

## Violence incidence in Food Supply Chains: the case of Nigerian Maize Traders

Carolina M. Vargas, Lenis Saweda O. Liverpool-Tasie, and Thomas Reardon

### Introduction

We examine the probability of incidence and vulnerability of Nigerian maize traders to conflict shocks. We focus on understanding if conflict and violence tend to harm female, small-scale, and rural traders more than male, large-scale, and urban traders. We also examine the relationship between experiencing a violent shock and the presence of non-state armed actors (NSAA) at the origin (where traders procure maize) and the destination (where traders supply) of traders' procurement and supply routes. Violence has become more common in Nigeria in the last decade. This includes attacks and kidnappings by Boko Haram, intensification of farmer-herder conflicts (FHC), kidnappings by other actors, and banditry. Even though violence has been proved to harm welfare and food security, very little is known about its effects on supply chain actors, including traders. Most studies have focused on the violence where the victims reside but not their places of business. We use data from a cross-section of more than 1000 maize traders collected in our own surveys in the North and South of Nigeria, as well as violence information from the Armed Conflict Location and Event Data Project to test if gender, size, and location of traders increase their probability of experiencing a shock from Boko Haram, Farmer Herder Conflict, or general banditry.

### Data

This study relies on cross section data for maize traders collected in 2021 and 2017. The sample was drawn from our own census of maize traders in 63 main urban maize wholesale markets in Ibadan in the South and in Jos, Kaduna, Kano, and Katsina in the North of Nigeria. A total of 1,111 active traders were surveyed. The data set contains information on trader characteristics, procurement and supply of maize; social and physical capital and distances from the traders from their suppliers and to their buyers as well as distances to main cities and highways. The survey also treats exogenous shocks (including Boko Haram, farmer-herder conflict (FHC), and banditry, as well as climate and spoilage shocks. Traders

### Key Findings

- The increase in the presence of non-state armed actors (NSAA) has increased violence-related shocks.
- Female traders have a higher chance of experiencing a violence shock. Women traders were more vulnerable to farmer-herder conflict and banditry than to Boko Haram.
- Both large and small traders are affected similarly by political and ethnic-related conflict.
- Urban traders have a higher probability of experiencing a violence shock, particularly for Boko Haram and banditry.
- There was a lot of NSAA at the origin (procure) and the destination (supply) of traders' procurement and supply routes.

were asked if they had experienced the shock, the severity of it, what measures were taken to address it, and how long it took the trader to recover from the shock.

To control for the degree of urbanization, climate risk, and exposure to violence of the areas where the trader procures and supplies and is based, we use three sources of data: (1) Nigerian government data on the population of "local government areas" (i.e., districts); (2) a violence index we computed based on data on the presence of armed actors from the Armed Conflict Location and Event Data Project ([www.acleddata.com](http://www.acleddata.com)). The latter covers actors, locations, fatalities, and types of all reported political violence (e.g., abduction, attacks, explosions), and sexual violence, looting, and property destruction; (3) temperature and rainfall data from the Climate Hazards Group InfraRed Precipitation with Station data collected by the US government for Nigeria.

Table 1 shows that about 49% of maize traders in our sample have experienced a violence shock. Almost 20% reported a shock from FHC, 42% from banditry, and 15% from Boko Haram. We analyzed the relationship between experiencing a violence shock and both trader characteristics and the presence of NSAA in the LGAs where the traders are based and in the LGAs of the trader's main suppliers and buyers. We focused on the traders' size, gender, and urban location. Size was measured by the amount of maize sold and the number of wholesale market stalls. Where large traders are those that sold 32 tons (or more) per month within the high season. Traders were stratified into if they sold to urban or rural markets. We also controlled for age, experience, maize farming, and

religion as a proxy for ethnic or tribal background. To calculate the presence of NSAA we used the ACLED data to track by year the presence and actions of specific NSAA: 1. Rebel groups: political organizations seeking to counter an established national government by violent acts. They include Boko Haram, Islamic State, and the Movement for the Actualization of the Sovereign State of Biafra (MASSOB). 2. Political Militias: a more diverse set of violent actors, who are often created for a specific political purpose. They include Niger Delta Avengers (NDA) and the Civilian Joint Task Force. 3. Identity militias which are armed and violent groups organized around a collective, common feature including community, ethnicity, region, and religion.

