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International migration, remittance and food security during food crises: the case study of Nigeria

Chinedu Obi[1,2] · Fabio Bartolini[2] · Marijke D'Haese[1]

Abstract

The paper argues for the need to integrate the linkages between migration, remittances and food crises in the migration-food security literature. Food crises that are exacerbated by erratic climatic changes, violence and other uncertainties are important drivers of international migration. Research on the impact of migration and remittances on food security has grown lately, but it is arguably not comprehensive in its approach. The role of remittances in improving household food security experience during food crises is a vital stream being neglected, and the impact of remittances on food security over a long-term is yet to be studied comprehensively. To fill this gap, we analysed the case study of Nigeria using a World Bank Living Standards dataset, and followed an instrumental variable approach. Our results showed that remittance is valuable in meeting both short and long-term food security, and it is a veritable instrument for meeting household food security during food crises. It is particularly crucial for female-headed households who are more vulnerable to food insecurity. Although it does not significantly improve dietary diversity, households receiving remittances are less likely to adopt unhealthy coping practices such as eating less nutritious food, and less likely to be worried about meeting household food requirements due to lack of money. We conclude that remittances do not only smoothen consumption; it also places households on higher food security equilibrium during food crises.

Keywords Remittance · Migration · Food security · Food crises · Instrumental variable

1 Introduction

Food crisis is arguably the main driver of international migration in low-income countries (FAO, IFAD, IOM, and WFP 2018). It is exacerbated by erratic climatic changes, conflicts, insecurities and uncertainties, threatening the livelihood and survival of many households (FAO 2016; FSIN 2018). The shock caused by food crisis is predominantly felt by vulnerable groups such as the poorest households, female-headed households, households with a large number of dependents, and those living in regions with little or no insurance

mechanisms (Grófová and Srnec 2012). Food crises cause food insecurity by raising food prices, which increase hunger and malnutrition, especially in young children, and forces vulnerable households to adopt diverse coping strategies (Compton et al. 2010; Dhraief et al. 2019). Migration and remittances are among the critical coping strategies, which can improve household food security experience during food crises (Adger et al. 2002; Ebadi et al. 2018; de Brauw and Ambler 2018; Sikder and Higgins 2017; Sirkeci et al. 2012).

The link between migration, remittance and food security is centred in the new economic theory of labour migration (Stark and Bloom 1985). The theory specified migration to be a coinsurance arrangement, in which households collaborate to send a member abroad with the expectation that remittances will improve insurance against risk and loosen financial constraints caused by varieties of market failures including food crises (Taylor 1999). The remittance sent home becomes an altruistic contribution to withstand current or future food crises and insecurities. Previous research linked migration, remittance and food security in at least three different ways. The first subset of literature considers how the departure of migrants may lower household food consumption

✉ Chinedu Obi
Chinedutemple.obi@ugent.be

1 Department of Agriculture Economics, Ghent University, Ghent, Belgium

2 Department of Agriculture, Food and Environment, University of Pisa, Pisa, Italy

requirements, but at the same time reduces the number of family labour available for food production (Maharjan et al. 2013; Urama et al. 2017). The second subset of studies examines the potential of the household to receive remittances and information which could directly increase the expenditure and consumption of nutritious food (Damon and Kristiansen 2014; Isoto and Kraybill 2017; Karamba et al. 2011). The third subset shows the possibilities of remittances and information to indirectly improve food security by enabling the household to invest in food production and other non-agricultural activities (Atamanov and Van den Berg 2012; Böhme 2015; McCarthy et al. 2009). These studies were conducted using several food security indicators such as household per capita food expenditure, caloric consumption, food diversity, food preparation assets and child growth standards.

While these studies concluded that the decision to migrate and send remittance is reflected by the need of households to meet their basic needs, including food security, essential gaps still exist in the literature. Choithani (2017) and Crush (2013) observed the disconnect between migration and food security, and argue for the need for more research and evidence to bridge this divide. Moreover, existing studies that analysed food security use mostly short-term direct measures which may not capture food insecurity experience during food crises (Maxwell and Caldwell 2008; Moltedo et al. 2014) nor its long-term effects. We also added that although remittance income may smoothen consumption as literature has shown, the real welfare impact could be explicitly captured by the extent remittance income was able to make household food secure not only in the short term but also over the long term, especially during food crises (Abadi et al. 2018; Smerlak and Vaitla 2017). The critical question that research is yet to answer is, does migration and remittance receipt makes a household more food secure during food crises, and to what extent, whether short or long term? Answering this question will increase the understanding of the potentials of migration and remittance as a critical household coping strategy against food crisis as well as an instrument to maintaining long term food security.

To answer this question, we build from the reality that during food crises, households select different livelihood and coping strategies that are available and are entitled to them (Pritchard et al. 2013). The option(s) adopted by the households to smoothen consumption could have short term impact as well as long term implications (Sikder and Higgins 2017). Poor and non-migrant households may decide to eat cheaper and less nutritious foods or reduce food rations, which may minimise short term food insecurity experiences (Christiaensen and Demery 2018). However, these short term coping strategies are unhealthy and could further lock them in low food security equilibrium, making them more vulnerable to long-term food shock (Chiripanhura and Niño-Zarazúa 2016; Smerlak and Vaitla 2017). The privileged households

may send a member abroad, receive remittance and information from the household members who migrated. This household decision could bring positive impact both in short and long term through several pathways, as shown in the literature. First, in the short term, migration and remittances could reduce the household consumption requirements via the reduction in food partakers, and an increase in per-capita food expenditure. Second, in the long term, the enhanced investment in agriculture and non-agricultural activities due to remittances and information could improve household food production, food availability, sales revenues and income which would lead to more purchase of diverse and quality food (Craven and Gartaula 2015; De Brauw 2011; Zezza et al. 2011). Therefore, we argue that during food crises, households that do not have access to remittance operate at a higher-risk base with food insecurity. Hence, we search empirical evidence that shows that households that receive remittances have access to extra income and food supply that enable them to operate at lower risk with food insecurity, making them more likely to achieve both short term and long term food security.

Following the study rationale explained above, our analysis studies the short-term and long-term food security experience of remittance and non-remittance households during food crises. We considered international remittance in this paper because it tends to be larger than internal remittances during hardships, and its magnitude is less responsive to domestic shocks (Mckay and Deshingkar 2014). Our study contributes to the literature on migration-food security nexus by showing how remittance is vital to household food security during hardships. Our study differs from the previous studies that consider this nuance subfield but have used qualitative data method (Adger et al. 2002; Sikder and Higgins 2017). We draw evidence from the World Bank's living standard surveys using the context of Nigeria, a critical remittance-receiving country that has several experiences with food crises. We equally adopted an instrumental variable approach which provides significant quantitative insights on the role of remittances on household food security, as well as capable of controlling for the possible selection bias that arises in this kind of research. The results and conclusion provide insights that are relevant to both research and policy.

2 The Nigerian context

Nigeria provides a relevant case study for this study, owing to its massive migration and remittance flow and its experience with food crises. Food security represents a significant challenge in Nigeria since the 1980s when the country abandoned agriculture as a focal sector for commercial oil exploration (Matemilola and Elegbede 2017). In recent times, a higher incidence of food insecurity has dramatically been manifested

in rural farming households (Jabo et al. 2017). In 2016, data showed that about 32.4% of the total population is undernourished (FAO, IFAD, UNICEF, WFP, and WHO 2017). Internal conflicts (such as Boko-haram terrorism and farmers-herdsmen clashes), the oil price induced recession, and climate change have limited domestic food production and increased food prices, which resulted to food crises in many communities (Nwoko et al. 2016; Obi and Peart 2016). The food price in Nigeria increased by 15.3% between mid-2015 and mid-2016 (National Bureau of Statistics 2016).

