Informal Associations, Shocks, and Household Food Consumption: Panel Data Estimation from Rural Nigeria

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Abstract

We use the three-waves panel data for households in rural Nigeria from the General Household Surveys (GHS), which is part of the World Bank Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA), to investigate how informal associations help households that are exposed to adverse shocks in smoothing their food consumption. We find that informal associations help to improve the percentage of food expenditure and dietary diversity of households who are members compared to those non-member households. Moreover, we investigate potential mechanisms through which these relationships hold, and we find that households are able to borrow from both the association and other individuals who may be members of similar networks. Our results are robust to different specifications.

Keywords: Cooperatives; Informal associations; Nigeria; Shocks; Rural Econom

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1. Introduction

Food consumption (including having sufficient access to safe and nutritious food that meets their dietary needs) has remained a major public policy issue in Africa. There is a rising rate of the number of chronic undernourished people in the region, from 20.8 percent in 2015 (200 million people) to 22.7 percent in 2016 (224 million people) [FAO, 2017]. Some factors such as weather variability, agricultural input price changes, and market fluctuations affect food production among households, which raises an important question on rural households' coping mechanisms. This question is even important noting the limitations of government interventions, such as inefficient outreach of programs to rural households. Hence the need to consider a more 'local' intervention for households to cope with related shocks.

This paper is focused on the role of informal associations in mitigating the impact of negative shocks on household food consumption. Studies have shown that membership of informal associations (such as informal saving schemes) could be an important coping strategy for different kinds of household and work-related shocks (see Abate, Francesconi, and Getnet, 2014; Ahmed and Mesfin, 2017; Getachew, Kibwika, Obaa, and Hassan, 2018). Such associations could also enhance poverty reduction among vulnerable groups by extending social protection, improving access to financial and material resources, and access to other forms of empowerment for members of the group (Bernard and Spielman, 2009; FAO, 2012; Ladipo, 2012; Woldu *et al*, 2013; Mendoza, 2016). However, the extent to which informal associations matter in smoothing food consumption for rural households that are exposed to unpredictable events has received limited attention.

This paper therefore investigates this relationship using a sample of rural households from the survey of the Nigerian General Household Surveys-Living

Standard Measurement Study for the period 2010/11, 2012/13, and 2015/16. We find, among others, that households that are members of these informal associations experience a significant increase in food consumption despite being exposed to shocks compared to non-members of informal associations. Evidence suggests that the sources of impact are driven by members having access to loans from the associations, but not through access to funds from other individuals who may be members of same association. The results have important implications for development policy for vulnerable groups (e.g. rural dwellers), and our findings also fill important gaps in the literature concerning the interdisciplinary study on socio-economic implications of informal institutions, which is gaining traction in many developing countries.

Specifically, this paper contributes to the broad literature on full risk sharing in developing countries (see Townsend, 1994; Devereux, 1999; Fafchamps and Lund, 2003; Agrawal, McSweeney, and Perrin, 2008; Pain and Kantor, 2012; Mubaya and Mafongoya, 2017; Riley, 2018). Mendoza (2016) in particular argues for the consideration of informal associations (like cooperatives) as an effective channel for inclusive development and empowerment of vulnerable groups. By considering cooperative societies, Mendoza (2016) finds that this kind of informal institutions can reduce poverty among vulnerable groups by creating opportunities, extending social protection, and facilitating empowerment, which are essential to any poverty reduction strategy. This paper is also closely related to Fafchamps and Lund (2003), who investigate how rural Filipino households use gifts and informal loans to cope with income and expenditure shocks. This study, however, is focused on the mitigating role of belonging to an informal association and the relationship between household' exposure to shocks and food consumption in rural Nigeria.