**Table 1. Trader characteristics and presence of armed groups for victims of violence shocks in 2021**

|  | Total | Traders experienced a shock by: |     |      |          |     |      |            |     |      |                   |     |      |
|--|-------|---------------------------------|-----|------|----------|-----|------|------------|-----|------|-------------------|-----|------|
|  |       | Farmer-herder conflicts         |     |      | Banditry |     |      | Boko Haram |     |      | Any violent shock |     |      |
|  |       | No                              | Yes | Sig. | No       | Yes | Sig. | No         | Yes | Sig. | No                | Yes | Sig. |
| All traders (%)                                    |       | 80                              | 20  |      | 58       | 42  |      | 85         | 15  |      | 51                | 49  |      |
| <b>Traders Characteristics</b>                     |       |                                 |     |      |          |     |      |            |     |      |                   |     |      |
| % Large Traders                                    | 68    | 69                              | 67  |      | 66       | 72  | **   | 68         | 71  |      | 66                | 71  | **   |
| Mean number of stalls                              | 0.8   | 1.0                             | 1.1 | **   | 1.0      | 1.0 |      | 1.0        | 1.0 |      | 1.0               | 1.0 |      |
| % Female   | 12    | 8                               | 27  | ***  | 10       | 16  | ***  | 12         | 15  |      | 8                 | 27  | ***  |
| % Urban  | 28    | 26                              | 35  | ***  | 24       | 34  | ***  | 23         | 56  | ***  | 20                | 37  | ***  |
| % Produce own maize                                | 14    | 11                              | 27  | ***  | 7        | 24  | ***  | 15         | 9   | **   | 7                 | 22  | ***  |
| <b>Violence History</b>                            |       |                                 |     |      |          |     |      |            |     |      |                   |     |      |
| Mean years presence armed groups in local LGA      | 3.6   | 3.2                             | 5.5 | ***  | 2.8      | 4.8 | ***  | 3.8        | 2.6 | ***  | 2.9               | 4.5 | ***  |
| Mean years presence armed groups in buyers' LGA    | 5.7   | 5.0                             | 8.1 | ***  | 5.0      | 6.5 | ***  | 6.1        | 3.9 | ***  | 5.2               | 6.2 | ***  |
| Mean years presence armed groups in suppliers' LGA | 4.3   | 4.1                             | 5.0 | ***  | 4.0      | 4.7 | ***  | 4.5        | 3.3 | ***  | 4.0               | 4.6 | ***  |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Patterns in the distribution of violence shocks

Experiencing a violent related shock varies significantly across traders of different characteristics (Table 1). Of the traders that experienced a violence-related shock, 27% were female, while only 8% of those that didn't experience a shock were female. Women traders were more vulnerable to farmer-herder conflict and banditry than to Boko Haram. Moreover, not all conflict affects larger traders in

the same way. Traders who experienced banditry on average were larger, but this is only significant for this type of violence. Still, traders that farm maize were significantly more affected than those who did not, perhaps because of their rural exposure via farming.

The share of urban traders experiencing a shock was higher than those who did not. Thus, although violence has tended to move to rural areas, urban-based traders are still most affected by the shocks, perhaps because they travel greater distances.

