Border Fences and the Mexican Drug War *

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Abstract

Border security is rapidly expanding globally as states build fences and walls to deter migration and smuggling. How do these barriers affect the behavior of the criminal organizations that engage in illegal cross-border activities? I provide evidence from the US-Mexico border, where 649 miles of fencing were built between 2007 and 2011. I use novel fine-grained data on violence from death certificates, engineering maps of the border fence, and a difference in differences research design to show that construction of the fence did not change violence in Mexican localities near the border fence, but caused at least 2,000 additional deaths in localities that provided access to alternate smuggling routes into the US. I hypothesize that by creating a shock to the value of territory near the border controlled by drug cartels, construction of the border fence undermined tacit agreements about territorial control that previously reduced violent conflict. This caused competition between cartels over territory providing access to newly more valuable alternate smuggling routes. This highlights the conditions under which non-state actors violently compete to control territory and provides stark evidence of the international effects of domestic policies.

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"We're going to build a wall and it's going to be a great wall. And Mexico is going to pay for the wall; we're going to stop those drugs from pouring in and poisoning our youth."

—Donald Trump

1 Introduction

Border walls and fences are being constructed around the world at an accelerating pace, as states seek to protect against security threats, real or imagined, and deter migration and smuggling (Rosière and Jones, 2012; Hassner and Wittenberg, 2015; Vallet, 2016; Carter and Poast, 2017). Of the 51 international boundaries along which walls or fences were built since 1945, half of these border fortifications were constructed since 2000 (Hassner and Wittenberg, 2015). The image of thousands of people tearing down the Berlin Wall with hammers and chisels is one of the most iconic images of end of the Cold War. In contrast, some of the starkest images of the early twenty-first century include massive walls along the United States' southern border, Israel's security barrier in the West Bank, and barbed wire to prevent refugee flows across Europe. In the United States alone, the administration's most recent budget request asks for $23 billion for enhanced border security, $18 billion of which would go toward construction of a wall along the US-Mexico border.[1] Despite the accelerating pace of border wall construction and proposals for more and larger walls, relatively little is known about the consequences of these barriers.

In this paper, I study how border fortifications affect the incentives and behavior of criminal organizations. While a few recent border security projects have been motivated by security concerns (Vallet, 2016), a primary aim of most border fortifications is to prevent smuggling (Sorrensen, 2014). A growing literature examines why states build border walls (Rosière and Jones, 2012; Jones, 2012; Hassner and Wittenberg, 2015; Simmons, 2016; Simmons and Kenwick, 2018). However much less is understood about the repercussions of this security infrastructure. If effective, border walls and fences change the incentives of criminal organizations involved in the lucrative smuggling of migrants and drugs by making crossing the border more difficult (Hassner and Wittenberg, 2015). As smugglers are forced to adapt to changing border security, criminals will compete, potentially

[1] See https://www.reuters.com/article/us-usa-budget-mulvaney/trump-budget-asks-more-than-200-billion-for-infrastructure- border-security-budget-director-idUSKBN1FW03N.

violently, for control over increasingly scarce smuggling routes.

I examine this question in the case of the US-Mexico border, where the US government built 649 miles of fencing between 2007 and 2011 (Borkowski, Fisher and Kostelnik, 2011). As the fence was being built, the drug war in Mexico escalated, reaching a peak of over 25,000 homicides in 2011 as drug cartels fought to control territory (Beittel, 2015). Territorial control is valuable to cartels by providing locations to grow, process, and store drugs, remain safe from the government, and smuggle drugs into and out of Mexico. The border region is especially valuable for its smuggling routes into the US. Border security, including walls and fences, changes the cost of smuggling from nearby territory. However, criminal organizations adapt to changing incentives (Olson, 1993). Intended to deter migrants and smugglers, border walls and fences have the potential to cause cartels to fight over territory. There is evidence that non-state actors compete to control valuable territory in a variety of other contexts (see, e.g., Klein, 1997; de la Sierra, 2014). The construction of the fence on the US-Mexico border provides an opportunity to investigate whether criminal organizations also fight to control territory when the expected future value increases.

I hypothesize that the construction of the border fence caused tacit agreements between drug cartels about territorial control to break down by changing the value of border territory for smuggling. I expect fighting over territory not where the new border fence constructed, but in areas that provide access to alternate smuggling routes—territory where the fence was not built. Once the border fence is completed and cartels understand how it impacts smuggling, cartels will be able to reach new agreements about territorial control and violence will fall.

To test this theory, I use novel fine-grained data on violence from death certificates, engineering maps of the border fence and a difference in differences research design. I show that construction of the fence caused at least 2,000 additional deaths in the border region. The entire effect of border fence construction is due to escalation of violence in areas where smuggling routes were not blocked by the new border fence—territories that became relatively more valuable for smuggling.

This contributes to our understanding of the conditions under which non-state actors violently compete to control territory. It also provides evidence of the potential for serious unintended consequences of border security policy (Sviatschi, 2017, 2018). Current proposals to build a new wall on the US-Mexico border make understanding all potential effects of border security vital.

The paper proceeds as follows. The next section provides more information on the context of

the US-Mexico border and the drug war in Mexico. Section 3 develops a theory of fighting for territorial control by drug cartels and contrasts it with other explanations for the Mexican drug war. Section 4 explains the data and section 5 outlines the empirical strategy used to find the effect of the border wall construction on drug cartel violence. Section 6 overviews the results and, finally, section 7 concludes.

2 Context

The fortification of the US-Mexico border has a recent history. While the oldest section of the wall was built in San Diego in 1962, by 1990 only 4.3 miles of the current wall had been built. Border security construction had been haphazard and plans were often proposed and never implemented. That changed after the passage of the Secure Fence Act of 2006, which led to the largest expansion of border security infrastructure in US history, requiring the US Department of Homeland Security (DHS) to construct double layered fencing along 850 miles of the US-Mexico border in five specific areas. At the time the primary motivation was to reduce illegal immigration from Mexico, but but President Bush presented reduce drug smuggling as a secondary goal of the border fence (Bush, 2006). By the time funding was appropriated a year later the initial requirement of double layer fencing had been dropped, the mandated length was reduced to 700 miles, and the Secretary of Homeland Security was given authority to use his discretion as to the type and location of fencing. Initial plans for the fence were quickly stymied by environmental lawsuits, numerous landowners on the border refusing to sell their land, and multiple tracts of land for which the owner could not be determined. In spite of these initial difficulties, the Secure Fence Act resulted in the construction 649 miles of border fence between 2007 and 2011 (Borkowski, Fisher and Kostelnik, 2011).

Shortly after construction of the border fence began, in late 2007, the intensity of the Mexican drug war began to increase dramatically, reaching a peak of over $25,000$ homicides in 2011 (see figure 1). The escalation of the drug war had numerous causes. Most research has focused on analyzing political (Snyder and Duran-Martinez, 2009; Rios Contreras, 2013; Zachary and Spaniel, 2015; Dell, 2015; Trejo and Ley, 2018) or law enforcement causes of violence within Mexico (Calderón et al., 2015; Dell, 2015; Phillips, 2015; Osorio, 2015). In spite of the consensus that Mexican politics and law enforcement played a role in the explosion of drug violence in this period, there is room for

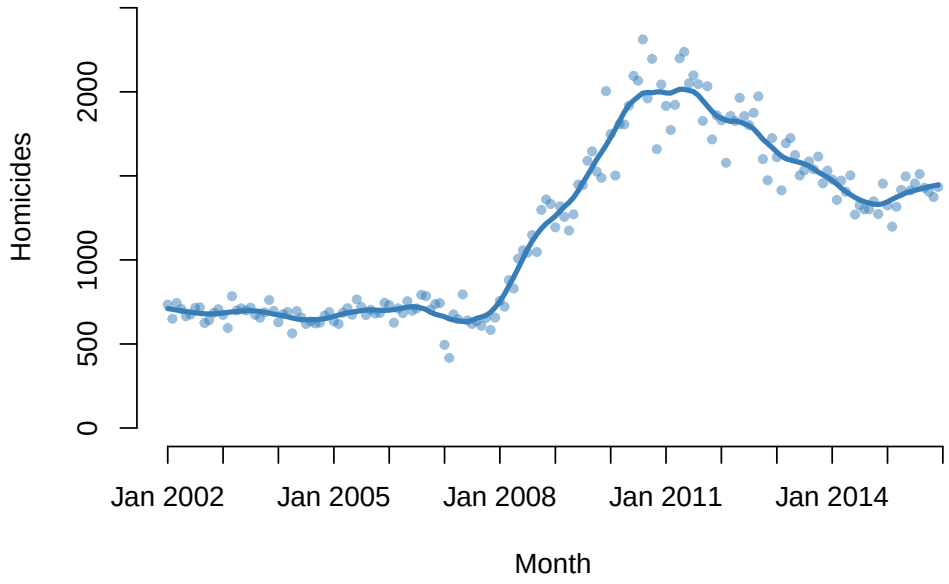

Figure 1: Violence in Mexico over time.

additional explanation. The spike in violence after 2007 is especially pronounced in areas of Mexico near the US border (see figure 2), lending plausibility to the idea that competition over smuggling routes could be part of the reason for the violence.

