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The Price of Fragility

Shocks, Food Security, and Lessons from Nigeria

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Abstract

Over the past decade Nigeria has experienced persistent food price inflation and substantial volatility, driven by domestic fragilities and global shocks. Three major shocks – the COVID-19 pandemic (2020), the Ukraine-Russia war (2022), and fuel subsidy reform (2023) – drove large and uneven price increases, with wheat prices rising by 63.3% and brown sorghum by 83.9%. Volatility was highest for wheat flour and groundnuts, with coefficients of variation of 0.53 and 0.51, reflecting Nigeria's dependence on imports and sensitivity to external price shocks. This study utilizes high-frequency retail price data for eight staple food commodities across all 36 states and the Federal Capital Territory to analyze spatial and temporal food price dynamics, volatility patterns, and their welfare implications. To quantify welfare impacts, we use the International Food Policy Research Institute's Food Price Simulator. Results show a 9.1 percentage point increase in food poverty (from 42.9% to 52.0%) and an 11.6-point rise in undernourishment (from 40.0% to 51.6%). Lower-income households reduced food expenditures by 12.7%, compared to 9.5% for higher-income groups, reflecting disproportionate exposure to food inflation. Northern zones had relatively lower prices for traditional grains due to more favorable agroecological conditions, while southern regions faced higher prices due to higher transport costs and limited local production. Conflict-affected northeastern states exhibited the highest volatility and food insecurity. We propose a three-pronged policy agenda: short-term safety nets and strategic reserves, medium-term reforms to strengthen market connectivity through improved transport and storage infrastructure, and long-term investments in climate-resilient, inclusive food systems.

Keywords: Food prices, food security, price volatility, household welfare, policy shocks, market integration, Nigeria

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1. Introduction

The sharp rise in staple food prices across Nigeria in 2023 and 2024 reignited concern over the structural vulnerabilities and regional disparities within the country's food system, as well as their far-reaching implications for household welfare and economic stability (Amare et al, 2023). Food price inflation has emerged as a critical macroeconomic and social challenge, exerting pressure on food security and disproportionately affecting poor and vulnerable households (Emediegwu, 2024; Akerele et al., 2024; Amare et al., 2024). Soaring food costs have significantly eroded purchasing power, making it increasingly difficult for low-income families to access basic nutrition. Recent data from the National Bureau of Statistics (NBS, 2024) underscores the depth of the food price crisis. For instance, between April 2023 and April 2024, the average retail price of brown cowpeas more than doubled, and tomatoes and white maize also recorded increases of over 130%. Monthly spikes remain sharp; tomato prices alone rose by 17 percent from March to April 2024. Intraregional domestic price disparities are stark: in April 2024, cowpeas cost over ₦1,590[1]/kg in the North-Central and South-South, but just ₦967/kg in the North-West. White maize showed a similar gap, peaking in the South-South and hitting its lowest in the North-West. These variations point to deeper structural inequalities in food production, transport, and market access.

Several interconnected drivers underline the recent food price spikes. Macroeconomic adjustments, including the removal of fuel subsidies and the sharp devaluation of the Naira, have increased transportation and input costs across supply chains (IMF, 2024, Amare et al., 2024). Climate-related shocks, including recurrent flooding and dry spells, have disrupted agricultural production cycles, reduced yields and create supply shortages (Sanusi & Dries, 2024; Amare et al., 2020). Insecurity in key agricultural regions, particularly in the North-East and North-West, continues to undermine farming activities, damage rural livelihoods, and obstruct food distribution networks (Amare et al., 2025). These drivers, combined with the already existing low productivity in Nigeria's food production systems, led to the price increases.

This study seeks to examine the dynamics of food price inflation and structural food system fragility in Northern Nigeria, with a focus on conflict-affected areas. By analyzing regional food price trends and bottlenecks along key value chains, the paper aims to identify leverage points for targeted interventions. The analysis is centered on eight key food commodities to reflect food staples included in food assistance provided by the UN World Food Programme (WFP) known as the 'food basket' (sorghum, millet, maize and cowpeas) in Nigeria; one cereal outside the basket with significant import shares (wheat), and three more additional commodities (soyabean, groundnuts, and tomatoes). This food commodities combination provides a broad food system perspective in the context of Nigeria. Soya oil is in the WFP's food basket, opening scope to consider processing-based solutions. We included wheat, because it is the third-most-

[1] Naira (₦) the Nigerian legal tender or currency. It exchanges rate with the US dollar at the time of this study was US$1 = ₦1,535. This applies for all monetary values in this study.

consumed grain in Nigeria after maize and rice but the domestic production of wheat accounts for only 1 percent of the 6 million metric tons of annual wheat consumption in the country (Balana et al., 2022). Thus, a rising wheat price has a significant implication for food security. Groundnuts and tomatoes are widely consumed food items with high nutritional and economic significance in Nigeria. By closely examining price trends and their effects on household welfare, this study provides evidence-based insights to guide coordinated policy, institutional, and investment responses. In light of the multiple and compounding pressures on Nigeria's food system, including conflict, climate shocks, and shifting economic policies, stabilizing food prices and strengthening system resilience are critical for safeguarding national welfare and advancing long-term development (Ragasa et al., 2025, Amare et al., 2025). Furthermore, the study's findings have direct implications for Nigeria's progress toward the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 10 (reducing inequalities).

The remainder of the paper is organized as follows. Section 2 presents background literature and methodological framework. Sections 3 through 7 report the empirical findings, including analyses of price trends at the state and geopolitical zone levels; the impacts of global shocks such as the COVID-19 pandemic and the Russia–Ukraine war; domestic shocks, including the removal of fuel subsidies and the sharp devaluation of the Naira; a focused case study on price dynamics in the North-East region using recent data from the World Food Programme (WFP) and FEWS NET; and the welfare implications for low-income households. Section 8 concludes with policy implications and recommendations for enhancing the resilience of Nigeria's food systems.

2. Background Literature and Methodological Approaches

2.1. Background literature

Recent research shows that a convergence of shocks, or poly-crises, can have severe impacts on food systems, particularly in low- and middle-income countries (LMICs). Major shocks such as the Covid-19 pandemic and related policies, global conflicts such as the Ukraine-Russia war and localized conflicts such as the Boko-Haram insurgence in northeast Nigeria, and major macroeconomic policy reforms such as fuel subsidy removals and currency devaluations, have had these effects in Nigeria. These shocks have heightened food price volatility and introduced persistent structural pressures, particularly in developing and emerging economies (Reardon et al., 2020a; Reardon et al., 2020b). In such contexts, prolonged inflation episodes erode the purchasing power of poor and food-insecure households, leading to worsening food insecurity and undernutrition (Barrett, 2020; Vos et al., 2022; Amare et al., 2021).

Given the relatively inelastic nature of staple food demand, local price spikes often reflect regional supply shortages rather than shifts in demand (Swinnen and Vos, 2021; Béné, 2020). Food price increases

have immediate welfare consequences, directly reducing food consumption among vulnerable households and aggravating nutritional outcomes (Brown and Kshirsagar, 2015; Golden et al., 2011; Handa and Mlay, 2006). As a result, localized food price dynamics serve as real-time indicators of scarcity and emerging food insecurity (Amare et al., 2024). Regular monitoring of food prices across representative markets enables timely detection of stress signals, facilitates comparisons across geographic and temporal scales, and provides an empirical foundation for designing targeted interventions for food price stabilization (Garg et al., 2016).

Interpreting these price signals depends critically on understanding market integration. In the absence of comprehensive trade flow data, most empirical analyses rely on price co-movements to evaluate spatial integration and price transmission (Amare et al., 2024). Evidence suggests that prices tend to converge more rapidly across urban markets than between urban and rural markets, due to infrastructure disparities and differential reliance on local production (Minten and Kyle, 1999; Dillon and Barrett, 2015, Amare et al., 2023). These spatial frictions become particularly binding during systemic shocks. For instance, conflict-related insecurity and movement restrictions during the Covid-19 pandemic have fragmented supply chains, intensified production shortfalls, and weakened market linkages (Hirvonen et al., 2021; Mogues, 2020).

The Covid-19 pandemic introduced severe disruptions in global food systems, affecting both supply and demand sides. On the supply side, containment measures such as lockdowns, transport restrictions, and border closures impaired labor mobility, interrupted logistics, and strained food assistance programs. These disruptions were especially acute in more integrated markets, where supply chain complexity heightened exposure to external shocks (Reardon and Swinnen, 2020; Amare et al., 2021; Laborde et al., 2021). On the demand side, income shocks from employment losses, reduced remittances, and collapsing export demand played a more significant role in driving food insecurity than production disruptions alone. These combined effects contributed to a sharp rise in extreme poverty and nearly doubled the global number of people facing acute food insecurity (Laborde et al., 2021).

The extent of these disruptions varied widely depending on structural characteristics such as market distance, road quality, and digital connectivity; each of these factors mediated market segmentation and the speed of price adjustments (Minten and Kyle, 1999; Dillon and Barrett, 2015; Jones and Salazar, 2021; Dietrich et al., 2022). While digital technologies facilitated adaptations, including e-commerce platforms, mobile money, and home delivery systems, they were unevenly accessible and often deepened existing inequalities in market participation (Reardon and Swinnen, 2020). Early pandemic responses, including export bans and restrictions on seasonal labor mobility, were subsequently lifted, but their effects reverberated across supply chains and left lasting distortions.