The importance of our study is further underscored in the growing evidence that informal associations can have significant beneficial effects for vulnerable households. For instance, in the absence of complete market for credits and risks in most developing countries (see Fafchamps, 1992), resorting to local structures of support service of risk sharing, as a coping mechanism for pernicious shocks to smooth consumption over time could be an important intervention. Informal associations are also important local institutional innovation for overcoming the constraints that hinder smallholders' access to market, and to cope with unexpected events (Abebaw and Haile, 2013; Verhofstadt and Maerstens, 2015; Ma and Abdulai, 2016). Other associated benefits of cooperatives is seen in Abate *et al.* (2014) and Wossen *et al* (2017) who note that members of agricultural cooperatives have improved technical efficiency from better access to productive inputs and services compared to non-members. Although our results emphasizes the importance of informal associations on the outcome of vulnerable households, our study also suggest specific channels through which these associations affect its members. For instance, our study acknowledges that through increased access to funding from the association, households are able to escape negative food shocks.

The rest of the paper, therefore, proceeds as follows. The second section discusses background on the Nigerian rural setup, informal associations, nutrition, and the theoretical linkages that exist between the variables. In the third section we provide an overview of our empirical approach, including details on the data. In the fourth section we present the results and outline the mechanisms through which this impact is transmitted, while the fifth section concludes the paper.

2. Background and Theoretical Linkages

As of 2016, over 51 percent of the Nigerian population is rural dwellers, which is the largest in Africa (World Bank, 2018). The poverty spread in Nigeria is

also spatially distributed, with 70 percent rural population estimated to be living on less than US$1.25 per day. The economic activities of the rural population are mainly agrarian, which include farm and other agricultural activities like rearing of livestock. The average smallholder farmer grows about six different crops and relies on such production for food and income, while external purchases are made to consume other food items not grown (Anderson et al, 2017). In addition to income from agricultural activities, rural dwellers also earn income from casual labor on other farms, petty trading, and remittances from relatives. Notwithstanding, rural dwellers are still constrained by irregular and volatile household cash flows, and other forms of shocks.

Belonging to informal associations, which has gained prominence in rural locations in Nigeria, is seen as an important mitigating strategy for vulnerable households (Otto and Ukpere, 2011; Ladipo, 2012). These associations are mostly the union of individuals with similar commonality (like trade, skills, and social interactions) with the main objective of improving the economic, social, and overall wellbeing of members. Usually, these associations are smaller than formal financial institutions (e.g. like the banks and microfinance institutions), and their operations are mostly informal and based on membership identification. Although there is lack of comprehensive data to estimate the origin and current state of informal associations in Nigeria, it was estimated in 2010 that there were over 80,000 of such associations (i.e. cooperatives), with about 1.4 million members across 605 local government areas (Ladipo, 2012).

These associations are set up at three levels, namely: primary, secondary, and tertiary level. The primary level concerns those associations that are usually based in communities and can further grow to become between 5 to 10 different associations. At the secondary level, it comprises of government organizations with responsibilities including supervising the activities of other associations at the state level. The

associations at this level have broader influence at the state level, and can engage in the training and financing activities of other associations within the state. The tertiary level of organization of informal associations are such that the group have a higher level of influence at the national level with matters that affect the welfare and benefits of its members at the primary and secondary level.

The main interests for this study are those informal associations at the primary level because they have a direct influence on household outcomes. These associations generally cover a smaller geographic area, usually in the communities or the local government of members. In principle, only very few members, as small as ten individuals, can form these informal associations (see Ladipo, 2012). Usually, members of these associations are financially committed by contributing a monthly or annual sum that ranges from 1.25 USD to about 1,250 USD (see Ladipo, 2012). With such contributions, members could qualify for other economic and social benefits from the associations at times of needs. In some other cases, members also benefit from other members through a mutual support scheme that they are entitled to as a result of their social networks that have been built by belonging to such associations. Hence, the importance of membership of these associations includes, but not limited to, economic outcome through improved income from better input and output market access, welfare improvement through capital availability for businesses and other income generating activities, and other forms of empowerment programs through training of members.