Beyond purely domestic explanations for violence in Mexico, some authors have pointed to the potential for policy changes across the border to cause violence in Mexico. For example, Dube, Dube and García-Ponce (2013) show that in an earlier period increased ease of smuggling weapons from the US caused violence in Mexico and (Castillo, Mejía and Restrepo, 2014) shows that law enforcement against traffickers in Colombia caused violence in Mexico. Did the construction of the border fence similarly cause cartel violence in Mexico from across the border?

Qualitative evidence supports the idea that construction of the border fence changed the behavior of drug cartels by making it more difficult to smuggle drugs across the border. A large segment of the border fence was built on the border in El Paso, Texas. Once the fence was built in El Paso, traffickers in neighboring Juarez had more difficulty smuggling drugs across the border. Juarez municipal president Armando Cabada told Reuters that when the fence was built "the narco traffickers had to battle much harder to cross their drugs into the United States."[2]

[2]See https://www.reuters.com/article/us-usa-trump-mexico/behind-fence-mexicos-notorious-juarez-is-wary-of-trumps-wall-idUSKBN14O14N

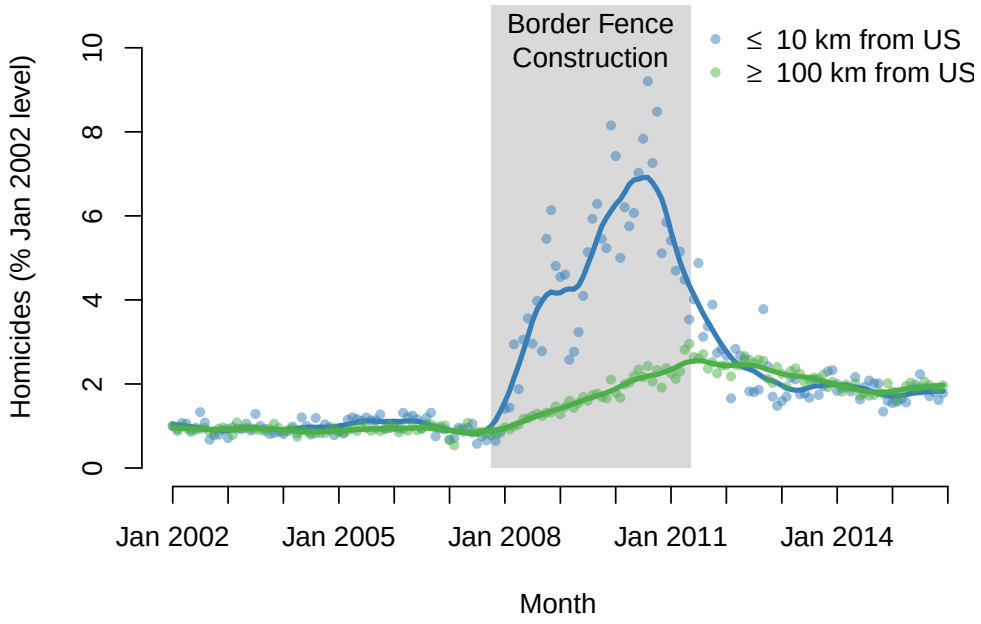

Figure 2: Violence in Mexico near and far from the US border.

Substantial evidence exists that drug cartels in Mexico respond to increased difficulties smuggling by switching to alternate routes and that this causes violence. For example, Dell (2015) shows that law enforcement within Mexico caused violence to shift to areas with alternate trafficking routes.[3] Juarez's public prosecutor, Jorge Arnaldo Nava López, blames the El Paso fencing for contributing to a sharp uptick in crime, which has been particularly acute where the barrier ends near Guadalupe municipality. "It has fostered a displacement towards the villages on the outskirts of Ciudad Juarez," says Nava.[4]

3 Theory

How does increased border security affect violent competition between drug traffickers? I argue that the construction of the border fence changed the value of territory in the border region by increasing the difficulty of crossing the border from areas in Mexico near the new border fence. This incentivized cartels to fight as they sought to control territory with access to alternative smuggling routes. However, the construction of the border fence is a temporary shock and these violent

[3]Similarly, Kronick (2018) argues that a law enforcement crackdown on drug traffickers in Colombia caused a shift to alternate routes through Venezuela.

[4]See http://www.reuters.com/article/us-usa-trump-mexico-idUSKBN14O14N

confrontations will decline once the the fence is completed and cartels have learned how it affects the value of controlling smuggling routes as well as the strength of rival cartels.

Popular opinion often views border walls either as impenetrable barriers or as having no effect and a large literature has emphasized the ease by which immigrants, refugees, smugglers, insurgents, terrorists can cross borders (e.g., Greenhill, 2002; Cornelius and Salehyan, 2007; Salehyan, 2008*a*,*b*). Walls and fences may not completely deter determined smugglers from crossing the border, but by making it more difficult to cross, they will cause traffickers to consider alternate routes that circumvent barriers (Hassner and Wittenberg, 2015). Border security does nothing to reduce demand for drugs from within the US, so profit motivated traffickers have strong incentives to find ways to continue to move drugs across the border. This is clear from the periodic discovery tunnels and drones used to smuggle drugs into the US This logic is not limited to such newsworthy smuggling routes; border fences also incentivize traffickers to smuggle drugs through official ports of entry. Rather than being merely symbolic or completely eliminating smuggling, border fortifications increase the cost of smuggling along routes where they are built and traffickers adapt by seeking easier smuggling routes. Consistent with this, recent work shows that border fortifications displaced migration and smuggling to alternate routes (Getmansky, Grossman and Wright, 2018; Braithwaite and Ghosn, 2018).

An important theoretical literature expects powerful individuals or organizations to seek to control territory when expectations of future revenue from that territory are high (Olson, 1993; Skaperdas, 2002; Acemoglu and Robinson, 2005; Konrad and Skaperdas, 2012). Recent work provides evidence that attempts to control territory by states (Caselli, Morelli and Rohner, 2015) and insurgent groups (de la Sierra, 2014) are driven by changes in the economic value of territory. Territory in Mexico along the border with the US is valuable to drug cartels because it provides access to cross-border smuggling routes. Construction of the border fence causes a negative shock to the value of territory near the new border fence by making smuggling more difficult in these areas. At the same time, the border fence increases the value of controlling other territories near the border that provide access to alternate smuggling routes.The increase in potential profits from controlling alternative smuggling routes can increase violence as drug cartels fight for control.[5] This is con-

[5]Changes in revenue to non-state actors has been shown to affect the production of violence in numerous other contexts (Berman et al., 2011; Dube and Vargas, 2013; Wright, 2016).

sistent with evidence that greater contested profits cause violence (Kronick, 2018).[6] The border wall may also lead to more criminal organizations competing over these territories, which is also understood to increase violence (Castillo, Mejía and Restrepo, 2014; Calderón et al., 2015).

Even in the absence of access to legal institutions, competing criminals often find ways to reduce violent conflict (Durán-Martínez, 2015, p. 1378). In Mexico, rival drug trafficking organizations coexisted for decades without resorting to large-scale violent confrontations (Osorio, 2015, p. 1404). This should not be surprising. Powerful profit motives encourage competing groups to resolve disputes nonviolently if possible (Fearon, 1995). Non-state actors reaching agreements about territorial control and fighting when those agreements break down has been documented in the context of organized crime (Klein, 1997; Gambetta, 1996, 7) and insurgent groups (Mampilly, 2011; Staniland, 2012). However, maintaining these tacit agreements between cartels about territorial control becomes more difficult when the value of smuggling routes accessible from the territory suddenly changes. The construction of the border fence acts as an economic shock and creates incentives to capture as much as possible from rival cartels (Castillo, Mejía and Restrepo, 2014).[7] This leads to the hypothesis that the border fence will increase violent competition between drug cartels—not in territory near the new fence—but in areas with access to alternative smuggling routes into the US.

Fighting between cartels for access to valuable smuggling routes is unlikely to persist indefinitely. The construction of the border fence is a transitory shock and cartels can achieve greater profits if they reach new agreements for control over territory. Two factors enable cartels to reach new agreements. First, once the fence is completed, cartels are able to understand how it affects smuggling across the border and the long-term value of territory near the border. Second, fighting reveals which cartels are stronger, enabling them to reach agreements that were previously impossible due to differing beliefs about the balance of power (Fearon, 1995; Reiter, 2003; Powell, 2006). For this reason, I hypothesize that, after increasing in areas providing access to valuable smuggling routes, violent conflict between cartels will fall once the border fence is completed.