The growing prevalence of violent conflicts and fragility presents serious obstacles to household food security in many LMICs like Nigeria. Rising global hunger is both a cause and a result of these fragile conditions, and projections indicate that by 2030, most people living in poverty will be concentrated in conflict-affected and fragile areas (Corral et al., 2020). In the context of Nigeria, conflict has severely disrupted food systems, leading to widespread vulnerability and food insecurity. This disruption occurs through multiple channels, including the impacts of conflicts on farmers' investment decisions, crop choices, and adoption of agricultural technologies (Amare et al., 2025). Interruptions of food transport networks and infrastructure can also contribute to high food prices. For instance, in the northeast region of Nigeria protracted violent conflicts have led to severe disruptions in food supply chains and restricted market access have led to upward pressure on food prices and increased food insecurity (OCHA, 2024).

Similarly, macroeconomic policy reforms, particularly the 2023 fuel subsidy removals and currency devaluations in Nigeria, have compounded pressures on food prices and household welfare (Dietrich et al., 2022) While such reforms are frequently implemented to address fiscal imbalances or external account deficits, they often result in immediate price surges for fuel, transport, and imported goods, further fueling inflation. Although declines in global oil prices reduced transportation costs, these savings were often insufficient to offset broader inflationary trends (Dietrich et al., 2022; Jones and Salazar, 2021).

Currency devaluations in net food-importing economies raised the cost of essential imports, further straining household budgets. Poorly sequenced or inadequately communicated reforms have triggered public opposition and, in some cases, political unrest. Successful reform efforts tend to rest on three pillars: careful timing, transparent public communication, and credible commitments to reinvest savings in social welfare programs such as health, education, and infrastructure. Evidence from multiple contexts shows that public support improves when citizens are informed of the long-term costs of subsidies and the expected benefits of reform (Beaton et al., 2013; IMF, 2013; Aklin et al., 2014), and this may have been the case in Nigeria where the initial public reactions to fuel subsidy reforms were muted (Kyle and Andam, 2023).

Nevertheless, supply disruptions contributed to price volatility across the food system. In some cases, consumer prices rose due to distribution bottlenecks and precautionary hoarding, even as farmgate prices declined due to downstream demand constraints (Badiane and Shively, 1998; Heigermoser et al., 2021; Hastings et al., 2021). Hoarding behavior, typically limited to wealthier households with greater storage capacity, temporarily exacerbated access challenges and contributed to retail price spikes (Mahajan and Tomar, 2021; Dietrich et al., 2022; Swinnen, 2020). Income shocks have also altered household food consumption patterns. In low-income settings, where food comprises a substantial share of total expenditure, households shifted consumption away from nutrient-rich, perishable items such as fruits and vegetables, toward more durable, calorie-dense staples like cereals and pulses (Hirvonen et al., 2021; Mogues, 2020). Given the higher income elasticity of demand for nutrient-rich foods, these substitutions

have likely worsened dietary quality and increased the risk of malnutrition among already vulnerable populations (Abay et al., 2021; Barrett, 2020; Vos et al., 2022; Amare et al., 2024).

The burden of these intersecting shocks is unevenly distributed. Vulnerable groups, particularly in regions with fragmented food supply chains and pre-existing high poverty rates, face disproportionate risks. Food value chain disruptions have been highly heterogeneous. While farming and food retailing were often designated as essential and remained largely operational during the COVID-19 pandemic, food services and related labor markets experienced substantial contractions. In sum, converging shocks from pandemics, armed conflicts, and macroeconomic reforms present a multifaceted and persistent challenge to food systems and overall macroeconomic stability. The complexity of these disruptions highlights the need for comprehensive, data-driven policy responses that integrate market monitoring, inflation containment, targeted social protection, and transparent public engagement. While the immediate impacts of these shocks have been most acutely felt in low- and middle-income countries, their long-term implications, including food system fragility, inequality, and political instability, carry global significance.

2.2. Methodological approach

This study employs a mixed-methods approach combining descriptive market analysis with household-level simulation to investigate the impacts of recent economic shocks on food prices and food security in Nigeria. Our primary data sources include monthly food price records from the Nigerian National Bureau of Statistics (NBS) spanning 2016 to 2024, complemented by market monitoring data from the World Food Programme (WFP) and the Famine Early Warning Systems Network (FEWS NET). These datasets provide high-frequency, geographically disaggregated information on prices of key staples, primarily cereals and legumes, across Nigeria's six geopolitical zones[2]. We begin by analyzing spatial and temporal price trends, focusing on patterns of price changes and dispersion. By aggregating prices at the six geopolitical zones of Nigeria, we capture regional heterogeneity and identify how food prices evolved over time and across space. To detect the impacts of major exogenous shocks, we incorporate structural break analysis to isolate significant changes in price trends corresponding to the peaks of three key shocks: the COVID-19 pandemic, the onset of the Russia–Ukraine war, and the removal of fuel subsidies in 2023. These shocks introduced marked volatility and altered market dynamics, with differentiated effects across commodities and regions. Our descriptive results quantify both average price shifts and changes in price dispersion, which reflect alterations in market integration and spatial arbitrage opportunities under stress.

[2] Nigeria is divided into six geopolitical zones—Northwest, North-East, North-Central, South-West, South-East, and South-South—each grouping states with shared agroecological, economic, and demographic features. This zonal structure provides a practical framework for analyzing regional food price dynamics, given similarities in climate, farming systems, and markets within zones.

To extend beyond price analysis and assess implications for household welfare, we utilize the Food Security Simulator, an Excel-based tool designed to estimate the short-term impacts of food price and household income shocks on consumption expenditure and caloric intake (Ecker and Comstock, 2021). The Food Price Simulator links changes in food prices to household welfare outcomes using a two-step process. First, it applies to a food demand system based on nationally representative household data to simulate how consumers adjust food purchases in response to price changes, accounting for substitution and income effects. Second, it estimates the resulting changes in food expenditure and caloric intake, enabling calculation of shifts in food poverty and undernourishment rates. The simulator integrates representative household survey data with food demand models that capture consumer behavior and substitution patterns (Ecker and Comstock, 2021). This allows us to translate observed market shocks into direct household-level outcomes, providing a nuanced picture of food security risks.

The study acknowledges the limitation that it focuses on short-term welfare impacts, as the Food Price Simulator captures only immediate household responses to food price shocks (e.g., consumption adjustments and substitution). It does not account for longer-term dynamics such as producer and wage responses, economic growth, or behavioral adaptations, which could either offset or intensify initial shocks. Thus, the results should be interpreted as lower-bound estimates of potential impacts, recognizing that actual long-run outcomes are shaped by policy, macroeconomic trends, and household resilience.

The study is framed within a broader fragility and resilience context, particularly emphasizing Northern Nigeria's vulnerable food system. Persistent insecurity, poor infrastructure, and climate variability exacerbate the impacts of food price shocks and elevated transportation costs. These exogenous shocks and structural constraints disproportionately affect smallholder farmers, pastoralists, and low-income consumers by eroding purchasing power and restricting access to affordable and nutritious food. High transport costs, resulting from poor road conditions, fuel price fluctuations, and protracted insecurity and conflicts along trade corridors, further impede agricultural trade and inflate input prices. Our findings highlight the critical need for targeted investments to strengthen local food production, enhance market infrastructure, and build resilient supply chains. Such interventions are vital for mitigating price volatility, reducing dependence on imports, and improving food system stability and household welfare in fragile contexts.

3. Regional and Temporal Patterns in Food Price Movements

This section examines the dispersion of price changes for key food commodities across Nigeria's six geopolitical zones over the study period. By analyzing the variation in price fluctuations both spatially and temporally, we assess the degree of market integration and identify regions exhibiting atypical price

volatility. Understanding the patterns and drivers of price dispersion is critical for diagnosing market inefficiencies and informing policies aimed at improving market functioning and reducing regional disparities.

3.1. Commodity price variations across Nigeria (2016–2024)

Table 1 summarizes price variations for selected commodities from 2016 to 2024 in Nigeria. The table presents mean prices, standard deviations, and minimum, maximum prices, variance and coefficient of variation for selected food commodities, capturing the extent of price fluctuations nationwide. The descriptive statistics on interstate price variability of selected agricultural commodities in Nigeria reveal important insights into the structure, functioning, and integration of domestic food markets. Nigeria's agricultural landscape is characterized by diverse agro-ecological zones, uneven production patterns, infrastructural constraints, and significant differences in local demand, all of which shape the spatial distribution of food prices.

The mean prices reflect clear differences in the market valuation of various food commodities. Leguminous crops such as groundnut (₦438.80) and cowpeas (₦421.36 brown; ₦390.39 white) command higher prices relative to staple grains. This reflects their relatively higher nutritional value, broader utility in household consumption, and limited production regions, predominantly concentrated in the northern states such as Kano, Katsina, and Borno. Processed commodities like wheat flour (₦405.86) also attract higher prices due to their dependence on imported raw materials, milling costs, and the strong influence of urban demand. In contrast, staple cereals such as millet (₦192.38), sorghum (₦193.05 brown; ₦191.33 white), and maize (₦286.95 white; ₦229.08 yellow) are relatively cheaper, reflecting their wider production base and role as household staples in both rural and urban Nigeria.

Table 1: Descriptive statistics of interstate price variability (by selected commodities)

Variable	Mean	Std. Dev.	Min	Max	variance	Coefficient of variation
Cowpeas (brown)	421.36	88.94	310.06	654.11	7910.33	0.21
Cowpeas (white)	390.39	82.86	295.05	601.68	6865.78	0.21
Maize (grain, yellow)	229.08	59.19	162.06	381.80	3503.46	0.26
Maize (grain, white)	286.95	195.64	164.88	995.90	38,275	0.68
Wheat flour	405.86	43.71	233.81	472.58	1910.56	0.11
Groundnut	438.80	89.77	331.64	668.92	8058.45	0.20
Millet	192.38	45.00	159.62	311.15	2025.0	0.23
Sorghum (brown)	193.05	56.79	140.04	332.28	3225.11	0.29
Sorghum (white)	191.33	61.45	132.51	359.91	3776.10	0.32

Source: Authors' computations. Analysis based on NBS data set: over the period January 2016 to October 2024.