Members can also be helped to mitigate shocks that confront their wellbeing - especially food consumption. Although poor nutrition is a problem throughout the country, rural areas are also disproportionately affected for different reasons including distance from markets, limited health and education resources, and other social issues that affect nutrition (Health Sector Component of National Food and Nutrition Policy,

2014-2019). However, these reasons are arguments for the necessity of informal associations Wossen et al., (2017), and Ma and Abdulai (2016) identify the following pathways through which informal associations can affect household food consumption. First, informal associations can relax liquidity constraint of members by providing credit. Studies such as Wickrama and Keith (1994), Majee and Hoyt (2011), Reito and Spagano (2014), and Koike *et al* (2018) highlight how members of informal associations benefit from low cost credit for varying household activities. Such credits come from the contribution of members to a common fund. Second, informal associations can affect food consumption by providing market information and efficient price bargain for its members. This is in congruence with findings in Fafchamps and Hill (2005), Horn (2005), Sauer, Gorton, and White (2012), Msimango and Oladele (2013), and Muller *et al* (2018), that individuals are able to exploit market information by becoming a member of an informal association. Third, informal associations can influence the adoption of improved agricultural technology by members through training, specialized programs, and social learning among members, which can result in higher food consumption and household welfare (see Conley and Udry, 2010; Abebaw and Haile, 2013; Fischer and Qaim, 2012; and Kolade and Harpham, 2014).

3. Empirical Approach

The empirical approach proceeds by discussing the data, then the variables, and the empirical strategy.

3.1. Data

The data for this study is from a panel data of households in rural Nigeria from the General Household Surveys (GHS) which was part of the World bank Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) for the periods 2010/2011 (wave 1), 2012/2013 (wave 2), and 2015/2016 (wave 3). The

GHS data is nationally representative and focus on households in both the rural and urban areas of Nigeria.

The data were collected from post-planting period between August and October, and post-harvest between February and April of the following year. The actual sample for the first wave of the data contains 4,916 households (3,347 for rural and 1,569 for urban). The second wave of the surveys includes 4,716 households (3,251 for rural and 1,465 for urban), while the third wave surveys 4,581 households (3,132 for rural and 1,449 for urban). The attrition across the waves are caused by outright refusal of the household to participate in the survey, some households not found in the follow-up survey, death of some participants, household migration, and violent crisis in some areas.

This study used the post-harvest data because it contained more information about household food availability. However, for information about the membership of informal groups, we used the post-planting data since it had this information. The three waves were merged at the household level. Households that are located in the rural sector and who reported their shock experiences were then selected for the analysis. There are 973 households for the first wave, 1,299 for the second wave, and 1,056 for the third wave. Thus, our sample is an unbalanced panel.

There are three reasons for focusing on this group of households: first, focusing on this group directly answers the research question on the importance of informal associations in reducing the effect of shocks on household nutrition in rural Nigeria. Second, there is a spatial distribution in development outcomes in Nigeria, such that households in rural Nigeria are generally disadvantaged (Betiang, 2010). Therefore, in such setting, informal associations will be more effective in narrowing income inequality in Nigeria, which makes our sample to be policy relevant and insightful. Third, the response on households' shock experiences in the GHS data is

scanty; therefore to avoid so many missing data in the analysis, we used only households that reported their shock experiences.

3.1.1. Variables and Measurements

(I) Food Expenditure

The measure of household food expenditure encompasses the access and availability components of food security (see Haddad *et al,* 1994; Barrett, 2010). The actual indicator from the LSMS-ISA data is the seven-day recall data of food expenditure in local currency unit (Naira) for all food categories (including grains and flours; starchy roots, tubers and plantain; pulses, nuts and seeds; oil and fats; fruits; vegetables; poultry products like chicken, eggs, etc.; meat; fish and sea food; milk and milk products; coffee, tea, cocoa, and beverages; sugar, sweets, and confectionary; other miscellaneous foods; non-alcoholic drinks; alcoholic drinks – bottle and can).

(II) Dietary Diversity index

In addition to food expenditure measure, we also used the dietary diversity score because it captures of household's food access and caloric availability (Pangaribowo, Gerber and Torero, 2013). Moreover, it is associated with important health outcomes such as improved birth weight and child anthropometric status (Hatloy *et al*., 1998; Rao *et al*., 2001), improved hemoglobin concentration (Bhargava et al. 2001), and reduced risk of mortality from cardiovascular disease (Kant *et al*., 1995). We compute this score based on the twelve food categories proposed by Swindale and Bilinsky (2006) in Kennedy, Ballard, and Dop (2013)[1]. Thus, the score is a summation of the household 7-day recall of the consumption of the following food items: cereals, white tubers and roots, vegetables, fruits, meat, eggs, fish and

[1] The 12-food categories is a good indication of household economic access to food compared to an alternative measure that considers only 9-food categories, which reflects the probability of micronutrient adequacy (Kennedy, Ballard, and Dop, 2013).

other sea food, legumes nuts and seeds, milk and milk products, oils and fats, sweets, spices, condiments and beverages.

