Agricultural Credit Mobilisation and Food Security in Nigeria: Investigating the Interaction Effect of Urbanisation

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Abstract

Nigeria's escalating food insecurity crisis is inadequately addressed by existing research, which often relies on qualitative insights and limited household surveys, failing to

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capture critical dimensions of the issue. Conventional food security metrics lack comprehensiveness, emphasising the need for broader approaches. This study fills the gap by employing holistic food security indices to offer a multidimensional evaluation and investigate urbanisation's moderating role in the relationship between agricultural credit mobilisation and food security. Using 24 years of data (2000–2023) from the Central Bank of Nigeria (CBN) statistical bulletin and the Food and Agricultural Organisation (FAO) database, the study employs advanced econometric methods, including autoregressive distributed lag (ARDL) estimation, unit root testing, F-bound tests for cointegration, and principal component analysis (PCA). Results show that agricultural credit mobilisation exerts a significant negative impact on food security, while urbanisation amplifies this negative impact, further intensifying the nation's food insecurity challenges. Hence, the study recommends tailored agricultural credit schemes that address the specific needs of rural and urban areas. Policymakers should prioritise sustainable agricultural practices and food production systems that align with Nigeria's broader goals for resilience and sustainable development.

Keywords: Food security, Agricultural credit mobilisation, urbanisation, Interaction effect, Nigeria

Introduction

The goal of zero hunger by 2030 faces increasing challenges as food insecurity worsens, particularly in Africa, which hosts a significant portion of the world's population. Since 2014, the global prevalence of undernourishment has risen, reaching 9.1% in 2022. Africa recorded the highest levels, with 20.4% undernourished in 2023 (FAO et al., 2024). In Nigeria, the situation is dire, with severe food insecurity escalating from 19.8% in 2021 to 22.6% in 2023. This is attributed to economic challenges, food inflation, farmer-herdsmen conflicts, and policy inefficiencies.

Compared to neighbouring countries like Ghana (8.2%) and South Africa (8.4%), Nigeria's levels are alarmingly higher (FAO, 2024b).

Agricultural credit mobilisation is low globally, with Africa's share increasing slightly from 1.6% in 2013 to 2% in 2022, while Asia's grew from 40% to 52% (FAO, 2024a). Urbanisation is a key factor in worsening food insecurity in Nigeria by straining food systems and reducing agricultural engagement. Despite research on urbanisation's impact, few studies focus on its moderating role between agricultural credit and food security. Jonah and May (2019) emphasise that rapid urban growth intensifies food insecurity in Africa, making it harder to meet the needs of expanding urban populations. Given the trends in agricultural credit in Nigeria, a pressing question arises: To what extent does the inefficiency in agricultural credit mobilisation contribute to the ongoing food insecurity? This paper aims to explore this critical issue, especially in Nigeria, where limited access to agricultural financing may hinder progress toward sustainable food security.

Previous studies on food security often rely on a single indicator or qualitative binary measures, leading to inconclusive results about the effects of agricultural credit mobilisation on food security (Arshad et al., 2024; Kehinde & Kehinde, 2020; Idi et al., 2019). This study utilises various proxy indicators, computing two food security indices through principal component analysis (PCA). The first set of indicators includes food insecurity prevalence, severely food-insecure individuals, undernourishment rates, and the value of food imports relative to total exports. The second set includes per capita food supply variability and average dietary energy, fat, and protein supply adequacy.

Literature indicates that urbanisation increases food insecurity as urbanised economies engage less in agriculture (Nchanji et al., 2023; Abebe, 2024). While this trend is evident in developed African nations, it also applies to emerging economies like Nigeria, where urbanisation's impact on food insecurity is under-researched. This study addresses the effects of agricultural credit on food security and examines urbanisation's moderating role using indicators from the Food and Agricultural Organisation. The rest of the paper is structured to capture the literature review in the second section, followed by an overview of methods used in section 3, result and Discussion in section 4, while section 5 captures the conclusion and policy recommendations of the study.

Literature Review

Empirical studies on food insecurity, urbanisation, and agricultural credit frequently employ logit regression techniques. Yeasmin et al. (2024) found that agricultural credit positively impacts farm size among 360 Bangladeshi farmers. Delbiso et al. (2024) indicated a link between household wealth and food security in Ethiopia, based on 573 households. In Pakistan, Saqib et al. (2018) showed a positive relationship between agricultural credit and owned land. Rehman et al. (2024) demonstrated the significant impact of farmer credit on food insecurity in South Asia using data from 1990 to 2021.