The extent of interstate price variability, measured by the coefficient of variation (CV), highlights key differences in how integrated and efficient Nigeria's commodity markets are. The relatively low price

variability for wheat flour (CV=0.11) suggests a high degree of market integration. Nigeria's wheat milling industry is dominated by a few large-scale processors with extensive distribution networks, ensuring price consistency across states. Furthermore, since most wheat is imported and centrally distributed from port cities like Lagos and Port Harcourt, transportation and distribution are more coordinated compared to locally produced staples. Groundnut, cowpeas, and millet (CV ≈ 0.20, 0.21, 0.23) exhibit moderate price variability, likely due to localized production and differences in agro-climatic suitability. Groundnuts and cowpeas, for instance, are cultivated primarily in northern Nigeria, but significant demand exists across the country, including in southern urban markets. Variations in storage, transportation, and middlemen margins also contribute to observed price differences. Seasonal production cycles further amplify these fluctuations.

Sorghum and yellow maize (CV ≈ 0.26–0.32) are staple grains widely cultivated across the northern states, yet they display higher variability, reflecting supply-demand imbalances and regional trade inefficiencies. White maize (CV=0.68) stands out as the most volatile commodity, with prices ranging from ₦164.88 to ₦995.90 across states. This extreme variation reflects fundamental structural challenges in Nigeria's maize market. Limited storage facilities, fluctuating rainfall, and post-harvest losses affect availability, while weak transportation networks and high logistics costs contribute to interstate price disparities. Additionally, increased demand from the feed industry for maize, particularly in the poultry sector, intensifies competition and price differences between surplus and deficit states.

Figure 1 present a graphical analysis of price trends for brown cowpeas and maize grain across Nigeria's six geopolitical zones, revealing distinct patterns that mirror the unique economic and environmental contexts of each region. In the North-Central zone, cowpea prices have exhibited a steady upward trajectory over the study period. This trend likely reflects growing urban demand alongside supply constraints linked to climate variability, which has adversely affected yields in some production areas. The sustained price increase signals potential opportunities for scaling up production in zones with favorable agro-ecological conditions, which could help bridge the gap between supply and the rising demand from urban markets.

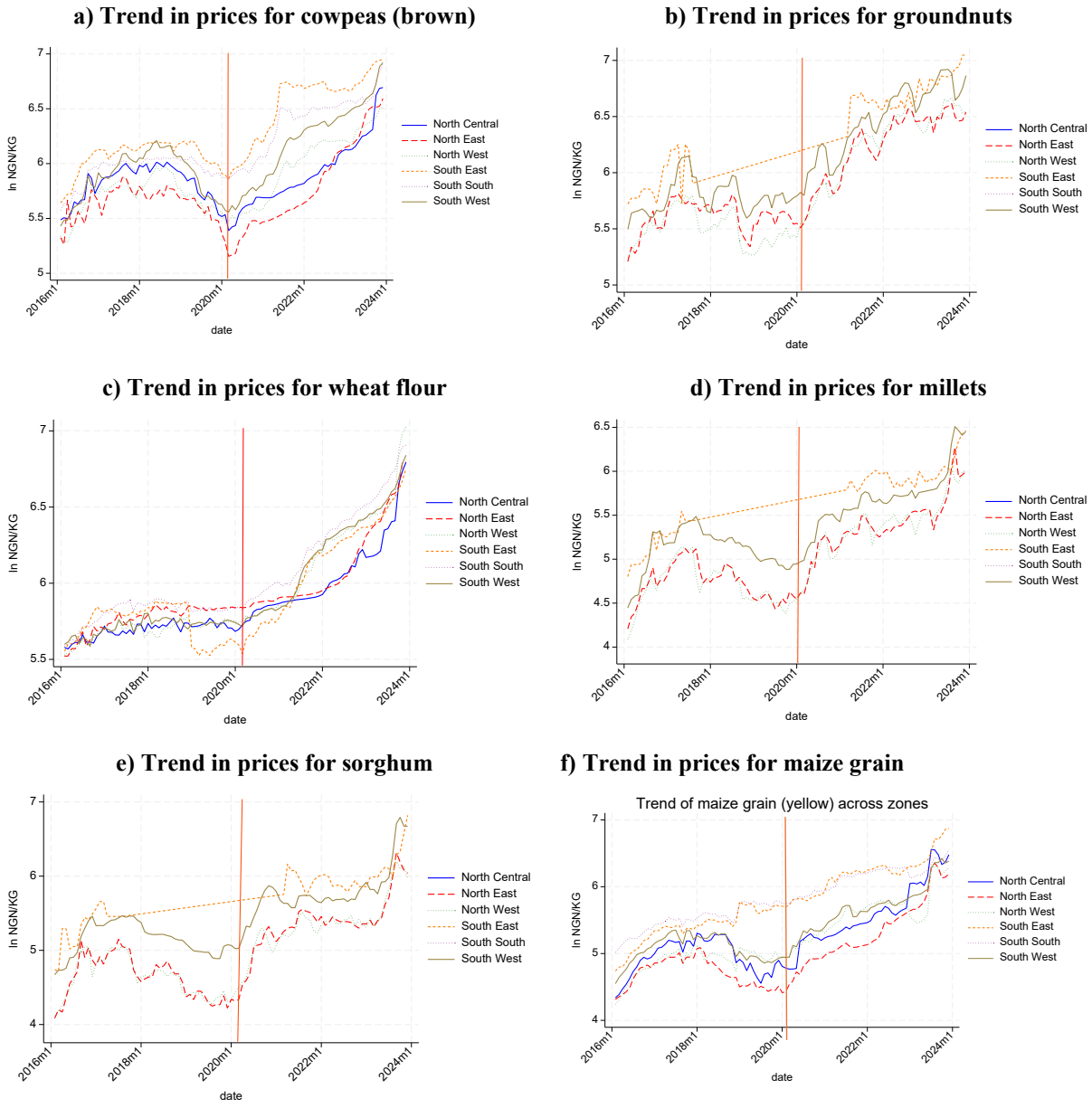
The Southeast zone experiences greater price volatility for cowpeas, a phenomenon that may stem from seasonal fluctuations, interruptions in supply chains, and higher transportation costs associated with moving cowpeas from core production areas to markets in this region. Such variability underscores the vulnerabilities of regions dependent on complex inter-state supply networks, where disruptions can have amplified price effects. By contrast, cowpea prices in the North-East and South-West zones remain relatively stable, suggesting a closer equilibrium between local production and consumption. This price stability may reflect either sufficient local supply or more efficient intra-regional trade that reduces reliance on volatile external markets. Notably, the North-East, despite being the most conflict-affected region in Nigeria, exhibits consistently low prices across all major commodities in Figure 1.

This pattern appears counterintuitive, as conflict is typically associated with rising food prices due to disruptions in production, market access, and logistics. However, several mechanisms may explain this outcome. First, the Northeast remains a major production zone for cowpea and other staples, so supply may remain robust even amid conflict. Second, protracted conflict may disproportionately disrupt outbound trade rather than local production, limiting access to distant or higher-value destination markets and thereby depressing local demand. Third, conflict may reduce household purchasing power, further constraining demand and reinforcing downward pressure on prices. Fourthly, the widespread humanitarian food assistance and support in-kind programs in response to conflict exposure to the area might have reduced food purchase by local households. Together, these dynamics suggest that conflict may generate dysfunctional localized food markets alongside the broader market inefficiencies, with important implications for producer welfare and the spatial targeting of agricultural policy and humanitarian supports.

Price patterns for maize grain also vary regionally. All zones experienced approximately a doubling of prices over the period, and a particularly sharp acceleration beginning around 2020-2021. The South-West zone demonstrated the most consistent price stability throughout the period, maintaining a smooth upward trajectory with minimal volatility. Similarly, the South-South zone showed relatively stable pricing, especially during the middle years of 2018-2021. In contrast, the North-East zone exhibited significant price volatility, including a notable decline around 2019-2020 followed by sharp increases, while the North-Central region displayed considerable fluctuations with particularly dramatic price surges in 2023-2024.

Throughout most of the period, the Southeast and Northwest maintained the highest price levels. The North-East zone recorded the lowest prices during its 2019-2020 dip but eventually converged with other zones by 2024. The southern zones, particularly the South-West, have maintained more predictable and stable price movements compared to the northern regions. This pattern can be attributed to several structural advantages in the South-West region. The high urbanization rate, combined with increased maize production to compensate for shortfalls from conflict-affected northern regions, has created a more stable supply base. Additionally, strong spatial integration across South-West markets, driven by robust inter-state trade and information flow enables arbitrage that equalizes prices throughout the region. In contrast, weaker market integration in rural northern areas exacerbates price volatility when localized shocks such as farmer-herder conflicts, insurgency, and flooding occur.

Figure 1: Trend in prices for selected commodities



Sources: Authors' computations. Analysis based on NBS data set: over the period January 2016 to October 2024.

Figure 1 extend the analysis to wheat flour, groundnuts, millet, and sorghum, providing a comprehensive overview of price dynamics across Nigeria's six geopolitical zones. Each commodity exhibits distinct regional patterns that reflect complex interactions between production, trade, and external market influences. Nigeria's heavy reliance on imported food creates considerable exposure to global market fluctuations. As a major net importer of both food and non-food items, the country experiences heightened sensitivity to international market volatilities (Amolegbe et al., 2021). This import dependence creates vulnerability to currency fluctuations and external trade imbalances, with cascading effects on

household food security, welfare, and the broader economy. The wheat flour market exemplifies this vulnerability. Figure 1 reveals steady and pronounced upward price trends across all six geopolitical zones with minimal regional variation. Given that domestic wheat production accounts for approximately 1% of national consumption, these uniform price increases primarily mirror global market fluctuations rather than local supply dynamics, demonstrating how import dependence transmits external price shocks directly into the domestic market. This situation is compounded by Nigeria's economic paradox, despite petroleum exports generating over three-quarters of government income, inadequate refining infrastructure forces the country to import processed fuel products.

