Anti-Open Grazing Laws: Evidence from Nigeria

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1 Introduction

Conflicts are impediments to development that are associated with loss of human lives and slowed economic progress. There can be different types of conflict. Conflict between herders and farmers is a particular type of conflict that have been growing in Africa. This phenomenon has been studied well (Moritz (2010), Babalola and Onapajo (2018)). These conflicts occur when the symbiotic relationship between the two groups weakens.[1] There are different factors like population growth, urbanization, climate change that contribute to the growing herder-farmer conflict that are seen in Sub-Saharan Africa. Policy makers are trying different approaches to reduce conflict and mitigate the harm of climate change. In Nigeria anti-open grazing laws are being used as a policy tool to reduce conflict. Out of the 36 states there 15 states adopted this law till October 22, 2021. Ekiti was the first state to adopt this law in 2016. One of the main goals of this law was to reduce conflicts which is the focus of this paper. In this paper I estimate the effect of Ekiti's anti-open grazing law on herder-farmer conflict and some other outcome variables in Ekiti and its neighboring states. That is I would like to find out if the law reduced conflict in Ekiti and its surrounding states and I want to know if there were any costs of adopting this law which is why I study the effect of the law on some outcome variables other than conflict. In that way I take a holistic approach to study the effect of the law.

To the best of my knowledge this study is the first one to estimate the effect of anti-open grazing law adopted by Ekiti state in Ekiti or its neighboring states. It is of interest to know how this law works. Another reason why this paper is a good contribution is that many problems arise because of changed weather patterns or climate change. Herder-farmer conflict is one such problem and anti-open grazing law

[1] A piece of land may be used by farmers to grow crops and used by herders to graze livestock animals where there are no crops in the field. If there are no problems in this process, then there are no herder-farmer conflicts because both the groups are benefited by this process - herders have permission to graze animals and in return the land becomes more fertile with organic fertilizer of the animals.

is a proposed solution to this problem. If the law proves to be effective in reducing conflict, then it can be adopted in other places that have such problems. So, we want to know what solutions work for climate change related problems. This paper is most related to McGuirk and Nunn (2020), which studies the effect of climate change on conflict between herders and farmers in Africa. They investigate whether aid projects and government representation of pastoral groups mitigate the effect of climate change on herder-farmer conflict. That is why my paper adds to the growing literature on the effect of climate change on conflict as well.

2 Background

2.1 Conceptual Framework

Herder-farmer conflicts are primarily related with right to use land. There are various reasons why land became increasingly scarce in Nigeria. It is a large country that saw rapid population growth in the twenty first century. It had a population of 122.3 million in 2000 that increased to 206.1 million in 2020.[2] The country is experiencing climate change - in the form of desertification and sea level rise for example. On top of that there has been a decrease in land usable for agriculture and livestock grazing due to urbanization. So, competition for land use rights increased.

Figure 1 depicts the framework that explains herder-farmer conflicts. There are generally two seasons - wet and dry season. The land is divided in three categories - less suitable for agriculture, more suitable for agriculture and land that is not used for agriculture. I name the land more suitable for agriculture as agricultural farmland. The general pattern of grazing is livestock graze on land less suitable for agriculture in the wet season[3] and on more suitable land for agriculture in the dry season after the crop harvest is done. But due to population growth and urbanization there is a growth in land not used for agriculture. So, demand for land available for agriculture, more or less suitable for agriculture, increases. And due to climate change the rainfall pattern changes which causes less rain and vegetation in the dry season on the lands that are less suitable for agriculture. It forces herders to graze animals in the farmlands before harvest in the dry season which makes the farmers angry who want to protect their crops. This is how different factors lead to conflict between herders and farmers.

[2]Source: World Bank.
[3]There is enough vegetation to graze for animals in the wet season on land that are less suitable for agriculture.

