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The Effect of Violence on Food Markets: Evidence from Nigeria

[version 1]

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Abstract

Food supply chains are rapidly expanding across Africa. These supply chains are vital conduits for food access and livelihoods but remain vulnerable to disruptions from conflict and insecurity. Activities in the midstream segments of food supply chains (e.g., trading and processing) remain under-researched, particularly in conflict-affected contexts. We leverage a unique dataset on food wholesale markets to examine how exposure to violence in surrounding communities and within market spaces affects their functioning across Nigeria. Our findings reveal that while general fatalities in the locality do not significantly impact market outcomes, specific conflict events, including riots and protests, are linked to measurable declines in food availability. When it comes to market-based violence, each additional violent crime within a market reduces food supply by approximately two percentage points, on average. We demonstrate that the types of violent events affecting markets vary across regions of the country. Our results highlight differentiated effects of violence types and locations on market performance and underscore the importance of strengthening supply chain resilience to support food security and economic stability.

Keywords

Crime, Food Security, Violence, Food Systems



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1. Introduction

Food is a basic human need, and in most developing countries, most people access it through traditional food markets. Beyond providing access to food, food markets serve as sites for the exchange of diverse goods and services, places of social cohesion, and a thermostat for local economic activity. While there are studies that examine the impact of conflict on agricultural productivity (e.g. Adelaja & George, 2019) and food consumption in general, there are limited studies that investigate the effects of conflict on the functioning of the middle segment of food supply chains (wholesaling, processing, and logistics). A few exceptions include Vargas, Liverpool-Tasie, and Reardon (2024) and Béné et al. (2024). Even less common in the literature are studies on the impacts of conflict on food markets, defined as the physical locations through which food is delivered from producers to customers, typically via intermediary traders. Functional food markets are crucial for food security in developing regions. They feed all households (both urban and rural), in contrast to the common misconception of the self-sufficient rural agricultural farmer in developing countries (Liverpool-Tasie, Reardon, & Belton, 2021; Dzanku, Liverpool-Tasie, & Reardon, 2024).

In this paper, we investigate the impact of market-based crime and community conflict on market activity, focusing on the quantity of food available for sale and the volume of vehicles delivering food in wholesale food markets in Nigeria. Conflicts disrupt economic activity and may exacerbate food insecurity by limiting food production, reducing purchasing power, and disrupting trade channels. We focus on violent crimes and fatalities from conflicts, given the ubiquity of non-fatal conflicts in our study context, and to examine the severity of conflict. When examining the impact of conflict fatalities, we disaggregate conflict events by type (to explore how different types of events affect market performance) and examine different types of market crimes, based on our hypothesis that responses to conflicts may be event specific. In addition, we also investigate how the effects of violence vary across regions, as Nigeria is de jure divided into the North and South.¹ The north is hotter, drier, and has experienced more conflict in recent decades, including the activities of the terrorist group Boko-Haram, notorious for capturing a group of schoolgirls from their school in Chibok in 2007. In general, the South performs better on human development indices (Adeleke, Alabede, Joel, & Ashibuogwu, 2023). However, the South has also experienced various types of conflict, including the burgeoning herder-farmer conflict, characterized by roaming herders engaging in banditry on farms as they seek pasture for their cattle (Chukwuma, 2020).

Our market data are from 299 wholesale markets that sell three main food products: fish, tomatoes, and green leafy vegetables (GLV) from seven states in Nigeria and Abuja, the Federal Capital Territory (FCT). From these data, we construct a retrospective panel spanning three periods. Our primary outcome variables are the annual quantities of each product category sold, as well as the volume of vehicular traffic delivering food to the markets. We combine the market data with conflict data from the Armed Conflict Location and Event Data Project (ACLED). From the ACLED data, we calculate our measure of exposure to violent conflict by summing the number of fatalities from each conflict type each year in the local government area where each market is located. We also use a more localized measure of violence, which is the sum of incidents of robberies, murders, and violence against women (Vawa) reported by each market each year. Hence, we examine both the effect of market-based violent crime and the intensity of violent conflict in the local area surrounding a market.

Empirically, we employ panel regressions with fixed effects for locality, product, and year to investigate the relationship between exposure to violence and market performance. We include locality fixed effects to account for fixed geographic and socio-cultural factors that increase the likelihood of conflict in a locality. We also include product fixed effects to account for market-specific supply characteristics peculiar to each product type. Finally, we include year-fixed effects to account for annual changes in the country's macroeconomic and political landscape, such as inflation, which may increase the likelihood of conflict each year. Finally, we include time-varying market and locality-based covariates, such as proxies for market size, agroecological conditions, and demographic composition. This includes the number of businesses operating in a market, the share of the market that is youth-oriented, and weather variables—temperature and precipitation. Our main findings on the effects of violent conflict on market outcomes remain unchanged when we use different fixed effects, such as product-form fixed effects rather than product fixed effects.

In summary, we find that increasing fatalities from protests and riots reduces both the quantity of food available in the market and the number of vehicles delivering to it. Regarding market-based crimes, we see that robberies and violence against women have substantial negative effects on our outcomes. Furthermore, we observe that the impact of market-based crime is significant only for markets in northern Nigeria, except for crimes that are Violence against women, which significantly reduce food available in both northern and southern markets. However, markets in the North and the South both experience reduced vehicular traffic when the number of fatalities from protests in their localities increases. To determine whether supply mechanisms are at play, we show that a reduction in the number of traders active in the market

¹With further subdivisions into six geopolitical zones, 36 states and a Federal Capital territory, and 774 local government areas.

accompanies a decrease in food volumes or deliveries, as crime in the market or fatalities from events such as Battles, riots, and protests increase. We also offer suggestive evidence that reduced consumer demand is not a mechanism, as increased fatalities are not associated with lower prices expected with a negative demand shock. Overall, our findings suggest that even when markets continue to operate, exposure to conflict reduces food availability.

We make three key contributions to the economics and food security literature. First, we contribute to the strand of literature examining the consequences of exposure to conflict on various microeconomic outcomes, in general, and to the emerging literature on the microeconomic effects of conflict on markets and institutions, in particular. Papers in this stream have examined the impact of violent conflict on agricultural investment (Arias, Ibáñez, & Zambrano, 2019), firm activity (Del Prete, Di Maio, & Rahman, 2023; Brancati, Di Maio, Gatti, & Islam, 2022; Ayele & Edjigu, 2025), and financial access (Blumenstock, Callen, Ghani, & Gonzalez, 2024). Though there is a strand of literature that has examined the effect of conflict on markets, it has typically focused not on physical market locations but rather on the role of international conflict in financial markets (Guidolin & Ferrara, 2010), stock exchanges (Schneider & Troeger, 2006), or commodity markets (Fang & Shao, 2022). We contribute to this literature by examining the impact of violence on the activities of physical food markets, considering both local, more frequent crimes and larger-scale conflicts captured by conflict reporting databases.

Second, we contribute to the literature on food security and resilience in food systems. While papers have examined the impact of conflict on food security (see survey papers: Martin-Shields & Stojetz, 2019; Vesco et al., 2025), most of these have focused on individual or household measures of food security and consumption (D'Souza & Jolliffe, 2013; Brück, d'Errico, & Pietrelli, 2019; George & Adelaja, 2022; Shemyakina, 2022; Rudolfson, Bartusevičius, van Leeuwen, & Østby, 2024) or farm-level measures of agricultural productivity (Lin et al., 2023; Appau, Churchill, Smyth, & Trinh, 2021). Although some studies have examined the role of conflict in food prices (Gil-Alana & Singh, 2015; Bar-Nahum, Finkelshtain, Ihle, et al., 2020), there are limited studies that have examined the impact of violence on food supply in markets themselves. We contribute to this literature by examining the effect of violence on a systemic measure of food security, i.e. the availability of food in wholesale markets. A few related studies measure the impact of conflict on mid-stream actors, including processors, transporters, and retailers (Maitre d'Hôtel, Béné, Pelloquin, et al., 2023; Béné et al., 2024; Vargas et al., 2024) but not on market locations. For example, (Béné et al., 2024) focuses on responses and mitigation strategies and the impact of an active conflict on retailers and transporters in a singular sub-region in Burkina Faso, and (Vargas et al., 2024) looks at the effect of the confluence of shocks on retailers in Nigeria. Conversely, we focus on wholesale markets and the impact of violence on food availability in these markets.