Also, currency depreciation, alongside ongoing food and non-food import dependence, placed additional pressure on the naira and intensified inflationary pressures. The consistent rise in wheat flour prices underscores the urgent need for policies that either expand local wheat production or insulate consumers from international market volatility. One such policy is the National Agricultural Growth Scheme and Agro Pocket (NAGS-AP) initiative, launched by the Federal Ministry of Agriculture and Food Security (FMASFS) for the 2023/2024 dry season wheat farming campaign. The program aims to boost domestic wheat production, curb food inflation, and enhance progress toward national self-sufficiency. Groundnuts, millet, and sorghum exhibit significant inter-zonal price variability, reflecting heterogeneous agro-economic conditions and varying degrees of market integration. For groundnuts in particular, wide price differences across zones suggest that some regions enjoy comparative production advantages, while others are dependent on inter-regional trade to meet local demand. This price dispersion may indicate inefficiencies in market connectivity that could be mitigated through targeted investments in trade infrastructure and supply chain development.

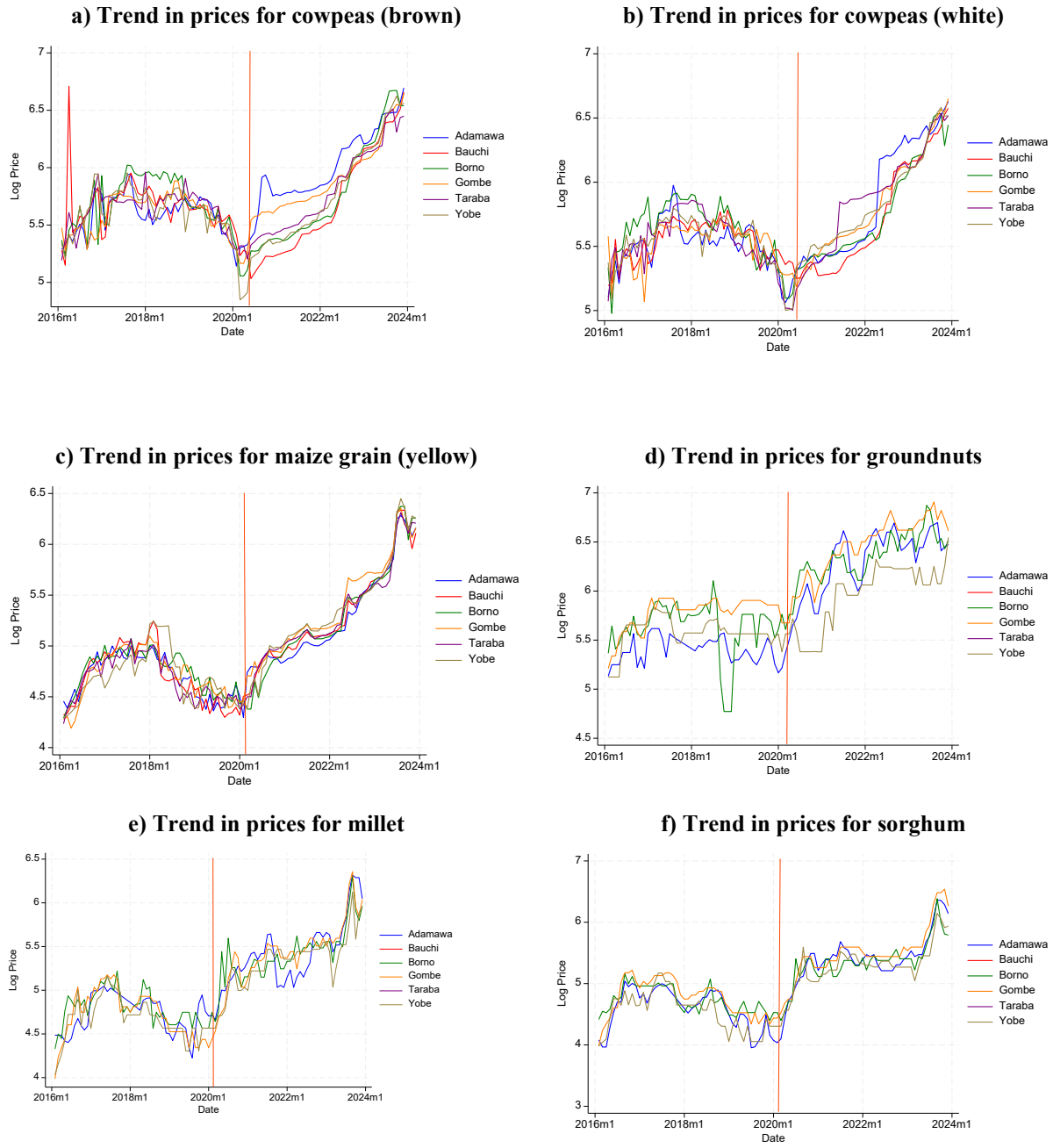
According to the production data from NAERLS (2024), the North Central zone is the largest producer, accounting for 36.4% of national groundnut output, while the Southeast contributes just 0.5%, relying heavily on flows from other regions. This production imbalance is mirrored in the price data: the Southeast exhibits the highest and most volatile prices over the study period, suggesting a tight and unreliable supply chain. In contrast, the North Central zone maintains lower and more stable prices, consistent with local production abundance and shorter distribution channels. This inverse relationship between production share and price volatility highlights the lack of regional market connectivity in the food system. that certain regions possess comparative production advantages, while others rely heavily on inter-regional trade to satisfy demand. Similarly, millet and sorghum, critical staples for food security particularly in northern Nigeria, show marked price differences between geopolitical zones. These disparities likely arise from variations in production costs, agro-climatic suitability, and localized demand patterns. The relatively lower prices observed in the Northwest and North-Central zones are consistent with more favorable growing conditions and established farming practices. Conversely, higher prices in the southern

zones may result from increased transportation costs, supply constraints, or limited local production capacity. Addressing these spatial price disparities requires enhancing regional market integration by improving transport infrastructure, storage facilities, and post-harvest handling. Such investments can reduce logistical bottlenecks, decrease post-harvest losses, and facilitate more efficient commodity flows, ultimately contributing to more stable and equitable food prices across Nigeria's diverse regions.

3.2. Food price evolution of selected commodities in conflict settings

Figure 2 illustrate price trends for staple foods across North-East Nigeria from 2016 to 2024, providing insights into regional market dynamics. Overall, prices for cowpeas, maize, groundnuts, sorghum, and millet have steadily increased, driven by inflationary pressures and shifting supply-demand conditions. Notably, cowpea and maize prices surged during 2020, coinciding with the COVID-19 pandemic disruptions that impaired supply chains through lockdowns, labor shortages, and transport restrictions. While price trajectories for each commodity are broadly similar across the six North-East states, minor inter-state variations suggest that local conditions, such as market accessibility, crop yields, conflict intensity, modulate price patterns. Cowpea and maize prices exhibit consistent upward trends with limited volatility, whereas millet and sorghum prices experience more pronounced fluctuations, reflecting their sensitivity to region-specific disruptions. Periodic price spikes, especially in cowpeas, maize, and millet, may correlate with escalations in regional conflict, which disrupts supply chains and limits market access, exacerbating food insecurity in this conflict-affected region.

Figure 2: Trend in prices for selected commodities in North-East Nigeria



Sources: Authors' computations. Analysis based on NBS data set: over the period January 2016 to October 2024.

In summary, the price analysis reveals distinct trends and regional disparities in food prices across Nigeria's geopolitical zones, with a consistent upward trajectory for all key commodities from 2016 to 2024. Price volatility has increased notably across states, especially following major disruptions such as the COVID-19 pandemic, the outbreak of Ukraine-Russia conflict, and the removal of fuel subsidies, which collectively intensified market fluctuations (Amare et al., 2024). These shocks precipitated significant price hikes, while structural challenges, including inadequate market information, high transportation costs,

persistent conflicts, and limited storage capacity, exacerbated inflationary pressures and widened regional price gaps. To stabilize food prices and mitigate regional disparities, targeted interventions should prioritize investments in infrastructure (notably transport and storage), the development of community exchange markets, enhancement of communication networks, and conflict resolution efforts.

4. Disruption and Divergence: Commodity Prices Amid COVID-19 and Ukraine-Russia War

4.1. Disruption and divergence in commodity prices during COVID-19

Figure 3 document the temporal and spatial dynamics of cowpea and maize prices in Nigeria during the COVID-19 pandemic, using monthly data disaggregated by geopolitical zone. Prior to the pandemic, prices for both commodities were relatively stable across regions, with low intra-annual volatility and limited interregional dispersion. This price behavior suggests that, under normal conditions, domestic agricultural markets exhibited a moderate degree of spatial integration and supply chain reliability.

The onset of COVID-19 in early 2020 coincided with immediate and substantial upward shifts in prices. Cowpea prices, in particular, spiked sharply beginning in Q2 of 2020, coinciding with the timing of lockdown measures, transport restrictions, and disruptions in labor markets and cross-state logistics. There are several possible reasons why cowpea prices responded more sharply and persistently to the COVID-19 shock compared to other staples. First, cowpeas have a short shelf life and are highly perishable, especially under smallholder storage conditions with limited pest control technologies common across West Africa Murdock and Baoua, 2014). This limits farmers' and traders' ability to hold stocks during supply disruptions, causing prices to react sharply to temporary shocks. Second, cowpea marketing depends heavily on informal, fragmented supply chains characterized by inter-state and cross-border trade with little formal coordination, a pattern widely documented across West African countries (Baributsa et al. 2019).