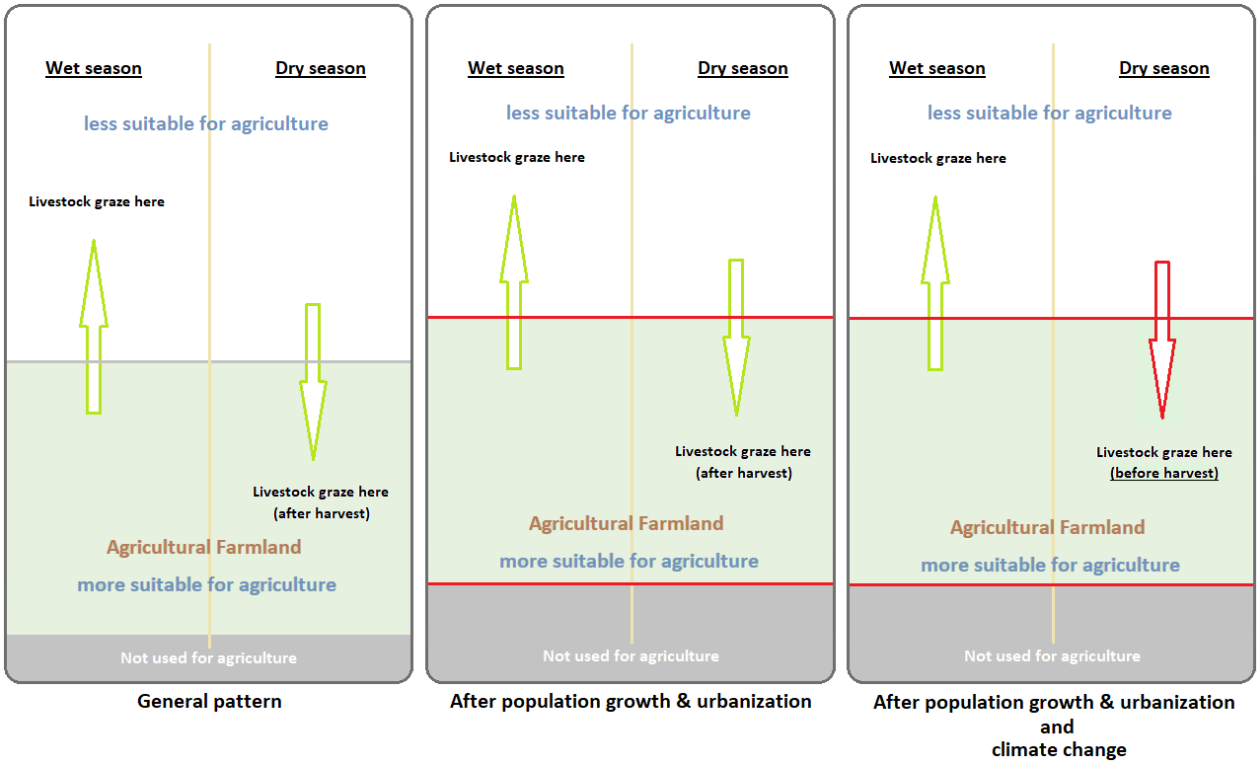


Figure 1: Transhumance pastoralism

2.2 Transhumance Pastoralism in Nigeria

In Nigeria many herders are nomadic who move from place to place in search of pasture and water following long established movement patterns. But as shown in figure 1 population pressure and climate change have changed their traditional pattern. This results in both the herders and farmers being in the same place at a time - meaning that herders are forced to graze their livestock where there are crops on the field. It leads to conflict and fatality. This way of the herders to raise livestock is not the only way to raise animals. Ranching is one alternative. But transhumance pastoralism for the herders is not just a way of living, it is their way of life as well. That's why it is hard to predict what the effect of anti-open grazing law would be on conflict since banning open grazing for the herders is like banning the way how they live.

2.3 Anti-Open Grazing Law

The timing of different states adopting anti-open grazing law are shown in the table 1 and figure 2. I got the dates of law adoption mainly in news and then I collected all these dates together. It can be seen that the

first few states adopted the law at different points in time.[4] Then many other states had this law in 2021.[5] Many of the states adopting the law late did so after there was call to have this law. That's why states that adopted the law earlier are different from states that adopted it later. So, it is interesting to know how the law works in the first state having this law, that is Ekiti state. Policy makers in Ekiti state did not know how this law would work unlike other late adopter states that could learn about the outcomes from early adopter states.

Table 1: Dates anti-open grazing laws were adopted

State	Adopted
Ekiti	Aug 29, 2016
Benue	May 22, 2017
Taraba	Jul 24, 2017
Abia	Jun 29, 2018
Oyo	Oct 24, 2019
Bayelsa	Mar 10, 2021
Osun	Aug 12, 2021
Rivers	Aug 19, 2021
Ondo	Aug 31, 2021
Enugu	Sep 14, 2021
Akwa Ibom	Sep 15, 2021
Lagos	Sep 20, 2021
Ogun	Sep 30, 2021
Delta	Sep 30, 2021
Anambra	Oct 22, 2021

Nigeria is situated to the south of the Sahara desert that explains why northern Nigeria is relatively more arid than southern Nigeria. Herder-farmer conflicts arise as a consequence of clash between the two groups. Farmers are less mobile compared to the herders and it is expected that the conflicts would occur where the farmers are, that is where lands are more suitable for agriculture or in other words southern Nigeria. That's why we see that many of the states in the southern part of Nigeria adopted anti-open grazing law.

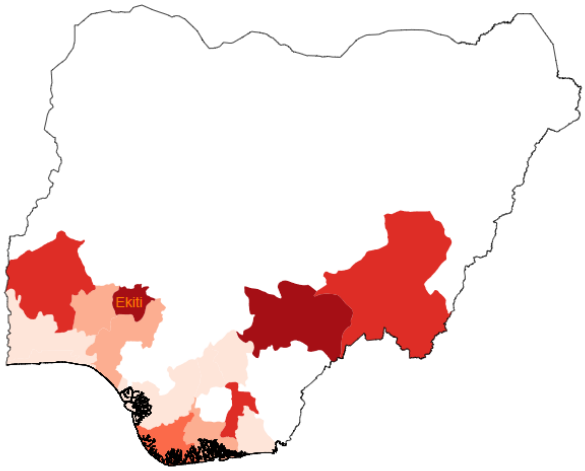
In Ekiti state the name of the anti-open grazing law is "Prohibition of cattle and other ruminants grazing in Ekiti state law, 2016". This law restricts land use for the herders banning open grazing while traditionally they grazed their livestock openly. Livestock grazing is limited to 11 hours in day time. There are penalties if herders don't abide by the restrictions or if they have weapons. Anyone found guilty of violating prohibitions of the law or regulations can be imprisoned for at least six months with no option of fine. Moreover, the herders would need to pay for any damage to property or farm products by cattle. The law promotes ranching as a method of raising livestock.

[4]Balarabe (2021) talks about the anti-open grazing law in a few states.

[5]There was call at some point in time from the governors of the southern states of Nigeria to adopt anti-open grazing law.