Finally, in contrast to studies that typically focus on food markets in general or the impact of conflict on markets specifically, which often examine only one or a few markets selling singular products (Bar-Nahum et al., 2020; Gil-Alana & Singh, 2015), we utilize unique data on 617 market-product outcomes from a universe of 299 markets across eight locations in Nigeria. This unique dataset enables us to examine how conflict impacts vary across sub-national units or regions within the same country, but with distinct socio-economic, cultural, or political contexts.

Understanding how food availability is affected by violence is critical, as conflict-induced food scarcity is linked to first- and second-order effects, including malnutrition (Dunn, 2018), mortality, and cognitive and labor outcomes (Akresh, Bhalotra, Leone, & Osili, 2012; Akresh, Caruso, & Thirumurthy, 2022). Understanding whether and how impacts vary across heterogeneous contexts informs appropriate responses by policymakers, donors, and other development practitioners concerned about food security.

2. Background

In this section, we provide an overview of the primary sources of conflict events in Nigeria.

2.1 Conflict in Nigeria

Nigeria, the most populous country in Africa, formally gained independence from British colonial rule in October 1960 and established its first republic, which was subsequently overthrown in a series of coups and counter-coups in 1966. Nigeria is characterized by a predominantly Muslim North and a predominantly Christian South. Some historians argue that one of the legacies of colonial rule is the ethnic fault lines in geopolitics that have been at the root of nepotism, ethnic competition, corruption, and consequently conflict since independence (Jacob, 2012).

A watershed moment in Nigeria's history of conflict was the Biafran War, which lasted from 1967 to 1970, following the Igbo nation's declaration of secession from Nigeria. This led to an estimated death of between one and two million people and inter-generational impacts on health and educational outcomes (Akresh, Bhalotra, Leone, & Osili, 2021). The Nigerian military ruled in Nigeria until the transition to democracy in 1999, a transition that has been tenuously sustained to date.

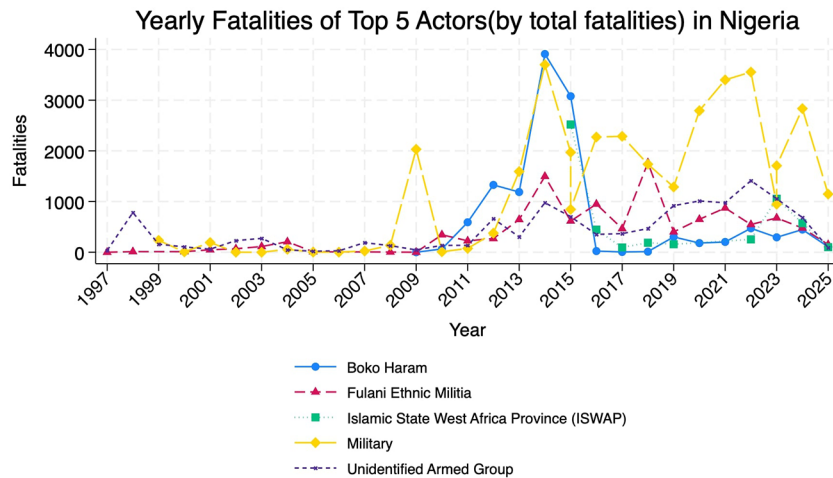


Figure 1. Annual total fatalities by the top main actors (1997-2025) in Nigeria.

Nonetheless, under democracy, there have been episodes of ethnic clashes as well as religiously motivated conflicts, such as clashes over the introduction of Sharia law, a strict Islamic penal code in Kano and Kaduna in the early 2000s (Dorff, Gallop, & Minhas, 2020). Also, starting in the late 1990s and intensifying in early 2002, violent insurgencies emerged in the oil-producing south-south region, driven by a desire for increased local resource control (Ikelegbe, 2005); The early 2000s also witnessed the start of violent religious clashes in the middle belt (north-central) of the country, such as in Jos, first in 2001 (Higazi, 2016). Across the country, there are also instances of election-related violence that occur during the four-year election cycle. Despite its chequered history of conflict by both government and non-government actors, conflict in Nigeria took a new turn when the activities of Boko Haram, which began quietly but took on a more violent tone since 2010, showed a sadistic sophistication that spanned religious and territorial lines (Paden, 2015). In 2014, Boko Haram infamously abducted over 200 school-aged girls from their School in Chibok, Borno State. Boko Haram also bombed places of worship, police stations, and seized some territory from the Federal Government. Boko Haram activities led to the widespread displacement of millions of people in Northeastern Nigeria. The Boko Haram group spun a different group, the Islamic State West Africa Province (ISWAP) in 2015, which continues to have skirmishes with the Federal government to date. Data from ACLED lists Boko-Haram, ISWAP, and the Military as some of the top five actors² by the total number of fatalities in Nigeria from 1997 to 2025 (See Figure 1).³

The Fulani are also a top 5 actor in terms of overall fatalities in Nigeria. The Fulani are a diverse grouping of actors from the Fulani tribe in the North. In recent decades, farmer-herder conflicts, often between pastoralist cattle herders, colloquially referred to as Fulani herdsmen, and stationary farmer and community vigilante groups, have entered and dominated the conflict lexicon of Nigeria. While the farmer-herders conflict has been ongoing in Nigeria for a long time, such as the Tiv-Fulani conflicts in Benue (Vanger & Nwosu, 2020), these conflicts have become more mainstream as scarce resources have altered the migratory patterns of the herdsmen, bringing them into southern Nigeria. These farmer-herder conflicts have been attributed to increased competition for water and land resources due to climate change, institutional policy gaps in resource management, and the changing demographics of pastoralists, to include those with criminal motives, such as asset laundering (Ajala, 2020).

3. Data

3.1 Market data

This study uses data from a comprehensive survey of all wholesale markets selling fish, tomatoes, or green leafy vegetables (GLVs) across seven Nigerian states and Abuja, the Federal Capital Territory (FCT). In this study, a wholesale market is defined as an established location where two or more wholesalers sell either of the three products. We define a wholesaler as an intermediary that procures a product from a supplier and sells it to a non-final user, such as a processor, retailer, or another wholesaler. The study states were chosen because they are regional leaders in the production of at least one of these commodities (NAERLS and FMARD, 2022) and represent a broad range of Nigeria's agro-ecological and socio-economic conditions. The markets capture heterogeneous cultural, trading, and market features between the more

²We define actor here as Actor 1 in the ACLED dataset, which is a coding choice made by ACLED that does not necessarily denote aggressor.

³See Figure 2 for a map showing the distribution of total fatalities across local government areas in Nigeria.

Total Fatalities across LGAs in Nigeria(1997-2025)