COVID-19-related mobility restrictions, checkpoints, and curfews severely disrupted these decentralized marketing networks, leading to localized supply shortages and heightened price volatility, particularly in regions dependent on inter-regional trade (Barrett et al., 2022; Amare et al., 2024). Third, cowpea production and processing are highly labor-intensive, especially during the post-harvest period when activities such as shelling and drying must be completed rapidly to avoid spoilage. Pandemic-induced labor shortages, exacerbated by lockdowns and rural mobility constraints, hindered these critical operations (Amare et al., 2021; Barrett, 2020). As these disruptions coincided with the harvest window in many cowpea-producing areas, they further constrained market supply and contributed to sustained upward price pressures.

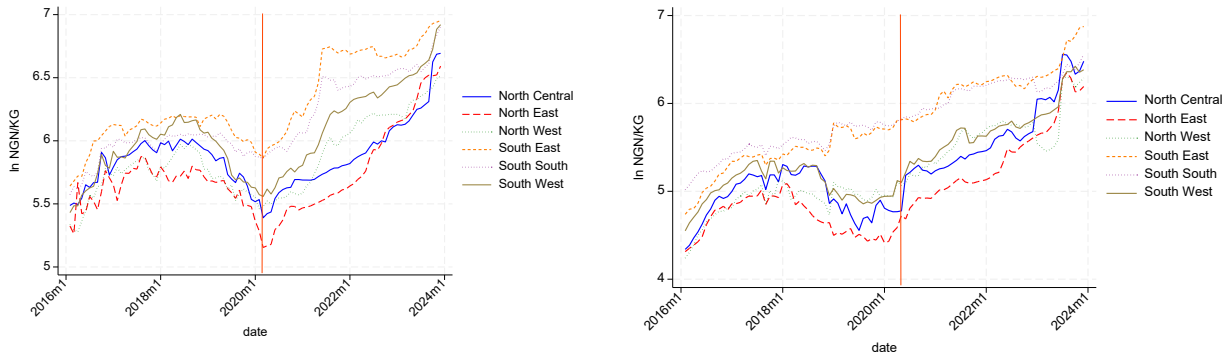
Unlike short-run seasonal fluctuations, these price increases persisted through 2020 and into 2021. Maize prices followed a similar pattern, albeit with smaller magnitude and somewhat greater regional

convergence. The persistence of these price increases beyond the initial shock suggests a slow adjustment in supply, consistent with frictions in production, transport, and interregional trade. In addition to the upward pressure on average prices, the pandemic was associated with a significant increase in spatial price dispersion. This rise in dispersion reflects a breakdown in normal price convergence mechanisms, such as arbitrage and trade flows, that typically equalize prices across regions in integrated markets. Zones with relatively strong local production and market connectivity, such as the North Central and Northwest, experienced more muted price effects. By contrast, the Southeast and South-South, regions with greater reliance on inter-state supply chains, faced larger price increases and higher volatility, highlighting the uneven burden of the shock.

From an economic standpoint, the observed patterns are consistent with spatial equilibrium models where temporary shocks to mobility and logistics introduce region-specific supply constraints. These constraints effectively create wedges between regional prices, particularly where alternative supply routes or substitutes are limited. The sustained nature of price divergence also suggests that market frictions, possibly due to transport costs, transaction costs, or informational barriers, persisted well beyond the initial lockdown period. In sum, the COVID-19 pandemic imposed both level and dispersion effects on staple food prices in Nigeria. These results underscore the importance of mobility and market access in maintaining spatial price stability in low-income country contexts and offer empirical evidence of how supply-side disruptions can propagate across geographically segmented markets.

Figure 3: COVID-19 shocks and trend in selected commodities prices

a) Trend in prices for cowpeas **b) Trend in prices for maize**



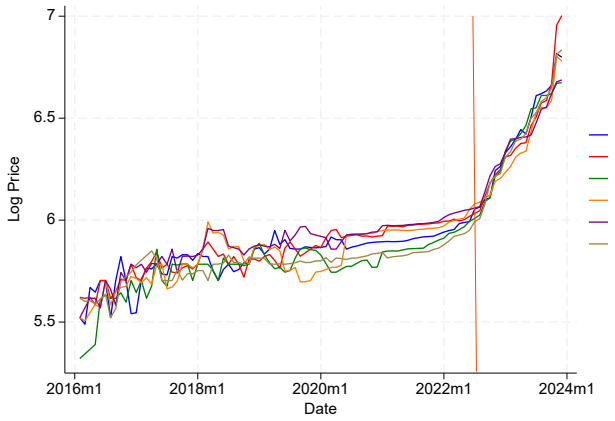
Source: Authors' computations. Analysis based on NBS data set: over the period January 2016 to October 2024.

4.2. The Ukraine-Russia conflict and wheat price fluctuations

Figure 4 and Table 2 provide empirical evidence of the sharp escalation in wheat prices in Nigeria following the onset of the Russia–Ukraine war in February 2022. Prior to the war, wheat prices in Nigeria were relatively stable, averaging ₦487.43 per kilogram. This price stability reflects a global market environment with steady supply conditions and limited geopolitical disruptions. However, immediately after the outbreak of hostilities, when Ukraine's Black Sea ports were blockaded and Russian grain exports became constrained due to sanctions and trade restrictions, Nigerian wheat prices rose sharply, reaching ₦796.29 by May 2023. This represents a nominal increase of approximately 63.3% in just over a year. The magnitude and speed of this price escalation underscore Nigeria's vulnerability to external supply shocks, particularly for commodities where domestic production is negligible. Nigeria imports more than 95% of its wheat, much of it historically sourced from global markets influenced by Eastern European supply. The war in Ukraine disrupted these flows, tightened global wheat availability, and led to speculative trading and precautionary purchasing, factors that collectively drove up international wheat prices, which were quickly transmitted to domestic markets.

Figure 4: Effects of Ukraine-Russia war on wheat prices in the north-east

a) Trend in prices for wheat



Source: Authors' computations. Analysis based on NBS data set: over the period January 2016 to October 2024.

Unlike domestic shocks with regionally varied effects, the Russia–Ukraine war induced a uniform national price response. The data show little variation across Nigeria's geopolitical zones, implying a well-integrated domestic wheat market with high pass-through from international to local prices. This uniformity contrasts with price shocks observed during COVID-19, which were more regionally differentiated due to localized supply chain disruptions. In this case, the wheat supply constraint originated externally and propagated evenly across Nigeria's markets through import channels. Furthermore, the persistence of elevated prices beyond the initial months of the war suggests limited substitution effects and high dependence on global wheat markets. Despite temporary price relief in global markets during late 2022,

local prices remained elevated, likely due to lag effects in procurement, currency depreciation, high shipping costs, and limited domestic buffering capacity. The absence of price reversion signals structural weaknesses in Nigeria's food system, including poor storage capacity, delayed policy responses, and a lack of viable alternative grains for processing and consumption at scale. Taken together, the results illustrate how conflict-induced global supply shocks can exert significant and prolonged effects on domestic food prices, particularly in import-dependent economies. The evidence highlights the importance of trade diversification, investment in local production, and grain reserve policies to mitigate the domestic consequences of geopolitical disruptions.

Table 2: Wheat price before and during Russia-Ukraine war

Time Period	Average Price (NGN/kg)	Percentage Change
Before Ukraine War (Jan 2022)	487.43	N/A
After the onset of Ukraine War (May 2023)	796.29	63.34

Source: Authors' computations. Analysis based on NBS data set: over the period January 2016 to October 2024.

5. Food Price Responses to Fuel Subsidy Removal and Devaluation

The dual policy shifts introduced in May 2023, namely, the removal of fuel subsidies and the devaluation of the Nigerian naira, have exerted significant inflationary pressure on food commodity prices, particularly maize, rice, beans, and wheat. As shown in Table 3, the Naira experienced a dramatic depreciation: it lost 50% of its value in Q3 2023 alone, plunging from ₦509 to ₦764per USD, and continued to weaken to historic lows exceeding ₦1,600 per USD in 2024. This steep exchange rate declines significantly increased the local currency cost of imported goods, including essential food items and agricultural inputs such as fertilizers, agrochemicals, and machinery.

At the same time, the removal of fuel subsidies triggered a sharp rise in domestic petrol prices, raising transportation and logistics costs across the entire agricultural value chain. Given agriculture's reliance on fuel-intensive processes, from input delivery to harvesting, processing, and market distribution, these costs were quickly passed through to consumer food prices. Together, these twin shocks have driven a surge in nominal food prices, contributed to broader consumer price inflation, and eroded real incomes, especially for low-income households that spend a disproportionate share of their budgets on food. The situation highlights the vulnerability of Nigeria's food systems to macroeconomic policy shifts and underscores the need for targeted safety nets and import substitution strategies to strengthen resilience.