(III) Shocks

Shocks, which are those occurrences of unplanned events experienced by the household, which may likely have severe negative consequences on other economic, social, and welfare outcome of the household (Sekhri and Storeygard, 2014; Ajefu and Abiona, 2018), is measured as a count of the number of occurrences of both agricultural and non-agricultural unexpected events that are reported by the household. From the data source, the household reports the number of times that the following events occurred in the past period: the death or disability of an adult working member of the household, death of someone who sends remittances to the household, illness of income earning member of the household, job loss, non-farm business failure, theft or destruction of farm yields, demolition or damage of dwelling, weather related shocks like poor rainfall, flood, pest infestation, loss of land and property, death of livestock, changes in agricultural input and output prices, and changes in prices of food items. These reports were then summed at the household level to derive the extent of exposure of each household to shocks. No weights were assigned to each of the events because there is no contextual justification to value their effect, especially because these households are mostly poor and each of these idiosyncratic events will equally affect their outcomes (see Dercon, 2005; Beegle *et al.*, 2012).

(IV) Informal Associations

The variable 'Informal associations' is measured using the response (yes/no) to the question such as "have you used any informal savings groups (adashi/esusu/ajo) to save money in the past 12 months?" This study then classifies household membership as '1' if an adult member of the household responds in the affirmative to

the question, and '0' otherwise. It is important to note that the modus operandi of these groups in Nigeria is such that members are the only persons allowed to save with the group. Such members are also entitled to other social and economic benefits from belonging to such group (Ladipo, 2012). Thus, the measurement of informal associations is contextually relevant.

(V) Control Variables

The covariates include gender of the household head, average age of the household, dependency ratio, and household size. The household wealth, such as the value of assets owned by the household, the ownership of farmland to cultivate crops, and household income were also included. The choice of these covariates was motivated by the literature on the determinants of household food consumption and shocks (see Demeke *et al*, 2011; Belmondo, Efobi, and Atata, 2017; Delvaux and Paloma, 2018).

3.1.2. Summary Statistics

The summary statistics begins by presenting the descriptive statistics of the main variables in Table 1. From Table 1, the logarithm value of the food expenditure of the entire sample is 3.884, which decreased from 5.374 in the first wave to 3.303 by the third wave. Similar pattern was seen for dietary diversity score, which was 3.532 for the entire sample, 3.596 for the first wave, and decreased to 3.389 for the second wave. The dietary diversity score slightly increased to 3.649 by the third wave. Thus, implying that there has not been a significant increase in food expenditure and dietary diversity score for the sampled period.

The summary statistics also suggest that about 37 percent of the households affirm their membership in an informal association. There was a consistent increase in the membership status of households across the waves of the survey: only 34 percent

of the sample affirm their membership status in the first wave, which increased to 36 percent in the second wave, and then to 40 percent in the third wave.

Another important variable of interest is the number of exogenous shock experiences by the household. The entire sample household across the survey waves records an average shock occurrence of about 2 incidences in the previous period. About 1.773 incidences were recorded in the first wave; the second wave was 1.33 incidences, while the third wave recorded 1.709 incidences. The summary statistics of the other household characteristics such as the household size, owning farmlands for agricultural activities, the household income, gender of head of the household, average age of the household head, and the dependency ratio are presented in Table 1. These variables were within similar range across the survey waves with slight variations. Significant increase was seen in the number of assets that are owned by the household across the survey waves. The regression analysis, which will be discussed subsequently, will include the time fixed effect to address for those time specific factors that could account for the variations in the household characteristics across the survey waves.