After adoption of the law the effectiveness of it would depend on whether it was known to people in general. People knew about the law and we can find evidence of this from Olutegbe and Ogungbaro (2020) which shows that based on its survey results 82.4% crop farmers and 90.4% herders had high level of knowledge of Ekiti state's anti-open grazing law. But these two groups had different opinions about the law. Almost every farmer thought the law to be effective and a minority of herders were of this view. Moreover, the effectiveness of the law is proportional to how well it is implemented. In an extreme situation where the law is not implemented at all, conflicts can still decrease due to the law because people would have the fear that there is some chance they can be punished for a violation of the law. That is why I don't focus on the implementation of the law, rather on the fact that the law exists.

The effectiveness of the anti-open grazing laws may depend on different factors like participation of stakeholders in decision making process and so forth.[6] There have been some news reports mentioning a lack of inclusion of the herders in the law making process. The law may not reflect herders' perspectives in this context. That is why it is important to empirically find out the effect of the law on conflict.



Note: States with darker color adopted anti-open grazing law earlier

Figure 2: Nigerian states with anti-open grazing law

2.4 Potential mechanisms for the effect of anti-open grazing laws on conflict

There can be a few potential mechanisms how the anti-open grazing law may have an effect on conflict. First, implementation of the law would result in less interaction between herders and farmers. So, there is less chance of conflict occuring. Second, herders tend to be from different ethnic groups than farmers and

[6]Fung (2006) discusses an example where citizen participation made a police organization effective.

the law weakens traditional land use rights for herders and strengthens for farmers. As a result the farmers have more support because of the law to pursue farming activities. This may make the herders fearful of the consequences of violating the law. Moreover, there can be spillover effects of the law. When the anti-open grazing law is adopted in Ekiti, the herders there may be prompted to move out of Ekiti to continue open grazing. It may therefore increase conflict in Ekiti's neighboring states. Or the herders may remain in Ekiti and protest for their right to graze animals openly; this may then increase conflict in Ekiti but not in its neighbors. In addition to these implementation of the law adds to the dynamics. The degree of enforcement would mediate the effects of the law on conflict.

3 Data

The law adoption dates are collected from different news sources documented in the appendix. Conflict and fatality data are taken from Armed Conflict Location & Event Data Project (ACLED)[7]. Data from wave 2, 3, and 4 of General Household Survey of Nigeria and Afrobarometer are also used to find the effect of the law on some other outcome variables.

The sample from ACLED that is used for estimation includes years from 2010 to 2020 and it does not include Benue, Taraba, Abia, and Oyo state and their neighboring states. The reason for this is since I am estimating the effect of the law on conflict in Ekiti and its neighbors, I make sure only Ekiti is the state in the sample with anti-open grazing law and the neighbors of the four states mentioned here are not considered in the sample because these may have the spill over effects of the law.

Nigeria has 36 states in total and after dropping the states mentioned above there is only Ondo state remaining in the sample as Ekiti's neighbor out of its four neighboring states. The sample in the end has 18 states. From the summary statistics table (table 3) I find that Ekiti is generally a relatively peaceful state relative to the other states in the sample in terms of both number of conflicts and fatalities. Ekiti's only neighboring state in the sample, that is Ondo state, has more conflicts and fatalities on average than Ekiti. The remaining 16 states in the sample are the comparison states that are on average less peaceful than Ekiti or Ondo. The standard deviations in general show a similar pattern like the means of number of conflicts or fatalities.

The sample is a balanced panel where the data is at the month-year level.[8] Ekiti is one state that has $(2020 - 2010 + 1) \times 12 = 132$ observations for all the months in the 11 years (72 before the law in 2016, and

[7] See Raleigh et al. (2010)

[8] The conflict data initially was the universe of conflicts. I then included the month-year observations in the data that did not have any conflict. For these observations number of conflicts and fatalities are both zero.

60 after the law). The same is true for Ekiti's neighbors that is just one state in this context. The other 16 states in the sample have $132 \times 16 = 2112$ observations in total (1152 before the law, and 960 after the law). The conflicts can be of three different general categories. The fatality measure is least accurate. So, it is appropriate to consider fatalities as reported fatalities. Figure 3 shows total conflicts over the years for Ekiti, its neighbors and other remaining states. It can be noticed that conflicts generally increase over time. In the first two sub-figures there is only one state each for Ekiti and Ekiti's neighbors and for the third sub-group there are 16 states.