In Africa, Cele and Mudhara (2022) found that credit access significantly improved food security among 243 South African households. Idi et al. (2024) analysed 168 respondents in Nigeria, highlighting a positive impact of microcredit on agricultural productivity. Additionally, Lolaso et al. (2024) studied food insecurity among smallholder farmers in Ethiopia's Shashogo district, noting uncertainty about food supply reliability. A study by Arshad et al. (2024) reveals that food insecurity is more prevalent in urban areas of Pakistan, based on the 2018–19 Household Integrated Economic Survey and assessed by the Foster-Greer-Thorbecke index. Meanwhile, Addai et al. (2024) found that rural rice farmers in Ghana benefit from farmer organisations, which enhance dietary diversity and reduce food insecurity. Their study suggests promoting such memberships for better food security among smallholder farmers. Additionally, Latulipe and Imo (2024) examined food security during COVID-19 in five rural districts of Upolu, noting that only a small percentage of communities maintained food security during the pandemic.

Several studies highlight the negative impact of urbanisation on food security. Liu et al. (2021) found negative impacts in Northwest China, while Ma et al. (2024) documented significant vegetation changes from 1986 to 2020. Liu and Zhou (2021) noted a reduction in cultivated land area, and Andrade et al. (2022) linked food production loss to urbanisation. Kousar et al. (2021) reported increasing food insecurity in Pakistan from 1990-2019, and Nchanji et al. (2023) connected urbanisation to agricultural land shortages in Northern Ghana. Globally, Magazzino et al. (2023) found a decline in agricultural land use due to urbanisation. In sub-Saharan Africa, studies by

Aboye et al. (2024), Abebe (2024), and Koroso and Zevenbergen (2024) indicated that urbanisation increases food insecurity in Ethiopia.

Method

Model Specification

This study is based on a sustainable livelihood framework, emphasising financial capital as a key factor for achieving food security. It also considers human, social, and natural capital, with control variables including population size, growth rate, government expenditure, political stability, and absence of violence. Reflecting on this framework with an adaptation of empirical models used by previous studies like Kehinde and Kehinde (2020), Idi, *et al* (2019); Iftikhar and Mahmood (2017); Ijaiya, *et al.* (2017). This study categorises models to examine how agricultural credit mobilisation affects food security and the moderating role of urbanisation in this relationship. It includes four sections, with the first set analysing the impact of overall agriculture credit (OAC) and agricultural credit from commercial banks (AGCB) on four food security indicators identified by the Food and Agriculture Organisation (FAO, 2024), including Number of severely food insecure people *(NSFI)*, Prevalence of severe food insecurity in the total population *(PSFI)*, Value of food imports in total merchandise exports *(VFI)*, Prevalence of undernourishment *(POU)*. The second set of models adds an interaction term to assess the impact of agricultural credit on food security indicators and the role of urbanisation in this relationship in Nigeria. The third set focuses on robustness using two food security indices: one based on prevalence and the other on food supply quality. Finally, the last set includes a moderation model that adds an interaction term for agricultural credit and urbanisation to the food security indices. For conciseness, each model set is presented using vector notation for the food security indicators and index.

Model Specification: First set

Model 1-4: (overall agricultural credit and food security indicators)

$$fsi_{it} = \alpha_0 + \alpha_1 lnoac_t + \alpha_2 lnps_t + \alpha_3 lnpgr_{ir} + \alpha_4 lngexp_t + \alpha_5 pav_t + \alpha_6 lnenvd_t + \varepsilon_i \quad ---(1-4)$$

Model 5-8 (Agricultural credit from commercial banks and food security indicators)

$$fsi_{it} = \alpha_0 + \alpha_1 lnagcb_t + \alpha_2 lnps_t + \alpha_3 lnpgr_{ir} + \alpha_4 lngexp_t + \alpha_5 pav_t + \alpha_6 lnenvd_t + \varepsilon_i \quad ---(5-8)$$

Model Specification: Second Set

Model 9-12: (moderation effect of urbanization on overall agricultural credit and food security indicators)

$$fsi_{it} = \alpha_0 + \alpha_1 lnoac_t + \alpha_2 lnurb_t + \alpha_3 lnoac * lnurb_t + \alpha_4 lnps_t + \alpha_5 lnpgr_{ir} + \alpha_6 lngexp_t + \alpha_7 pav_t + \alpha_8 lnenvd_t + \varepsilon_i \quad ---(9-12)$$

Model 12-16 (moderation effect of urbanization on Agricultural credit from commercial banks and food security indicators)

$$fsi_{it} = \alpha_0 + \alpha_1 lnagcb_t + \alpha_2 lnurb_t + \alpha_3 lnagcb * lnurb_t + \alpha_4 lnps_t + \alpha_5 lnpgr_{ir} + \alpha_6 lngexp_t + \alpha_7 pav_t + \alpha_8 lnenvd_t + \varepsilon_i \quad ---(13-16)$$

Model Specification: Third set

Model 17 and 18

$$fsi1_{it} = \alpha_0 + \alpha_1 lnoac_t + \alpha_2 lnps_t + \alpha_3 lnpgr_{ir} + \alpha_4 lngexp_t + \alpha_5 pav_t + \alpha_6 lnenvd_t + \varepsilon_i \quad ---(17)$$

$$fsi2_{it} = \alpha_0 + \alpha_1 lnoac_t + \alpha_2 lnps_t + \alpha_3 lnpgr_{ir} + \alpha_4 lngexp_t + \alpha_5 pav_t + \alpha_6 lnenvd_t + \varepsilon_i \quad ---(18)$$