A survey of the impact of food crises in Nigeria showed a significant degree of heterogeneity between northern and southern regions, and urban and rural areas (Chiripanhura and Niño-Zarazúa 2016). Many poor households have adopted several coping strategies to ensure food stability, for example borrowing food from friends, reducing portion sizes of food, and consumption of street food (Akerele et al. 2013; Fonta et al. 2015; Ike et al. 2017; Jabo et al. 2017). Another coping strategy used by households is migration and remittances. Nigeria is one of the significant departure hubs for migrants into Europe (UNHCR 2017). Migration is generally common in the southern regions where food is usually more expensive compared to the northern regions (Afaha 2012; Carling 2006). With a remittance flow of $22 billion in 2017, Nigeria is the highest remittance-receiving country in Africa and 5th in the world (World Bank 2018). Although this value may be underestimated,[1] formal remittance inflows are significant in the country when considered as a share of GDP, contributing to about 5.6% of the GDP. The Central Bank of Nigeria (CBN) reported that home remittance compares favourably as a source of foreign income inflows with crude oil (CBN 2017). The impact of remittance on the national economy has been studied extensively with majority views indicating that remittances contribute positively to the Nigerian economic growth (Afaha 2012; Eigbiremolen and Nnetu 2015; Olubiyi 2014). At the micro-level, research has shown that a significant portion of migrants remittance in Nigeria is used for food expenditure (Fonta et al. 2015). Nevertheless, aside from few mentions (Ajaero et al. 2017; Urama et al. 2017), studies of the impact of remittance on household food security are scarce, and research on whether migrants remittance can reduce food insecurity experiences during food crises in Nigeria is practically non-existing.

3 Methodology

3.1 Data

The data used in this paper was collected from the Nigerian 2015/2016 General House Survey (Nigeria National Bureau of Statistics 2015). It is implemented in collaboration with the World Bank Living Standards Measurement Study. The period of data collection fell within the time Nigeria experienced severe food crises due to the drop in crude oil price and a rise in domestic violence. This period also corresponded with the period of migration crises in Europe, when a significant number of Nigerians migrated into Europe through Italy. About 5% of the households that were sampled received international remittances during this crisis time. To adequately capture the impact of the remittance on household food security, a strategic sample selection is required. This is to ensure a sufficient comparison between households that receive remittances and those that do not. We restricted our analysis to states were migration/remittances are large enough to yield sufficient comparison.

We follow a multistage stratified sampling procedure to ensure regional representativeness of our sample. This was done by selecting only the top 3 remittances receiving states each from the Northern and Southern region of the country. Further cleaning was done to drop enumeration areas from these states that do not have at least one remittance-receiving household. Finally, 570 households were used in the study; 107 remittance household against 463 non-remittance households. We carried further test on the data confirming that the exclusion of households would not cause a significant change in the results.[2] The figure below shows the case study areas; Plateau, Bauchi, Kaduna for the northern region, and Anambra, Edo, and Lagos for the southern region Fig. 1.

3.2 Econometric approach

The paper is aimed at testing the hypothesis that remittance income is beneficiary to the household food security experience by improving their food expenditure and food diversity, and as such, has a short-term impact. The ultimate impact on long term food security depends on the ability to cope during

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[1] In Nigeria, due to the exchange rate fluctuations, undocumented resident statue of some migrants, and challenges of remitting directly to rural areas, there is often more incentives to use informal channels to remit money back home than the formal channels (Hernandez-Coss and Bun 2007; World Bank 2018). This unrecorded informal transfer had been reported to constitute about 50% of total transfers from the UK to Nigeria (Hernandez-Coss and Bun 2007).

[2] To ensure that our sample does not lose its representativeness and external validity, we tested if there are significant differences in the household characteristics of the control groups and the households not selected in the study (result table is provided in the supplementary material). We found that the household size, sex of household head, household total expenditure, marital status of head, and ownership of insurance were not significantly different at a 5% significant level. Nevertheless, the t-test also returns that households included in the sample are more likely to practice agriculture than those not included. Our results clearly showed that the exclusion of the households would not cause a significant change in the result. Furthermore, the result compares favourably with earlier research conducted in Nigeria and neighbouring West African countries.
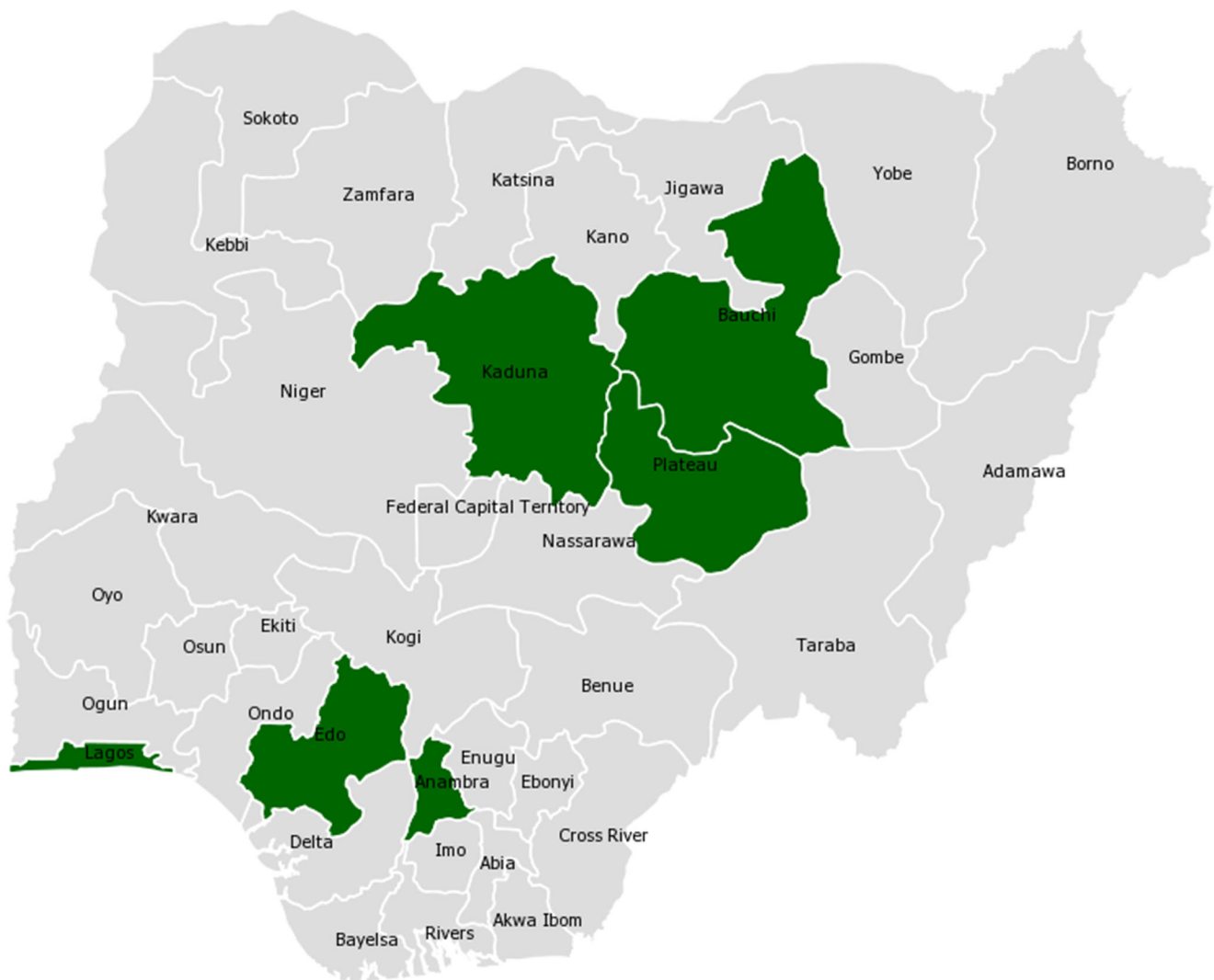
Fig. 1 Nigerian map showing the case study areas

persistent food shocks. Thus, to test this hypothesis, the data of the case study areas were included in econometric models. The aim is to compare the short-term and long-term food security of remittance household with non-remittance households, and how they cope during food crises. Four food security instruments were used in the analysis. (1) Household food expenditure per-capita, (2) Household Dietary Diversity Score (HDDS), (3) the Reduced Coping Strategy Index during food crises (rCSI), and (4) the Long-term Food Insecurity Experience Scale (FIES). The combination of these indicators has proved to be a consistent proxies measure of the different dimensions of food security in both long and short term and during food crises (Maxwell et al. 2013; Ike et al. 2017).