[6]The effect of economic shocks on rebellion by groups seeking to capture the state and its revenue is conceptually similar. However, the large literature on whether economic shocks affect the onset of civil war has mixed results. Some authors find a higher chance of rebellion when the value that could be expropriated is higher (Collier and Hoeffler, 1998; Fearon, 2005; Besley and Persson, 2008, e.g.,). Others find that there is less rebellion when economics shocks increase the value that can be captured by rebelling (Miguel, Satyanath and Sergenti, 2004; Brückner and Ciccone, 2010; Nielsen et al., 2011; Bazzi and Blattman, 2014).

[7]This is similar to theories of collusion between firms, which can also break down due to market shocks. Firms, however, do not usually engage in violence in response.

4 Data on Drug War Violence and Construction of the Border Fence

To estimate the effect of the construction of the border fence on violence in Mexico, I combine geocoded data on the location of the border fence, both before and after the Secure Fence Act, with geographically fine-grained data on lethal violence. I overlay the map of the fence, released through a Freedom of Information Act (FIOA) lawsuit and coded from satellite imagery, with the locations of localities in Mexico to identify which territories in Mexico the border fence may have affected directly by increasing the difficulty of cross-border smuggling. In order to leverage the geographic detail of the maps of the border fence, I use death certificates to compile a locality-level count of lethal violence over a fourteen year period. The combined locality-month panel dataset contains over 200,000 localities between 2002 and 2014.

Maps of the location of the border fence produced by Michael Baker Jr., Inc, the engineering firm that planned and managed the construction of the fence, were obtained through a Freedom of Information Act (FIOA) lawsuit against the US Department of Homeland Security, US Customs and Border Protection, and the US Army Corps of Engineers and provided by the plaintiffs.[8] These maps show where the fence authorized by the Secure Fence Act was constructed, but do not indicate whether the fence replaced a prior border fence in the same location or if it was built in a location that never had a border fence. A newly constructed fence and a replaced existing fence are expected to affect smuggling routes and violence differently, so satellite imagery from 2006, the year before construction began, was used to code border fence that existed before the SFA. Figure 3 shows the path of the fence constructed along the California, Arizona, and New Mexico borders, as well as border fencing that was in place prior to the Secure Fence Act, and ports of entry into the US. Fencing constructed along the Texas border faced significant delays and only a small amount was actually constructed. Because of uncertainty about when different portions of the small border fence in Texas was constructed, I exclude areas of Mexico near Texas from the analysis.

To measure drug war violence I use data from death certificates for more than $200,000$ localities in Mexico. Previous studies of the Mexican drug war generally use data on violence at the municipality-level. However, only 39 municipalities are adjacent to the US border and, because

[8] Gilman v. US Department of Homeland Security, No. 1:09-CV-00468 (D.D.C.)

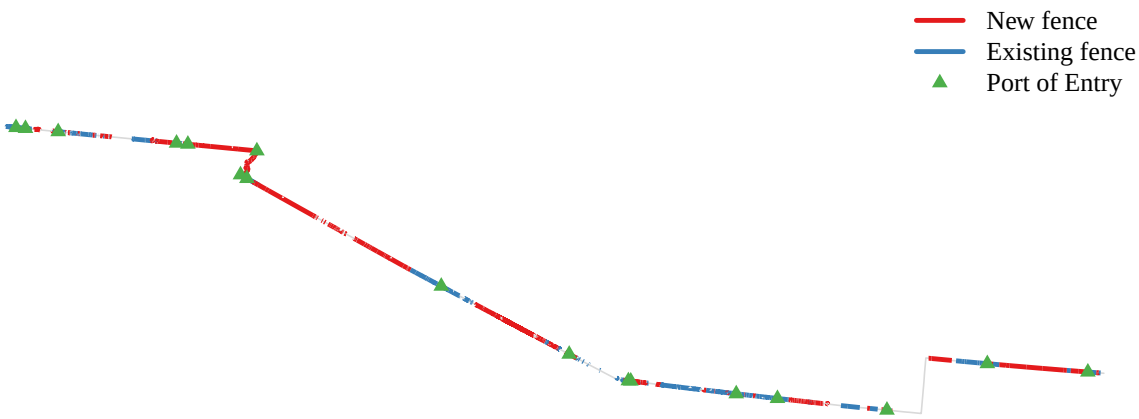

Figure 3: Fencing along the Mexican border in California, Arizona, and New Mexico both before the Secure Fence Act and locations of fence construction between 2007 and 2011.

of the large size of Mexican municipalities, the construction of the border fence may have different impacts on different parts of the same municipality. The National Institute of Statistics and Geography has made available mortality microdata from death certificates issued by the Ministry of Health. This shows homicides in Mexico by locality—cities, towns, or villages—the smallest territorial unit in Mexico. Homicides related to drug trafficking organizations are not distinguished from other homicides, but drug related violence accounted for the vast majority of homicides in Mexico during this period.

Locality characteristics are compiled from a variety of sources. Locality-level population figures are from the 2005 census. Data on the local presence of drug cartels are from Coscia and Rios (2012), who machine code mentions of drug cartel activity from newspapers. Dell (2015) provided data on municipal elections. Data on law enforcement operations were automatically coded from Mexican newspapers by Osorio (2015) and data on beheading of drug cartels is from (Calderón et al., 2015).

Table 1 compares the pre-treatment characteristics of localities within 10km of the US border where the border fence was built and where it was not built. The most notable difference is that the fence was more likely to be built near localities with lower populations.

Table 1: Summary Statistics Near US Border

Statistic	N	Mean	St. Dev.	Min	Max
New Fence					
Population 2005	150,696	108.450	1,071.428	0	22,007
Mean educational attainment 2005	150,696	8.847	0.651	6.440	9.230
Literacy rate 2005	150,696	98.665	0.577	97.000	99.600
Human development index 2005	150,696	0.811	0.008	0.783	0.820
Running water 2005	150,696	0.936	0.059	0.772	0.979
Sewer 2005	150,696	0.880	0.027	0.778	0.972
Electricity 2005	150,696	0.967	0.021	0.913	0.986
Urban	150,696	0.008	0.088	0	1
Criminal charges per 1000 pop. 2005	150,696	7.638	2.650	1.831	20.216
Gun charges percent 2005	150,696	13.482	4.364	2.890	30.556
Drug charges percent 2005	150,696	14.192	5.707	4.818	35.857
Number of cartels 2005	150,696	1.847	0.692	0	3
PAN mayor 2005	150,696	0.061	0.240	0	1
PRI mayor 2005	150,696	0.939	0.240	0	1
PRD mayor 2005	150,696	0.000	0.000	0	0
No New Fence					
Population 2005	192,192	2,142.095	43,242.800	0	1,286,187
Mean educational attainment 2005	192,192	8.241	0.557	6.290	9.230
Literacy rate 2005	192,192	98.268	0.840	97.000	99.600
Human development index 2005	192,192	0.805	0.008	0.783	0.820
Running water 2005	192,192	0.901	0.079	0.772	0.979
Sewer 2005	192,192	0.901	0.048	0.782	0.972
Electricity 2005	192,192	0.942	0.023	0.911	0.986
Urban	192,192	0.010	0.098	0	1
Criminal charges per 1000 pop. 2005	192,192	7.983	3.819	0.731	20.216
Gun charges percent 2005	192,192	11.578	6.667	0.000	30.556
Drug charges percent 2005	192,192	16.848	9.695	4.818	35.857
Number of cartels 2005	192,192	1.568	1.096	0	3
PAN mayor 2005	192,192	0.343	0.475	0	1
PRI mayor 2005	192,192	0.657	0.475	0	1
PRD mayor 2005	192,192	0.005	0.072	0	1

5 Empirical Strategy

In order to assess the effect of the construction of the border fence on violence in the Mexican drug war, I use a difference in differences design to compare changes in violence in localities affected by construction of the border fence to changes in violence in localities not directly affected by construction of the border fence. In order to consider both the direct effect of the border wall on violence in areas where it is built and the indirect effect on violence in areas near alternate smuggling routes, I include two treatment groups: localities near the border fence and localities near the parts of the border where the SFA fence was not built. To distinguish the immediate effects while border security was in flux from the longer-term effects after the border fence was finalized, I include two treatment periods, the period of border fence construction and the period after the fence was completed.