Model 19 and 20

$$fsi2_{it} = \alpha_0 + \alpha_1 lnoac_t + \alpha_2 lnps_t + \alpha_3 lnpgr_{ir} + \alpha_4 lngexp_t + \alpha_5 pav_t + \alpha_6 lnenvd_t + \varepsilon_i \quad ---(18)$$

$$fsi2_{it} = \alpha_0 + \alpha_1 lnagcb_t + \alpha_2 lnps_t + \alpha_3 lnpgr_{ir} + \alpha_4 lngexp_t + \alpha_5 pav_t + \alpha_6 lnenvd_t + \varepsilon_i \quad ---(20)$$

Model Specification: Fourth Set

$$fsi1_t = \alpha_0 + \alpha_1 lnoac_t + \alpha_2 lnurb_t + \alpha_3 lnoac * lnurb_t + \alpha_4 lnps_t + \alpha_5 lnpgr_{ir} + \alpha_6 lngexp_t + \alpha_7 pav_t + \alpha_8 lnenvd_t + \varepsilon_i --- (21)$$

$$fsi2_t = \alpha_0 + \alpha_1 lnoac_t + \alpha_2 lnurb_t + \alpha_3 lnoac * lnurb_t + \alpha_4 lnps_t + \alpha_5 lnpgr_{ir} + \alpha_6 lngexp_t + \alpha_7 pav_t + \alpha_8 lnenvd_t + \varepsilon_i --- (22)$$

$$fsi1_t = \alpha_0 + \alpha_1 lnagcb_t + \alpha_2 lnurb_t + \alpha_3 lnoac * lnurb_t + \alpha_4 lnps_t + \alpha_5 lnpgr_{ir} + \alpha_6 lngexp_t + \alpha_7 pav_t + \alpha_8 lnenvd_t + \varepsilon_i --- (23)$$

$$fsi2_t = \alpha_0 + \alpha_1 lnagcb_t + \alpha_2 lnurb_t + \alpha_3 lnoac * lnurb_t + \alpha_4 lnps_t + \alpha_5 lnpgr_{ir} + \alpha_6 lngexp_t + \alpha_7 pav_t + \alpha_8 lnenvd_t + \varepsilon_i --- (24)$$

Where FSI represents food security indicators including*: NSFI*=Number of severely food insecure people, PSFI=Prevalence of severe food insecurity in the total population, VFI=Value of food imports in total merchandise exports, POU=Prevalence of undernourishment. OAC= overall agricultural credit mobilisation AGCB= Agricultural credit from commercial banks, PS=Population size, PGR= population growth rate, GEXP=Government expenditure, Political stability and absence of violence, ENVD= environmental degradation, ln= natural log operator, FSI= food security index 1, FSI2= food security index 2.

Data Source and Estimation Technique

Data for this study were obtained from the Central Bank of Nigeria's statistical bulletin and the Food and Agriculture Organisation's database on food security, covering 2000 to 2023. The analysis included Pearson correlation, Augmented Dickey-Fuller test, F-bound cointegration test, and ARDL estimation for short and long runs. Principal component analysis was also utilised to create a food security index for robustness checks.

Result

Preliminary Statistics and Test

Table 1: Pairwise Correlation Analysis

	lnNSFI	*lnPSFI*	*lnVFI*	*lnPOU*	*lnOAC*	*lnAGCB*	*LnURB*	*lnPS*	*lnPGR*	*lnGEXP*	*PAV*	*lnENVD*
lnNSFI	1											
lnPSFI	0.997	1										
lnVFI	0.009	0.059	1									
lnPOU	0.286	0.318	0.699	1								
lnOAC	-0.172	-0.167	0.357	0.427	1							
lnAGCB	0.147	0.172	0.653	0.443	0.511	1						
lnURB	0.108	0.136	0.644	0.780	0.250	0.169	1					
lnPS	0.120	0.149	0.662	0.798	0.433	0.573	0.299	1				
lnPGR	-0.265	-0.320	-0.420	-0.788	-0.478	-0.583	-0.780	-0.502	1			
lnGEXP	0.062	0.087	0.546	0.716	0.365	0.540	0.383	0.479	-0.207	1		
PAV	0.320	0.339	0.177	0.203	-0.461	-0.089	-0.227	-0.195	-0.258	-0.291	1	
lnENVD	0.280	0.318	0.772	0.408	0.301	0.711	0.279	0.298	-0.286	0.594	0.252	1