35% of traders's base LGAs had NSAA. However, 41% of traders had their main buyer located in an area with NSAA and 60% had their main supplier located in an area with NSAA in 2021. Table 1 shows that the mean number of years of NSAA presence is bigger in the locations of the traders' main buyers and suppliers than in the traders' bases. More years of NSAA presence are significantly correlated with the trader's experiencing a violent shock. For FCH and banditry, the difference in the mean of the presence of NSAA across those that experienced a shock versus not was 3 years. The only case in which this differed was with Boko Haram as the mean presence of NSAA was less for those who experienced a shock. This is not surprising as Boko Haram is relatively new compared to FCH.

### Regressions explaining the determinants of traders' experience of violence shocks

Probit regression analysis of the determinants of the probability of experiencing a violent shock shows four things.

First, although trader's size and their chance of experiencing a violent shock are correlated, the effect is significant only for banditry and not for FHC and Boko Haram. This implies that both large and small traders are affected by political and ethnic related conflict. Having more market stalls raises the chance of experiencing a banditry shock by 20%, perhaps because more stalls make a trader more "visible" to bandits. The size effect is not significant.

Second, female traders are more apt to experiencing a violent shock, in particular from Boko Haram. Women are 53% more likely to be harmed by them.

Three, being an urban trader increases the chance of a shock from Boko Haram and banditry in particular. Since there is little Boko Haram presence in cities, the shock is occurring when the traders are outside their urban base, procuring maize or on the road to do so or to supply maize, and not within the urban markets. NSAA's presence in buyers/suppliers' LGAs was correlated with the traders' experiencing a violent shock, and that effect was higher than NSAA presence in the trader's base location.

### Policy implications

The role of violence and insecurity in the transformation of food systems in Africa is a complex and multifaceted issue that warrants significant attention. In general, the identification of victims is crucial to developing effective strategies that can help support victims of violence and strengthen security in food systems. As well, it allows policymakers to understand the scope and nature of the problem and to develop appropriate responses to address it. For example, identifying victims can help to design targeted interventions that meet the specific needs of different groups of victims. It can also help to prioritize resources and allocate them to the most vulnerable and marginalized victims.

In the case of maize traders, identifying victims in order to better generate prevention mechanisms is key to strengthening food systems and decreasing the risk of food insecurity. Our results show that female and urban traders are disproportionately affected.

Our results also highlight the fact that policy must not only focus on residents but also on non-local victims. In the case of traders, the presence of NSAA at the origin and the destination of traders' supply and procurement routes significantly increased their probability of experiencing a shock.

### Key References

- Arias, María Alejandra, Ana María Ibáñez, and Andrés Zambrano. "Agricultural Production amid Conflict: Separating the Effects of Conflict into Shocks and Uncertainty." *World Development* 119 (July 2019): 165–84. <https://doi.org/10.1016/j.worlddev.2017.11.011>.
- Bozzoli, Carlos, and Tilman Brück. "Agriculture, Poverty, and Postwar Reconstruction: Micro-Level Evidence from Northern Mozambique." *Journal of Peace Research* 46, no. 3 (May 2009): 377–97. <https://doi.org/10.1177/0022343309102658>.
- George, Justin, Adesoji Adelaja, Titus Awokuse, and Olufemi Vaughan. "Terrorist Attacks, Land Resource Competition and Violent Farmer-Herder Conflicts." *Land Use Policy* 102 (March 2021): 105241.

<https://doi.org/10.1016/j.landusepol.2020.105241>.

survey of maize traders in Nigeria. No. 1879-2018-2151. 2017.

Liverpool-Tasie, Lenis Saweda O., and Charuta M. Parkhi. "Climate risk and technology adoption in the midstream of crop value chains: evidence from Nigerian maize traders." *Journal of Agricultural Economics* 72.1 (2021): 158-179.

Okoli, Al Chukwuma, and Stephen Nnaemeka Azom. "Boko Haram Insurgency and Gendered Victimhood: Women as Corporal Victims and Objects of War." *Small Wars & Insurgencies* 30, no. 6–7 (November 10, 2019): 1214–32. <https://doi.org/10.1080/09592318.2019.1650473>.