The main specification is

$$\begin{aligned} \text{homicides}_{i,t} =& \alpha(\text{Fence}_i \times \text{Construction}_t) + \beta(\text{Fence}_i \times \text{Post}_t) \\ &+ \gamma(\text{Alternate}_i \times \text{Construction}_t) + \delta(\text{Alternate}_i \times \text{Post}_t) \\ &+ \zeta_i + \eta_t + \psi X_{i,t} + \epsilon_{i,t} \end{aligned} \tag{1}$$

where $\text{homicides}_{i,t}$ is the number of homicides in locality i at time t, Fence_i is a treatment indicator indicating the locality is near a newly constructed border fence, Alternate_i is a treatment indictor indicating that the locality is near the US border but not near a newly constructed border fence, Construction_t indicates the period during fence construction, Post_t indicates the period after construction was complete, ζ_i and η_t represent locality and month fixed effects, and $\psi X_{i,t}$ indicate time-varying covariates, which are not included in all specifications. The locality fixed effects will remove time-invariant characteristics correlated with homicide rates and treatment status. Time fixed effects remove trends in violence common to all localities. I use a conditional fixed effects Poisson model because the count of homicides in a locality month is clustered at low values and left censored.[9] As suggested by Cameron and Trivedi (2009), I cluster standard errors at the locality level to account for possible violations of the assumption that the conditional mean is equal to the

[9] A fixed effects Negative Binomial model is an alternative that explicitly allows for over-dispersion, but its consistency is more sensitive to the assumption of the distribution of the error term.

variance.

The unit of analysis is the locality-month from the beginning of 2002 to the end of 2015. A geographically fine-grained unit of analysis is important because the border fence is made up of many, often small, unconnected segments, so larger geographic units are partially treated. Municipalities, the administrative unit above localities, have areas along their borders with the US where there is newly constructed border fence, no border fence, and previously existing fence. September 30, 2007 to May 10, 2011 is the construction period. September 30, 2007 is the first date the Government Accounting Office lists any construction progress on the border fence.[10] May 10, 2011 is the day Barack Obama announced the completion of the border fence (Obama, 2011). The post-construction period begins May 11, 2011.

The treatment indicators Fence_i and Alternate_i indicate whether or not a shortest-path smuggling route from a locality near the border into the US is blocked by a newly constructed border fence. A locality near the US border is coded as directly affected by the border fence if a straight line from the locality reaching 5 km into the US passes through a border fence. Actual smuggling routes are unobservable and unlikely to consist of straight lines, but I choose this measure of proximity to the border fence conservatively in order to minimize assumptions underlying the results. For localities near the US border, blocking the most direct route into the US with a fence will increase the travel distance and therefore the costs of smuggling from that locality. Due to the high density of localities, alternative smuggling routes would involve travel through other localities where the best path into the US is not blocked by a border fence. [11] The nearest point 5km within the US is chosen because the border fence is sometimes over a kilometer into the US.

The set of localities potentially affected by construction of the border fence is conservatively restricted to localities within 10 km of the border with California, Arizona, and New Mexico. Localities very close to the US border are likely to be the most valuable for smuggling, as smugglers must cross these areas to reach the US It is less clear how small changes in the border fence might affect smuggling from localities farther from the US Localities near the Texas border are not considered for three reasons. First, less than 15 km of the SFA fence was constructed along the Texas border

[10] See http://www.gao.gov/new.items/d09244r.pdf

[11] An alternative used by Dell (2015) is to calculate optimal smuggling routes on road networks. This is not possible in this context because the type of drug smuggling potentially blocked by a border wall is not along roads, which cross the border only at official ports of entry.

because the Rio Grande provides a natural barrier. These localities are a poor comparison group because DHS's strategic decision not to build a border fence in these areas indicates differences that might affect trends. With the exception of Juarez, areas of Mexico bordering Texas are much more rural and poorer than areas in Mexico bordering California, Arizona, and New Mexico. Second, the border fence that was built in Texas was delayed by cost overruns and lawsuits. All of the border fence built in California, Arizona, and New Mexico was built between September 30, 2007 and May 10, 2011, but fence construction in some parts of Texas did not start until 2013. It is unclear from the data DHS has released exactly when different border fences in Texas were built, which is necessary to code the construction and post-construction period indicators. Third, because of the huge distance, the Texas border would be an unlikely location to displace smuggling routes from localities near California, Arizona, and New Mexico. Nearer areas where no new border fence was built are likely to be better alternative smuggling routes.

I hypothesize that the border fence will affect violence near where it is built, as well as violence in border areas where no fence is built because these regions provide alternative, more valuable smuggling routes for drug traffickers. Analyses comparing changes between localities near the US border only result in estimates of partial equilibrium effects, unable to distinguish whether the construction of the border fence had an overall effect on violence in Mexico (see Appendix A). This is because of the potential for violence to simply be displaced from territory where the border fence was built to localities with access to alternate routes, which could be accompanied by overall increases in violence, decreases in violence, or no change. Therefore, it is necessary to have a control group that is not near the US border and unlikely to be directly affected by the construction of the border fence.[12] In the following section I compare results using several different control groups. All control groups consist of localities at least 100 km from the US border in order to minimize spillover effects from the treatment groups to nearby control groups.

6 Results

The theory presented in section 3 implies that the shock to the value of territory controlled by drug cartels due to the construction of the border fence will cause competition between drug cartels for

[12]The approach I use here—using geographically distant locations as a control group in order to distinguish both local and displacement effects—was first developed by Donohue, Ho and Leahy (2013).

territorial control. This leads to the hypothesis that construction of the border fence will cause an increase in violence in localities near the US border where the the fence is *not* built because these areas provide access to alternate cross-border smuggling routes that become more valuable when the fence is built. These effects are expected during the period when the border fence is under construction, when there is still uncertainty about how the fence will impact the cost of smuggling. Once construction is complete, cartels will understand how the increased border security affects the ease of smuggling along different routes and agreements over territorial control between cartels will be able to reduce fighting. Therefore, I also hypothesize that once construction of the border fence is complete violence will decline.

Figure 4 shows the average increase in death rates for localities near the SFA fence, localities near the border that may provide access to alternate smuggling routes, and localities far from the US border. Prior to the construction of the SFA border fence trends in lethal violence appear largely parallel and flat. Immediately after construction of the border fence commences in Fall 2007, the trends diverge. Homicide levels remain flat in localities near the new border fence, but there is a pronounced increase in deaths in localities near the US border that are not near the SFA fence—locations that provide access to alternate smuggling routes. However, after the fence is completed, in 2011, violence in localities with access to alternate smuggling routes fall nearly to pre-fence levels. After the fence construction began, violence increases in the rest of Mexico that, but not as dramatically as the initial increase in localities near alternate smuggling routes.

The graphical results shown in figure 4 are suggestive evidence that the border fence may have impacted violence near the border. To test the hypothesis that construction of the border fence caused violence in localities providing access to alternate smuggling routes, where the fence was not built I estimate equation 1. Table 2 presents the results. These models include locality and month fixed effects to remove time-invariant differences in violence between localities and and trends in violence common to all localities, but do not include time-varying control variables.

The three columns differ in the control group of localities far from the border that are used to remove nationwide trends in violence. Column 1 uses a random sample of localities that are not near the US border as a control group. The geographically and temporally fine-grained data I have collected are vital to capture the distinction between violence in territory from which smuggling is made more difficult by the construction of the border fence and territory with access to alternate

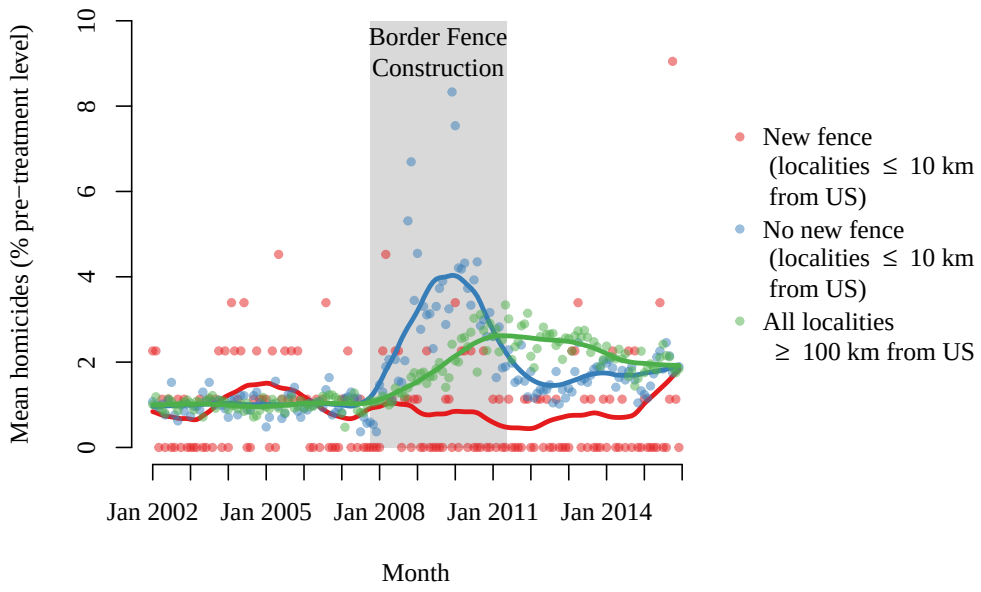

Figure 4: Homicides in localities near new border fence construction and localities near alternative routes without new border fence construction compared to homicides in localities far from the US border.

cross-border smuggling routes as well as distinguishing the effect of border security from effects of other events that occurred around the same time. However, estimating regression models with so much data is computationally challenging. Therefore, I use a random sample of one percent of the 248,196 localities that are at least 100 km from the US border.