Note: *ln = natural logarithm; NSFI=Number of severely food insecure people (million people); PSFI=prevalence of severe food insecurity in the total population (per cent); VFI=Value of food import in total merchandise export (per cent); POU=Prevalence of undernourishment (per cent); OAC=Overall agricultural credit (million USD); AGCB=Agricultural credit from commercial banks (billion naira); URB=urbanisation (urban population as % of total); PS=population size(million people); PGR=population growth rate (annual % growth); GEXP=Government expenditure (billion naira); PAV=Political stability and absence of violence/terrorism (index ranging from -2.5 to 2.5); ENVD=Environment degradation (proxied by CO2 emission in Metric ton of carbon-dioxide equivalence [Mt CO2e])*

Source: Authors' Computation (2024)

Table 1 shows a negative correlation between severely food insecure individuals and both agricultural credit and population growth rate. In contrast, there is a positive correlation with other variables. The value of food imports as a percentage of total merchandise exports and undernourishment are negatively related only to population growth. Additionally, weak correlations among explanatory variables suggest a lack of multicollinearity in the models used.

Unit Root Test

Table 2: Summary of unit root test

@ level				*@ first difference*			
Variables	*ADF stat*	*Critical Value 1%*	*Critical Value 5%*	*ADF stat*	*Critical Value 1%*	*Critical Value 5%*	*Order of integration*
lnNSFI	-2.323	-3.752	-2.998	-4.733	-3.769	-3.004	I (1)
lnPSFI	-2.217	-3.752	-2.998	-4.646	-3.769	-2.004	I (1)
lnVFI	-0.968	-3.808	-3.020	-4.131	-3.831	-3.029	I (1)
lnPOU	0.850	-3.886	-3.052	-4.067	-3.886	-3.052	I (1)
lnOAC	-2.241	-3.857	-3.040	-3.306	-3.808	-3.020	I (1)
lnAGCB	-0.029	-3.752	-2.998	-3.382	-3.808	-3.020	I (1)
lnURB	-3.800	-3.769	-3.004	-4.637	-3.886	-3.052	I (1)
lnPS	-1.905	-3.788	-3.012	-4.637	-3.886	-3.052	I (1)
lnPGR	-0.674	-3.857	-3.040	-3.261	-3.886	-3.052	I (1)
lnGEXP	-0.679	-3.752	-2.998	-5.264	-3.769	-3.004	I (1)
PAV	-3.964	-3.788	-3.012	-	-	-	I (0)
lnENVD	-1.131	-3.769	-3.004	-5.977	-3.788	-3.012	I (1)

Source: *Authors' Computation (2024)*

The unit root test results in Table 2 indicate that several variables, including the number of severely food insecure people and agricultural credit, are integrated of order one I(1), as they become stationary only after first differencing. In contrast, political stability and absence of violence/terrorism are stationary at 5% level, indicating they are integrated of order zero I(0). Thus, the study shows a mix of integrated orders I(0) and I(1)), which justifies the use of ARDL co-integration to meet the study's objectives.

Main Result (Effect of Agricultural Credit Mobilisation on Food Security)

Estimation results in Table 3 show the impact of credit mobilisation on food security in Nigeria, divided into two sets of models. The first set examines the overall agricultural credit's effect on four food security indicators, while the second focuses on agricultural credit from commercial banks. Models 1-4 indicate that overall agricultural credit has a significant negative effect on the number of severely food insecure individuals in both the short and long run. The prevalence of severe food insecurity shows a positive and

significant effect in the short run, which turns negative in the long run. Additionally, a significant positive effect on the value of food imports is noted in the short run. For agricultural credit from commercial banks, there is a significant negative long-run effect on the number of severely insecure people and the prevalence of severe food insecurity, while a positive significant effect on food import value is observed in the short run.

The findings presented in Table 3 unequivocally demonstrate that agricultural credit mobilisation in Nigeria plays a critical role in alleviating food insecurity, significantly reducing both its prevalence and the number of severely food insecure individuals. Increased agricultural credit is essential for enhancing food security in both the short and long term. The reality is that a substantial portion of the agricultural workforce lacks the necessary funding to produce beyond basic subsistence, which underscores the urgency of expanding agricultural credit. By facilitating greater access to credit, we empower agricultural players to scale up and commercialise production, leading to a marked increase in the availability, accessibility, and quality of food within the country. This conclusion is supported by Ngong et al. (2023), which confirms that credit from commercial banks markedly boosts productivity in the agricultural sector, consequently enhancing food availability. Furthermore, Cele and Mudhara (2022) assert the vital connection between agricultural credit and food-secure households, while Rehman et al. (2024) affirm that providing credit to farmers directly reduces food insecurity.