We defined these indicators according to Ballard et al. (2013); Leroy et al. (2015); Maxwell and Caldwell (2008) and Maxwell et al. (2013). Household food expenditure per-capita is a summation of the amount spent on food in the last 7 days, divided by the number of household food partakers. HDDS is the total number of food types eaten by household

members in 7 days. The scale used in the survey includes seven food groups- starch, pulses, fat and oil, fruits and vegetables, sugar, meat and fish, condiments. The rCSI is a set of weighted five questions with 7 days recall period asked to ascertain the vulnerable households that struggle to meet its food need during food crises. The question for the rCSI is: in the past 7 days, how many days have you or someone in your household had to: 1, rely on less preferred foods; 2, borrow food or rely on help; 3, limit portion size at mealtimes; 4, restrict adult consumption for children; and, 5, reduce the number of meals. The sum of the weighted score was used in the calculation of the household rCSI, and households with lower rCSI are regarded as more food secure. FIES is a 12-months recall period question that asked a set of eight questions on the subjective well-being of the household as regards to food consumption. The FIES question is during the last 12 months, was there a time when you were: 1, worried you would not have enough food to eat because of lack of money; 2, unable to eat healthy and nutritious food because of lack of

money; 3, ate only a few kinds of food because of lack of money; 4, had to skip a meal because there was not enough money; 5, ate less than you thought you should because of lack of money; 6, your household ran out of food because of lack of money or other resources; 7. were hungry but did not eat because there was not enough money; and, 8, went without eating for a whole day because of lack of money. The sum of the raw score of the questions was used in the calculation of the household FIES, of which a higher score means more problem with long term food insecurity. Further description of the indicators is presented in Table 1.

The set of dependent variables includes food expenditure parameters (per-capita food expenditure and per-capita food expenditure on different food classes) which were natural log-transformed for the analysis, as well as the HDDS, rCSI, and FIES which are count variables. The primary independent variable, remittance, is a discrete dummy variable which is represented as 1 for a household that receives international remittance within the period of food crises, and 0 for the non-remittance household. Considering the kernel distribution of these variables (see Fig. 2), it is appropriate to use two modelling approaches. First, we use a two-stage least square equation to estimate the impacts of remittance on the log of household food expenditure and the log of the expenditures on food classes. Second, an exponential mean model with endogenous regressors was used to examine the impact of remittance on HDDS, rCSI and FIES. As will be explained, these models are a considerable improvement on the standard ordinary least square (OLS) and Poisson regression model (PRM), which served as the first stage analysis.

Formally, the structural form of the OLS and PRM can be expressed below as:

$$\text{OLS}: y_{1i} = \beta_1 y_{2i} + x'_{1i}\beta_2 + u_i \qquad (1)$$

$$\text{PRM}: E\left(y_{1i}|y_{21}, x_{1i}, u_{i1}\right) = \exp\left(\beta_1 y_{21} + x'_{1i}\beta_2 + u_{1i}\right) \qquad (2)$$

where y_{1i} is the dependent variable (OLS: log of food expenditure per-capita per day, and log of food class expenditures per-capita per day; and for PRM, dependent variables are HDDS, rCSI, and FIES), y_{2i} is remittance household, x'_{1i} represent the control variables, and u_i is the error term.

The control variables include several covariate factors collected from the household head and are expected to influence the outcome variables such as sex, marital status, education, insurance, household expenditure as a proxy for income, household size, agriculture occupation, and household assets such as access to internet, possession of gas stove, fridge and insurance. Some community-level variables that control for possible community variation in the food crises experience were collected from the community head. This includes region either south or north, location in urban or rural, the average price of table water, and the incidence of food crises in the community.

Remittance is the variable of interest in our analysis. A dummy variable of receiving remittance against non-receiving remittance was used. Another possibility would have been to use a continuous variable that represents the magnitude of remittance received. However, due to data inconsistencies, we found during data cleaning, we were not confident enough to use the latter. Equally, we decided not to use migrants versus non-migrants comparison as some researchers have done because of the possibilities of non-migrant households receiving remittances during food crises, which may lead to noise in the analysis (Adger et al. 2002; Sikder and Higgins 2017). Moreover, at least in the context of Nigeria and other West African communities where communal life still exists, it may be the case that non-migrant households receive remittances from friends and distant relatives.

Table 1 Summary of main indicators used in the study

Indicator	Description	Data	Measures
Per-capita food expenditure and expenditure on food classes	This is a summation of the amount spent on food in the last 7 days divided by the number of household food partakers. It includes food eaten away from home, purchased, own production and food as a gift. This value is further disintegrated into different food classes.	The continuous variable measured in Naira Per capita per day	Short-term food expenditure
Household Dietary Diversity Score (HDDS)	This is the total number of food types eaten by household members in 7 days. We categorised the food classes into seven groups, including starch, pulses, fat and oil, fruits and vegetables, sugar, meat and fish, condiments.	Count variable from 1 to 7, indicating the total number of food class consumed	Short-term food quality and diversity
Reduced Coping Strategy Index (rCSI)	Household Coping strategy during food shock. This is a set of weighted five questions with 7 days recall period asked to ascertain the households that struggle (cope) to meet its food need during food crises.	Count variable between 0 and 56 with lower values signifying higher food security	Sufficiency of food supply during food crises
Food Insecurity Experience Scale (FIES)	This is a 12-months recall period question that asked a set of eight questions on the subjective well-being of household as regards to food consumption	Count variable between 0 and 8 with lower values signifying higher food security	Long-term food stability perception

Source: Ballard et al. (2013); Leroy et al. (2015); Maxwell and Caldwell (2008) and Maxwell et al. (2013)

Fig. 2 Distribution pattern of the food security indicators

Receiving remittance nevertheless does not occur randomly across households resulting in potential endogeneity problems. Endogeneity problems caused by reversed causality, selection bias and omitted variables have been extensively discoursed (Davis et al. 2010; McKenzie and Sasin 2007). In this study, similar problems emerge, because households that receive remittances during food crises may be different from households that do not receive remittances. They may be those that experience severe shocks from the food crises and can seek and acquire help from relatives abroad, or they may be those that are already privileged to have a migrant household member. Hence, survivor and selection bias may exist when either of these groups is compared to non-remittance households who do not have a similar privilege. To account for this bias, we adopted an instrumental variable (IV) regression approach (McKenzie et al. 2010).

Specifically, we developed our instrumental variable through the migration network theory (Lee 2010; Mckenzie and Rapoport 2007). This theory assumes that residing in migrants' communities increases the propensity to migrate, and by extension, increasing the likelihood of remittance

receipt (Lee 2010; Mckenzie and Rapoport 2007). However, another bias may be created when using the migrant network as an instrument. It may not satisfy the exclusive restriction law, as migration itself may affect food security by reducing household food productivity (Arouri and Nguyen 2018; McKenzie et al. 2010). Previous studies have made some modification in respect to this issue. Taylor and Lopez-Feldman (2010) added another instrumental variable to compensate for the lapses of migration network variables, Böhme (2015) divided the GDP growth of the destination country by the migrants network, and Nguyen and Winters (2011) strengthened the migration network approach by including an interaction between the network and adult equivalent household size.