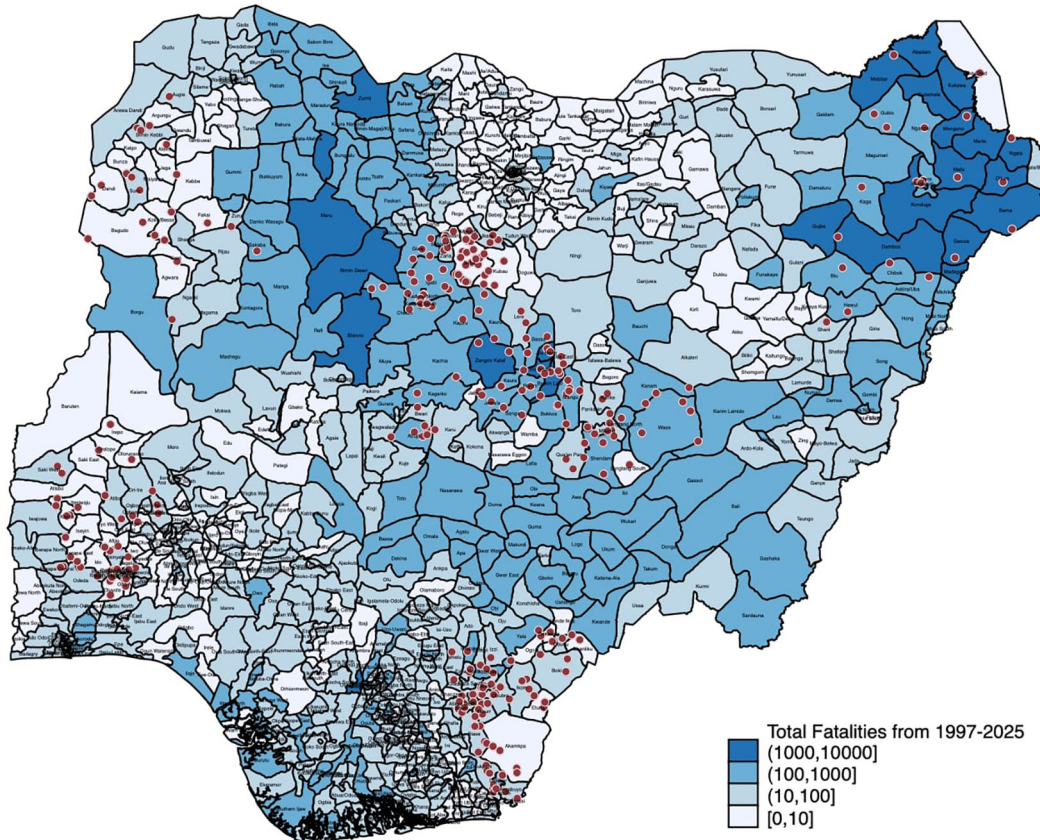


Figure 2. Exposure to Conflicts across Nigeria by LGA. Note: The figure shows the sum of total fatalities reported in the ACLED data from 1997-2025 for all the LGAs across Nigeria, including those that are not covered in the Wholesale Market data. The red points denote the locations of the wholesale markets in our data.

conservative north, characterized by lower education levels, population density, and higher poverty rates, and the more affluent southern region, which has higher education levels.

Markets in this study were identified through a multi-stage approach. First, a list of all known wholesale markets was compiled from various government sources in each state, including agencies responsible for agriculture and markets, such as estate departments and chambers of commerce. These lists were supplemented with online searches and field visits to verify the identified markets. Then, a snowball sampling method was used to ensure comprehensive coverage of wholesale markets. During field visits, our survey team visited the Local Government Authority (LGA) headquarters.⁴ The headquarters, which oversees market operations, systematically identified all markets serving consumers in the area. Upon arriving at each market, the survey team identified the market leaders or commodity traders to confirm whether the market met our definition of a wholesale market. They also consulted wholesalers, retailers, and processors to find additional locations where our study products were sold wholesale. This process continued until all identified markets were visited. The listing activity spanned 12 months (to capture seasonal variation) and was supplemented by validation meetings in each state. During these meetings, up to three representatives from each wholesale market, along with representatives from state and local governments, reviewed the list and maps of identified markets to ensure that no markets were overlooked.

Our census identified 299 wholesale markets. Data was collected from July to December 2023 through structured questionnaires administered to focus groups in each market. These groups included diverse stakeholders with in-depth market knowledge, such as established traders, women traders, and youth. While the survey team aimed for uniformity in

⁴Local governments are the third tier of administration in Nigeria. There are 774 local government areas in Nigeria.

Location of Markets across Nigeria

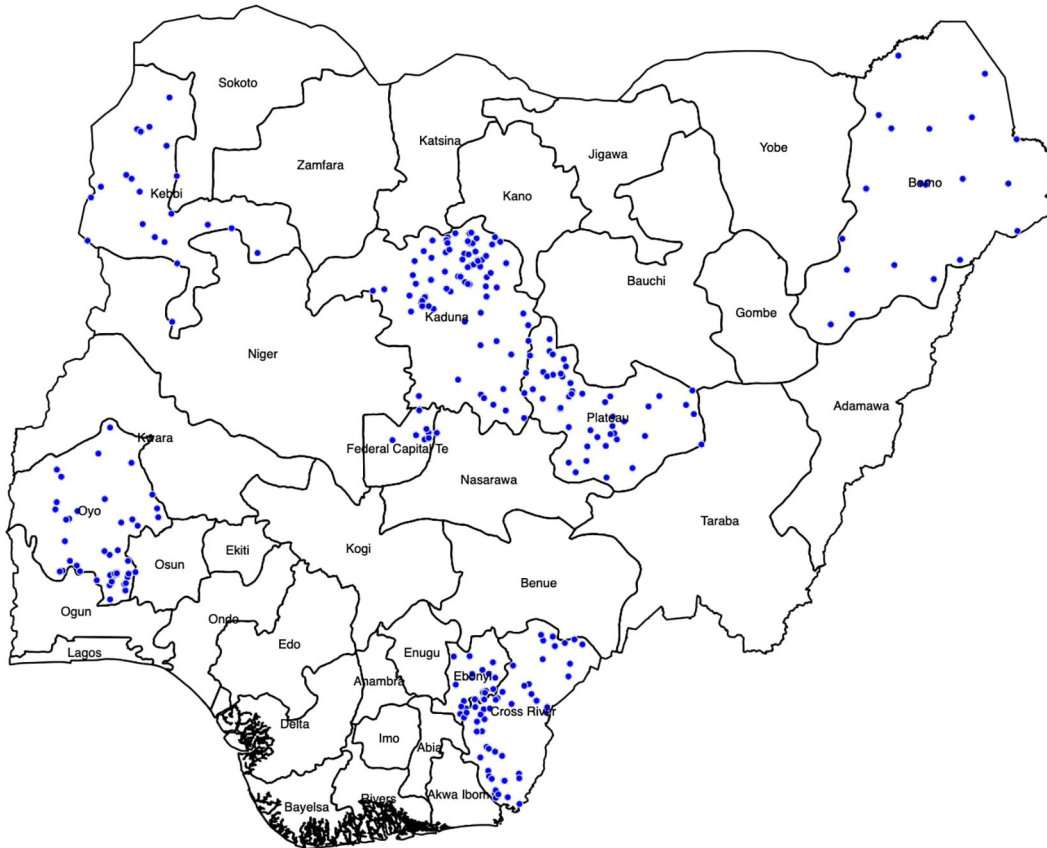


Figure 3. Geographical spread of wholesale markets in data. Note: The figure shows the location of wholesale markets in the sample in blue dots.

focus group composition, this was not always feasible due to variations in trader representation across markets.⁵ The questionnaire was completed by participants in the focus group and administered through the SurveyCTO platform on tablets by trained enumerators to ensure consistency and data quality. The enumerators received training to ensure consistent responses and to collaborate with the group to reach consensus on potentially controversial answers.

As a result, the study includes market-level information from all 299 wholesale markets identified in the study areas. From the focus group discussions held in these markets, we generated 617 product form-level observations regarding various forms of the main study products.⁶ The product form-level variables capture information on the quantities and prices of different product forms,⁷ as well as their leading sourcing and sales locations. The data is essentially a retrospective panel of wholesale markets. The respondents were asked retrospectively about specific market characteristics and market performance for the years 5 and 10 preceding the interview year, as well as for the current year. Hence, we created a panel of three periods (2023, 2018, and 2013). Our primary outcome variables are measured at the product-form level, while market-reported crime is measured at the wholesale market level. See Figure 3 for a map showing the locations of the wholesale markets in our sample.

3.2 Conflict and other data

Our data on LGA fatalities comes from the Armed Conflict Location and Event Data (ACLED) Project (Raleigh, Clionadh, Andrew, Håvard, & Karlsen, 2010). ACLED includes data on conflicts, including battles, explosions, violence

⁵The main difference between the composition of respondents was around the presence of women traders in markets in the north, where there might have been no female wholesalers.

⁶The three products sold in the markets are tomatoes, fish, and green leafy vegetables, while product form is the state in which a product is sold, e.g. fresh tomatoes or the specific vegetable name, e.g. spinach in the case of green leafy vegetables.