FMain results (credit mobilization and food security)

Table 3: estimation results (model 1-8)

Overall agricultural credit (OAC) models

Dep Var	LnNSFI	lnPSFI	lnVFI	lnPOU
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Short run				
D(LNOAC)	-0.66***	0.55***	0.45***	-0.04
D(LNPS)	-	-	8615.6***	2448.01***
D(LNPGR)	-11.32***	-9.03***	-211.56***	-60.22***
D(LNGEXP)	-	-	0.07	-
D(PAV)	-	-	-0.37**	-
D(LNENVD)	-	-	1.14***	-
ECT(-1)*	-0.88***	-0.85***	-1.06***	0.01***
Long run				
LNOAC	-1.35***	-1.16***	0.58	-12.37
LNPS	6.57	5.46	6.53	-104.05
LNPGR	3.91	2.78	-209.59	8551.3
LNGEXP	-0.28	-0.23	-1.87**	13.41
PAV	0.41	0.29	-1.19	-25.54
LNENVD	-2.19**	-1.78	2.93	-23.29
C	-6.37	-4.84	-49.54	1265.5
R-squared	0.77	0.76	0.90	0.92
Normality	1.677	1.651	1.762	1.221
LM test (F-stat)	1.451	1.491	145.2	1.658
BPG (F-test)	0.438	0.441	0.265	0.451
Ramsey t-Test	1.592	1.696	0.486	0.980
F-Bounds Test	**4.175*****	**4.127*** **	**5.284*** **	**8.146*** **

Agricultural credit from commercial banks (AGCB) models

	lnNSFI	LnPSFI	lnVFI	lnPOU
Variables	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Short run				
D(LNPOU(-1))	-	-	-	0.90***
D(LNAGCB)	0.11	0.07	0.39**	-0.01
D(LNAGCB(-1))	0.31**	0.28***	-1.29**	-0.05**
D(LNAGCB(-2))	-0.27***	-0.21***	-0.79**	-0.04*
D(LNPS)	-10669.49***	-9034.67	-21497.2**	
D(LNPS(-1))	30372.1***	25050.26***	31286.48**	
D(LNPS(-2))			-35467.04**	
D(PGR)	228.71***	195.31****	529.2**	3.03***
D(LNPGR(-1))	1.58	1.73	-881.59**	-0.46
D(LNPGR(-2))	-13.02***	-9.98***	-9.04**	3.16***
D(LNGEXP)	-	-	1.72**	-0.31***
D(LNGEXP(-1))	-	-	0.48	-0.39***
D(LNGEXP(-2))	-	-	-0.99	
ECT(-1)	-1.43***	-1.42***	-2.44	-0.45***
Long run				
LNAGCB	-0.72***	-0.65***	0.66	0.26
LNPS	0.58	0.99	-5.89	-0.72
LNPGR	-364.74***	-299.91***	269.08	-4.08**
LNGEXP	0.04	-0.02	0.57	-0.04
C	-3.72	-4.52	40.01	9.09
R-squared	0.95	0.95	0.97	0.96
Normality	0.207	0.279	0.130	0.195
LM test (F-stat)	4.522	4.953	2.255	37.70***
BPG (F-test)	2.337	1.726	7.607	2.513
Ramsey t-Test	0.308	0.272	0.491	1.177
F-Bounds Test	**14.56*** **	**14.31*** **	**4.084*** **	**6.706*** **

Source: *Authors' Computation (2024)*

Main Result (Moderation Effect of Urbanisation in the Agricultural Credit Mobilisation and Food Security Nexus)

Table 4 reports the estimation results of the moderation effect of urbanisation on the agricultural credit mobilisation and food security nexus. As presented in Table 4, the results showed that in the short run as well as in the long run urbanisation exerts significant positive moderation effect on the negative effect of overall agricultural credit on food security for all measures of food security, except in the case of the value of food importation in total merchandise. Result showed that as the percentage of urban population in the total population increases in Nigeria, the effect of agricultural credit mobilisation that culminated in reduced food insecurity tends to decline.

Result for agricultural credit from commercial banks in column 7-10 on Table 4 also established that on the long run urbanisation exerts significant positive moderation effect on the negative effect of agricultural credit from commercial bank on food security measured in terms of number of severe food insecure people, prevalence of severe food insecurity and prevalence of undernourishment, while only value of food import shows a reverse moderation effect.

This study established that ringing percentage of urban population in the entire population significantly reduces the impact of agricultural credit mobilisation on improved food security in Nigeria. This discovery reflects that movement away from the rural area is inimical to building sustainable framework that can maintain adequate food security in Nigeria, other things held constant. This discovery is in congruence with the conclusion of Farooq and Rashid (2024) that urbanisation has a significant negative impact on agricultural land engagement and food production. Another study that shared a similar discovery is the study of Abebe (2024) that established that urbanisation worsens food insecurity through a reduction in production and an increase in food prices. A similar discovery was made by the study of Aboye, Gebre-Egziabher, and Kebede (2024) in the context of sub-Sahara Africa, where it was established that urbanisation increases vulnerability to food insecurity. Liu and Zhou (2021) submitted that urbanisation reduces cultivated land area, thus engendering food insecurity in most cases. Additionally, Andrade, Cassman, Rattalino, Edreira, Agus, Bala, Deng and Grassini (2022) submitted that food production loss is associated with urbanisation.

