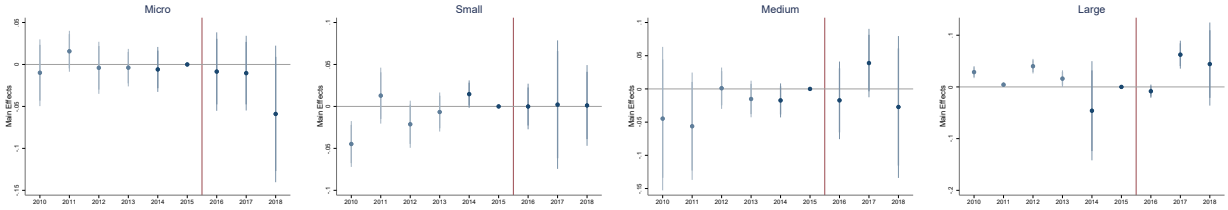
(a) Manufacture



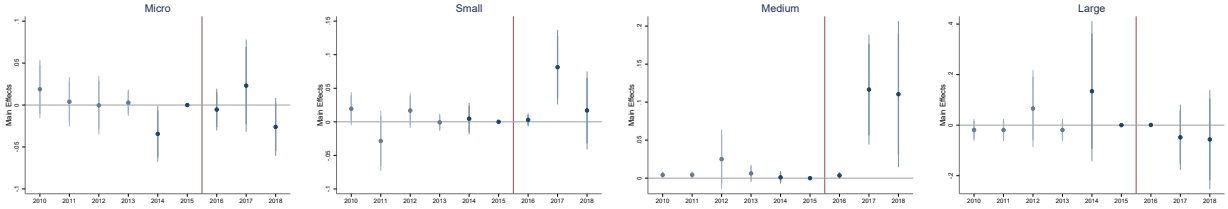
(b) Retail



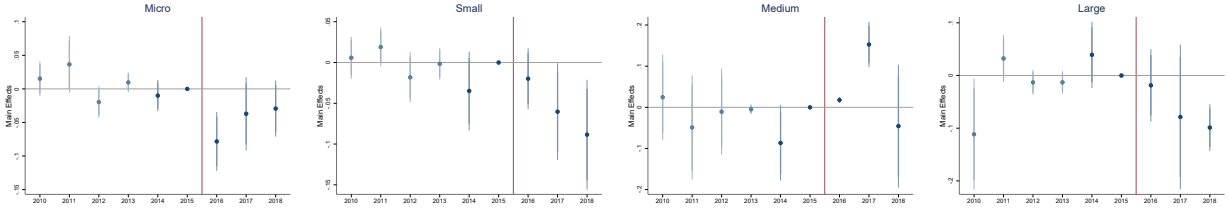
(c) Services



(d) Construction



(e) Transport



(f) Agriculture

Figure B6: Effects on Exit, by industry-size

Notes: Each plot shows the effects of the truce on the probability of exit the market. Each row shows a different industry, and each column a different firm size. Confidence intervals at the 95% level.