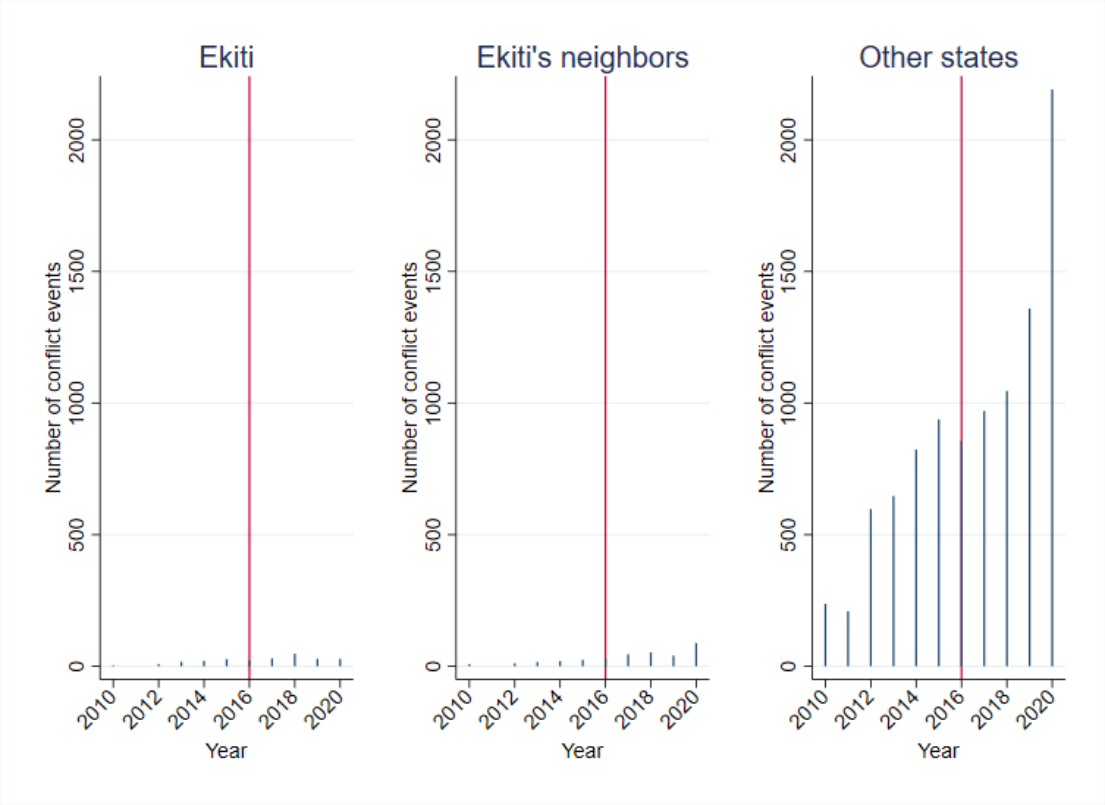


Figure 3: Total conflicts over time

4 Empirical Strategy

In order to estimate the effect of the law I need a control group that has the same trend in the outcome variable as the state with the law, that is Ekiti. I use states other than Ekiti that did not have this law by 2020 excluding those having this law after Ekiti by 2020 and their neighbors. That means Ekiti is the only state in my sample with the law. A difference-in-differences strategy would be appropriate to estimate the

effect of the law. Ekiti is considered treated in 2016 or afterwards.

So, I use difference-in-differences strategy exploiting the state-by-year variation (two sources of variation in exposure to law: Ekiti and its neighbors vs. comparison states, before and after) in law adoption to estimate the effect of the law. For state s in year t, I estimate the following event-study specification -

$$y_{st} = \alpha + \sum_{j=2010,\ j\neq 2015}^{2020} \beta_j Ekiti_s + \sum_{l=2010,\ l\neq 2015}^{2020} \kappa_l EkitiNeighbor_s + \delta_t + \gamma_s + \epsilon_{st} \tag{1}$$

where, y_{st} is number of conflict or fatality, $Ekiti_s$ and $EkitiNeighbor_s$ are indicators for Ekiti and its neighboring states, δ_t is time fixed effect[9], γ_s is state fixed effect, and ϵ_{st} is the error term. Year 2015 is the base category. The direct effect of the law is captured by the variable $Ekiti_s$. The neighboring states of Ekiti may be affected by the law if herders move away from Ekiti to those states or if herders in those states behave differently. This is an indirect effect of the law. That is why it is important to include $EkitiNeighbor_s$ variable as a predictor in estimation to capture the spill-over effects of the law. The purpose of the time and state fixed effects in the specification is that I don't want any time or state specific variation to bias the coefficients of interest, that are the effects of the law which are β_j and κ_l.

The key identifying assumption is the parallel trend assumption which is in the absence of the law the outcome y_{st} for Ekiti or its neighbors would have changed as much as the outcome for the remaining states of Nigeria. The causal interpretation of the law is dependent on this assumption. I used the event study specification that shows if the parallel trend assumption seems to hold[10] and the effect of the law as well.

The difference-in-differences estimators, in other words β_j and κ_l are the difference in differences between the mean outcome before and after the law between Ekiti or its neighbors and the remaining states. The levels of number of conflicts and fatalities are different for Ekiti, its neighbors and other states. It is not a concern for the validity of the estimators since they are differences, not levels. Any difference beyond the difference between Ekiti or its neighbors and the other comparison states before the law adoption is attributed to the law.

[9] It includes month and year fixed effect.

[10] We cannot test parallel trend assumption, but we can try to find evidence if this assumption seems to hold.

5 Results

5.1 Effect on Conflict and Fatality

Table 2 has the main results of the effect of the law on conflict and fatality that I focus on first. Fatality can be thought of as the severity of conflict. There are event study figures that show the effect of the law in Ekiti state and in states neighboring Ekiti. In these figures I show the effect of the law for year 2012 to 2020. I consider year 2015, one year before adoption of the law, as the base category year. Firstly, parallel trend assumption seems to hold because I find no significant coefficients for any year before adoption of the law in 2016. As shown in figure 4 I find the law reduces conflict in Ekiti starting from 2019. There are no significant effects of the law before 2019. That means the law took time to have any effect since people took time to adjust to the law and there were perhaps enough opposition to the law in the beginning that caused a positive but insignificant effect on conflict.[11] But then the benefits of the law are seen in lower conflict as time passes. In figure 4 in the states neighboring Ekiti the law increases conflict in the beginning but later in 2019 and 2020 I find negative but insignificant effect on conflict. This result makes sense since herders in Ekiti state may have moved to neighboring states at first fearing consequences of violation of the law, hence I find increased conflict in 2017 and 2018. But herders don't generally have advanced technology to know which state they are in. So, they try to avoid grazing their livestock freely in Ekiti state and also portions of its neighboring states that causes negative point estimates of the effect on conflict afterwards in Ekiti's neighbors.