Table 1: Summary Statistics

Variables	Measures	All Household			Wave 1			Wave 2			Wave 3		
		N	Mean	Std. Dev.	n	Mean	Std. Dev.	n	Mean	Std. Dev.	n	Mean	Std. Dev.
Food expenditure	Measured in local currency as total household food expenditure (Log value).	3186	3.884	1.250	930	5.374	0.669	1242	3.244	0.848	1014	3.303	0.862
Dietary diversity	Measured as a score from 0 (less diverse) to 12 (perfect diversity).	3208	3.532	1.527	935	3.596	1.568	1256	3.389	1.518	1017	3.649	1.488
Informal association	1 if the household is a member of this association, and 0 otherwise.	3185	0.367	0.482	938	0.335	0.473	1,232	0.362	0.481	1015	0.403	0.491
Shocks	Count variable on the number of occurrence that the household is exposed to shocks as earlier defined.	3214	1.812	2.523	939	1.773	1.655	1257	1.330	1.069	1018	1.709	3.270
Gender of Hh_head	Dichotomous variable '1' if female and '0', otherwise.	3214	0.219	0.414	939	0.128	0.335	1257	0.153	0.361	1018	0.197	0.398
Hh_age	Count variable for the age of the household head	3178	52.399	15.173	938	50.672	15.378	1222	52.993	15.289	1018	52.189	15.033
Dependency ratio	Ratio of number of children aged 5 and below to total household size.	3214	0.158	0.164	939	0.226	0.176	1257	0.190	0.171	1018	0.151	0.150
Hh_size	Number of individuals living within the household.	3214	6.313	3.551	939	6.246	3.192	1257	6.872	3.375	1018	7.789	3.708
Asset owned	Number of assets that the household owns.	3206	3.933	15.355	933	2.485	8.273	1256	14.431	29.629	1017	15.313	12.591
Farmland owned	Dichotomous variable: '1' if household owns farmland they cultivate on and '0', otherwise.	2713	0.021	0.143	809	0.021	0.144	1050	0.029	0.167	854	0.012	0.107
Hh_income	The household income measured as the total household consumption in local currency.	3213	136.251	204.214	938	499.559	588.519	1257	291.382	728.511	1,018	269.180	551.393

Note: 'N' refers to the total number of samples for the three waves of the survey. 'n' refers to the sample for each wave of the survey.

3.2. Empirical Strategy

To achieve the main objective of this paper, we used a panel of household data across waves to observe (overtime) the conditioning effect of membership in an informal association on the relationship between shock experiences and food consumption. We interact household membership of an informal association with the variable that captures the level of exposure to shocks. We then control for the time effect, and we also adjust for additional time-invariant spatial differences across the rural communities in the sample. Hence, the equation that underlies our estimation is:

$$\gamma^{*}_{i,d,t} = \alpha + \delta Shocks_{i,d,t} + \varphi(Mutual\ assoc. \times Shocks)_{i,d,t} + \sigma\chi'_{i,d,t} + \tau + \varepsilon_{i,d,t} \quad (1)$$

Where $\gamma^{*}_{i,d,t}$ denotes food consumption variables of the household *'i'* in community *'d'* at time *'t'*. The other variables are as defined in Table 1[2]. The interaction term is such that positive coefficients suggest that informal associations are able to help households consume more food despite shocks. $\chi'_{i,d}$ is the set of covariates as earlier presented in Table 1. The time effect is denoted as 'τ ', while the usual error term is denoted as '$\varepsilon_{i,d}$'. The identifiers $\beta, \delta, \varphi, and\ \sigma$ are the estimates to predict the relationship, while the constant term is represented as 'α'. The errors are clustered at the community level (i.e. 125 of them) to adjust for intragroup correlation between the variables of interest in equation (1).

4. Results and Discussions

4.1. Further Descriptive Evidence

Table 2 shows the main differences between households that are members of an informal association and those that are not. The shock variable was higher for households that are members of an informal association, however, the advantages of membership of an informal association are higher across all indicators of food

[2] Including Gender and age of household head, household dependency ratio, size, asset owned, farmland owned, and income.

consumption. The difference was only significant for dietary diversity. We also find from Table 2 that there are no significant differences across all the covariates for both groups of households, except for household size and income. These two variables are significantly higher for households that are members of an informal association.