The estimates shown in Column 1 of table 2, comparing localities near the border fence and near the border but not near the fence to localities at least 100 km from the US shows, that during the period of fence construction localities near the new border fence experienced an 0.8 log-point, or 55.1 percent, reduction in violence compared to localities not near the US border during the period of fence construction and a 1.039 log-point, or 64.6 percent, reduction in violence in the period after construction of the fence was completed. In contrast, localities located near alternate smuggling routes across the border, where the fence was not built, suffered from a 0.482 log-point, or 61.9 percent, increase in violence while the border fence was being built, but experienced a 0.311 log-point, or 26.7 percent, reduction in violence in the period after the border fence was completed. An average of 35.4 homicides per month occurred within 10 km of the US states of California, Arizona, and New Mexico in localities that are not near the new border fence, so a 61.9 percent increase represents an additional 963 homicides during the period that border fence was

being constructed.

Table 2: Effect of Construction of the Border Fence on Violence

	(1)	(2)	(3)
$\text{Fence}_i \times \text{Construction}_t$	-0.800^{***}	-0.385	-0.360
	(0.272)	(0.288)	(0.314)
$\text{Alternate}_i \times \text{Construction}_t$	0.482^{***}	0.897^{***}	0.922^{***}
	(0.156)	(0.182)	(0.221)
$\text{Fence}_i \times \text{Post Construction}_t$	-1.039^{***}	-0.816^{**}	-0.743^{**}
	(0.273)	(0.324)	(0.369)
$\text{Alternate}_i \times \text{Post Construction}_t$	-0.311^{***}	-0.088	-0.016
	(0.112)	(0.208)	(0.273)
Control group	Rest of Mexico	Southern border	Matched in rest of Mexico
Observations	6,082,104	643,440	685,776

Note: Standard errors clustered at the locality level.

These difference in differences estimates rely on the assumption that if the border fence had not been built, violence in the border region and violence in the control region would have had the same trends over time. The main concern in selecting a control group is that border localities and control localities may differ in ways related to the trends in violence over time. There is a potential concern that all localities in Mexico far from the border is not an ideal control group for localities near the border that may have been affected, directly or indirectly, by the construction of the border fence. Pre-treatment trends appear parallel, but it may be the that areas near the border are unique because of the value of the territory for cross-border smuggling and that this affects trends. This suggests localities near Mexico's southern border with Guatemala and Belize as a control group. Drugs are smuggled across this border by cartels, but no border fence was build along Mexico's southern border. Trends in violence comparing areas near the US border and Mexico's southern border are shown graphically in figure 5. Column (2) in table 3 shows that Mexican localities near alternate smuggling routes experienced an additional 0.897 log-point, or 145.2 percent, increase in violence compared to localities near Mexico's southern border. This represents an additional 51

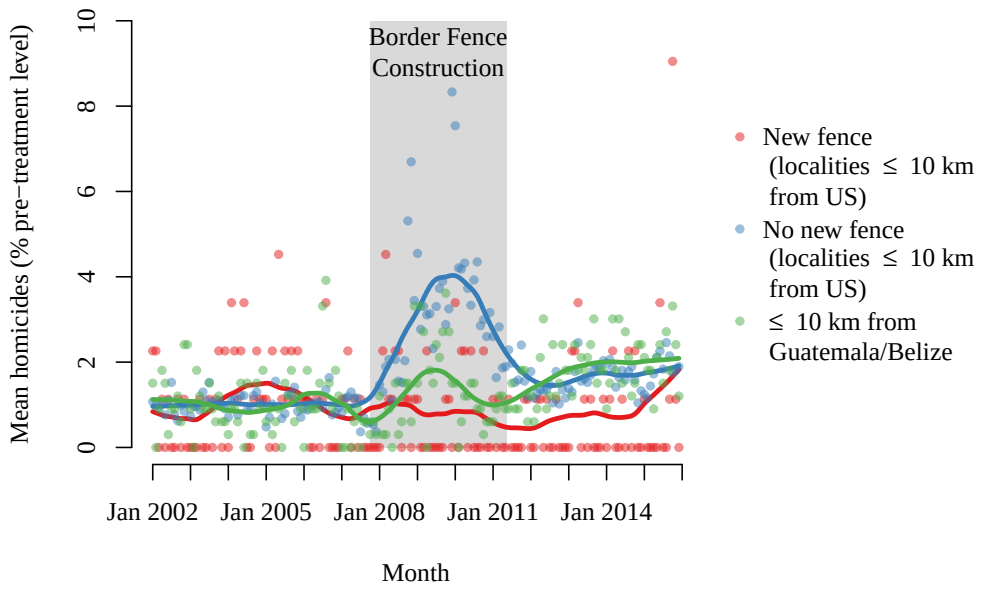

Figure 5: Homicides in localities near new border fence construction and localities near alternative routes without new border fence construction compared to homicides in localities near Mexico's southern border.

homicides per month in localities near alternate smuggling routes into the US or 2,262 additional homicides during the period that the border fence was being constructed. Additionally, localities near the border fence experienced a 0.816 log-point, or 55 percent decline in violence during the period after the border fence was completed. However, there is no evidence that localities near alternate smuggling routes have experience greater violence once the border fence is completed.

It may be that localities near the US border differ in ways that affect trends in homicides from localities that are not near the border. Localities near the US border differed prior to construction of the border fence from those far from the border in ways previous research has indicated may affect drug war violence. Localities near the border are on average richer, better educated, and differ in crime rates, drug cartel presence, and political parties elected. To alleviate the concern that the results may be driven by these differences, I construct a control group from localities at least 100 km from the U.S border matched on pre-treatment covariates. I use nearest neighbor propensity score matching without replacement to match on pre-treatment population, average education level, literacy rate, human development index, indices of access to running water, sewer, and electricity, urban or rural status, criminal charges, gun charges, drug charges, the presence of drug cartels before the fence was constructed, and the political party of the mayor. An seen in

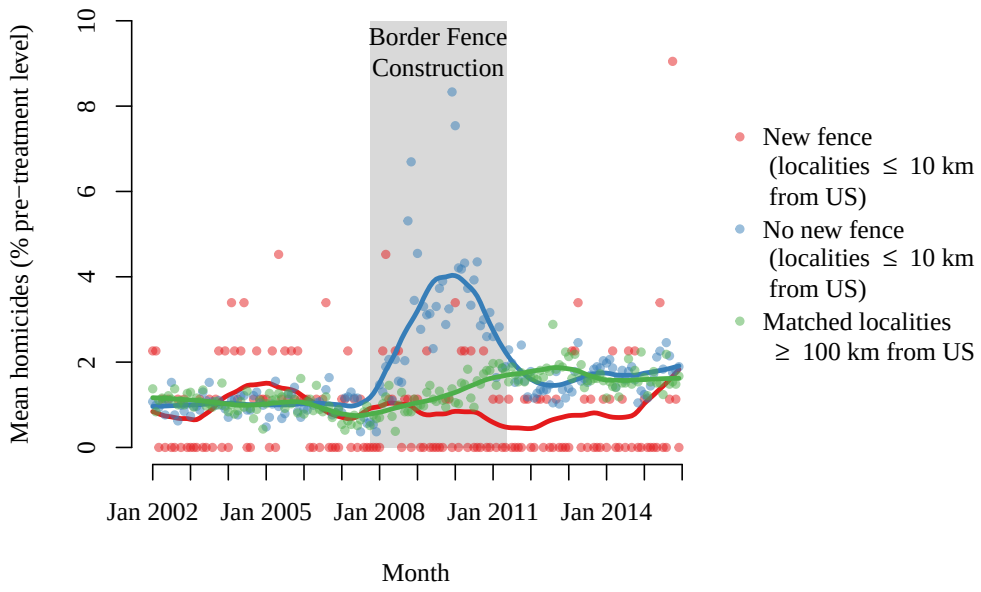

Figure 6: Homicides in localities near new border fence construction and localities near alternative routes without new border fence construction compared to homicides in localities matched on pre-treatment variables.

table 3, this substantially improves covariate balance. The trends are shown graphically in figure 6. Results are substantively similar to the previous estimates. Column (3) in table 2 shows that Mexican localities near alternate smuggling routes experienced an additional 0.922 log-point, or 151 percent, increase in violence compared to the matched localities. This represents an additional 54 homicides per month near the US border or $2,359$ additional homicides during the period that border fence was being constructed. Again, there is no evidence that localities near alternate smuggling routes have experience greater violence once the border fence is completed.