So, the pattern of the effect of the law is similar but statistical significances are sometimes different in Ekiti and its neighboring states. That means initially after the law was adopted in 2016 herders may have moved out of Ekiti and the ones who stayed in Ekiti did not like this law which explains the positive point estimates before 2019. By 2019 the situation settled down a bit and we can see the benefits of the law in Ekiti as conflicts decreased in 2019 and continued to decrease in 2020 as well. I also find the point estimates of the effect of the law on conflict to be negative in Ekiti's neighbors. The benefit of the law in Ekiti's neighbors are lower than that of in Ekiti because the effect of the law in Ekiti's neighbors is an indirect spill over effect and we expect the indirect effect in this context to be smaller than the direct effect in Ekiti.

There are two main reasons why anti-open grazing law reduces conflict. First, there is less interaction between farmers and herders since the herders avoid places in or near Ekiti state because of the law. This may happen because herders are fearful that the law may be implemented against them. Second, when

[11] Olutegbe and Ogungbaro (2020) describes different evidences that show herders mainly perceived the anti-open grazing law to be against their interests. This could have led to the opposition of the law.

farmers see that there is less conflict because of the law, they don't want to take part in conflict since the opportunity cost now for this is higher compared to when there were more conflicts.

Next, I look at the effect of the law on fatality. Figure 5 shows that there are no significant effects of the law on fatality either in Ekiti or its neighbors although the point estimates tend to decrease over time. In conflict data fatality measure is the least accurate one. That's why I did this analysis using different measures of fatality found in the literature. The fatality measures I use are dummy variables if there are any fatalities or 10 fatalities or 25 fatalities, log(1+fatality), and square root of fatality. Figure 7 in the appendix show the results for different fatality measures. Overall, in Ekiti state I find mostly insignificant effect on fatalities except an increase in fatalities around 2018 for some measures of fatality. In Ekiti's neighbors I find insignificant effects on fatality in general with few exceptions. The pattern of the estimates of the effect on fatality is similar to the pattern found for conflict. This is expected since fatality is some measure of severity of conflict.[12] The first three graphs for both Ekiti and its neighbors have the dependent variable as an indicator above or below some threshold of conflict. That is why a lot of variation is reduced in this process and I find evidence of this in decreased standard errors of the estimates.

One thing to notice here is that I study the effect of the law on total conflict and fatality and associate the effect with herder-farmer conflict. I do this because of the specification I use which finds the effect on conflict or fatality related to herder-farmer conflict. And the coefficients of interest, that are the effect on outcome variable in Ekiti and its neighbors are measures of change coming from the law. If I had data that distinguish perfectly between herder-farmer conflicts from other types of conflict then I could study herder-farmer conflicts alone. To do that in reality I would need to rely on the description of conflict to determine herder-farmer conflicts. This is problematic because the descriptions are subjective on the sources. If there are no other things happening around the time of the law adoption I can attribute the change in conflict or fatality to that of herder-farmer conflicts. In other words, if the parallel trend assumption holds then I can find the effect of the law on total conflicts or fatalities and attribute that effect to herder-farmer conflicts.

5.2 Types of Conflict

Then I do the analysis of the effect on conflict for the three conflict categories that cover all conflicts. These categories are violent events, demonstrations and non-violent actions.[13] Figure 6 show the results. For violent events in Ekiti I get results similar to the main results for the effect on conflict, but in Ekiti's neighbors I

[12]The main results don't hinge on the inclusion of any state in the sample.

[13]All conflicts can also be documented under different event types under these general categories. Doing the analysis for the general categories alone made more sense than to do it for event types.

find a decrease in conflict in 2019 and no change before. This is expected since herder-farmer conflicts are violent in general. Demonstrations (protests and riots) decrease in Ekiti because of the law few years after its adoption, but it generally increases in Ekiti's neighbors. I find very small effects for non-violent actions in Ekiti and its neighbors compared to violent events and demonstrations. So, for violent events the anti-open grazing law took time to bring about any decrease in conflict. In general for any event category I find after adoption of the law an increase in the point estimates and then decrease in the point estimates even though the statistical significances are different sometimes.

6 Next Steps

After analyzing the effect of the law on conflicts and fatalities I would focus on the effect of the law on some other outcome variables like food security and people's perceptions.

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Table 2: Event study analysis: effect of the law on conflict and fatality

	Conflict	Fatality
ekiti <2012	1.583	41.18
	(1.406)	(38.90)
ekiti 2012	0.130	37.18
	(0.975)	(35.98)
ekiti 2013	0.641	29.69
	(0.644)	(27.27)
ekiti 2014	0.0833	5.109
	(0.413)	(9.390)
ekiti 2016	0.0156	30.16
	(0.478)	(26.23)
ekiti 2017	-0.0937	30.03
	(0.409)	(25.25)
ekiti 2018	1.073	30.07
	(0.697)	(28.77)
ekiti 2019	-2.099*	25.22
	(0.782)	(30.17)
ekiti 2020	-6.542**	13.01
	(1.797)	(24.83)
neighbor <2012	2.042	41.14
	(1.406)	(38.90)
neighbor 2012	0.547	37.09
	(0.975)	(35.98)
neighbor 2013	0.724	29.69
	(0.644)	(27.27)
neighbor 2014	-0.250	4.859
	(0.413)	(9.390)
neighbor 2016	0.682	30.16
	(0.478)	(26.23)
neighbor 2017	1.156*	30.36
	(0.409)	(25.25)
neighbor 2018	1.823*	29.40
	(0.697)	(28.77)
neighbor 2019	-1.266	25.14
	(0.782)	(30.17)
neighbor 2020	-1.542	13.68
	(1.797)	(24.83)
Observations	2376	2376