Table 2: Mean Differences between Households by Membership Status in an Informal Association

	HH is not a member of an Inform. Assoc.	HH is a member of an Inform. Assoc.	Diff
Food expenditure	3.885	3.904	-0.018
Dietary diversity	3.422	3.748	-0.326***
Shocks	1.641	1.482	0.159**
Gender of Hh_head	0.157	0.159	-0.002
Hh_age	52.401	51.561	0.840
Dependency ratio	0.186	0.191	-0.004
Hh_size	6.837	7.259	-0.423***
Asset owned	10.823	12.143	-1.320*
Farmland owned	0.021	0.020	0.001
Hh_income	323.196	390.176	-66.980***

Note: The household income was presented in its local currency unit. However, the log value of this variable will be used in the estimations. The superscripts '***', '**', and '*' indicates significant level at 1, 5, and 10 per cent.

4.2. Regression Results – Controlling for Household Characteristics

The regression is focused on the relationship between household exposure to shocks and food consumption while considering the conditioning effect of household membership of an informal association. The estimates are presented in Table 3, with the different columns (1-2) focused on different outcome variables. Columns 1a and 2a represents the estimations when the time effect was not included, and the sample error were not clustered within the communities, while columns 1b and 2b has the inclusion of these two effects.

We find from Table 3 that the basic patterns (in terms of signs of the variables) are consistent. The results show that, as earlier predicted, rural household exposure to any of the identified shocks is negatively associated with food

consumption – whether measured as food expenditure or dietary diversity. This result is consistent with findings in Akter and Basher (2014), and Ajefu and Abiona (2018), who find that shock experiences have an adverse effect on household outcomes.

The next important estimate in Table 3 is the interaction term between informal associations and shocks, which was included to understand the extent to which belonging to these associations help households in coping with shocks for improved food consumption. It is evident from columns 1a and 1b that being a member of an informal association significantly help households to improve their food consumption outcomes despite shock occurrences. For the average household that experiences, for instance 0.225 and 0.240 percent negative food expenditure as a result of shock occurrence, members of an informal association experience between 0.169 and 0.100 percent increase in food expenditure compared to non-members. For every increase in shock experiences, those households who are members of an informal association see a 0.056 percent (i.e. -0.225 + 0.169) or 0.14 percent (i.e. -0.240 + 0.100) combined increase in food expenditure compared to those non-member' households.

For the dietary diversity model in columns 2a and 2b we find that household exposure to shocks further reduces the dietary diversity score of rural households. The combined effect (interaction between shocks and membership of an informal association) shows that, compared to households that are non-members of an informal association, there is a significant increase in dietary diversity score for households who are members of an informal association of about 0.107 and 0.108 (i.e. -0.056 + 0.163, and -0.067 + 0.175) for the estimate that (does not) control for community and time effect. The results in Table 3 further establish the cushioning effect of informal associations for vulnerable households in rural Nigeria during exogenous shock experiences that could threaten food consumption. These results still stand when

controlling for the characteristics of the community where the household resides (see Table A1 in the appendix). For instance, from Table A1 the signs of shocks and the interaction terms in relation to food consumption outcomes are consistent when controlling for distances from the household residence to the market and health center as highlighted in some studies such as Bartfeld, Ryu, and Wang (2010), and Sharpe et al (2017).

Table 3: The impact of shocks (and its interaction with membership of an informal association) on household food consumption