In our case, we used the interaction between the community migration network and the age of the household head as our instruments. During food crises, the age of the household head may affect remittance receipt but may not directly affect household food security. For instance, older household heads may have middle-age children that could migrate and remit,

and they are more likely to receive remittance from non-relatives out of share empathy and respect. To be convinced that the adjusted migration network variable does not capture other community factors that could be linked to the outcome of interest, we ran a correlation test with the community level variables (Table 3 of supplementary material). We found a weak correlation between the community variables and the adjusted migration network.

We conducted a series of exclusion restriction tests to justify the IV equations. The Robustified Durban-Wu-Hausman test of endogeneity model leads to a firm rejection of the null hypothesis that the remittance variable is exogenous ($p = 0.003$), confirming the endogeneity of remittance. The Cragg-Donald Wald F statistic is approximately 10 (9.699) satisfying the widely used thumb of the rule suggested by Staiger and Stock (1997) for identifying the weak instrument. The R-square is approximately 0.08, which, according to Cameron and Trivedi (2010), is not low enough to flag the weak instrument problem in a just-identified model. We also conducted a test and conditional sets estimation (Mikusheva and Poi 2006). The three coverage-corrected tests gave similar 95% confidence interval of [0.93, 5.76] which is more extensive than the regular asymptotic interval of the endogenous variable [0.45, 3.59]. This result suggests that there is no strong need to correct for the weak instrument. We also followed the recommendation of Angrist and Krueger (2001) that when the number of instruments is equal to the number of endogenous variables, the bias created by the weak instrument is approximately zero. Finally, The Pagan-Hall general test statistics confirm that the error term is heteroskedastic ($p = 0.09$). Hence, to make allowance for the heteroscedasticity of the errors, we used the robust standard errors in our estimation and clustered the errors at the regional level. It is also important to note that for a further robust check, we rerun the experiment with the whole population and find no significant changes in the results. The next section reports the results of the IV regressions and Poisson regressions with endogenous regressors (IV Poisson), of which the results are robust to Treatment effect model.

4 Results

4.1 Description of household and food security variable

Table 2 presents the descriptive statistics of the variables included in the analyses. The means of the variables are shown for both remittance household and non-remittance households. The table provides valuable insight into the profile of households that receives remittances during food crises. In average, the remittance household heads are significantly older (57 years) than the non-remittance household heads (52 years). About 61% of the remittance household heads are married compared to 71% for non-remittance households that are married. More so, 39% of remittance household heads are widowed, which is significantly higher than the percentage of the non-remittance household that are widowed (29%). More female-headed households receive remittances (31%) than male-headed households (22%). Remittance households have smaller household size than non-remittance households, confirming that they have lower consumption requirement. Moreover, about 8% of remittance households have at least one international migrant, which is significantly higher than the 2% of the non-remittance household that has an international migrant. Remittance households are more likely to possess fridge and cooking gas, which could improve food preparation. As expected, receiving remittance (average 136,326.43 naira per year per household, approximately $500) translated to higher income for remittance-receiving households. The community-level questions confirm that in the period under review, food insecurity was a covariate risk borne across all communities.

The summary statistics of the food security indicators considered in this analysis are shown in Table 3 and Fig. 2. The table also includes disaggregated expenditure on food classes. The food classes are divided into food eaten at home; such as (a) starch staples (grains, flour, starchy roots), (b) pulses, nuts and seeds; (c) fats and oils, (d) fruits and vegetables, (e) meat, fish egg, milk and other animal products, (f) sugar, beverages, alcohol and juice and (g) condiments, water and miscellaneous, and food eaten away from home. The table suggests that remittance households spent significantly more on food per-capita per day (660 naira) compared to non-remittance households (501 naira). Consistent with previous results (Ike et al. 2017; Kuku-shittu et al. 2016), the overall household food consumption is predominantly on starch staples. The HDDS indicator equally shows that remittance households tend to eat more diversified food than non-remittance households. More so, the remittance households recorded lower scores for both the reduced coping strategy index (rCSI) and the long-term food insecurity experience scale (FIES). The distribution plots further explain these results. As expected, the food expenditure shifts to the right for the remittance households while the rCSI and FIES are denser towards zero, indicating a higher food security level for remittance households.

Nevertheless, the above interpretations are rather intuitive and do not imply causality as they do not control for possible household and community characteristics that may influence the level of food security. For instance, the distribution plots for HDDS seems very similar for remittance and non-remittance households. To explain causality, a more robust econometric strategy is required, as discussed later.

Table 2 Descriptive statistics of variables

	Remittance household (n = 107)		Non-Remittance Household (n = 463)		
	Mean	Std. Dev	Mean	Std. Dev	t-test
Key household characteristics					
Age (head age in number of years)	57.17	16.16	52.71	13.98	2.64***
Sex: female headed household (1: yes)	0.39	0.49	0.22	0.42	3.28***
Married: head is presently married (1: yes)	0.61	0.49	0.71	0.45	−2.03**
Education: attended post-secondary (1: yes)	0.15	0.36	0.13	0.33	0.61
Household size (number)	5.41	3.57	5.55	3.21	−0.39
Occupation: agriculture (1: yes)	0.51	0.50	0.59	0.49	−1.39
Household expenditure (Naira)	408,023	486,423	303,408	313,324	2.125**
Remittance Characteristics					
Remittance (Naira receive per year)	136,326	247,983	0	0	–
Migrant: has international migrant (1: yes)	0.08	0.27	0.02	0.13	2.42**
Household assets					
Internet: head has access to the internet (1: yes)	0.15	0.36	0.15	0.94	0.07
Insurance: head has insurance (1: yes)	0.07	0.25	0.03	0.18	1.30
Gas: household has gas cooker (1: yes)	0.14	0.36	0.05	0.22	2.35*
Fridge: household has a fridge (1: yes)	0.44	0.55	0.28	0.54	2.69***
Community Variable					
Region: a household in the south (1: yes)	0.68	0.47	0.65	0.48	0.58
Location: a household in an urban location (1: yes)	0.58	0.50	0.49	0.50	1.63
Price of table water (per 50CL)	9.49	9.34	9.81	10.49	−0.29
Experience sharp change in food prices (1: yes)	0.51	0.50	0.54	0.50	−0.53
Instrumental Variable					
Migrant Network: the presence of other migrants (1: Yes)	0.43	0.50	0.32	0.50	2.09**
Adjusted migrant network with age of head	3577.86	1876.27	3010.14	1558.70	2.91***

***, **, * are significant in 1%,5% and 10% respectively. All monetary measures are calculated in Naira; 1 US dollar = 305 Naira in 2016

4.2 Econometric results

Table 4 shows the result of the analysis of the short term impact of remittance on household food security. This is measured by the food expenditure per-capita per day and food expenditure of different food classes. The table is a truncated version which reports only the remittance coefficient. The results of the full model are found in the supplementary material. We find that without controlling for selection bias, the result of the OLS analysis tends to suggest that remittance have no significant impact on household food expenditure per-capita. After controlling for selection bias and possible heteroskedastic issues, we find that receiving remittances has a tremendous impact on the food expenditure parameters. The alternative treatment effect models equally produce a similar and consistent result. These models report significant but lower coefficients.