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Summary Statistics

	Ekiti		Neighbors		Others[a]	
	Before	After	Before	After	Before	After
Number of conflicts	1.1	2.6	0.94	4	3	6.7
	(1.31)	(1.7)	(1.24)	(3.3)	(5.44)	(9.63)
Number of fatalities	0.11	0.9	0.13	1.03	21.6	22.41
	(0.36)	(1.1)	(0.41)	(1.4)	(123.9)	(61.4)
Observations	72	60	72	60	1152	960

sd = standard deviation (in parentheses).

Data is at the month-year level. The numbers without parentheses are means.

a: excluding the states of Benue, Taraba, Abia, Oyo, and their neighbors.

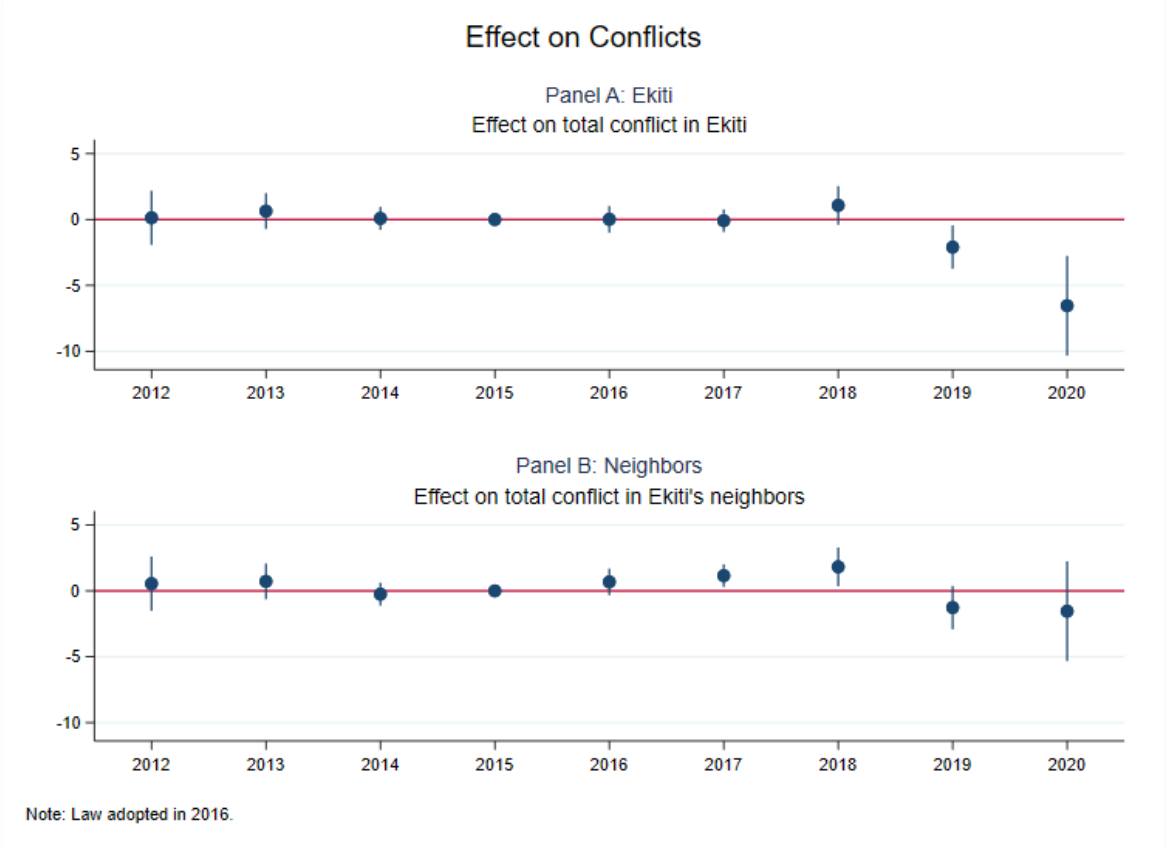

Figure 4: Effect of the law on conflicts

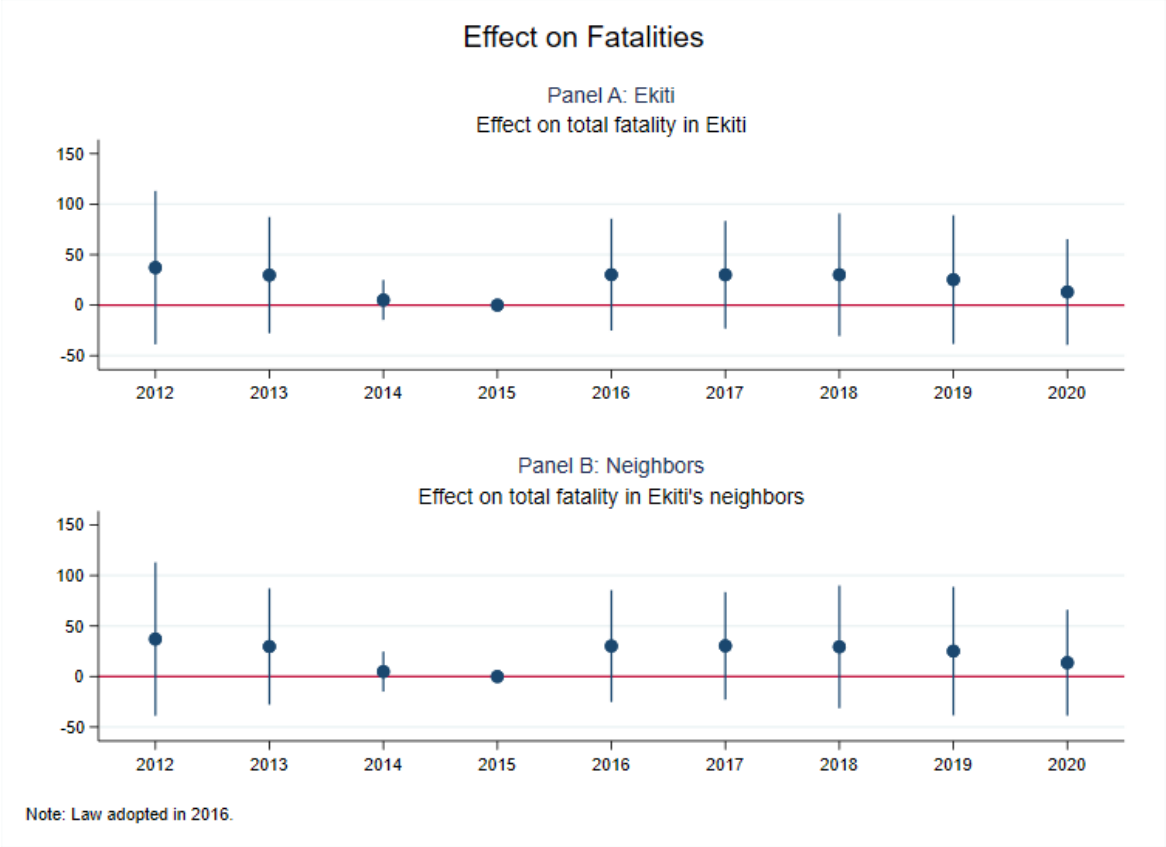

Figure 5: Effect of the law on fatalities