⁷See Table 8 for details about the percentage of each product form under each food group.

against civilians, protests, riots, and strategic developments (see [Table 9](#) for the definition of conflict types in the ACLED record). ACLED provides information on conflict dates and locations, from which we construct the total number of fatalities by type for each LGA and year.⁸

The market reported violent crimes, including Robberies (violent theft), murders (homicide), and Violence against women (including rape).⁹ The information on market-reported crime was collected in a module in the same process that recorded other market outcomes. The market also reported other non-violent incidents, including traffic, product theft, fires, and floods, which are included as controls in the regressions.

Table 1. Summary table of key variables by region.

Full sample mean	North mean	South mean
Market-level Crime measures		
Violent crime	2.59	3.02
Robbery	1.07	0.57
Murder	0.12	0.07
Violence against women	1.49	2.55
Total crime	40.05	19.16
ACLED Conflict measures		
Total Fatalities	15.99	1.86
Number of conflicts	7.17	2.32
Fatalities from Battles	6.27	0.97
Fatalities from Explosions	1.82	0.00
Fatalities from Strategic developments	0.05	0.00
Fatalities from Violence against civilians	7.22	0.69
Fatalities from Protests	0.03	0.00
Fatalities from Riots	0.61	0.21
Outcomes and Controls		
Average Quantity of Product across seasons (Kg)	106,503.52	186,545.11
Average Number of Vehicles making deliveries across seasons	33.45	20.85
Average of Number of Wholesalers across seasons	36.59	24.75
Average of Number of Retailers across seasons	49.34	35.57
Price per kg (Naira), product == Tomato	484.56	997.97
Price per kg (Naira), product == GLV	330.53	475.36
Price per kg (Naira), product == Fish	3647.07	2386.68
Number of Auxiliary Businesses in Market	308.48	148.11
Fires	0.25	0.27
Floods	0.38	0.29
Share of market that is youth (%)	34.92	32.65
Average annual temperature (Kelvin)	304.74	302.52
Average annual precipitation (Millimeters)	154.33	204.13
Market is in urban area	0.29	0.40
Market is in Northern Nigeria	0.61	0.00
Observations	1848	729

⁸see [Figure 4](#) for a figure showing the annual number of fatalities from the ACLED data by region.

⁹see [Figure 5](#) for a figure showing violent crimes by region for the years in our data.

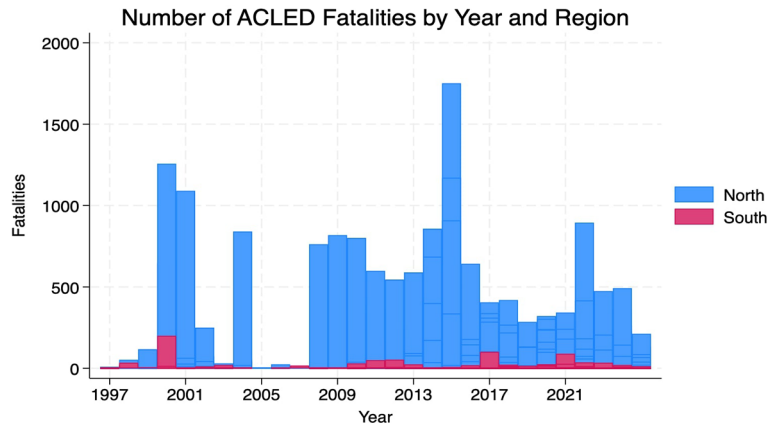


Figure 4. Count of ACLED fatalities by region. *Note:* This shows the number of fatalities from 1997 to 2025 for the states located in the north and south of Nigeria, for the sample of markets in the data. The northern states are Plateau, Borno, Kebbi, Kaduna, and FCT, while the southern states are Oyo, Ebonyi, and Cross River.

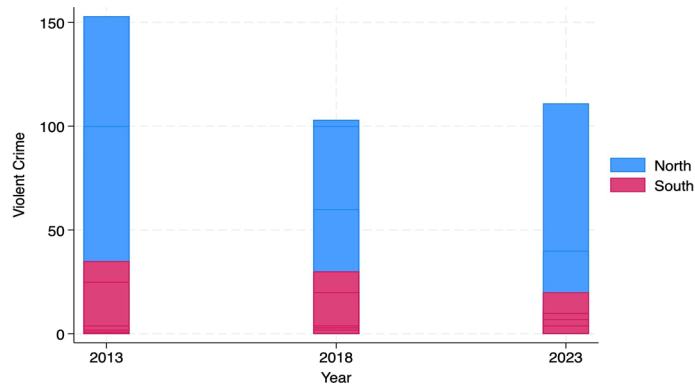


Figure 5. Market reported violent crime by region. This figure compares the total reported violent crime for the markets in our data for those located in the north and south, respectively.

We also control for weather data. The temperature data used is the average annual daytime land surface temperature from MODIS, and the average yearly IMERG precipitation data. Both the temperature and rainfall data are at the LGA level and were downloaded from AIDDATA (Goodman, BenYishay, Lv, & Runfola, 2019). All variables used in the analysis are as defined in Table 10.

3.3 Summary of key variables

In Table 1, we present a summary of the key study variables by region (North and South). In our data, the Northern states are Borno, Kebbi, Kaduna, Plateau, and the Federal Capital Territory (FCT), while the Southern states are Oyo, Cross River, and Ebonyi. The average violent crime reported by the markets (e.g., violent theft, murders, and violence against women) is 2.3 and 3 for the northern and southern wholesale markets, respectively. At the same time, the north has more fatalities per year, averaging 25 compared to 2 in the south. However, these averages mask significant heterogeneity between markets, as the largest number of ACLED conflicts and deaths recorded by an LGA is 148 and 589, respectively.¹⁰

When it comes to measures of market size and performance, wholesale markets in the North are larger, with an average of 44 wholesalers and 413 total auxiliary businesses, compared to 25 wholesalers and 148 auxiliary businesses in southern markets. The Northern states are hotter (306 Kelvin versus 302 Kelvin) and experience less rain (121 mm versus 204 mm) than the South, on average. More markets in the south are in urban areas (40%), compared to 21% in the north.

¹⁰See Table 11 for a summary table that shows minimum, median, and maximum values of key variables.

3.4 Causal pathways and outcomes

Before discussing the estimation strategy, we explicitly state the assumptions underlying the causal pathway from exposure to violence to market activity, using a simple demand-and-supply framework (see Appendix A for a fuller discussion of our model). First, we assume that the inverse demand curve for each product p is a linear function of its quantity, and a demand shock that is common to all products within a wholesale market i , with a product-specific coefficient, which allows the impact of the shock to vary by product. Second, we assume a linear inverse supply curve, where prices are a function of quantity and a common supply shock across all products in a market, indexed by a product-specific coefficient. Third, in a static equilibrium, there is a market-clearing price and quantity (q_p^*, p_p^*) that equates supply and demand for each product. For simplicity, we also assume that there are no cross-product substitutions, which is plausible because the products in our data—tomatoes, green leafy vegetables, and fish — belong to different food groups and play unique roles in Nigerian cuisine. Taken together, this suggests several plausible pathways through which violence may affect market activity. Suppose conflict leads to a negative demand shock, for example, by damaging livelihoods in local communities or prompting consumers to boycott specific markets out of fear of exposure to violence. In that case, this strictly reduces each q_p^* and prices p_p^* also decrease, all else being equal. Conversely, if conflict causes a negative supply shock, such as an increase in transportation costs, we also expect to see a decrease in q_p^* , albeit at higher prices. Finally, if conflict results in both a negative demand and a negative supply shock, we will still see a decrease in q_p^* . However, the effect on prices will be ambiguous, depending on the strength of each shock. In this paper, we investigate the impact of exposure on the quantity of food available. Within the scope of our data, we also examine evidence for supply-side mechanisms, including vehicular traffic, as well as suggestive evidence for a demand-side shock (food prices in a single period).

3.5 Estimating equation

We estimate the impact of violence on local market performance using the following specification:

$$Y_{ipst} = \theta_s + \delta_t + \eta_p + \sum_i^j \beta_j Fatalities_{st}^j + \beta_7 ViolentCrime_{ist} + X_{ipst}\beta + \epsilon_{ipst} \quad (1)$$

We denote Y as the outcome for market i selling product p located in LGA s in year t . In our analysis, the dependent variables are the logs of the average quantities of goods sold in each market and the number of vehicles used to deliver food. We designate θ_s , δ_t , and η_p as LGA, year, and product fixed effects, respectively.