In general, the IV models indicate that remittance households spend more on starchy staple foods than non-remittance households. It further shows a negative impact on expenditure on food away from home. This means that remittance households are more likely to prepare their food at home rather than purchasing food from the street. This may be due to the possibility that preparing food at home is more expensive than street food during food crises. This is in line with the study of Compton et al. (2010) who showed that during food crises, street food is often cheaper than home cooking due to economies of scale. Hence, as a coping strategy, non-remittance households with limited liquidity may rely on the purchase of cheap meals from local street food vendors. Although, this choice may increase their access to food, by enabling them to buy food cheaper, on credit or purchase smaller portions, the diversity and quality of food will be a matter of concern. Nevertheless, remittance income increases the liquidity of

Table 3 Comparing food security level of remittance and non-remittance households

	Remittance Household		Non-Remittance Household		
	Mean	Std. Deviation	Mean	Std. Deviation	t-test
Total food expenditure per capita per day	660.75	731.29	501.17	517.52	2.14**
Food expenditure away from home	79.08	193.78	59.33	114.12	1.02
Grains, flours, starchy roots	270.59	345.08	220.42	328.15	1.41
Pulses, nut and seeds	29.25	99.50	18.38	37.19	1.11
Fats and oils	7.30	15.83	6.53	16.88	0.43
Fruits and vegetables	88.76	170.93	73.53	150.13	0.92
Meat, fish eggs and milk	86.92	132.58	63.89	92.93	1.70*
Sugar, beverages, alcohol and juice	65.63	151.46	34.80	108.17	1.99**
Condiments, water	33.21	100.52	25.10	58.29	0.80
HDDS	6.40	0.76	6.22	1.02	2.07**
rCSI	4.67	7.14	5.63	6.61	−1.33
FIES	2.66	2.86	3.71	2.91	−3.36***

***, **, * are significant in 1%,5% and 10% respectively. Questions on food category expenditure are measured in per capita per day. 1dollar = 305 Naira in 2016

remittance households, enabling them to overcome financial constraints that impede domestic food production and enable them to purchase food item for home cooking.

Table 4 Model estimates of the impact of remittance on food expenditure levels ($n = 570$)

	OLS	IV regression	Treatment effect model
Lnfood expenditure	0.04 (0.06)	2.02** (0.85)	1.84** (0.69)
Lnfood away	−0.26 (0.16)	−4.37** (1.63)	−4.38** (1.65)
Lnstarch	0.13 (0.09)	2.51*** (0.76)	2.39** (0.92)
Lnpulses	0.07 (0.13)	1.81** (0.72)	1.39 (1.03)
Lnfats	−0.12 (0.12)	0.89 (1.30)	1.00 (0.90)
Lnfruits and veg	0.04 (0.13)	3.54** (1.42)	3.39** (1.34)
Lnmeat and fish	0.12 (0.12)	3.45** (1.59)	3.07** (1.21)
Lnsugar	0.24 (0.18)	1.39 (1.44)	0.69 (1.31)
Lncondiments	−0.12 (0.10)	1.71** (0.86)	1.13 (0.80)

Note: the full models control for the head of household characteristics (sex, marital status, education), household characteristics (insurance, total expenditure, household size, agriculture occupation), household assets (internet, gas fridge) and community characteristics (region, location, table water price, and food price changes). Standard errors are presented in parenthesis. All analysis is clustered at the regional level that includes all the six geopolitical regions. *, **, *** are significant at 10, 5 and 1% level respectively

We inferred that the positive signs of remittance on food expenditure might be more pronounced in high migration regions. To confirm this, we disaggregate our results into the northern and southern region, and we find that remittance contributes significantly more to food expenditure for households in the southern region than it does in the northern region, and more in the rural locations compared to the urban settings (Table 5). This suggests that migration and remittance are veritable tools for improving household food security in migrant-sending communities. In particular, it provides evidence for the use of migration and remittances as a community coping strategy against food crises. In the case that food crises drive young people from the southern region of Nigeria to migrate to help households left behind, it is possible that solving the problem of food security could help in curtailing the incidents of irregular migration occurring in the region.

We now focus on the impact of remittance on household dietary diversity, coping index during food crises, and the long-term food insecurity experience (Table 6). The results from Table 6 show a positive but insignificant increase in dietary diversity for remittance household. This result is surprising but robust to other models. It is surprising because we saw that remittance households were more likely to spend more on different food classes than the non-remittance household. A plausible explanation of the insignificant effect is that the bulk of food expenditure during food crises is often on starch stable.

The results of the rCSI and FIES models are significant and negative. The rCSI model results indicate that with fixed values for the other regressors, remittance households are less likely to resort to unhealthy coping strategies during food crises. For instance, remittance households are less likely to eat less nutritious food or ration

Table 5 Estimate of the impact of remittance on food expenditure levels on sub-samples by region

	Northern region	Southern region	Rural	Urban
Food expenditure	2.85	1.33**	3.88*	0.86**
	(2.20)	(0.61)	(2.22)	(0.40)

*, and ** show significant differences with the comparison groups (non-remittances households). ***, **, * are significant in 1%,5% and 10% respectively. The standard error in parenthesis

food because of lack of money or purchase poor quality food from street food vendors. These are some of the short-term coping strategies that are more likely to be adopted by non-remittance households, which may have negative consequences on the household health and food security level in the long term. This proven ability of remittance household to maintain higher food security level during food crises pays off over the long run. The results of the FIES model shows that remittance households have a strong subjective perception of long-term food stability. They were less likely to be worried about not having enough to eat in the year that the food crises occurred. This probably would be due to the regular inflow of remittance that serves as insurance against the food crises.

5 Discussion

The main question we tried to address is if remittance can improve the short and long term food security of households during food crises. We find that although a significant heterogeneity exists, indeed, households that receive international remittances succeed to achieve higher food security during food crises. This is very true for the short term food security experience and possible for long term food security. In the first place, it is essential to reiterate

Table 6 Remittance, dietary diversity, coping practices and long term food security experiences

	Poisson	IV Poisson	Treatment effect model
HDDS	0.02	0.20	0.02
	(0.01)	0.16	(0.01)
rCSI	−0.09*	−1.55**	0.18***
	(0.05)	(0.68)	(0.06)
FIES	−0.26**	−1.25*	−1.99***
	(0.13)	(0.74)	(0.75)

NB: The sample is 570 households. The report provides remittance coefficient estimates from models that include all the households and community-level characteristics described in Table 2. Standard errors are presented in parenthesis. *, **, *** are significant at 10, 5 and 1% level respectively

that remittance households are predominantly headed by older females who are likely to be widowed or divorced. This finding is in line with the literature that shows the role of gender in migration-food security nexus (Kassie et al. 2014; Maharjan et al. 2013; Tibesigwa and Visser 2016). Indeed, female-headed households are less food secure than male-headed households, and vulnerable to food insecurity during food crises. However, our finding goes further to show that this disadvantage places the female-headed household in a strategic position to receive more remittances in times of hardship. Their ability to receive international remittances can not only be explained by the possibility of having children who may have migrated and remitting; but also by their position of being old and widowed, which make them more likely to receive altruistic remittances from non-family members living abroad. This insight also resonates with the finding that non-migrant but vulnerable households also receive remittances during food crises. In India, Choithani (2017) highlights the crucial role that remittance place in improving food access among vulnerable rural households. In the Nigerian context, the community way of living has necessitated a norm where vulnerable people could be supported through remittance and gifts from non-relatives during hardship.

Secondly, our study provides evidence on the different pathways through which remittances impacts on long term food security. Generally, while non-remittance households are more likely to adopt unhealthy short term coping strategies such as eating cheaper and less nutritious foods or reducing food rations which could be detrimental to their long term food security experience, our study confirms that remittances serve as an extra income that places the remittance households at lower risk with food insecurity during food crises, making them less likely to adopt the unhealthy coping practices. Households that receive remittances have significantly higher food expenditure percapita per day. This is possible because they have lower consumption requirements, as they are likely to have more members that have migrated. They are also able to consume more quality home-made food, which means that they have more money to purchase the priced market food items, or they have invested in domestic food production. They also invest more in cooking gas and fridges, which improve food preparation and ensure longer preservation of food. Generally, these healthier coping practices enable remittance households to be more confident and less worried about meeting the household's food requirements over the long term. The finding implies that as remittance households become less worried about meeting the household food demand, they could be able to channel their efforts towards the investment in other meaningful human

capital such as sending children to schools and improving household health cares, which have long term benefits.