Notably, while the overall agricultural credit mobilisation exert predominantly negative effect on food security measures (such as number of severely food insecure people and prevalence of severe food insecurity), both in the short run and long run, evidence of positive significant effect especially for value of food imports in total merchandise exports raise a concern, though this might be adduced to the rising exchange rate in Nigeria, on the one side, as well as high interest rate charged, especially in the case of agricultural credit from commercial banks. Intuitively, therefore, to further validate the robustness of the established predominant negative effect of agricultural credit mobilisation on food security, indices of food security were computed using principal component (PCA) methodology.

Robustness Check (Credit mobilisation and Food Security)

Robustness check carried out in this study made use of two different index of food security in an attempt to validate the relationship between agricultural credit mobilisation and to track the role of urbanisation in the nexus between agricultural credit mobilisation and index of food security from the perspective of prevalence of food insecurity, as well as from the purview of food supply indicators reflecting food security in terms of quality of food consumption in the society. Table 5 reports estimation results reflecting the effect of credit mobilisation (measured both in terms of overall agricultural credit mobilisation and agricultural credit mobilisation from commercial banks) on food security index 1 (FSI1) and food security index 2 (FSI2). Coefficient estimates reported in column 2 and 3 revealed that overall credit mobilisation had significant negative impact on food security index 1 on average ceteris paribus at 5% level of significance, in the short run, while in the long run, the impact is negative but not significant. For food security, index 2 results on column 3 of table 5 showed that overall agricultural credit mobilization has an insignificant positive effect on food security index 2 on the short run, while on the long run, the effect is negative but also not significant. Additionally, estimation results corresponding to agricultural credit from commercial banks reported in column 5 for food security index 1 revealed that the effect on agricultural credit from commercial banks on food security index is positive and insignificant both in the short run and on the long run. In the case of food security index 2, as shown in column 6 of Table 6, the effect of agricultural credit mobilisation is positive and

insignificant in the short run, but negative and insignificant in the long run. In a nutshell, result showed that agricultural credit from commercial banks has no significant effect on food security in Nigeria from the short run and long run perspectives, even when an index of food security was considered. In essence discovery made in the main estimation of this study as torching the negative effect of agricultural credit mobilisation is largely validated by the robustness check result, hence, it can be established that in Nigeria agricultural credit mobilisation exerts significant negative effect on food security, especially when measured in terms of prevalence of severe food insecurity and undernourishment.

Robustness Check (Moderation Effect of Urbanisation)

The robustness result that tracked the moderation effect of urbanisation on the relationship between Agricultural credit mobilisation and food security in Nigeria as reported in Table 6 revealed that in the long run there is evidence of a significant positive moderation effect on the negative effect of agricultural credit on food security index 1, both for overall agricultural credit mobilisation and agricultural credit mobilisation from commercial banks as shown in column 2 and column 5 of Table 6. In addition, result showed that urbanisation only exert significant moderating effect on the negative effect of agricultural credit from commercial bank on food security 1 in the long run, while there is evidence of significant positive moderating effect on the negative effect of agricultural credit from commercial banks on food security index 2 in the short run. Because the result from the robustness check does not reflect substantial deviation from the result of the main estimation, especially in the long run, this study submits that urbanisation positively moderates the negative effect of agricultural credit mobilisation on food security in Nigeria.

FMain results (credit mobilization and food security)

Table 3: estimation results (model 1-8)

Overall agricultural credit (OAC) models				
Dep Var	*LnNSFI*	*lnPSFI*	*lnVFI*	*lnPOU*
Variables	***Model 1***	***Model 2***	***Model 3***	***Model 4***
Short run				
D(LNOAC)	-0.66***	0.55***	0.45***	-0.04
D(LNPS)	-	-	8615.6***	2448.01***
D(LNPGR)	-11.32***	-9.03***	-211.56***	-60.22***
D(LNGEXP)	-	-	0.07	-
D(PAV)	-	-	-0.37**	-
D(LNENVD)	-	-	1.14***	-
*ECT(-1)**	-0.88***	-0.85***	-1.06***	0.01***
Long run				
LNOAC	-1.35***	-1.16***	0.58	-12.37
LNPS	6.57	5.46	6.53	-104.05
LNPGR	3.91	2.78	-209.59	8551.3
LNGEXP	-0.28	-0.23	-1.87**	13.41
PAV	0.41	0.29	-1.19	-25.54
LNENVD	-2.19**	-1.78	2.93	-23.29
C	-6.37	-4.84	-49.54	1265.5
R-squared	0.77	0.76	0.90	0.92
Normality	1.677	1.651	1.762	1.221
LM test (F-stat)	1.451	1.491	145.2	1.658
BPG (F-test)	0.438	0.441	0.265	0.451
Ramsey t-Test	1.592	1.696	0.486	0.980
F-Bounds Test	**4.175*** **	**4.127*** **	**5.284*** **	**8.146*** **