Our $Fatalities_{st}^j$ is defined as the number of ACLED-reported fatalities from conflict type j (Battles, Explosions, Riots, Protests, Violence against civilians and Strategic Developments) that occurred within a market's LGA during the preceding year, while $Violentcrime_{ist}$ is the number of violent crimes, including robbery, murder, and violence against women, reported by the market for the year. These two distinctive measures of conflict can be interpreted as the effects of the macro-conflict environment and localized violence, respectively. Understanding the broader conflict context by examining fatalities in the locality is critical, as a 2017 survey of Nigerians depicted in Figure 6 shows that only 4% of crimes occur in the market; nonetheless, the crimes within the market are likely to be the most salient for participants in a market. Our coefficients of interest are β_j and β_7 . If conflict harms markets, then we expect these coefficients to be negative.

The standard errors ϵ_{ipst} are clustered at the LGA level, which is the unit of analysis for conflict exposure in ACLED data.

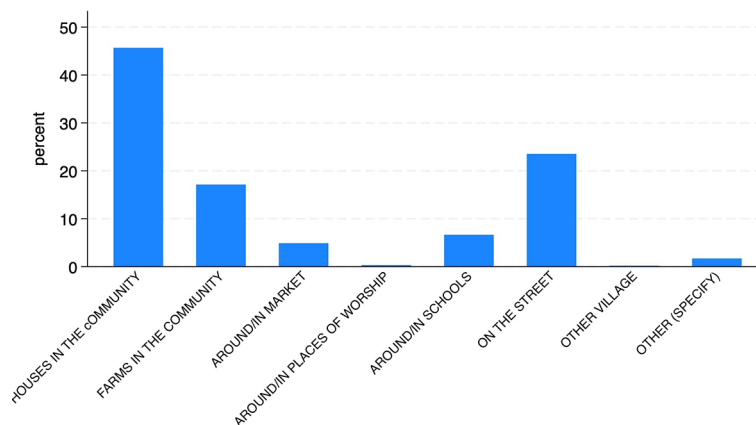


Figure 6. Distribution of crime locations from 2010-2017 in Nigeria. Note: The figure is from a survey that asks Nigerians across the country to note the locations where they experience crime the most in the country (Sources: Nigeria Bureau of Statistics (NBS) Conflict and Food Security Survey 2017).

We denote X as a vector of controls including temperature, precipitation, and its squared term, measured at the LGA level. We also include market-level covariates, such as the number of market-reported fires and floods, other non-violent crimes, the average number of businesses in the market, which proxies for market size, and the share of the market composed of youth.

Our identification relies on the assumption that, conditional on year fixed effects, which control for annual macroeconomic conditions in the country, product fixed effects (which control for fixed characteristics determining the availability of a particular product), and location fixed effects (which accounts for fixed religious and geographic contexts that may make conflict in a location likelier) and a rich set of time-varying controls including weather, conflict is not related to any other unobserved measure that affects market performance.

One limitation of this analysis is that it utilizes recall data, which may be subject to misreporting. However, we are not so concerned about this because the surveys were completed and validated by multiple stakeholders within the market.

Also, although our empirical strategy aligns with the literature on the effect of conflict on microeconomic outcomes, as seen in (Del Prete et al., 2023), another limitation is that there may be other time-varying variables at the market level that affect both market performance and conflict, that may not be captured by year fixed effects. Likely candidates include weather-related disasters; we address this by controlling for temperature and rainfall at the LGA level, and for floods and fires at the market level. We also note that, given Nigeria's conflict context, certain socio-cultural factors that increase the likelihood of conflict, such as living in the north or near specific locations, are unlikely to change from year to year. Nonetheless, readers must read our results with these caveats in mind.

4. Results

4.1 Violence and market activity

We examine the effect of exposure to violence, measured at both the LGA and market level, on the average quantity of goods available in each market and the average number of vehicles making deliveries. Using the reported ACLED conflicts by type, we present results with and without time-varying controls at the market and LGA levels in Table 2. For the disaggregated ACLED fatalities caused by Battles, Explosions, Strategic Developments, Violence against civilians, Protests, and Riots, we discuss results from columns (3) and (4), which include all controls, as well as product, year, and LGA fixed effects. In addition, the tables display coefficients from the regression that uses the total fatalities from all event types in columns (5) and (6). We report the same results showing the complete set of controls in Table 12.

We observe that fatalities from riots and protests negatively affect both the quantity available and the number of vehicles making deliveries. In particular, the effect of an additional fatality from riots and protests is a one percentage point and a 20 percentage point reduction in the quantity of food available in markets, respectively. We do not see a significant impact from other ACLED conflict types, nor do we find an effect of total fatalities on average, highlighting the importance of considering distinct conflict types.

Conversely, an additional market-reported violent crime reduces the amount of goods available in the market by about two percentage points. When market activity is measured by the average number of vehicles making deliveries, we observe results like those for the quantity of products. The coefficient on market-reported violent crime is one percentage point. Taken together, these results suggest a stronger relationship between localized market conflict and market performance.

4.2 Decomposing results by type of market crime

To understand which violent crimes drive our main results on violent crime, where we observed that market-reported crimes reduce vehicular traffic and quantity supplied, we conduct our primary analysis of the effect of market crime on market performance, using reported market crime in each category. For our measure of market-reported violent crimes, these are Robbery, Murder, and Violence against women (VAWA). We maintain all our controls and regressors from the main specification but only display results for decomposed market crime.

We present the results in Table 3 and discuss results from the regressions with controls in columns (3) and (4). We see that armed robbery and violence against women significantly impact our outcomes. Specifically, we observe that an additional robbery and VAWA incident is associated with a decrease in the quantity of food by 1 and 3 percentage points, respectively, with smaller magnitudes also observed in the case of vehicles making deliveries, of a reduction of approximately one percentage point caused by both an additional robbery and VAWA. In contrast, we do not see a significant effect of murders on our outcomes, perhaps because murders are relatively less frequent (less than one on average, compared to 1 and about 2 Robberies and Violence against women events, respectively).

Table 2. The effect of violent conflict on market activity.

VARIABLES	(1) Quantity (kg)	(2) Vehicles	(3) Quantity (kg)	(4) Vehicles	(5) Quantity (kg)	(6) Vehicles
Fatalities from Battles	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)		
Fatalities from Explosions	0.001 (0.001)	0.000 (0.001)	0.000 (0.002)	0.000 (0.002)		
Fatalities from Riots	-0.009 (0.006)	-0.010* (0.005)	-0.011* (0.006)	-0.013*** (0.004)		
Fatalities from Violence against civilians	0.002 (0.001)	0.002 (0.001)	0.001 (0.001)	0.002** (0.001)		
Fatalities from Protests	-0.041 (0.041)	-0.093*** (0.028)	-0.195*** (0.067)	-0.154*** (0.054)		
Fatalities from Strategic developments	0.001 (0.169)	0.015 (0.157)	0.109 (0.192)	0.112 (0.179)		
Violent crime	-0.013** (0.005)	-0.008*** (0.003)	-0.017*** (0.005)	-0.010*** (0.003)	-0.013** (0.005)	-0.008*** (0.003)
Total fatalities					0.000 (0.001)	0.000 (0.000)
Observations	1,330	1,357	1,272	1,281	1,330	1,357
R-squared	0.519	0.541	0.562	0.577	0.519	0.540
Controls	No	No	Yes	Yes	Yes	Yes
LGA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Fatalities from events such as Battles and Riots are the total fatalities from these events in an LGA in the previous year. Total Fatalities are the sum of all ACLED-reported fatalities in an LGA in the previous year. Violent crime is the sum of market-reported violent events, including violent theft, murders, and violence against women. Controls include the counts of fire and flood incidents, the number of auxiliary businesses, other non-violent events, the share of the market that is young, and the average annual temperature, rainfall, and its squared term, all measured at the local government level. Standard errors, clustered at the LGA level, are presented in parentheses.