Table 3: CBN quarterly exchange rate (US$1 vs Naira)

Year	Q1	Q2	Q3	Q4
2016	196.5	221.5	302.1	304.7
2017	305.0	305.1	305.2	305.4
2018	305.1	305.4	305.4	306.1
2019	306.2	306.5	306.4	306.5
2020	313.4	360.5	371.8	379.4
2021	379.5	395.6	409.6	410.4
2022	415.2	415.0	420.6	441.3
2023	458.4	509.4	763.9	842.5
2024	1318.5	1384.3	1587.1	1620.9

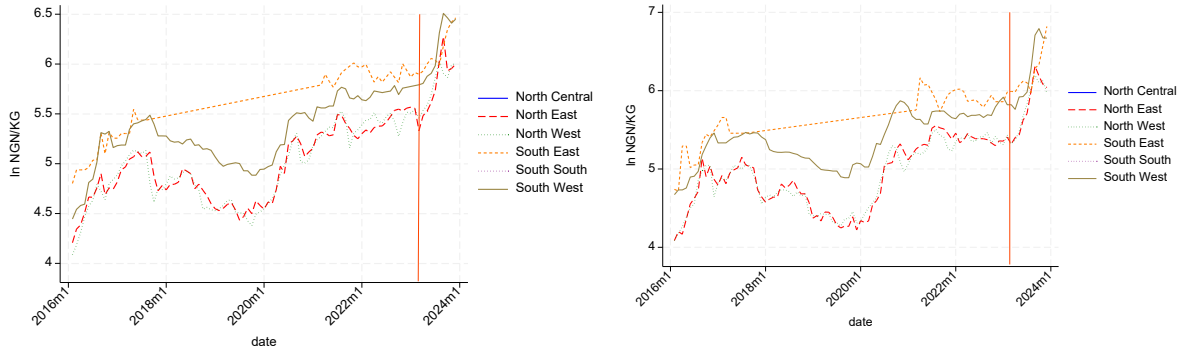
Source: CBN Statistical Database, 2025

5.1. Removal of fuel subsides and price changes in Nigeria

Figure 5 and Table 4 present the estimated effects of the Nigerian government's removal of fuel subsidies in May 2023 on domestic food prices, illustrating a substantial and uneven increase across key staple commodities. The fuel subsidy elimination led to a sharp rise in transport prices, with immediate implications for food supply chains, particularly in regions reliant on long-distance logistics and inter-state trade. These results offer empirical insight into how energy price shocks, even when policy-induced, are transmitted through commodity markets in low-income settings.

Figure 5: The effect of removal of fuel subsides and price changes in Nigeria

a) Trend in prices for millet **b) Trend in prices for sorghum**



Source: Analysis of NBS: over the period January 2016 to October 2024.

White maize prices increased by 56.7% in the months following the subsidy reform, while brown sorghum experienced an even steeper rise of 83.9%. Millet, another widely consumed staple in northern Nigeria, saw prices rise by 57.7%. These grains tend to originate from rural production zones and travel long distances to urban consumption centers, making them particularly sensitive to increases in transport and distribution costs. The magnitude of these increases reflects the high elasticity of farmgate-to-market costs with respect to fuel prices in Nigeria's underdeveloped logistics system. In contrast, price increases were more modest for other commodities. Groundnuts, for instance, rose by only 10.6%, suggesting a more

localized or resilient supply chain with lower exposure to long-haul transportation. Similarly, price movements for cowpeas differed by variety: brown cowpeas rose by 19.7%, while white cowpeas increased by 24.7%. These differentiated effects across similar commodities may reflect variation in regional sourcing patterns, perishability, or value chain concentration.

These findings are consistent with a cost-push transmission mechanism, whereby rising fuel prices drive up marginal transport costs, which are then passed through to consumer food prices, more acutely for commodities transported over longer distances or handled in less integrated supply chains. The particularly steep increases in sorghum and millet prices suggest that these grains may serve as leading indicators of logistics-driven inflation, particularly in fragile and infrastructure-poor contexts like northern Nigeria. Importantly, the uniform direction of price changes across commodities underscores the general inflationary pressure exerted by the subsidy removal, but the heterogeneity in magnitudes offers insight into market segmentation and structural inefficiencies in the agricultural transport system. These price responses also point to potential welfare losses concentrated among rural producers and low-income urban consumers, who are disproportionately affected by both higher food prices and reduced real incomes in the wake of fuel cost increases. From a policy perspective, these results highlight the trade-offs of subsidy reform in contexts where compensatory social safety nets or logistics infrastructure remain underdeveloped. While fuel subsidy removal may be fiscally rational, its inflationary consequences for essential food commodities, especially those critical to food security, necessitate parallel investments in transport efficiency, rural-urban market linkages, and targeted income support mechanisms.

Table 4: Average price of food commodities' before and after subsidy removal (NGN)

Commodity	Average Price Before Subsidy Removal (NGN)	Average Price After Subsidy Removal (NGN)	Percentage Change
Cowpeas Brown	626.2	749.57	19.67
Cowpeas White	582	725.57	24.65
Maize Grain White	337.2	528.14	56.68
Maize Grain Yellow	415.4	609.14	46.66
Wheat Flour	620.63	796.29	28.35
Groundnut	711.6	787.14	10.59
Millet	272.2	429.14	57.65
Sorghum Brown	253	465.57	83.91
Sorghum White	256.6	471.57	83.46

Source: Authors' computations. Analysis based on NBS data set: over the period April 2022 to May 2024.

5.2. Commodity price trends in selected markets

In May 2023, the Nigerian government implemented two major policy shifts: the removal of petrol subsidies and a sharp devaluation of the naira. Together, these reforms have triggered significant inflationary pressures across staple food markets, particularly for maize, rice, beans, and wheat. The naira's depreciation substantially increased the local currency cost of imported goods, most notably rice and wheat, for which Nigeria is heavily import-dependent. Even in the absence of global price movements, the

exchange rate shock alone drove a sharp rise in domestic food prices. As the cost of imported staples increased, consumers substituted toward locally produced alternatives. However, domestic supply proved insufficiently elastic to absorb this shift in demand, thereby exerting additional upward pressure on local food prices and contributing to broader food inflation. To quantify the effects of these twin policy shocks, we analyze market-level price trends using FEWS NET data for 2023 and World Food Programme data for 2024. We compare two distinct periods, pre-reform (April 2022–May 2023) and post-reform (June 2023–May 2024)—to estimate the short-run impact of fuel subsidy removal and exchange rate adjustment on retail food prices.

Maize

Maize prices experienced a pronounced increase following the policy changes in May 2023. For example, in Abuja, maize prices rose from ₦288per kilogram before May 2023 to ₦493 per kilogram afterward, marking an approximate 71% increase. A similar pattern was observed in Maiduguri, where prices increased from ₦290/kg to ₦496/kg, also reflecting a roughly 71% rise (see Figure 6). This sharp escalation in maize prices corresponds with the expected effects of increased fuel costs following the removal of petrol subsidies, as well as the depreciation of the naira, which elevated transportation and input expenses across the supply chain.

Rice (Imported and Local)

Following the removal of fuel subsidies and the concurrent naira devaluation in May 2023, both imported and local rice prices exhibited substantial increases across major Nigerian markets (Figure 6). Imported rice prices in Abuja rose by 22 percent (from ₦862/kg to ₦1,052/kg), while Maiduguri experienced a 37 percent increase (from ₦649/kg to ₦892/kg). Port Harcourt saw a 21 percent rise (₦1,015/kg to ₦1,226/kg). Local rice prices increased even more sharply in some regions, with Abuja recording a 62 percent jump (₦462/kg to ₦757/kg), and Maiduguri a 32 percent increase (₦534/kg to ₦706/kg). These adjustments reflect the combined impact of higher transport and input costs following subsidy withdrawal, alongside increased import costs due to exchange rate depreciation. The differential magnitude of price changes across markets and between rice types of points to both shifting demand dynamics and constraints in local supply responsiveness.

Notably, Figure 6 reveals a sharp, temporary decline in rice prices across markets in January 2024, followed by an abrupt spike in Abuja. The January dip likely reflects post-harvest seasonal effects, as main-season rice harvests reach markets and ease supply constraints. However, the immediate price surge in Abuja may signal localized supply bottlenecks, potentially driven by transport disruptions, fuel shortages, or speculative behavior, amplified by the city's dependence on inbound trade. These spatially divergent

patterns underscore the uneven transmission of macroeconomic shocks through Nigeria's fragmented food market system.