Agricultural credit from commercial banks (AGCB) models				
	lnNSFI	*LnPSFI*	*lnVFI*	*lnPOU*
Variables	***Model 5***	***Model 6***	***Model 7***	***Model 8***
Short run				
D(LNPOU(-1))	-	-	-	0.90***
D(LNAGCB)	0.11	0.07	0.39**	-0.01
D(LNAGCB(-1))	0.31**	0.28***	-1.29**	-0.05**
D(LNAGCB(-2))	-0.27***	-0.21***	-0.79**	-0.04*
D(LNPS)	-10669.49***	-9034.67	-21497.2**	
D(LNPS(-1))	30372.1***	25050.26***	31286.48**	
D(LNPS(-2))			-35467.04**	
D(PGR)	228.71***	195.31****	529.2**	3.03***
D(LNPGR(-1))	1.58	1.73	-881.59**	-0.46
D(LNPGR(-2))	-13.02***	-9.98***	-9.04**	3.16***
D(LNGEXP)	-	-	1.72**	-0.31***
D(LNGEXP(-1))	-	-	0.48	-0.39***
D(LNGEXP(-2))	-	-	-0.99	
ECT(-1)	-1.43***	-1.42***	-2.44	-0.45***
Long run				
LNAGCB	-0.72***	-0.65***	0.66	0.26
LNPS	0.58	0.99	-5.89	-0.72
LNPGR	-364.74***	-299.91***	269.08	-4.08**
LNGEXP	0.04	-0.02	0.57	-0.04
C	-3.72	-4.52	40.01	9.09
R-squared	0.95	0.95	0.97	0.96
Normality	0.207	0.279	0.130	0.195
LM test (F-stat)	4.522	4.953	2.255	37.70***
BPG (F-test)	2.337	1.726	7.607	2.513
Ramsey t-Test	0.308	0.272	0.491	1.177
F-Bounds Test	**14.56*** **	**14.31*** **	**4.084*** **	**6.706*** **

Source: *Authors' Computation (2024)*

Robustness Results (credit mobilization and food security)

Table 5: Estimation result (model 17-20)

Overall agricultural credit (OAC) models			***Agricultural credit from commercial banks (AGCB) models***		
Dep Var	*FSI1*	*FSI2*	***Dep Var***	*FSI1*	*FSI2*
Variables	***Model 17***	***Model 18***	***Variables***	***Model 19***	***Model 20***
Short run	*Coefficient*	*Coefficient*	***Short run***	*Coefficient*	*Coefficient*
D(LNOAC)	**-146.6159***	6.758262	*D(LNAGCB)*	0.916847	0.587014
D(LNPS)	**-26872.54***	**-22589.51***	*D(LNPS)*	**27932.83***	**-23224.67***
D(LNPGR)	**636.2640***	**599.5722***	*D(LNPGR)*	**-757.5926***	**606.5459***
D(LNGEXP)	-2.832774	0.812697	*D(LNGEXP)*	0.168253	2.023632
D(PAV)	**3.769404***	-0.622590	*D(PAV)*	-0.141214	-1.065871
D(LNENVD)	**-6.994293***	**-4.509112***	*D(LNENVD)*	1.082178	-1.604643
*CointEq (-1)**	**-1.253460***	**-0.596961***	*CointEq (-1)**	**-0.746098***	**-0.443014***
Long run	*Coefficient*	*Coefficient*	***Long run***	*Coefficient*	*Coefficient*
C	*344.7961*	274.1090	*C*	-30.86615	136.4195
LNOAC	*-215.0493*	-141.1990	*LNAGCB*	0.505596	-1.287419
LNPS	*-36.57866*	-27.95022	*LNPS*	-13.78598	-17.47363
LNPGR	*540.3675*	983.2307	*LNPGR*	-988.1367	1354.452
LNGEXP	*1.560943*	1.850889	*LNGEXP*	-0.373873	4.839741
PAV	*5.562021*	-0.271070	*PAV*	-5.710288	-0.322886
LNENVD	*-10.31375*	-11.84869	*LNENVD*	12.96404	-2.350782
R-squared	**0.788747**	**0.773027**	*R-squared*	**0.716710**	**0.660581**
Normality	*0.54413*	*0.77259*	*Normality*	*0.802843*	*0.334485*
LM test (F-stat)	*1.254679*	4.439401	*LM test (F-stat)*	2.898228	1.676868
BPG (F-test)	2.780681	1.016145	BPG (F-test)	0.665713	3.451691
Ramsey t-Test	1.553515	0.949728	Ramsey t-Test	0.754025	0.312304
F-Bounds Test	**4.388144***	**8.328904***	*F-Bounds Test*	**11.151787***	**5.718653***

Robustness Results (moderation effect of urbanization)

Table 6: Estimation result (model 21-24)