***p<0.001,

**p<0.01,

*p<0.05.

Table 3. Effect of violent crimes on market performance.

VARIABLES	(1) Quantity (kg)	(2) Vehicles	(3) Quantity (kg)	(4) Vehicles
Robbery	-0.005** (0.002)	-0.005*** (0.002)	-0.010** (0.004)	-0.008*** (0.002)
Murder	-0.029 (0.041)	-0.011 (0.032)	-0.019 (0.028)	-0.004 (0.022)
Vawa	-0.023*** (0.005)	-0.011** (0.005)	-0.027*** (0.005)	-0.014*** (0.004)
Observations	1,327	1,354	1,272	1,281
R-squared	0.521	0.540	0.562	0.577
Controls	No	No	Yes	Yes
LGA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes

Notes: All crime events, such as Robbery and Murder, are market-reported for each year. Controls include the counts of Fire and Flood Incidents, the number of auxiliary businesses, the share of the market that is young, and the average annual temperature and rainfall measured at the local government level. Additionally, other non-violent crimes, such as theft and traffic incidents, are controlled for. Standard errors, clustered at the LGA level, are presented in parentheses.

***p<0.001,

**p<0.01,

*p<0.05.

4.3 Heterogeneous effect of violence on market activity by region

Next, we examine how the effect varies across markets located in the south and the north of Nigeria, given the distinct sociocultural contexts of these regions.

4.3.1 Effect of violence by region

Here, we also examine decomposed ACLED-reported conflict in the locality by region as shown in Table 4. These results show that fatalities from riots and protests are the most salient type of conflict in markets in the North, while protests are the most salient in Southern markets. Specifically, an additional fatality from protests is associated with a reduction in the quantity of food available in the market of about 18 percentage points in the north and 40 percentage points in the south.

Table 4. Effect of violent conflict on market activity by region.

VARIABLES	(1) North Quantity (kg)	(2) South Quantity (kg)	(3) North Vehicles	(4) South Vehicles
Fatalities from Battles	-0.001 (0.001)	-0.001 (0.002)	-0.001 (0.001)	-0.001 (0.002)
Fatalities from Explosions	-0.001 (0.002)		-0.001 (0.002)	
Fatalities from Riots	-0.012* (0.007)	0.024 (0.019)	-0.014** (0.006)	0.022 (0.015)
Fatalities from Violence against civilians	0.001 (0.001)	0.006 (0.010)	0.002* (0.001)	0.005 (0.007)
Fatalities from Protests	-0.181** (0.078)	-0.378** (0.145)	-0.181** (0.072)	-0.142* (0.080)
Fatalities from Strategic developments	0.133 (0.177)		0.181 (0.165)	
Observations	764	508	765	516
R-squared	0.618	0.378	0.632	0.509
Market FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes: Fatalities from events such as Battles and Riots are the total fatalities from these events in an LGA in the previous year. Controls include the counts of Fire and Flood Incidents, the number of auxiliary businesses, the share of the market that is young, and the average annual temperature and rainfall measured at the local government level. Additionally, other non-violent crimes, such as theft and traffic incidents, are considered. Standard errors, clustered at the LGA level, are presented in parentheses.

***p<0.001,

**p<0.01,

*p<0.05.

This may be because protests are, by definition, non-violent demonstrations; hence, a fatality from them is likely to be newsworthy, which may factor into market activity. On the other hand, riots are only significant for markets in the north, where an additional fatality reduces the quantity of food available and the number of vehicles making deliveries by 1 percentage point.

Table 5. Effect of violent crime on market activity by region.

VARIABLES	(1) North Quantity (kg)	(2) South Quantity (kg)	(3) North Vehicles	(4) South Vehicles
Robbery	-0.007*** (0.002)	-0.043 (0.099)	-0.008*** (0.002)	0.014 (0.040)
Murder	-0.021 (0.030)	-0.010 (0.187)	0.000 (0.020)	-0.010 (0.093)
Violence against women	-0.028*** (0.004)	-0.062* (0.032)	-0.020*** (0.004)	-0.010 (0.017)
Observations	764	508	765	516
R-squared	0.619	0.378	0.632	0.510
Market FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes

Notes: All crime events, such as robberies, are reported by the market for each year. Controls include the counts of Fire and Flood Incidents, the number of auxiliary businesses, the share of the market that is young, and the average annual temperature and rainfall measured at the local government level. Additionally, other non-violent crimes, including theft and traffic incidents, are considered. Standard errors, clustered at the LGA level, are presented in parentheses.

***p<0.001,

**p<0.01,

*p<0.05.

Table 6. The effect of violent conflict on food prices.

VARIABLES	(1) Price per Kg
Fatalities from Battles	-7.634 (5.324)
Fatalities from Explosions	13.038* (7.284)
Fatalities from Riots	152.160* (80.116)
Fatalities from Violence against civilians	1.160 (3.216)
Fatalities from Protests	136.729 (518.334)
Violent crime	20.884 (13.081)
Observations	580
R-squared	0.201
Controls	Yes
State FE	Yes
Product FE	Yes
Mean of dep. var	1150

Notes: The dependent variable Price per Kg is the Log of the price of the most commonly sold variety of the product sold in the market. Fatalities are the sum of all ACLED-reported fatalities in an LGA in the previous year. Violent crime is the sum of market-reported violent events, including violent theft, murders, and violence against women. Controls include the counts of Fire and Flood Incidents in the market, the number of auxiliary businesses in the market, other non-violent events in the market, the share of the market that is young, and the average annual temperature, rainfall, and its squared term measured at the local government level. Standard errors, clustered at the LGA level, are presented in parentheses.

***p<0.001,

**p<0.01,

*p<0.05.

Table 7. Effect of violent conflict on traders in the market.

VARIABLES	(1) Wholesalers	(2) Retailers
Fatalities from Battles	-0.002** (0.001)	0.000 (0.001)
Fatalities from Explosions	0.003** (0.001)	0.000 (0.001)
Fatalities from Riots	-0.012*** (0.004)	-0.011*** (0.004)
Fatalities from Violence against civilians	0.001* (0.001)	0.000 (0.001)
Fatalities from Protests	-0.102* (0.055)	-0.024 (0.035)
Fatalities from Strategic developments	-0.037 (0.143)	-0.197** (0.089)
Violent crime	-0.009*** (0.003)	-0.004 (0.004)
Observations	1,665	1,534
R-squared	0.500	0.603
Controls	Yes	Yes
LGA FE	Yes	Yes
Year FE	Yes	Yes
Product FE	Yes	Yes

Notes: All conflict types, such as Battles and Riots, are the total fatalities from these events in an LGA in the previous year. Fatalities are the sum of all ACLED-reported fatalities in an LGA in the previous year. Violent crime is the sum of market-reported violent events, including violent theft, murders, and violence against women. Controls include the counts of Fire and Flood Incidents, the number of auxiliary businesses, other non-violent events, the share of the market that is young, and the average annual temperature, rainfall, and its squared term, all measured at the local government level. Standard errors, clustered at the LGA level, are presented in parentheses.

***p<0.001,

**p<0.01,

*p<0.05.

Table 8. Product type and percent table.

Product	Product type	Percent
Tomato	Fresh	94.39
Tomato	Dried	5.61
GLV	Spinach	42.05
GLV	Amaranthus	1.89
GLV	Bitter leaves	0.76
GLV	Jute leaves	9.47
GLV	Fluted pumpkin leaves	21.21
GLV	Sorrel leaves	0.38
GLV	Garden egg leaves	0.76
GLV	Sweet potato leaves	0.38
GLV	Karkashi	0.76
GLV	Spring onions	4.17
GLV	Cabbage	16.67
GLV	Moringa – Zogale	0.76
GLV	Rosette	0.38
GLV	Roselle plant	0.38
Fish	Fresh	19.57
Fish	Dried	43.48
Fish	Smoked	28.99
Fish	Frozen	7.97

Notes: Within each of the three main products, Tomatoes, Green Leafy vegetables (GLV), Fish, this table shows the proportion of product-type sold by the markets within our data.

Table 9. Definition of conflict events by ACLED.