Finally, it is essential to note some limitations of our result that should be of interest in future research. We adopted mostly point estimates to make projections about long term food security. Although FIES is a fundamental instrument that enables us to estimate households reflection of long term food security experience, we agree that long term food security experience may be graciously captured using panel data assessment. Moreover, we used HDDS as an easy and less complicated measure of food quality, yet we recognised the shortcoming of HDDS and its criticism in literature. For instance, a simple summation of different classes of food consumed may not sufficiently reflect the nutritional quality of the food.

6 Conclusion and policy implications

In this study, we examined how international remittances could impact on short and long term food security of households during food crises. We argued that this subfield is relevant but neglected in the migration-food security literature. Taking the case study of Nigeria, our results showed that remittance is an essential coping strategy, valuable in meeting both short and long-term food security during food crises. International remittances are very much crucial for older female-headed households, who are more vulnerable to food insecurity and making them more likely to receive altruistic remittances even from non-household members that are migrant. Although receiving remittance does not significantly increase household food diversity, it enables the household to maintain higher food security equilibrium during persistent food crises. Households that receive remittances have higher food expenditure per-capita per day, lower likelihood to adopt unhealthy coping strategies such as eating cheaper but less nutritious food, and are lesser likely to be worried about meeting households food requirements due to lack of money. Invariably, the improved capability to maintain higher food security could enable them to concentrate more on improving other human capitals that has long term consequences.

Necessary policy implication can be drawn from the results. First, we saw a significant impact of remittance on household food consumption expenditure and at the same time, an insignificant increase in household food diversity. This is a concern especially as to how remittance influence the food choices of beneficiary households. Previous research has confirmed this problem when they saw that migrants household often make wrong food choices, shifting towards the consumption of potentially less nutritious food, mostly starch and sugary food (Karamba et al. 2011). Consistency in this way of feeding may lead to child obesity (Damon and

Kristiansen 2014; Howard and Stanley 2017). Hence, the policy that encourages dietary choice education in high migrant communities is necessary for improving the nutritional level of migrant households. This is of utmost importance if the migrant community is also experiencing food crises.

Second, we found significant heterogeneity in impacts between the high migrating southern region and low-migration northern region, as well as between rural and urban areas. Remittance contributes significantly more to food expenditure for households in the southern high migrating region than it does in the northern low migrating region, and more in the rural locations compared to the urban areas. Generally, this implies that there is a need to improve the remittance channels to high migrating regions and rural areas to contribute to better food security experience. Moreover, as our analysis captures that remittances are significant in meeting food security in high migrating regions, it is imperative to assert that the migration policy that hinders regular migration and distorts remittance may have a countervailing effect on food security in migrant communities. In extreme food insecurity crises, young people may seek all possible ways to migrate to high-income countries to help their households. It is based on this that we reiterate the need for policies that aim to solve the root causes of migration in low-income countries to see reducing food insecurity and improving remittance outlets as critical goals.

Finally, although we did not estimate this pathway, the level of remittance may also depend on the economic and financial status of the migrants in the host community. Hence, for migrants to contribute in providing for households during food crises, a healthy "second-order effect" of policy instruments that enables them to maintain gainful labour in host countries is very important (i.e. agricultural policy or structural funds). Thus, further studies may seek to develop conceptual and empirical models to estimate the spill-over effect of policy in promoting migrant jobs in host countries.

References

Abadi, N., Techane, A., Tesfay, G., Maxwell, D., & Vaitla, B. (2018). *The impact of remittances on household Faood security: A micro perspective from Tigray, Ethiopia* (RePEc:Unu:Wpaper:wp2018-40). *WIDER working paper series 040, World Institute for Development Economic Research (UNU-WIDER).* Retrieved from https://www.wider.unu.edu/sites/default/files/Publications/Working-paper/PDF/wp2018-40.pdf

Adger, W. N., Kelly, P. M., Winkels, A., Huy, L. Q., & Locke, C. (2002). Migration, remittances, livelihood trajectories, and social resilience. *Ambio: A Journal of the Human Environment, 31*(4), 358–366. https://doi.org/10.1579/0044-7447-31.4.358.

Afaha, J. S. (2012). Migration, remittance and development in origin countries: Evidence from Nigeria. *Etude de La Population Africaine, 27*(1), 53–69. https://doi.org/10.11564/27-1-7.

Ajaero, C. K., Nzeadibe, C. T., Obisie-Nmehielle, N., & Ike, C. C. (2017). The linkages between international migration, remittances and household welfare in Nigeria. *Migration and Development, 2324*(June), 1–15. https://doi.org/10.1080/21632324.2017.1322171.

Akerele, D., Momoh, S., Aromolaran, A. B., Oguntona, C. R. B., & Shittu, A. M. (2013). Food insecurity and coping strategies in south-West Nigeria. *Food Security, 5*(3), 407–414. https://doi.org/10.1007/s12571-013-0264-x.

Angrist, J. D., & Krueger, A. B. (2001). Instrumental variables and the search for identification: From supply and demand to natural experiments. *Journal of Economic Perspectives, 15*(4), 69–85. https://doi.org/10.1257/jep.15.4.69.

Arouri, M., & Nguyen, C. V. (2018). Does international migration affect labor supply, non-farm diversification and welfare of households? Evidence from Egypt. *International Migration, 56*(1), 39–62. https://doi.org/10.1111/imig.12384.

Atamanov, A., & Van den Berg, M. (2012). Heterogeneous effects of international migration and remittances on crop income: Evidence from the Kyrgyz Republic. *World Development, 40*(3), 620–630. https://doi.org/10.1016/j.worlddev.2011.07.008.

Ballard, T., Kepple, A., & Cafiero, C. (2013). *The food insecurity experience scale: Development of a global standard for monitoring hunger worldwide. Technical paper. Rome, FAO.* (Vol. version 1.). https://doi.org/10.1016/j.measurement.2017.10.065.

Böhme, M. H. (2015). Does migration raise agricultural investment? An empirical analysis for rural Mexico. *Agricultural Economics (United Kingdom), 46*(2), 211–225. https://doi.org/10.1111/agec.12152.

Cameron, A., & Trivedi, P. (2010). *Microeconometrics using Stata, Revised Edition.* StataCorp LP. Retrieved from https://econpapers.repec.org/RePEc:tsj:spbook:musr

Carling, J. (2006). *Migration, human smuggling and trafficking from Nigeria to Europe. IOM Migration Research Series.* Retrieved from http://www.iom.int

CBN. (2017). *Central Bank of Nigeria: Economic Report For the First Half of 2017.* Retrieved from https://www.cbn.gov.ng/Out/2018/RSD/halfyear 2017innerx.pdf.

Chiripanhura, B. M., & Niño-Zarazúa, M. (2016). The impacts of the food, fuel and financial crises on poor and vulnerable households in Nigeria: A retrospective approach to research inquiry. *Development and Policy Review, 34*(6), 763–788. https://doi.org/10.1111/dpr.12183.

Choithani, C. (2017). Understanding the linkages between migration and household food security in India. *Geographical Research, 55*(2), 192–205. https://doi.org/10.1111/1745-5871.12223.

Christiaensen, L., & Demery, L. (2018). Agriculture in Africa: Telling Myths from Facts. Agriculture and Rural Development. Washington D.C: World Bank. https://doi.org/10.1596/978-1-4648-1134-0.