Was the construction of the border wall the cause of the spike in violence near alternate smuggling routes while it was being constructed? The overall increase in violence in Mexico during this period is often attributed to increased law enforcement targeting of drug cartels after the presidential election of Filipe Calderón in 2006 (Calderón et al., 2015; Dell, 2015; Phillips, 2015; Osorio, 2015). This crackdown began prior the start of construction on the border fence, but continued through the period of border fence construction. The differences in differences research design removes nationwide trends in violence, but if Mexican law enforcement targeted localities near alternate smuggling routes more intensely than other areas, law enforcement could be driving the results in table 2.

Table 3: Summary Statistics Near US Border

Statistic	N	Mean	St. Dev.	Min	Max
Localities within 10 km of US					
Population 2005	342,888	1,248.33	32,398.15	0	1,286,187
Mean educational attainment 2005	342,888	8.51	0.67	6.29	9.23
Literacy rate 2005	342,888	98.44	0.76	97.00	99.60
Human development index 2005	342,888	0.81	0.01	0.78	0.82
Running water 2005	342,888	0.92	0.07	0.77	0.98
Sewer 2005	342,888	0.89	0.04	0.78	0.97
Electricity 2005	342,888	0.95	0.03	0.91	0.99
Urban	342,888	0.01	0.09	0	1
Criminal charges per 1000 pop. 2005	342,888	7.83	3.36	0.73	20.22
Gun charges percent 2005	342,888	12.41	5.85	0.00	30.56
Drug charges percent 2005	342,888	15.68	8.29	4.82	35.86
Number of cartels 2005	342,888	1.69	0.95	0	3
PAN mayor 2005	342,888	0.22	0.41	0	1
PRI mayor 2005	342,888	0.78	0.41	0	1
PRD mayor 2005	342,888	0.003	0.05	0	1
Localities at least 100 km from US					
Population 2005	4,169,592	433.57	12,883.62	0	1,137,465
Mean educational attainment 2005	4,169,592	6.41	1.52	1.41	11.25
Literacy rate 2005	4,169,592	95.54	4.83	43	100
Human development index 2005	4,169,592	0.75	0.06	0.46	0.87
Running water 2005	4,169,592	0.78	0.20	0.01	1.00
Sewer 2005	4,169,592	0.69	0.24	0.00	0.99
Electricity 2005	4,169,592	0.91	0.12	0.29	1.00
Urban	4,169,592	0.02	0.12	0	1
Criminal charges per 1000 pop. 2005	4,169,592	1.88	1.46	0.00	11.16
Gun charges percent 2005	4,169,592	10.01	11.88	0.00	100.00
Drug charges percent 2005	4,169,592	6.53	10.73	0.00	100.00
Number of cartels 2005	4,169,592	0.35	0.79	0	4
PAN mayor 2005	4,169,592	0.30	0.46	0	1
PRI mayor 2005	4,169,592	0.47	0.50	0	1
PRD mayor 2005	4,169,592	0.22	0.42	0	1
Matched Localities at least 100 km from US					
Population 2005	342,888	1,583.99	41,624.18	0	1,687,549
Mean educational attainment 2005	342,888	8.51	1.16	5.52	9.90
Literacy rate 2005	342,888	98.64	0.51	96.80	100.00
Human development index 2005	342,888	0.82	0.02	0.76	0.84
Running water 2005	342,888	0.94	0.09	0.69	0.98
Sewer 2005	342,888	0.91	0.10	0.56	0.98
Electricity 2005	342,888	0.98	0.02	0.92	0.99
Urban	342,888	0.02	0.13	0	1
Criminal charges per 1000 pop. 2005	342,888	5.10	2.66	0.41	11.16
Gun charges percent 2005	342,888	8.42	18.51	0.00	100.00
Drug charges percent 2005	342,888	9.84	12.76	0.00	100.00
Number of cartels 2005	342,888	1.56	1.21	0	4
PAN mayor 2005	342,888	0.42	0.49	0	1
PRI mayor 2005	342,888	0.58	0.49	0	1
PRD mayor 2005	342,888	0.003	0.05	0	1

To examine this alternative explanation, I use data on Mexican law enforcement operations against drug cartels collected by Osorio (2015) using automated text analysis of Mexican newspapers (see Osorio and Reyes, 2017). This provides data on multiple measures of law enforcement activity against drug cartels. In table 4 I show estimates of equation 1 that include five time-varying measures of using law enforcement action against drug cartels in a municipality: state violence, drug seizures, assets seizures, gun seizures, and arrests. I use the same three controls groups as previously: localities in Mexico far from the border, localities along the southern border of Mexico, and localities matched on pre-treatment variables. The alternate explanation being examined is that law enforcement operations account for the results in table 2 during the period of fence construction, so it is not a concern that data on law enforcement is only available until the end of 2010, which does not include the post-treatment period. The estimates in table 4 are substantively similar to the previous results that did not control for law enforcement activity. This indicates that the increase in violence in localities providing access to alternate routes is not primarily driven by law enforcement in Mexico.

Several authors have shown that another form of law enforcement causes violence in Mexico: "beheading" drug cartels by capturing leaders (Calderón et al., 2015; Phillips, 2015). This may cause violent power struggles within the cartel. A focus on beheading drug cartels is also associated with the Calderó presidency, which partially overlaps with the time period when the border fence was under construction. It is possible that cartel leaders were more likely to be in areas with access to alternate smuggling routes and that when they are captured there by the government this causes the increased violence in these areas while the border fence was under construction. To see if a state policy to capture cartel leaders is driving the estimated effect, I include time-varying data on cartel beheadings in the municipality in table 5. These data were collected by Calderón et al. (2015) and measure the capture of cartel leaders and lieutenants. These controls do not substantially change the estimated effects of construction of the border fence on violence in alternate smuggling routes. This indicates that, like other forms of law enforcement, cartel beheadings are not driving the results.

Table 4: Effect of Construction of the Border Fence on Violence

	(1)	(2)	(3)
$\text{Fence}_i \times \text{Construction}_t$	-0.710^{**}	-0.924^{***}	-0.361
	(0.288)	(0.353)	(0.328)
$\text{Alternate}_i \times \text{Construction}_t$	0.493^{***}	0.397^{*}	0.770^{***}
	(0.146)	(0.216)	(0.201)
State violence	0.080^{***}	0.200^{***}	0.186^{***}
	(0.023)	(0.065)	(0.064)
Drug seizures	0.009^{*}	0.020^{***}	0.011^{*}
	(0.005)	(0.003)	(0.006)
Asset seizures	0.119^{***}	0.222^{***}	0.163^{**}
	(0.044)	(0.062)	(0.071)
Gun seizures	-0.008	-0.020	-0.013
	(0.021)	(0.026)	(0.016)
Arrests	0.004	0.005	0.005
	(0.007)	(0.008)	(0.005)
Control group	Rest of Mexico	Southern border	Matched in rest of Mexico
Observations	6,082,104	643,440	685,776

Note: Standard errors clustered at the locality level.

Table 5: Effect of Construction of the Border Fence on Violence

	(1)	(2)	(3)
$\text{Fence}_i \times \text{Construction}_t$	-0.837^{***}	-0.536^{*}	-0.391
	(0.290)	(0.321)	(0.329)
$\text{Alternate}_i \times \text{Construction}_t$	0.455^{***}	0.807^{***}	0.933^{***}
	(0.159)	(0.187)	(0.212)
Leader capture	1.782^{***}	2.658^{***}	2.589^{***}
	(0.615)	(0.877)	(0.726)
Lieutenant capture	1.164^{***}	1.617^{***}	1.429^{***}
	(0.410)	(0.513)	(0.430)
Control group	Rest of Mexico	Southern border	Matched in rest of Mexico
Observations	6,082,104	643,440	685,776

Note: Standard errors clustered at the locality level.

7 Conclusion

In this paper I have shown that governments' decisions about border security can have profound effects beyond their own borders. Specifically, I study how shocks to the value of territory for drug smuggling caused by the construction of a fence on the US-Mexico border affect violent competition for territorial control by drug cartels in Mexico.

I show that construction of the border fence caused fighting over territory—not near where the fence was built—but in areas that provide access to alternate cross-border smuggling routes. By making control of territory near alternate smuggling routes more valuable, construction of the border fence undermined tacit agreements about territorial control and caused fighting. The estimated effects are large and unrelated to differences in economic conditions, crime rates, the activities of drug cartels or electoral politics before the construction of the border fence. I can also rule out alternative explanations including arrests, seizures of drugs, guns, and assets, state violence, and captures of cartel leaders.