Event type	Definition
Battles	Violent clashes between two or more armed groups
Explosions/remote violence	Events involving the use of explosive devices
Violence against civilians	Attacks on civilians
Riots	Violent demonstrations, often spontaneous
Protests	Nonviolent demonstrations
Strategic Developments	Important instances of non-violent activity by conflict actors and other agents

Source: ACLED.

Table 10. Variables and their description.

Variable	Description
Violent Crime	Total of Market-reported violent theft, murders, and violence against women
Total Fatalities	Total annual ACLED Fatalities by LGA
Number of Conflicts	Total annual number of ACLED conflicts by LGA
NumBiz	Number of auxiliary businesses in the market, including laborers & storage, etc.
Average Vehicles	Average number of vehicles making deliveries to a market across seasons in a year
Average Quantity	Average volume of goods in kilograms delivered to market across seasons in a year
Fire	Number of Fire Incidents reported by a market in a year
Flood	Number of Flood incidents reported by a market in a year

Table 11. Summary table.

Variables	Mean	sd	Min	Max	Count
Market-level Crime measures					
Violent crime	2.59	10.45	0.00	153.00	1841
Robbery	1.07	9.01	0.00	150.00	1781
Murder	0.12	0.93	0.00	30.00	1779
Violence against women (Vawa)	1.49	5.56	0.00	110.00	1783
Total crime	40.05	131.95	0.00	1531.00	1817
ACLED Conflict measures					
Fatalities	15.99	49.27	0.00	589.00	1848
Number of conflicts	7.17	19.74	0.00	148.00	1848
Fatalities from Battles	6.27	29.78	0.00	467.00	1848
Fatalities from Explosions	0.05	1.91	0.00	82.00	1848
Fatalities from Strategic developments	7.22	24.77	0.00	211.00	1848
Fatalities from Violence against civilians	0.55	6.88	0.00	180.00	1848
Fatalities from Protests	0.03	0.19	0.00	2.00	1848
Fatalities from Riots	0.61	4.05	0.00	44.00	1848

Table 11. *Continued*

Variables	Mean	sd	Min	Max	Count
Outcomes and Controls					
Average Quantity of Product across seasons (Kg)	106,503.52	1,703,784.58	0.00	45,000,000.00	1848
Average of Number of Wholesalers across seasons	36.59	57.04	0.00	700.00	1779
Average Number of Vehicles making deliveries across seasons	33.45	66.56	0.00	797.50	1848
Average of Number of Retailers across seasons	49.34	86.11	0.00	1100.00	1646
Price per Kg (Naira), product == Tomato	484.56	496.00	0.40	3000.00	642
Price per Kg (Naira), product == GLV	330.53	338.74	13.82	2500.00	792
Price per kg, product == Fish	3647.07	7489.21	6.67	50000.00	414
Number of Auxiliary Businesses	308.48	556.78	0.00	7563.00	1848
Fires	0.25	0.83	0.00	10.00	1780
Floods	0.38	2.47	0.00	40.00	1781
Share of market that is youth (%)	34.92	24.55	0.00	100.00	1776
Average annual temperature (Kelvin)	304.74	2.67	298.74	312.34	1818
Average annual precipitation (Millimeters)	154.33	60.38	36.46	353.00	1818
Market is in urban area	0.29	0.45	0.00	1.00	1848
Market is in Northern Nigeria	0.61	0.49	0.00	1.00	1848
Observations	1848				

Table 12. The effect of violence on market activity showing controls.

Variables	(1) Quantity (kg)	(2) Vehicles
Fatalities from Battles	-0.001 (0.001)	-0.001 (0.001)
Fatalities from Explosions	0.000 (0.002)	0.000 (0.002)
Fatalities from Riots	-0.011* (0.006)	-0.013*** (0.004)
Fatalities from Violence against civilians	0.001 (0.001)	0.002** (0.001)
Fatalities from Protests	-0.195*** (0.067)	-0.154*** (0.054)
Fatalities from Strategic developments	0.109 (0.192)	0.112 (0.179)
Violent crime	-0.017*** (0.005)	-0.010*** (0.003)
Fire	-0.045 (0.065)	-0.047 (0.049)
Flood	-0.035*** (0.011)	-0.016* (0.008)
Temperature	-0.094** (0.043)	-0.095** (0.040)
Rainfall	-0.004 (0.003)	-0.006* (0.003)
Rainfall (squared)	0.000 (0.000)	0.000** (0.000)
Share that is young	0.003 (0.004)	0.006** (0.003)
Number of Business	0.449*** (0.089)	0.264*** (0.065)
Assault	-0.005* (0.002)	-0.002*** (0.001)
Traffic	-0.001 (0.010)	-0.009 (0.006)
Theft	0.003** (0.001)	0.003*** (0.001)

Table 12. *Continued*

Variables	(1) Quantity (kg)	(2) Vehicles
General theft	-0.001 (0.002)	-0.001 (0.001)
Urban	-0.453 (0.459)	-0.050 (0.230)
Observations	1,272	1,281
R-squared	0.562	0.577
Controls	Yes	Yes
LGA FE	Yes	Yes
Year FE	Yes	Yes
Product FE	Yes	Yes

Notes: Fatalities from events such as Battles and Riots are the total fatalities from these events in an LGA in the previous year. Violent crime is the sum of market-reported violent events, including violent 4th1eft, murders, and violence against women. Controls include the counts of Fire and Flood Incidents, the number of auxiliary businesses, other non-violent events, the share of the market that is young, and the average annual temperature, rainfall, and its squared term, all measured at the local government level. Standard errors, clustered at the LGA level, are presented in parentheses

Table 13. The effect of violence on marking activity using lagged and contemporaneous conflict.

Variables	(1) Quantity (kg)	(2) Vehicles
Fatalities from Battles $t-2$	-0.001 (0.001)	-0.001 (0.001)
Fatalities from Explosions $t-2$	0.000 (0.002)	-0.001 (0.002)
Fatalities from Riots $t-2$	-0.003 (0.004)	-0.001 (0.003)
Fatalities from Violence against civilians $t-2$	0.000* (0.000)	0.001** (0.000)
Fatalities from Protests $t-2$	0.071 (0.088)	0.027 (0.075)
Fatalities from Strategic developments $t-2$	-0.064 (0.533)	-0.558 (0.498)
Fatalities from Battles $t-1$	-0.000 (0.001)	-0.001 (0.001)
Fatalities from Explosions $t-1$	-0.001 (0.002)	0.001 (0.001)
Fatalities from Riots $t-1$	-0.015* (0.008)	-0.015** (0.006)
Fatalities from Violence against civilians $t-1$	0.002* (0.001)	0.002* (0.001)
Fatalities from Protests $t-1$	-0.379*** (0.124)	-0.317*** (0.098)
Fatalities from Strategic developments $t-1$	-0.019 (0.573)	0.600 (0.535)
Fatalities from Battles	-0.001 (0.001)	-0.002* (0.001)
Fatalities from Explosions	0.002 (0.002)	0.000 (0.002)
Fatalities from Riots	-0.013** (0.005)	-0.010** (0.004)
Fatalities from Violence against civilians	-0.000 (0.001)	-0.000 (0.001)
Fatalities from Protests	0.076 (0.107)	0.101 (0.102)
Fatalities from Strategic developments	0.006*** (0.002)	0.002 (0.002)
Violent Crime	-0.017*** (0.005)	-0.010*** (0.003)
Observations	1,272	1,281
R-squared	0.562	0.578
Controls	Yes	Yes
LGA FE	Yes	Yes
Year FE	Yes	Yes
Product FE	Yes	Yes

Notes: Controls include the counts of Fire and Flood Incidents, the number of auxiliary businesses, other non-violent events, the share of the market that is young, and the average annual temperature, rainfall, and its squared term, all measured at the local government level. Standard errors, clustered at the LGA level, are presented in parentheses.

***p<0.001,

**p<0.01,

*p<0.05.

Table 14. The effect of violent conflict on market activity using conflict count.