Overall agricultural credit (OAC) models			***Agricultural credit from commercial banks (AGCB) models***		
Dep Var	*FSI1*	*FSI2*	***Dep Var***	*FSI1*	*FSI2*
Variables	***Model 21***	***Model 22***	***Variables***	***Model 23***	***Model 24***
Short run	*Coefficient*	*Coefficient*	***Short run***	*Coefficient*	*Coefficient*
D(LNOAC)	-323.2562	***-3707.572****	*D(LNAGCB)*	*28.49150*	***-65.16407****
D(LNURB)	**7010.247***	***-41380.85****	*D(LNURB)*	***-1248.607****	**-13942.87***
D(LNOACURB)	86.22198	***944.7714****	*D(LNAGCBURB)*	*-7.972198*	**17.13489***
D(LNPS)	**-39333.23***	***42.79293****	*D(LNPS)*	***-67250.12****	
D(LNPGR)	**979.7351***	***0.624425****	*D(LNPGR)*	***1775.819****	
D(LNGEXP)	**6.835934***	*9.357861*	*D(LNGEXP)*	***2.379873****	
D(LNENVD)	**-4.525631***	***-6.914129****	*D(PAV)*	***4.985416****	**4.008371***
CointEq (-1)*	**-1.505454***	***0.544472****	D(LNENVD)		-0.564491
			*CointEq (-1)**	***-1.042564****	**0.150527***
Long run	*Coefficient*	*Coefficient*	***Long run***	*Coefficient*	*Coefficient*
C	2209.240	-14622.74	*C*	*855.3300*	-12396.53
LNOAC	**-7665.489***	19869.65	*LNAGCB*	***-164.4710****	675.2375
LNURB	**-2086.250***	1126.208	*LNURB*	*206.6112*	-6825.889
LNOACURB	**2011.830***	-5309.296	*LNAGCBURB*	***43.03046****	-176.4108
LNPS	**1099.642***	1751.550	*LNPS*	*-316.7778*	7086.692
LNPGR	666.3823	-126.3876	*LNPGR*	*1758.763*	-503.4563
LNGEXP	6.584070	-23.85033	*LNGEXP*	*3.184556*	23.06626
PAV	1.884307	-27.39048	*PAV*	*10.74015*	-51.97328
LNENVD	-0.736305	51.34267	*LNENVD*		54.93206
R-squared	0.996861	*0.971859*	*R-squared*	*0.977353*	0.961102
Normality	*0.575398*	*570942*	*Normality*	*1.498224*	*0.832165*
LM test (F-stat)	1549388	*24.76121*	*LM test (F-stat)*	*490.2293*	*1.885*
BPG (F-test)	1.945728	*0.83114*	BPG (F-test)	*0.998132*	0.853008
Ramsey t-Test	1.66985	1.19137	Ramsey t-Test	*1.027127*	0.350896
F-Bounds Test	**44.99174***	***4.538390****	*F-Bounds Test*	***11.52595****	**6.458541***

Conclusion and Policy Recommendations

This study investigated the effects of agricultural credit mobilisation on food security in Nigeria, focusing on both overall agricultural credit and credit mobilisation from commercial banks. It further examined how urbanisation moderates these relationships. The findings revealed that agricultural credit mobilisation, while significantly influencing food security, has complex dynamics. Specifically, it was shown to have a pronounced negative effect on food insecurity indicators over both the short and long run, although positive effects were observed on food importation in the short run. Notably, the results varied when using alternative measures of food security, prompting the development of comprehensive food security indices. Urbanisation emerged as a significant moderating factor, demonstrating a reduction in the negative effect of agricultural credit mobilisation on food security, measured in terms of prevalence of severe food insecurity, value of food import as well as prevalence of undernourishment. While urbanisation amplified the negative effects of credit on food importation in the short run, it significantly enhanced the positive long-run effects of credit on food security outcomes in terms of declining food insecurity. These findings underscore the importance of contextualising agricultural credit strategies within broader socio-economic trends like urbanisation to optimise their impact on food security. Hence, this study recommends, among other things, that Policymakers should design agricultural credit schemes that align with the specific needs of rural and urban contexts. Credit programmes should prioritise investments in sustainable agricultural practices and food production systems that directly contribute to reducing food insecurity. Efforts should be made to streamline access to agricultural credit, especially for smallholder farmers, and ensure that funds are utilised effectively to boost domestic food production rather than increasing dependency on food imports. Furthermore, urbanisation trends should be factored into agricultural policies. Initiatives such as urban agriculture, peri-urban farming, and efficient food distribution networks can help enhance the positive moderating role of urbanisation on agricultural credit impacts. There is also the need for investments in infrastructure, such as transportation and storage facilities, and the promotion of agricultural technology, which can help reduce post-harvest losses and improve the

effectiveness of credit utilisation, particularly in rapidly urbanising regions. Finally, programmes aimed at improving urban food systems should be introduced. These may include: subsidising urban food markets, supporting urban farming initiatives, and ensuring food affordability for urban populations.

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