Estimates suggest that in localities within 10 km of the US border and near alternate smuggling

routes that avoid the new border fence, the number of homicides increased by 151 percent. This is an additional 2,359 homicides during the construction of the border fence compared to similar localities at least 100 km from the border. The construction of the border fence accounts for 48.9 percent of the additional homicides near the US border during this period.

These results speak to current proposals in the US to expand the fence along the border with Mexico, which largely do not consider its potential to intensify the drug war in Mexico. Since increases in border security does not directly affect demand for drugs in the US, drug cartels in Mexico continue to have incentives to control territory along the US-Mexico border in order to smuggle drugs into the US. Changes in border security will change the value of this territory to drug cartels, which can upset prior agreements about territorial control and cause fighting to control alternate smuggling routes.

By demonstrating that construction of the border fence caused drug cartel violence, I provide evidence that non-state actors fight to control territory and that the value of the territory affects their willingness to fight. The increase in violence persisted only while the fence was under construction—while the effects on smuggling revenues remained uncertain. This suggests that uncertainty prevented drug cartels from reaching agreements about territorial control earlier that would have prevented fighting between cartels.

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A Displacement Effects of Border Fence Construction

In this section I present results from difference in differences models testing whether construction of the border wall displaces violence to other areas near the US border. These results are embedded within the main specification, which compares both areas near the border fence and localities providing access to alternate cross-border smuggling routes to control localities that are not near the US border. This examines the hypothesis that construction of the border fence displaced violence from areas where the new fence increased the difficulty of smuggling and lowered the value of the territory to drug cartels to other areas near the border where border security was not increased. Areas not next to newly constructed border fence are alternative smuggling routes, so the relative value of these territories to drug smugglers will increase. Violence is expected to increase in localities providing access to these alternatives due to competition between drug cartels for control of these territories.

All localities near the border where a new fence is not constructed are alternatives to localities where smuggling is more costly due to border fence construction. These include areas where no fence is constructed, areas where a prior border fence existed, and ports of entry into the US The cost of using these smuggling routes has not changed, but alternatives are more costly after the SFA fence is built, so these areas become relatively more valuable to drug cartels.

Table A1 shows difference in differences estimates of equation 1 for localities within 10 km of the US. Column (1) shows that Mexican localities next to a newly constructed fence along the US border experienced an additional 1.282 log-point, or 72.3 percent, decrease in violence compared to localities where no new fence was built during the period of fence construction and a 0.727 log-point, or 51.6 percent, reduction in violence in the period after construction of the fence was completed.

The identifying assumption of the difference in differences estimator is that trends in homicides in in treated and untreated groups would be parallel in the absence of the treatment. The trends do appear parallel prior to construction of the SFA fence, but the locations chosen for new fence construction but the DHS strategic, which has an interest in reducing drug smuggling into the US Because of these strategic decisions as to the location of the border fence, it is possible that the fence was more likely to be built in areas where the exceptions of future violence were higher. It could also be that the presence of nearby construction crews affected violence. If that is the case, the counterfactual trends may not have been parallel, resulting in a biased estimate in model (1). A solution to this concern is to compare areas where the fence was newly constructed to areas where existing border fence was replaced. Both areas where strategically chosen by DHS as locations where a border fence should be built, but in areas where border fence was replaced, rather than newly constructed, the value of the territory to drug cartels has not decreased. In these localities the additional cost of smuggling across a border fence should have existed prior to the SFA fence. This provides a more stringent test of the hypothesis that violence will be displaced from areas where the border fence is constructed. Model (2) shows that localities near the US border affected by a newly constructed fence experienced an additional 2.312 log-point, or 90.1 percent, decrease in violence compared to localities where existing border fence was replaced during the construction period and a 1.960 log-point, or 85.9 percent, decrease in violence after the fence was constructed.

The border fence may increase the cost of smuggling drugs across parts of the border that

are not authorized crossings, but does not directly affect the ease of smuggling through official ports of entry into the US. Control of territory near these official border crossings is expected to become increasingly valuable when fence is constructed along more of the border, so violence is expected to be displaced from areas where the border fence is constructed to areas near US ports of entry. Localities are identified as near US ports of entry if they are within 10 km of an official port of entry. Model (3) shows that localities near the US border affected by a newly constructed fence experienced an additional 1.285 log-point, or 72.3 percent, decrease in violence compared to localities near US ports of entry and a 0.729 log-point, or 51.8 percent, decrease in violence after the fence was constructed.

Table A1: Displacement of Violence near US Border

	(1)	(2)	(3)
$T_i \times Construction_t$	-1.282^{***}	-2.312^{***}	-1.285^{***}
	(0.281)	(0.320)	(0.281)
$T_i \times Post_t$	-0.727^{***}	-1.960^{***}	-0.729^{***}
	(0.259)	(0.747)	(0.259)
Treatment group	New fence	New fence	New fence
Control group	No new fence	Replaced fence	Port of entry
Observations	342,888	165,984	266,280

Note: Standard errors clustered at the locality level.

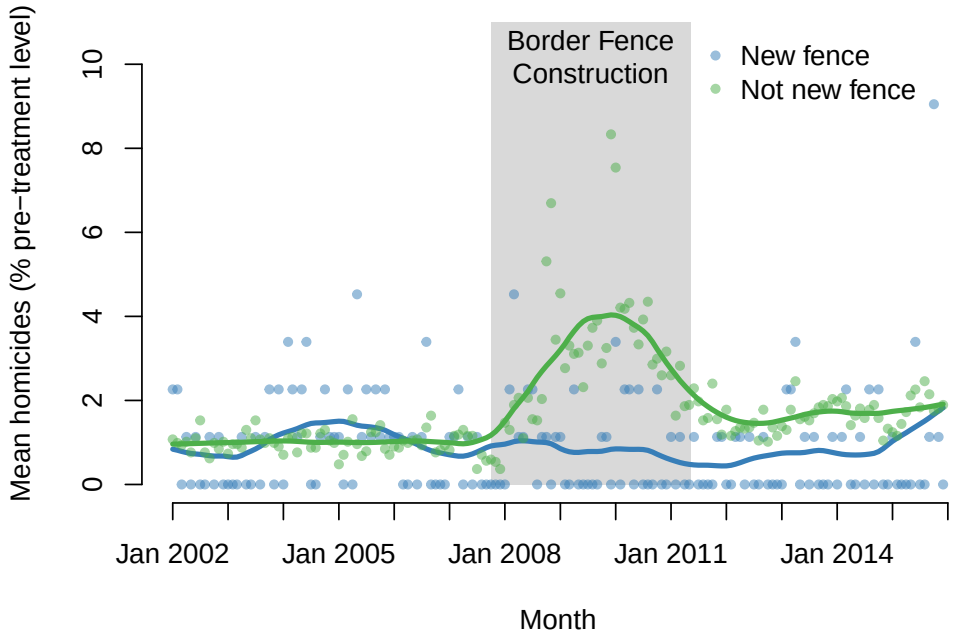

Figure 7: Homicides in localities with new border fence construction compared to homicides in all other localities.

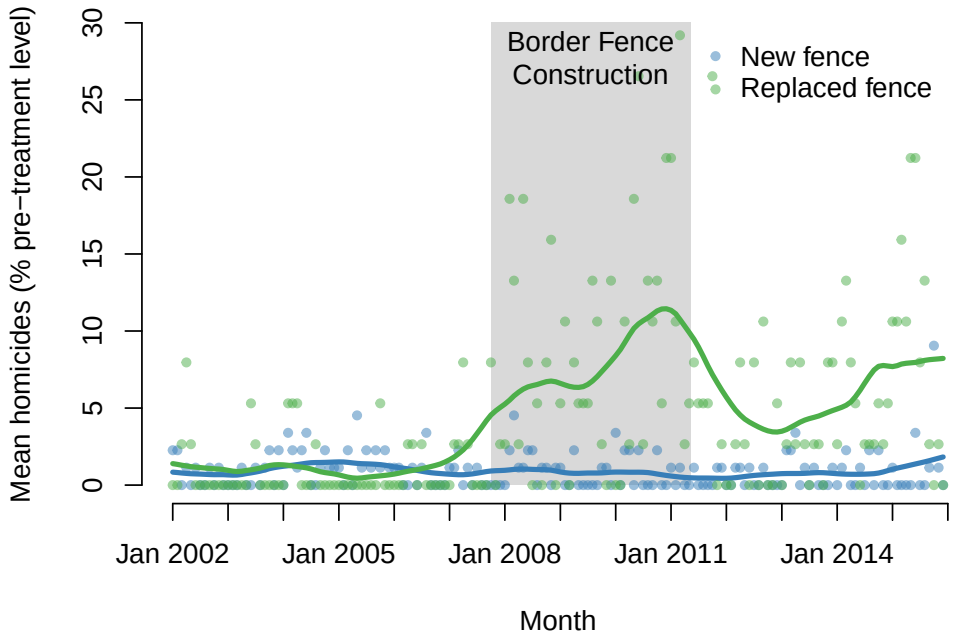

Figure 8: Homicides in localities with new border fence construction compared to homicides in localities with replacements of existing border fence.