Liverpool-Tasie, Saweda, Thomas Reardon, Awa Sanou, Wale Ogunleye, Iredele Ogunbayo, and Bolarin T. Omonona. The transformation of value chains in Africa: Evidence from the first large

To understand the vulnerability of a trader to a violence shock, we draw on repeat victimization literature and model violent shocks using the following dynamic probit specification:

$$g_i = \mathbf{M}_i\beta_M + \mathbf{MV}_i\beta_{MV} + \mathbf{X}_i\beta_x + u_i$$

Where  $g_i$  is a binary indicator of violent shock for trader  $i$ , where  $g_i=1$  if the trader has experienced that shock and 0 otherwise. We estimate four sources of violence: (1) Boko Haram (2) Farmer-herder conflict;; (3) Banditry; (4) Any violence shock.

$\mathbf{M}_i$  is a vector of variables of interest including size, number of stalls, gender, location (urban or rural) of the main market where the trader sells,  $\mathbf{MV}_i$  is a vector of LGA-level variables that include a violence index (measuring the relative number of violent attacks), the number of years of NSAA presence at the traders' location, and the buyers and sellers LGA, a variable indicating if the LGA had NSAA presence the year before (2021). We include geographical variables such as average daily rainfall and temperature for 2021.  $\mathbf{X}_{it}$  is a vector of control trader characteristics that include education, experience, religion, a dummy variable if a trader has experienced any other shock (besides violence), maize farming by the trader, and the trader's base location (North vs South).  $\beta_m, \beta_{MV}, \beta_x$  are the coefficient estimates associated with the study covariates.  $u_{it}$  is the error term which we assume is distributed  $u_i | \mathbf{M}_{it}, \mathbf{MV}_i, \mathbf{X}_i, \sim N(0,1)$ .

We model the probability of experiencing a shock by using the standard probit framework:

$$\Pr(g_{it} = 1 | \mathbf{M}_{it}, \mathbf{MV}_i, \mathbf{X}_{it}, ) = \Phi(\mathbf{M}_{it}\beta_M + \mathbf{MV}_i\beta_{MV} + \mathbf{X}_{it}\beta_x) \quad t = 1 \dots T \quad [2]$$

Where  $\Phi$  is the cumulative distribution function of the standard normal distribution. Following Wooldridge (2005) we use a conditional maximum likelihood estimator (MLE) to obtain the estimates of  $\beta_m, \beta_{MV}$ , and  $\beta_x$ . As well we calculate the average partial effect by averaging across the distribution of all observable covariates.

This Policy Research Brief was prepared for USAID/Nigeria by Michigan State University (MSU), Federal Ministry of Agriculture and Rural Development (Nigeria), and the International Food Policy Research Institute (IFPRI) under the USAID/Nigeria funded Food Security Policy Innovation Lab Associate Award, contract number AID1-620-LA-15-00001, with additional funding from USAID Cooperative Agreement with MSU's Feed the Future Innovation Lab for Food Security Policy, Research, Capacity, and Influence (IL-FSPRCI).

*This research is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the Feed the Future initiative. The contents are the responsibility of study authors and do not necessarily reflect the views of USAID or the United States Government.*

**Copyright © 2023, Michigan State University. All rights reserved. This material may be reproduced for personal and not-for-profit use without permission from but with acknowledgement to MSU and IFPRI.**

**Published by the Department of Agricultural, Food, and Resource Economics, Michigan State University, Justin S. Morrill Hall of Agriculture, 446 West Circle Dr., Room 202, East Lansing, Michigan 48824**

### **About the Authors**

**Carolina Vargas** is a PhD candidate at MSU.

**Lenis Saweda O. Liverpool-Tasie** is University Foundation Professor at MSU and Visiting Scientist at IITA Ibadan.

**Thomas Reardon** is University Distinguished Professor at MSU and Non-Resident Senior Research Fellow at IFPRI.