Compton, J., Wiggins, S., & Keats, S. (2010). Impact of the global food crisis on the poor: What is the evidence. Overseas Development Institute. Retrieved from http://www.odi.org.uk

Craven, L. K., & Gartaula, H. N. (2015). Conceptualising the migration–food security Nexus: Lessons from Nepal and Vanuatu. *Australian Geographer, 46*(4), 455–471. https://doi.org/10.1080/00049182.2015.1058797.

Christiaensen, L., & Demery, L. (2018). *Agriculture in Africa: Telling myths from facts. Agriculture and Rural Development.* Washington D.C: World Bank. https://doi.org/10.1596/978-1-4648-1134-0.

Crush, J. (2013). Linking food security, migration and development. *International Migration, 51*(5), 61–75. https://doi.org/10.1111/imig.12097.

Damon, A., & Kristiansen, D. (2014). Childhood obesity in Mexico: The effect of international migration. *Agricultural Economics (United Kingdom), 45*(6), 711–727. https://doi.org/10.1111/agec.12117.

Davis, B., Carletto, G., & Winters, P. C. (2010). Migration, transfers and economic decision making among agricultural households: An introduction. *Journal of Development Studies, 46*(1), 1–13. https://doi.org/10.1080/00220380903198000.

De Brauw, A. (2011). Migration and child development during the food price crisis in El Salvador. *Food Policy, 36*(1), 28–40. https://doi.org/10.1016/j.foodpol.2010.11.002.

de Brauw, A., & Ambler, K. (2018). Migration: Tightening borders and threats to food security. In *Tightening Borders and Threats to Food Security* (pp. 38–45). https://doi.org/10.2499/9780896292970_05.

Dhraief, M. Z., Dhehibi, B., Hassen, H. D., Zlaoui, M., Khatoui, C., Jemni, S., et al. (2019). Livelihoods strategies and household resilience to food insecurity: A case study from rural Tunisia. *Sustainability (Switzerland), 11*(3), 1–17. https://doi.org/10.3390/su11030907.

Ebadi, N., Ahmadi, D., Sirkeci, I., & Melgar-Quiñonez H. (2018). The impact of remittances on food security status in the Global South. *Remittandes Review, 3*(2), 135–150

Eigbiremolen, G. O., & Nnetu, V. I. (2015). Nigeria's economic growth: Do remittance inflows really matter? *Argumenta Oeconomica, 35*(2), 67–84. https://doi.org/10.15611/aoe.2015.2.04.

FAO. (2016). FAO. (2016). Migration, Agriculture and Rural Development: Addressing the root causes of migration and harnessing its potential for development. Rome: FAO. Retrieved from http://www.fao.org/3/a-i6064e.pdf.

FAO, IFAD, IOM, & WFP. (2018). *The Linkages between Migration, Agriculture, Food Security and Rural Development.* Rome. 80pp Retrieved from http://www.fao.org/3/CA0922EN/CA0922EN.pdf Licence: CC BY-NC-SA 3.0 IGO.

FAO, IFAD, UNICEF, WFP, & WHO. (2017). *The state of food security and nutrition in the world 2017. building resislience for peace and food security.* Rome FAO. Retrieved from http://www.fao.org/3/a-I7695e.pdf

Fonta, W. M., Ayuk, E. T., Chukwu, J. O., Onyukwu, O. E., Agu, C. C., & Umenwa, I. O. (2015). Dynamics of remittance utilization by Nigerian households. *Progress in Development Studies, 15*(4), 1–15. https://doi.org/10.1177/1464993415592742.

FSIN. (2018). *Global report on food crisis 2018. Food security information network.* Retrieved from https://docs.wfp.org/api/documents/WFP-0000069227/download/?_ga=2.59985454.202303217.1564397094-235228057.1564397094

Grófová, Š., & Srnec, K. (2012). Food crisis, food production and poverty. *Agricultural Economics (Czech Republic), 58*(3), 119–126. https://doi.org/10.17221/91/2011-AGRICECON.

Hernandez-Coss, R., & Bun, C. (2007). *The UK-Nigeria remittance corridor: Challenges of Embracing Formal Transfer Systems in a Dual Financial Environment.* World Bank working paper no. 92. World Bank Group. Retrieved from http://siteresources.worldbank.org/INTAFRSUMAFTPS/Resources/NigeriaRemittanceCorridor(background).pdf

Howard, L. L., & Stanley, D. L. (2017). Remittances channels and the physical growth of Honduran children. *International Review of Applied Economics, 31*(3), 376–397. https://doi.org/10.1080/02692171.2016.1257582.

Ike, C. U., Jacobs, P. T., & Kelly, C. (2017). A multidimensional approach to measuring household food security in Taraba state, Nigeria:

Comparing key indicators. *Development in Practice, 27*(2), 234–246. https://doi.org/10.1080/09614524.2017.1281225.

Isoto, R. E., & Kraybill, D. S. (2017). Remittances and household nutrition: Evidence from rural Kilimanjaro in Tanzania. *Food Security, 9*(2), 239–253. https://doi.org/10.1007/s12571-017-0656-4.

Jabo, M. S., Ismail, M., Abdullah, A. M., & Shamsudin, M. N. (2017). Measurement and determinants of rural food poverty in Nigeria: Recent evidence from general household survey panel. *International Food Research Journal, 24*(3), 1011–1018. https://doi.org/10.1002/jsfa.6038.

Jef L. Leroy, Marie Ruel, Edward A. Frongillo, Jody Harris, Terri J. Ballard, (2015) Measuring the Food Access Dimension of Food Security. Food and Nutrition Bulletin 36 (2):167-195

Karamba, W. R., Quiñones, E. J., & Winters, P. (2011). Migration and food consumption patterns in Ghana. *Food Policy, 36*(1), 41–53. https://doi.org/10.1016/j.foodpol.2010.11.003.

Kassie, M., Ndiritu, S. W., & Stage, J. (2014). What determines gender inequality in household food security in Kenya? Application of exogenous switching treatment regression. *World Development, 56*, 153–171. https://doi.org/10.1016/j.worlddev.2013.10.025.

Kuku-shittu, O., Onabanjo, O., Fadare, O., & Oyeyemi, M. (2016). *Child malnutrition in Nigeria: Evidence from Kwara State*. Working paper no. 33. International food policy research institute. Retrieved from https://nssp.ifpri.info/files/2016/08/NSSP-WP-33-Child-Malnutrition-in-Nigeria_July-2016.pdf

Lee, S. E. (2010). The ties made in the harvest: Nicaraguan farm-worker networks in Costa Rica's agricultural exports. *Journal of Agrarian Change, 10*(4), 510–536. https://doi.org/10.1111/j.1471-0366.2009.00242.x.

Leroy, J. L., Ruel, M., Frongillo, S. A., Harris, J., & Ballard, T. J. (2015). Measuring the food access dimension of food security. *Food and Nutrition Bulletin, 36*(2), 167–195.

Maharjan, A., Bauer, S., & Knerr, B. (2013). International migration, remittances and subsistence farming: Evidence from Nepal. *International Migration, 51*(SUPPL.1). https://doi.org/10.1111/j.1468-2435.2012.00767.x.

Matemilola, S., & Elegbede, I. (2017). The challenges of food security in Nigeria. *OALib, 04*(12), 1–22. https://doi.org/10.4236/oalib.1104185.