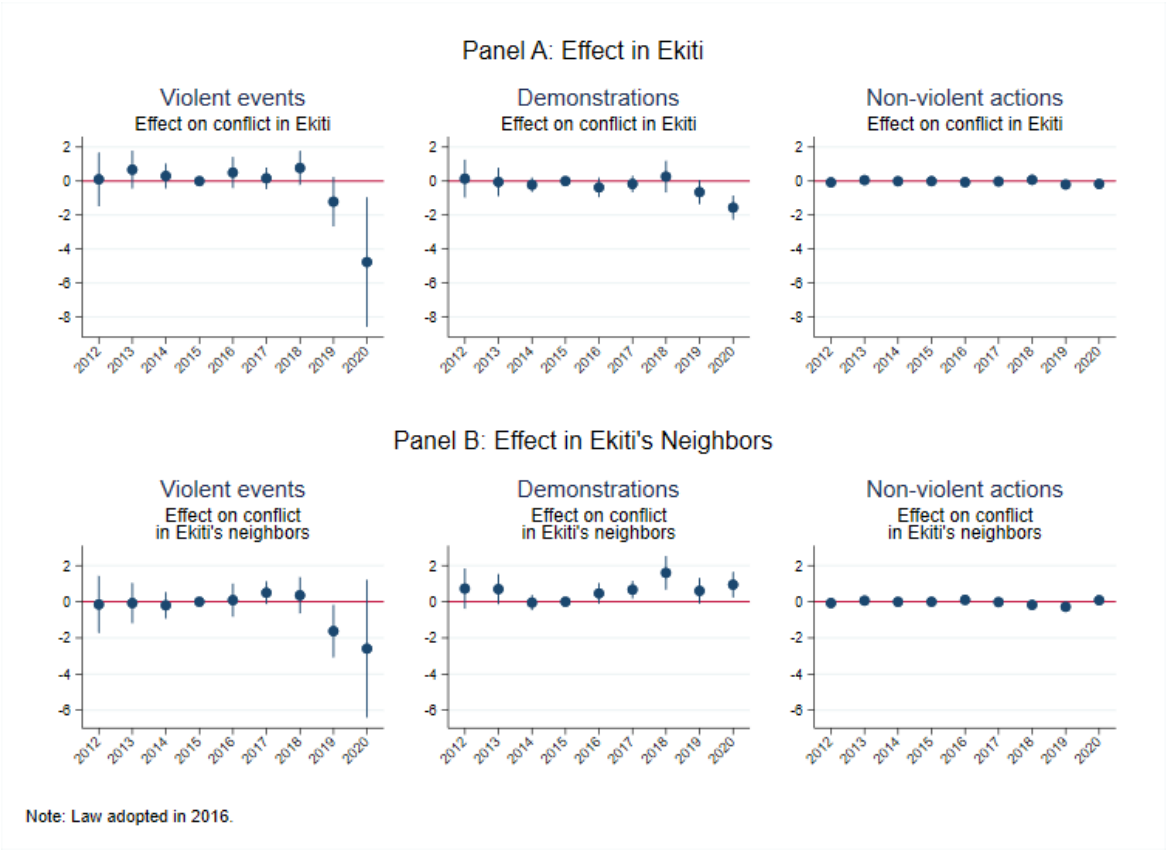

Figure 6: Effect of the law on conflicts for different categories of conflict

7 Appendix

7.1 Effect of the law on alternative measures of fatality

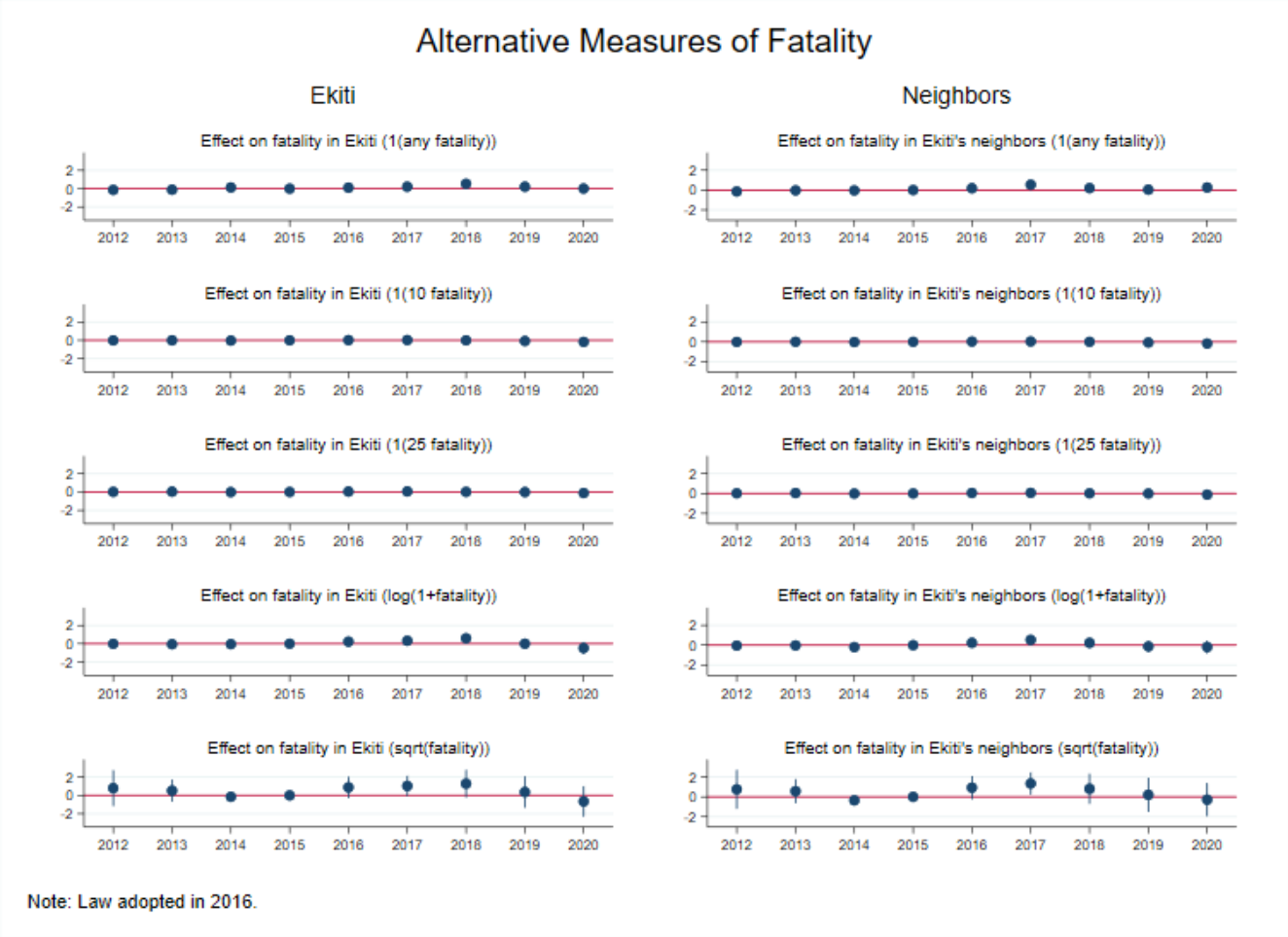

Figure 7: Effect of the law on alternative measures of fatality

7.2 Sources of law adoption dates

The dates anti-open grazing laws were signed and implemented were collected mainly from news sources and articles mentioned below.

https://www.thisdaylive.com/index.php/2016/09/05/ekiti-grazing-law-the-way-to-go/
https://www.sfcg.org/wp-content/uploads/2018/02/Open-Grazing-Prohibition-Law-in-Benue-State-December-2017.pdf
https://www.today.ng/news/nigeria/taraba-govt-suspends-anti-open-grazing-law-83449
https://guardian.ng/news/anti-open-grazing-laws-police-mum-over-enforcement/
https://www.insideoyo.com/9-things-you-need-to-know-about-oyo-anti-open-grazing-law/
https://independent.ng/breaking-diri-signs-bayelsa-anti-open-grazing-bill-into-law/
https://www.naija247news.com/2021/08/17/more-southern-nigeria-states-enact-anti-open-grazing-bills-next-month/
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https://www.thisdaylive.com/index.php/2021/10/01/okowa-signs-anti-open-grazing-bill-into-law/
https://www.vanguardngr.com/2021/09/breaking-sanwo-olu-signs-anti-open-grazing-bill-to-law/
https://nairametrics.com/2021/10/22/governor-obiano-signs-anti-open-grazing-bill-into-law-as-enforcement-takes-off/