	Food expenditure		**Dietary diversity**	
	1a	1b	2a	2b
Shocks	-0.225**	-0.240***	-0.056***	-0.067***
	(0.043)	(0.042)	(0.010)	(0.007)
Inform. Assoc. × Shocks	0.169***	0.100**	0.163***	0.175***
	(0.064)	(0.045)	(0.012)	(0.015)
Gender of Hh_head	-0.164***	-0.188***	-0.314***	-0.405***
	(0.050)	(0.058)	(0.096)	(0.089)
Hh_age	0.001	-0.0002	-0.004*	-0.001
	(0.001)	(0.001)	(0.002)	(0.002)
Dependency ratio	-0.970***	-0.831***	-0.597***	-0.815***
	(0.117)	(0.133)	(0.225)	(0.212)
Hh_size	0.005	0.003	0.060***	0.048***
	(0.005)	(0.006)	(0.011)	(0.010)
Asset owned	0.006***	0.008***	0.005***	0.004**
	(0.001)	(0.001)	(0.001)	(0.002)
Farmland owned	0.214*	0.057	0.319*	0.275*
	(0.110)	(0.142)	(0.163)	(0.165)
Hh_income	0.446***	0.474***	0.153***	0.177***
	(0.014)	(0.013)	(0.020)	(0.024)
Constant	1.626***	1.232***	2.441***	0.158***
	(0.094)	(0.295)	(0.193)	(0.018)
Clustering at Community level	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Observation	3105	3105	3105	3105
R-squared	0.415	0.530	0.089	0.391

Notes: The direct effect of informal association was not included in Table 3 because it significantly interferes with the main estimates (i.e. shocks and the interaction terms). Food expenditure is measured in its logarithm form. Household total expenditure is also included in its logarithm form. Table 2 presents the estimates with the inclusion of the covariates as earlier explained in the third section of the paper. We use wave dummies to control for the difference in the time of survey between each wave (i.e. year fixed effects). The superscripts '***', '**', and '*' indicates significant level at 1, 5, and 10 per cent. Standard errors are in parenthesis.

4.3. Adjusting for Household Fixed Effect, Endogeneity Concerns, and Heterogeneity Trends

Three issues are addressed in the additional estimations. First is the likelihood that the survey response of the household to shock experiences could be subjective since it likely depends on the respondents' perceptions, which may be influenced by

unobserved household experiences. To address this concern, we controlled for the household fixed effect in a different estimation.

Second is the endogeneity issue that arises from the non-random nature of household membership status in an informal association, since this is likely to be explained by some other network effect within the community. For instance, Murendo et al (2017) identified the largeness of the social network in Uganda as a significant determinant of household decisions, while Newman, Tarp, and van den Broeck (2014) linked network effect to finance decisions of rural Vietnamese households. Further, social interactions within the community among members and non-members of these associations can significantly influence membership decision (Fafchamps and Lund, 2003; Cooper and Rege, 2011; Zhang et al., 2012; Banerjee, Chandrasekhar, Duflo, and Jackson, 2013; Bursztyn *et al*, 2014).

To address the endogeneity concern, the number of informal associations in the community of the sampled households, and the number of members of these associations that resides within the community are used as an instrument for the instrumental variable estimation. These instruments are direct measures of the strength of the informal association network in the host community (Zhang *et al*., 2012; Murendo *et al*, 2017). These instruments are relevant as they are significantly correlated with the household membership status in an informal association as shown in the first stage first-stage F-statistics results from the instrumental variable (IV) estimation in Table 4. Moreover, for these instruments to be valid it should affect the outcome variables only through the membership status and should not be correlated unobserved variables that can affect household consumption or the error term. There is empirical evidence that the presence of such networks affects households only when they are members of the network (Fafchamps and Lund, 2003; Zhang, Lin and Li, 2012; Abebaw and Haile, 2013).

Third, an interaction term between the time period and the household membership status in an informal association is included to control for heterogeneous differences over time between member households and non-member households. The results of this additional analysis are also included in Table 4.

The results from the regression that controls for the household fixed effect in columns 1 and 2 of Table 4 is consistent with the earlier findings that household shock experiences have an adverse effect on food consumption outcomes. Although the magnitude of the effect varies, the sign of the shock variable maintained its direction. The interaction term was also positive, suggesting that – compared to households that are non-members of an informal association – member households experienced higher food consumption outcomes despite shocks. The coefficient for food expenditure was not significant in column 1 of Table 4, while that of dietary diversity was significant at the 5 percent level.

The estimates from the two-stage least square (*2SLS*) that adjust for endogeneity issues are also presented in Table 4. As usual, shock incidences are negatively associated with food consumption outcomes. The *2SLS* estimates the local average treatment effect such that it tests the outcome only for the population whose choice of membership of informal associations was affected by the instrument (see Becker, 2016). However, one consistent outlook is the sign of the estimate, which we find not to change despite the use of *2SLS* estimation technique. The interaction term was also included in Table 4 and the sign of these estimates suggest that informal association plays a cushioning effect on households' food consumption outcomes in periods of shock.