Beans and Wheat

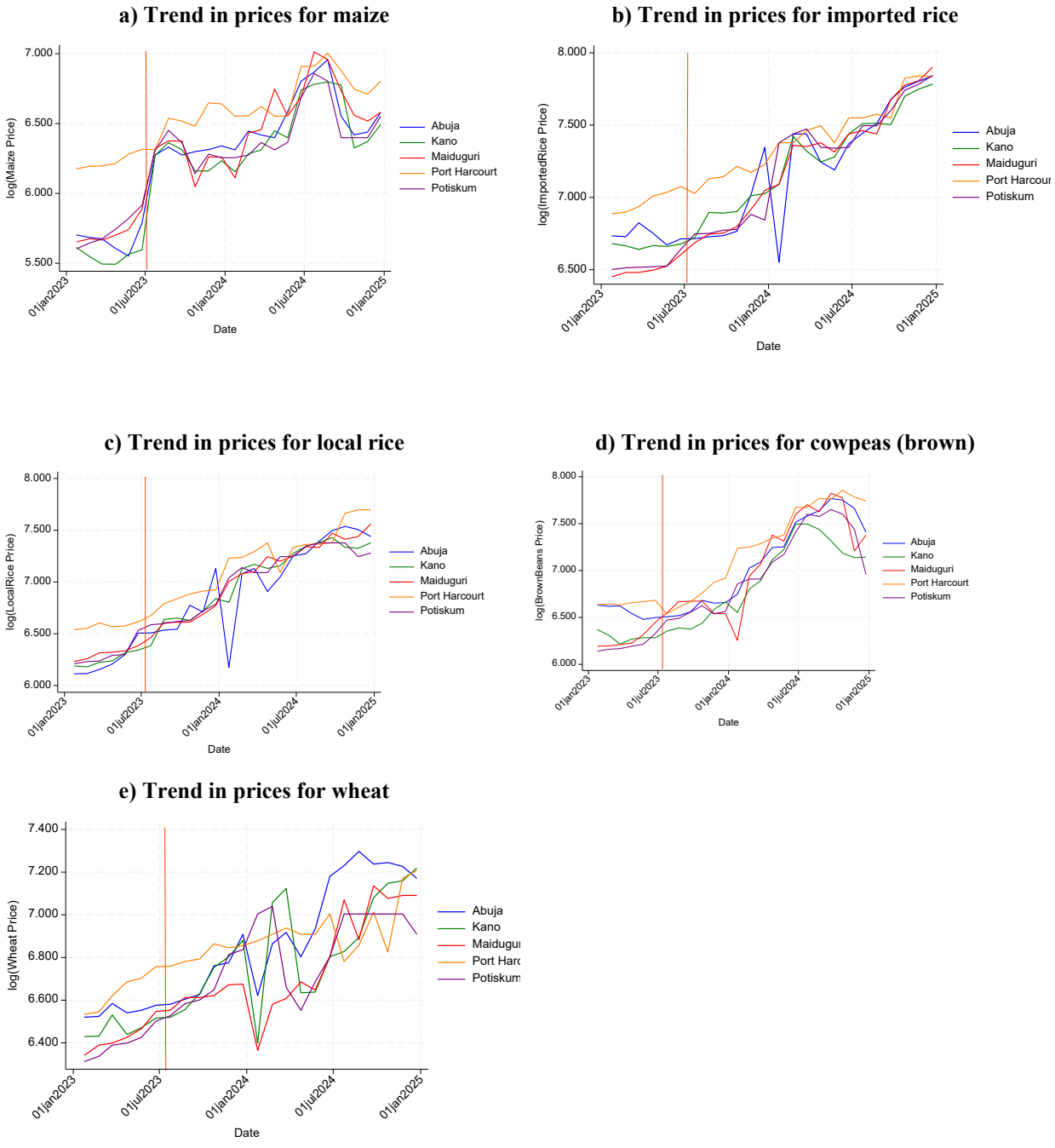
The analysis reveals notable increases in beans prices with considerable regional variation. Despite being predominantly locally produced, beans rely heavily on transportation networks for market distribution. The removal of petrol subsidies and subsequent rise in fuel prices significantly increased transportation costs, which have been passed on to consumers, driving up beans prices (see Figure 6). Wheat prices similarly exhibited an upward trend. In Abuja, wheat prices increased by 18%, rising from ₦691/kg before May 2023 to ₦818/kg after May 2024. Maiduguri saw a 14% increase, from ₦656/kg to ₦750/kg over the same period (see Figure 6). Comparable price increases were observed in Kano (14%), Potiskum (11%), and Port Harcourt (10%).

A particularly striking feature of the post-reform price dynamics is the disproportionately large percentage increase in domestically produced staples—notably sorghum, maize, and local rice—compared to imported commodities such as wheat and imported rice. At first glance, this appears counterintuitive: since fuel subsidy removal and naira devaluation primarily affect the cost of imported goods, one would expect the price of imported staples to rise more sharply. However, several structural features of Nigeria's food economy help explain this pattern. First, the demand substitution effect following the surge in import prices played a critical role. As imported staples such as wheat and rice became more expensive, many households and food processors substituted toward cheaper, domestically produced alternatives like sorghum and maize. This sudden and widespread shift in consumption patterns exerted intense upward pressure on domestic markets, where supply responses are typically sluggish due to limited input use, smallholder-dominated production, and seasonal planting cycles.

Second, Nigeria's domestic agricultural supply is highly inelastic in the short run. Smallholder farmers, who constitute the bulk of producers, face structural barriers including inadequate access to fertilizers, improved seeds, mechanization, and finance. The removal of fuel subsidies exacerbated these constraints by significantly increasing the cost of inputs and transportation, thereby inflating production and marketing costs throughout the supply chain. With supply unable to adjust rapidly to the surge in demand, price spikes for domestic staples were amplified.

Third, the transportation cost component of domestic food prices increased substantially post-reform, disproportionately affecting domestically produced commodities. Imported wheat and rice, once landed and processed, are distributed through relatively more efficient commercial networks, whereas domestic grains often rely on fragmented and less efficient logistics systems. Rising diesel and petrol prices thus had a larger proportional impact on domestic supply chains, further widening price differentials.

Figure 6: Price analysis of selected states and markets



Sources: Authors' computations. Analysis based on NBS data set: over the period January 2016 to October 2024.

Finally, the market structure and storage dynamics for domestic cereals such as sorghum and maize magnify price volatility. These markets are less formalized and more susceptible to speculative behavior, hoarding, and localized supply shocks. As traders anticipated higher future prices amid rising transport costs and policy uncertainty, stock withholding may have further tightened supply and accelerated price increases. Collectively, these factors explain why price increases for domestic staples exceeded those of

imported commodities, despite the latter being directly affected by naira depreciation. The post-reform environment thus exposed structural weaknesses in Nigeria's domestic food system, where limited supply responsiveness, high transaction costs, and intense substitution pressures amplified the inflationary impact of macroeconomic policy changes.

Table 5: Price changes for selected food items

Food Item	Location	Average Price Before May 2023 (₦/kg)	Average Price After May 2023 (₦/kg)	Percentage Change (%)
Maize	Abuja	288.4	493.3	71.3
	Maiduguri	290.3	496.8	71.3
	Kano	253.3	489.5	93.4
	Potiskum	288.5	520.2	80.3
	Port Harcourt	489.5	634.6	29.6
Rice (Imported)	Abuja	862.3	1052.4	22.1
	Maiduguri	649.4	891.6	37.3
	Kano	782.2	962.8	23.1
	Potiskum	672.8	848.1	26.1
	Port Harcourt	1015.5	1226.5	21.0
Rice (Local)	Abuja	467.2	757.2	62.0
	Maiduguri	534.3	706.6	32.3
	Kano	495.8	742.7	49.7
	Potiskum	513.4	742.6	44.7
	Port Harcourt	720.2	868.6	20.6
Beans	Abuja	737.3	708.5	-3.9
	Maiduguri	495.2	706.8	42.7
	Kano	539.6	609.5	13.0
	Potiskum	475.2	627.1	31.9
	Port Harcourt	766.0	832.2	8.6
Wheat	Abuja	691.4	818.4	18.4
	Maiduguri	656.1	749.7	14.3
	Kano	625.8	715.5	14.3
	Potiskum	618.3	688.5	11.4
	Port Harcourt	796.3	877.9	10.2

Source: Authors' computations, Analysis is based on WFP-Nigeria recent and FEWS NET data set: over the period 2023 to 2024.

6. Impacts of Food Prices Increases on Lower-Income Households

Lower-income households in Nigeria have experienced disproportionately higher incidences of food insecurity in response to significant food price increases observed between 2023 and 2024. To quantify these welfare impacts, we employed the International Food Policy Research Institute (IFPRI)'s Food Price Simulator for Nigeria, a robust modeling tool designed to estimate the short-term effects of food price shocks on household-level food security outcomes (Ecker and Comstock, 2021). [3] Using the recorded price

[3] The Food Security Simulator is an MS-Excel-based tool for assessing the potential short-term impacts of food price or household income shocks on food security and people's diets. The tool provides evaluations of direct, household-level outcomes. For this illustrative analysis we focused on food security (consumption expenditure and caloric intake). The underlying data include estimates from representative household survey data and rigorous, sophisticated food demand models to capture consumer behavior.

increases for maize, locally produced rice, beans, and wheat as reported in Table 4, we simulated their effects on key indicators such as food poverty rates, prevalence of under-nourishment, per capita food consumption expenditure, and per capita caloric intake. The simulation results are summarized in Table 6.

Our analysis reveals several critical insights. First, the food poverty rate escalates sharply by 9.1 percentage points, from 42.9% to 52.0%, while the prevalence of under-nourishment rises by 11.6 percentage points, from 40.0% to 51.6%. These figures suggest a substantial deterioration in food security outcomes nationally, directly attributable to the recent food price inflation. Additionally, the simulation shows a uniform reduction in per capita food consumption expenditure across all household income quintiles, with the national average declining by 10.5%. Caloric intake per adult equivalent also contracts significantly, falling by 13.7% on average. Crucially, the burden of these food price shocks falls disproportionately on lower-income households. Table 5 disaggregates food consumption expenditure and calorie intake reductions by household income quintiles, revealing that the lowest income quintile reduces food consumption expenditure by 12.7%, compared to a 9.5% reduction among the highest income quintiles. Similarly, calorie intake per adult equivalent declines by 16.0% for the lowest quintile, but only 11.0% for the highest. These patterns hold consistently across both rural and urban populations, although the impacts tend to be slightly more pronounced in rural areas, reflecting the greater vulnerability of rural households to food price fluctuations.

This illustrative analysis underscores the widening inequality in food security outcomes in Nigeria, highlighting the acute vulnerability of poorer households to food price shocks during the 2016–2024 period and especially following the sharp price rises in 2023–2024. The observed declines in food expenditure and caloric intake among low-income households pose a severe risk to nutrition and well-being, exacerbating the already high prevalence of food poverty in the country. These results emphasize the urgent need for targeted social protection policies and interventions aimed at shielding the most vulnerable populations from ongoing and future food price volatility.