Maxwell, D., & Caldwell, R. (2008). *The Coping Strategies Index: Field Methods Manual 2nd Edition*. Retrieved from https://documents.wfp.org/stellent/groups/public/documents/manual_guide_proced/wfp211058.pdf

Maxwell, D., Coates, J., & Vaitla, B. (2013). How do different indicators of household food security compare? Empirical evidence from Tigray. Feinstein International Center, Tufts University*: Medford, USA. Retrieved from http://fic.tufts.edu/assets/Different-Indicators-of-HFS.pdf

McCarthy, N., Carletto, C., Kilic, T., & Davis, B. (2009). Assessing the impact of massive out-migration on Albanian agriculture. *The European Journal of Development Research, 21*(3), 448–470. https://doi.org/10.1057/ejdr.2009.12.

Mckay, A., & Deshingkar, P. (2014). *Internal remittances and poverty: Further evidence from Africa and Asia. Migration out of poverty Reserach Programme consortium*. Retrieved from http://migratingoutofpoverty.dfid.gov.uk/

Mckenzie, D., & Rapoport, H. (2007). Network effects and the dynamics of migration and inequality: Theory and evidence from Mexico. *Journal of Development Economics, 84*(1), 1–24. https://doi.org/10.1016/j.jdeveco.2006.11.003.

McKenzie, D., & Sasin, M. J. (2007). Migration, remittances, poverty, and human capital: Conceptual and empirical challenges. *World Bank Policy Research Working Paper, 4272*, 1–16. https://doi.org/10.1596/1813-9450-4272.

McKenzie, D., Stillman, S., & Gibson, J. (2010). How important is selection? Experimental VS. Non-Experimental Measures of the Income Gains from Migration. *Journal of the European Economic Association, 8*(4), 913–945. https://doi.org/10.1111/j.1542-4774.2010.tb00544.x.

Mikusheva, A., & Poi, B. P. (2006). Tests and confidence sets with correct size when instruments are potentially weak. *Stata Journal, 6*(3), 335–347 https://doi.org/TheStataJournal.

Moltedo, Ana; Troubat Nathalie; Lokshin, Michael; Sajala, Z. (2014). Analyzing Food Security Using Household Survey Data (Vol. 1). Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-0133-4.

Narges Ebadi, Davod Ahmadi, Ibrahim Sirkeci, Hugo Melgar-Quiñonez, (2018) The Impact of Remittances on Food Security Status in the Global South. REMITTANCES REVIEW 3 (2):135-150

National Bureau of Statistics. (2016). *Consumer Price Index (base Period November 2009 = 100)*. Abuja. Retrieved from http://nigerianstat.gov.ng/elibrary

Nguyen, M. C., & Winters, P. (2011). The impact of migration on food consumption patterns: The case of Vietnam. *Food Policy, 36*(1), 71–87. https://doi.org/10.1016/j.foodpol.2010.11.001.

Nigeria National Bureau of Statistics. (2015). General household survey, Panel (GHS-Panel) 2015–2016. Retrieved January 15, 2018, from www.microdata.worldbank.org

Nwoko, I. C., Aye, G. C., & Asogwa, B. C. (2016). Effect of oil price on Nigeria's food price volatility. *Cogent Food and Agriculture, 2*(1). https://doi.org/10.1080/23311932.2016.1146057.

Obi, C. T., & Peart, T. A. (2016). The gendered challenges faced by rural Nigerian adolescents (15 to17 years) in agriculture and vocational education. *International Journal of Social Science and Humanities Research ISSN, 4*(2), 23483156.

Olubiyi, E. A. (2014). Trade, remittances and economic growth in Nigeria: Any causal relationship? *African Development Review, 26*(2), 274–285. https://doi.org/10.1111/1467-8268.12081.

Pritchard, B., Rammohan, A., Sekher, M., Parasuraman, S., & Choithani, C. (2013). *Feeding India: Livelihoods, entitlements and capabilities. Feeding India: Livelihoods, Entitlements and Capabilities*. Routledge. https://doi.org/10.4324/9780203117620.

Sikder, M. J. U., & Higgins, V. (2017). Remittances and social resilience of migrant households in rural Bangladesh. *Migration and Development, 6*(2), 253–275. https://doi.org/10.1080/21632324.2016.1142752.

Sirkeci, I., Cohen, J. H., & Ratha, D. (2012). Introduction: Remittance Flows and Practices during the Crisis. In I. Sirkeci, J. H. Cohen, & D. Ratha (Eds.), Migration and Remittances during the Global Financial Crisis and Beyond (pp. 1–14). The World Bank. https://doi.org/10.1596/978-0-8213-8826-6.

Smerlak, M., & Vaitla, B. (2017). A non-equilibrium formulation of food security resilience. *Royal Society Open Science, 4*(1). https://doi.org/10.1098/rsos.160874.

Staiger, D., & Stock, J. (1997). Instrumental variables regression with weak instruments. *Econometrica, 65*(3), 557–586 http://www.jstor.org/stable/2171753.

Stark, O., & Bloom, D. (1985). The new economics of labor migration. *The American Economic Review, 75*(2).

Taylor, E. (1999). The new economics of labour migration and the role of remittances in the migration process. *International Migration, 37*(1), 63–88. https://doi.org/10.1111/1468-2435.00066.

Taylor, E., & Lopez-Feldman, A. (2010). Does migration make rural households more productive? Evidence from Mexico. *Journal of*

Development Studies, 46(1), 68–90. https://doi.org/10.1080/00220380903198463.

Tibesigwa, B., & Visser, M. (2016). Assessing gender inequality in food security among small-holder farm households in urban and rural South Africa. *World Development, 88*, 33–49. https://doi.org/10.1016/j.worlddev.2016.07.008.

UNHCR. (2017). Desperate Journeys Refugees and migrants entering and crossing Europe via the Mediterranean and Western Balkans routes. *Bureau for Europe*, (February), 9. Retrieved from http://www.refworld.org/country,,UNHCR,,TUR,,58b58b184,0.html.

Urama, N. E., Nwosu, E. O., Yuni, D. N., & Aguegboh, S. E. (2017). International migrant remittances and labour supply in Nigeria. *International Migration, 55*(1), 37–50. https://doi.org/10.1111/imig.12289.

World Bank. (2018). *Migration and Remittances - migration and development brief 29.*

Zezza, A., Carletto, C., Davis, B., & Winters, P. (2011). Assessing the impact of migration on food and nutrition security. *Food Policy, 36*(1), 1–6. https://doi.org/10.1016/j.foodpol.2010.11.005.

of Bologna, Italy in 2007.

Marijke D'Haese is a professor in the department of agriculture economics of Ghent University. She is an expert in rural development economics. Her research interests' centers on the link between household agriculture activities and rural economic development in the global south. Her research aims at analyzing how agriculture can contribute to improved welfare of rural communities; either by improving the farming system, by increasing access to markets or by improving the working conditions of those working in agriculture. She spent her childhood in Africa and returned to home-country Belgium to study bioscience engineering at Ghent University. At the moment, she is involved in several projects which research different aspects of agricultural development in the South.

Chinedu Obi is a Doctoral student at the Department of Agriculture, Food and Environment (DAFE), University of Pisa (Italy), and Department of Agriculture Economics, Ghent University (Belgium). He obtained his MSc in International rural development (IMRD), an Erasmus mundus programme jointly offered by a consortium of universities led by Ghent University (2017). In his research, chinedu combine knowledge from behavioral economics and development economics to understand how microlevel decisions are made and the impact of such decisions. His PhD project is 'The Impact of International Migration on Agriculture, Food and Rural Development of Home and Host Communities: Evidence from Nigerian Immigrants in Italy and Belgium'.

Fabio Bartolini is presently an Associate Professor in Agricultural Economics at the Department of Agriculture, Food and Environment (DAFE), Università di Pisa. His research activity focus on Common Agricultural Policy, Bioeconomy and Bio-based Economy, Value chain and Rural development. His research activities are pursued by applying quantitative methods (econometrics, mathematical programming model and agency models) and mixed methods (foresight). He holds a PhD in Agriculture Economics from University