Variables	(1) Quantity (kg)	(2) Vehicles	(3) Quantity (kg)	(4) Vehicles
Number of Explosions	-0.006 (0.010)	-0.007 (0.009)		
Number of Riots	-0.002 (0.010)	0.003 (0.007)		
Number of Violence against civilians	0.007 (0.004)	0.005 (0.003)		
Number of Protests	-0.010*** (0.004)	-0.009*** (0.003)		
Number of Strategic developments	0.008 (0.011)	-0.004 (0.012)		
Violent crime	-0.017*** (0.005)	-0.010*** (0.003)	-0.017*** (0.005)	-0.010*** (0.003)
Total number of Conflicts			-0.003 (0.003)	-0.003 (0.002)
Observations	1,272	1,281	1,272	1,281
R-squared	0.562	0.578	0.561	0.577
Controls	Yes	Yes	Yes	Yes
LGA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes

Notes: The Number of Explosions, Riots, etc, is the total count of conflict types related to that event for each LGA in the previous year. Violent crime is the sum of market-reported violent events, including violent theft, murders, and violence against women. Controls include the counts of Fire and Flood Incidents, the number of auxiliary businesses, other non-violent events, the share of the market that is young, and the average annual temperature, rainfall, and its squared term, all measured at the local government level. Standard errors, clustered at the LGA level, are presented in parentheses.

***p<0.001,

**p<0.01,

*p<0.05.

Table 15. The effect of violent conflict on market activity using product form fixed effects.

Variables	(1) Quantity (kg)	(2) Vehicles
Fatalities from Battles	-0.001 (0.001)	-0.001 (0.001)
Fatalities from Explosions	0.000 (0.002)	0.000 (0.001)
Fatalities from Riots	-0.012** (0.006)	-0.013*** (0.004)
Fatalities from Violence against civilians	0.002 (0.001)	0.002** (0.001)
Fatalities from Protests	-0.190*** (0.073)	-0.139*** (0.053)
Fatalities from Strategic developments	0.127 (0.194)	0.158 (0.169)
Violent crime	-0.017*** (0.005)	-0.011*** (0.003)
Observations	1,272	1,281
R-squared	0.571	0.614
Controls	Yes	Yes
Market FE	Yes	Yes
Year FE	Yes	Yes
Product Form FE	Yes	Yes

Notes: All conflict types, such as Battles and Riots, are the total fatalities from these events in an LGA in the previous year. Total Fatalities are the sum of all ACLED-reported fatalities in an LGA in the previous year. Violent crime is the sum of market-reported violent events, including violent theft, murders, and violence against women. Controls include the counts of Fire and Flood Incidents, the number of auxiliary businesses, other non-violent events, the share of the market that is young, and the average annual temperature, rainfall, and its squared term, all measured at the local government level. Standard errors, clustered at the LGA level, are presented in parentheses.

***p<0.001,

**p<0.01,

*p<0.05.

4.3.2 Decomposed market crimes by region

Further, we examine decomposed market crimes by region as shown in [Table 5](#). These results confirm that most of the decomposed effects of market crime on markets in the north are coming from Robberies and Violence against women, which affects both quantity and vehicular traffic in the north. Nonetheless, Violence against women (VAWA) is significantly associated with a decrease in the amount of food available in both northern and southern markets. An additional violent crime against women reduces the quantity of food available in the north and south by approximately 3 and 6 percentage points, respectively. Additionally, for markets in the north, the coefficient on VAWA for both quantity and vehicular traffic is more than twice that of Robbery. For example, an additional VAWA reduces the amount of food by 2.8 percentage points, compared to 0.7 percentage points for an additional robbery case in northern markets.

4.4 Possible mechanisms

The effect of conflict on reduced food availability, as observed in the results discussed above, may be due to either reduced supply or decreased consumer demand. In this section, we examine evidence that might support the existence of demand or supply mechanisms.

4.4.1 Demand

Our earlier results on reduced vehicular traffic suggest that supply-side mechanisms are at play. Here, we check if higher conflict intensity is reflected in food prices. If demand is reduced, we would expect food prices to decrease as conflict intensity increases. In our data, we have product-form market-level food prices for 2023. Hence, we regress food prices on fatalities from distinct conflict types, measured at the local government level, while controlling for state- and product-fixed effects. As presented in [Table 6](#), the increasing fatalities from explosions and riots are positively associated with increased prices, albeit only at a 90% confidence level. Similarly, market-reported violent crime is not correlated with food prices. Overall, this evidence, while not conclusive, suggests that increased violent conflict in the locality and in the market does not reduce consumer demand.

4.4.2 Number of traders

We observe a reduction in market activity due to violent crime and fatalities caused by specific conflict events in our results. It is plausible that lower activity is driven by fewer wholesalers and/or retailers in the market. We verify this using decomposed ACLED fatalities, with the number of wholesalers and retailers as the dependent variable and report our results in [Table 7](#), with results for wholesalers in column (1) and retailers in column (2). The results show that fatalities from battles, riots, and protests significantly reduce the number of wholesalers by about 0.2, 1.2, and 10 percentage points, respectively, on average. Likewise, an additional violent crime within the market reduces the number of wholesalers by approximately one percentage point on average. Among retailers, we observe that an additional riot-related fatality is associated with a decrease of about 1 percentage point in the number of retailers. We also see that an additional fatality from strategic developments significantly reduces the number of retailers by about 20 percentage points. These results suggest that the decrease in food availability we observe in our main results may be driven by, or accompanied by, fewer traders in the market, reinforcing the idea that conflict causes a supply shock to food markets.

4.5 Robustness checks

Our main conclusions are confirmed in robustness checks. We still see our results on the significant adverse effect of fatalities from riots and protests remain robust when we include additional conflict lags and contemporaneous conflict in our principal regression, as shown in [Table 13](#). Second, we still observe a significant adverse effect of protests when using conflict counts rather than fatalities, as reported in [Table 14](#). Finally, we also check our main conclusions using a more stringent product-form fixed effects in place of product-fixed effects, as presented in [Table 15](#).

5. Conclusion

This paper examines the impact of exposure to violence—specifically, localized violent crime and the number of fatalities in a market’s locality—on food availability in wholesale markets in Nigeria. Our research contributes to the emerging literature on the effects of conflict within the midstream segments of the food supply chain, particularly the extremely thin research on conflict and food markets. We utilize a retrospective panel of market data from wholesale food markets across eight Nigerian states, focusing on three primary food products: tomatoes, leafy green vegetables, and fish.

Detailed information on the flow of these products within the market is combined with market-reported crime statistics and conflict events to which market participants are exposed, measured at the local government level using ACLED records. We examine distinct conflict categories to finely account for which events drive market outcomes. To identify the

effects of violent crime on market outcomes, we employ a fixed-effects approach, controlling for locality, product, and year, while accounting for time-varying market and locality variables, including weather conditions. Our findings indicate negative impacts of violence on market outcomes. Specifically, exposure to violence is associated with a decrease in the quantities available for sale in wholesale food markets, with one contributing factor being reduced vehicular traffic for food deliveries. Additionally, we observe regional variations (between northern and southern Nigeria) in the types of conflict events that have significant impacts and the magnitude of these effects.

These results have important implications for policies and programs aimed at enhancing food security. Our findings highlight the need for increased attention to the security of food markets in Nigeria. More than 30% of the studied markets lacked any security presence, and among those with security, the trader-to-security guard ratio exceeded 450 (Therault et al., 2025). We also find that regional differences are critical for developing and implementing effective strategies to improve food market safety. For instance, increasing the number of security guards and efforts to reduce robberies and manage riots are more crucial in the northern regions, whereas governance measures to prevent violence against women and strategies to reduce fatalities from conflicts are important for both areas, particularly in the south.

Ultimately, it is essential to ensure adequate protection for food markets to facilitate the safe and reliable movement of food along the supply chain, thereby guaranteeing access to food for the people and communities that depend on them.

Ethical approval and consent statement

All studies in this project involving humans were approved by the Michigan State University Institutional Review Board and conducted in accordance with local legislation and institutional requirements. This project has the Michigan State University IRB Study ID: STUDY00007403 and was determined exempt Category: Exempt 2ii. The participants provided their written informed consent to participate in this study.

Data availability statement

Data will be made available on request.

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