Table 6: Simulated impacts of price increases of selected commodities on food and calorie consumption

		Baseline		**Simulation effect**			
				Total		**Change from baseline (%)**	
Sector	Income quintile	Food poverty rate (%)	Prevalence of undernourishment (%)	Food poverty rate (%)	Prevalence of undernourishment (%)	Food poverty rate (%)	Prevalence of undernourishment (%)
National	Total	**42.9**	**40.0**	**52.0**	**51.6**	**9.1**	**11.6**
Rural	Total	49.4	37.0	59.0	48.0	9.6	10.9
Urban	Total	32.6	44.7	40.9	57.4	8.3	12.6
		Baseline		**Simulated impact**			
				Total		**Change from baseline (%)**	
Sector	Income quintile	Food consumption expenditure per capita (NGN/day)	Calorie consumption per adult equivalent (kcal/day)	Food consumption expenditure per capita (NGN/day)	Calorie consumption per adult equivalent (kcal/day)	Food consumption expenditure per capita (%)	Calorie consumption per adult equivalent (%)
National	**Total**	**274.90**	**2,175**	**246.13**	**1,876**	**-10.5**	**-13.7**
	1	110.12	1,565	96.10	1,314	-12.7	-16.0
	2	172.55	1,949	152.41	1,640	-11.7	-15.8
	3	230.07	2,083	204.28	1,775	-11.2	-14.8
	4	300.14	2,249	268.86	1,943	-10.4	-13.6
	5	479.47	2,775	433.83	2,465	-9.5	-11.2
Rural	**Total**	**254.98**	**2,196**	**229.80**	**1,905**	**-9.9**	**-13.3**
	1	109.88	1,595	96.21	1,339	-12.4	-16.0
	2	173.31	1,996	153.39	1,681	-11.5	-15.8
	3	236.37	2,186	211.18	1,873	-10.7	-14.3
	4	315.68	2,424	285.98	2,131	-9.4	-12.1
	5	499.98	2,973	458.46	2,698	-8.3	-9.3
Urban	**Total**	**320.09**	**2,128**	**283.15**	**1,813**	**-11.5**	**-14.8**
	1	111.98	1,325	95.24	1,115	-14.9	-15.9
	2	168.19	1,676	146.74	1,402	-12.8	-16.3
	3	212.50	1,797	184.99	1,501	-12.9	-16.4
	4	277.86	1,997	244.32	1,673	-12.1	-16.3
	5	459.30	2,579	409.59	2,236	-10.8	-13.3

Source: Authors' computations based on price increases for maize, local rice, beans, and wheat in WFP-Nigeria recent and FEWS NET data set over the period 2023 to 2024.

Recent price data analysis confirms that food price inflation in Nigeria has been persistent and widespread, with particularly pronounced effects in the northern regions. Since mid-2020, food prices have steadily increased across all eight key commodities examined, including maize, cowpeas (brown and white), groundnuts, millet, sorghum, rice, and wheat flour. Notable price spikes emerged in late 2020 and continued throughout 2021 and 2022, coinciding with macroeconomic pressures, ongoing insecurity, and systemic supply chain disruptions. This escalation has been recorded consistently across states such as Adamawa, Bauchi, and Borno, albeit with varying degrees of intensity, suggesting localized factors are compounding broader national inflationary trends.

These increases have had disproportionate impacts on lower-income households, who are more vulnerable to food price volatility due to limited purchasing power. As prices for staple commodities rise, these households are often forced to reduce both their food consumption expenditures and caloric intake, heightening the risk of undernutrition and exacerbating food insecurity in already fragile areas. Moreover, the data reveal substantial interstate variation in food prices, reflecting deep-seated structural issues within

Nigeria's food system. Inconsistent storage infrastructure, uneven market access, and transport bottlenecks contribute to wide spatial disparities in price levels for identical commodities. In conflict-affected and hard-to-reach zones, prices tend to be significantly higher due to limited supply, disrupted trade flows, and elevated distribution costs. This fragmentation not only reduces the efficiency of food markets but also undermines national food security efforts by entrenching regional inequalities in food access. Price instability and volatility further complicate market functioning. While all commodities exhibit upward price trends, some, such as cowpeas, show particularly erratic fluctuations, with pronounced peaks and troughs in early 2020 and late 2021.

These dynamics may reflect seasonality, weather shocks, and conflict-related disruptions. Maize prices also rose steadily but with fewer abrupt shifts, while wheat flour displayed the most stable price pattern, likely due to its reliance on imported inputs and more centralized supply chains. This instability presents serious challenges for contract enforcement and agricultural planning. Frequent and unpredictable price swings discourage buyers from entering long-term contracts with farmers and traders, weakening price signals and increasing uncertainty across the value chain. Farmers, in turn, struggle to plan production or secure predictable income streams, amplifying their exposure to market risk and food insecurity. Together, these findings point to an urgent need for targeted policy interventions. Addressing regional food price disparities requires investment in transport and storage infrastructure, conflict-sensitive market development strategies, and institutional mechanisms to support price stabilization. Without such measures, rising and volatile food prices are likely to further deepen poverty and undermine resilience in Nigeria's most vulnerable regions.

7. Conclusions

This study provides a detailed examination of food price trends, volatility, and household-level impacts in Nigeria from 2016 to 2024, using high-frequency price data and household simulation modeling. The analysis highlights a persistent upward trend in food prices, significant regional disparities, and the disproportionate burden of price inflation on lower-income households. Food poverty increased by 9.1 percentage points, and the prevalence of undernourishment rose by 11.6 percentage points during the study period. These increases in food poverty and undernourishment illustrate the magnitude of these pressures, directly undermining progress toward SDG 2 (Zero Hunger).Three major economic shocks, the COVID-19 pandemic (2020), the onset of the Ukraine–Russia war (2022), and the partial removal of fuel subsidies (May 2023), acted as structural breaks, amplifying commodity price inflation across all staple goods. These shocks were exacerbated by existing vulnerabilities such as market fragmentation, inadequate transport infrastructure, and heavy dependence on food imports, especially wheat. For example, wheat prices surged by over 63% following the Ukraine–Russia conflict, while maize and sorghum prices rose by up to 83.91%

after fuel subsidies were removed. These disruptions had immediate and sustained impacts, reducing food consumption and caloric intake, particularly among the lowest-income households.

The empirical findings underscore that Nigeria's food markets are highly segmented, with substantial interstate price dispersion, such as maize ranging from ₦165 in Plateau to ₦996 in Rivers, often driven by poor connectivity, conflict, and inconsistent market integration. This fragmentation not only hinders equitable food access but also complicates agricultural contracting and weakens price transmission, discouraging investment and reducing income stability for smallholder farmers. The simulation analysis using the IFPRI Food Price Simulator further reveals that households in the lowest income quintile reduced their food consumption expenditure by 12.7%, compared to 9.5% among higher-income households. Similarly, their caloric intake declined by 16%, intensifying food insecurity.

To address the challenges of food price volatility, we propose a set of actionable policy interventions with short-, medium-, and long-term horizons. *In the short term (1–2 years),* the government should deploy targeted food assistance in high–risk zones where insecurity and inflation have sharply reduced access to staples. Strategic food reserves for highly volatile staples, such as maize, wheat, and groundnuts—would provide a buffer against future supply shocks. A national food-price early warning system, coupled with the removal of informal checkpoints, can improve both monitoring and price stability. Concurrent investments in rural roads will reduce transportation bottlenecks and help equalize prices between production areas and urban consumers. *Over the medium term (3–5 years),* policy interventions should prioritize the development of decentralized storage and cold-chain infrastructure to minimize post-harvest losses and stabilize market supplies. Expanding inclusive contract-farming schemes, with features such as minimum-price guarantees and crop–insurance—would provide farmers with income security and improve market coordination. Supporting the adoption of climate-resilient, high-yield crop varieties, tailored to local agroecological conditions, would bolster production in vulnerable regions. Enhancing the capacity of social safety nets to respond dynamically to food-price inflation will further shield vulnerable households from extreme price shocks.

In the long term (over 5 years), addressing systemic insecurity in northern Nigeria should be a national priority, achieved through governance reforms, infrastructure investments, and youth-employment initiatives. Building climate-resilient, large-scale storage and logistics platforms via public–private partnerships can improve food supply reliability and facilitate regional trade. Promoting sustainable agriculture, through conservation farming, low-carbon techniques, and improved water efficiency, will support both productivity and environmental resilience. Finally, upgrading inter-regional highways, rail corridors, and bridges will strengthen national market integration and reduce price disparities across states.

While deeply grounded in the Nigerian context, the insights from this study contribute to a growing body of evidence that can help shape more inclusive, shock-resilient, and regionally coordinated food

security systems globally. The Nigerian experience offers timely and instructive lessons for low- and middle-income countries (LMICs) confronting similar structural and macroeconomic vulnerabilities. First, the evidence reinforces the centrality of price volatility, not just price levels, as a key transmission channel through which global and domestic shocks impact household welfare. The combined impacts of the COVID-19 pandemic, the Russia–Ukraine war, and macroeconomic policy reforms in Nigeria produced not only significant food inflation, but also amplified spatial disparities and market segmentation, particularly in fragile and conflict-affected regions. These patterns are likely to be replicated in other countries with weak transport infrastructure, fragmented food systems, and high import dependence for staple foods.

Second, the findings highlight how external shocks, especially those originating in global commodity markets, can reverberate through domestic markets with speed and intensity that overwhelm national mitigation mechanisms. Nigeria's experience with wheat price inflation following the Russia–Ukraine war underscores the vulnerability of countries that rely heavily on a narrow range of global suppliers. This calls for renewed attention to diversification in sourcing strategies, regional trade integration, and enhanced domestic production capacity, especially for highly consumed and import-sensitive commodities. Third, the paper's demonstration of differential welfare impacts across income groups and geographic zones has broader relevance for global discussions on equity in food system resilience. As seen in Nigeria, poorer households not only reduce their food expenditure more sharply in response to price shocks but also experience deeper nutritional losses. In fragile contexts across West Africa and other regions, this asymmetric burden demands that food security policy and programming move beyond aggregate price monitoring to explicitly target vulnerability reduction and welfare stabilization. Finally, the methodological approach, linking high-frequency market price data with household-level simulations, offers a valuable tool for real-time policy design. As global institutions such as WFP, FAO, and IFPRI work with national governments to develop adaptive and anticipatory food security strategies, country-level studies like this one provide grounded evidence to calibrate interventions. The Nigeria case underscores the importance of integrating economic modeling, spatial market analysis, and welfare simulation to inform both emergency responses and long-term resilience planning.

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