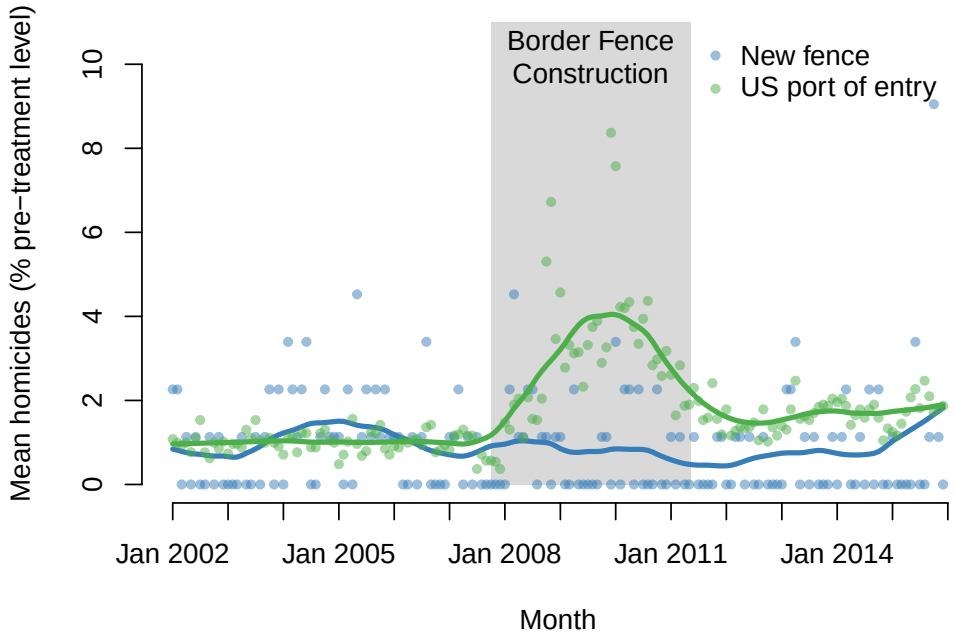

Figure 9: Homicides in localities with new border fence construction compared to homicides in localities near US ports of entry.

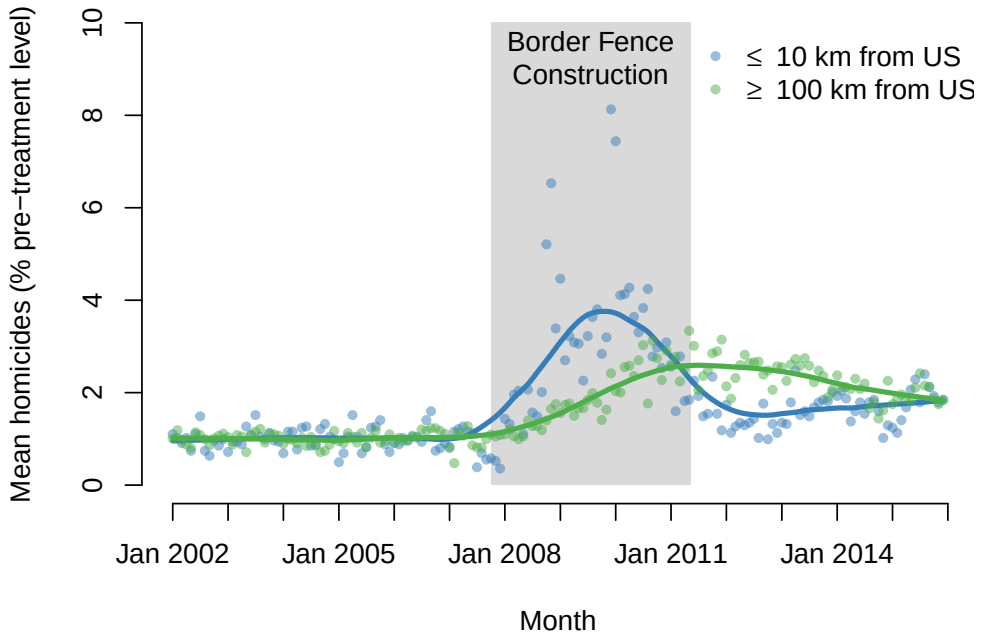

Figure 10: Homicides in localities near the border compared to homicides in a one percent sample of all localities not near the border.

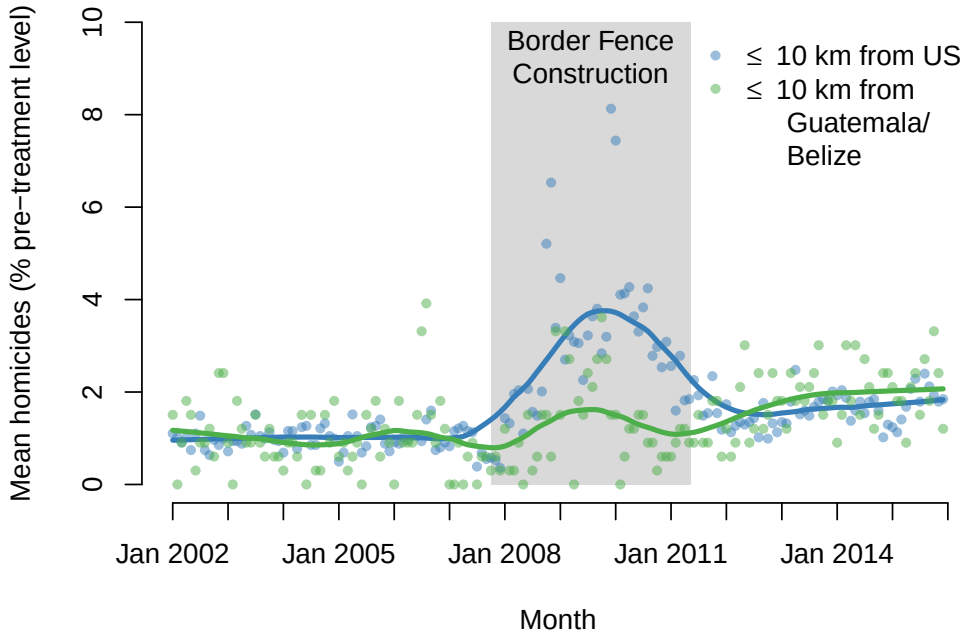

Figure 11: Homicides in localities near the border compared to homicides near the southern border with Guatemala and Belize.

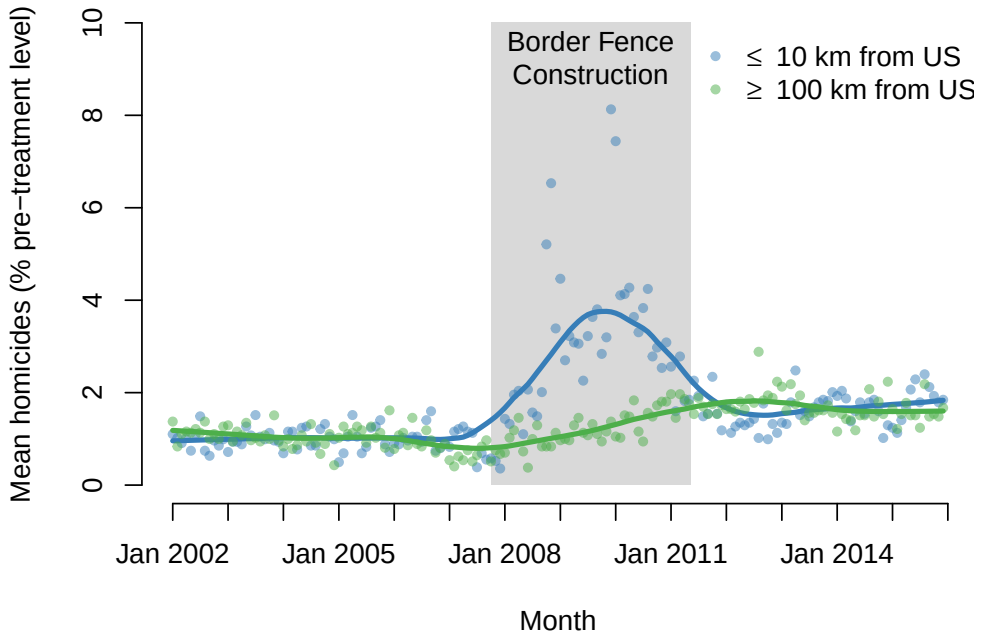

Figure 12: Homicides in localities near the border compared to homicides in a propensity score matched set of localities not near the border.