Finally, the results in the last section of Table 4 include the interactive term between the time period and the household membership status, to control for the heterogeneous trends between member households and non-member households. The

results presented also shows that shock incidences have a negative relationship with food expenditure and dietary diversity of the households. Further, the signs and significant values of the interaction variable remain consistent with the previous estimations.

Table 4: Household Fixed Effects and Instrumental Variable Regression Estimation

	Adjusting for Household Fixed Effect		2SLS regression		Regression – Including Heterogeneous trend	
	Food expenditure	Dietary diversity	Food expenditure	Dietary diversity	Food expenditure	Dietary diversity
Shocks	-0.202**	-0.008***	-2.527*	-3.534*	-0.103**	-0.037***
	(0.093)	(0.001)	(1.497)	(2.151)	(0.046)	(0.007)
Inform. Assoc. × Shocks	0.063	0.059**	6.466*	9.397*	0.126***	0.017***
	(0.151)	(0.026)	(3.022)	(5.091)	(0.008)	(0.001)
Gender of Hh_head	-0.429*	-0.190	-0.383*	-0.631**	-0.197***	-0.325***
	(0.238)	(0.295)	(0.206)	(0.288)	(0.055)	(0.084)
Hh_age	-0.009*	-0.002*	-0.003	-0.001	-0.0003	-0.003*
	(0.005)	(0.001)	(0.005)	(0.007)	(0.001)	(0.002)
Dependency ratio	- 1.847***	-0.389***	-1.332***	-1.203*	-0.859***	-0.661***
	(0.379)	(0.058)	(0.503)	(0.723)	(0.131)	(0.203)
Hh_size	0.103***	0.092*	0.034	0.001	0.007***	0.056***
	(0.034)	(0.056)	(0.032)	(0.046)	(0.001)	(0.009)
Asset owned	0.010***	0.012***	0.008**	0.038***	0.007***	0.004***
	(0.002)	(0.003)	(0.003)	(0.004)	(0.001)	(0.001)
Farmland owned	0.054	0.242	0.194	0.462	0.214*	0.307
	(0.293)	(0.335)	(0.338)	(0.522)	(0.128)	(0.198)
Hh_income	0.677***	0.169***	0.371***	0.028***	0.444***	0.158***
	(0.031)	(0.063)	(0.061)	(0.009)	(0.011)	(0.017)
Year × Inform. Assoc.	----	----	----	----	0.135***	0.130***
					(0.018)	(0.028)
Constant	1.690***	2.245***	-0.589	-0.643	1.773***	2.426***
	(0.434)	(0.842)	(1.462)	(2.126)	(0.107)	(0.165)
Clustering at Community level	Yes	Yes	Yes	Yes	No	No
Year fixed effects	Yes	Yes	No	No	No	No
Household fixed effect	Yes	Yes	No	No	No	No
First stage F-statistic on instrument	----	----	46.11	46.05	----	----
R-squared	0.859	0.822	0.249	0.252	0.433	0.095
Observation	2655	2658	2927	2476	2655	2658

Notes: The direct effect of informal association was not included in Table 4 because it significantly interferes with the main estimates (i.e. shocks and the interaction terms). Food expenditure is measured in its logarithm form. Household total expenditure is also included in its logarithm form. We use wave dummies to control for the difference in the time of survey between each wave (i.e. year fixed effects). The superscripts '***', '**', and '*' indicates significant levels at 1, 5, and 10 per cent. Standard errors are in parenthesis. The instruments are the number of informal associations in household community and the number of members of informal association that are living in the community of the household.

4.4. Mechanisms

A number of evidence has shown that informal associations helps households that are exposed to shocks smooth their food consumption, the next concern is to understand some mechanisms through which this effect exist. We argue that credit availability through the informal association is an important mechanism through which informal associations in Nigeria help its members cope with shocks. This is through the provision of affordable and easily accessible loans (Abay, Koru, Abate, and Berhane, 2017).

In particular, the probability that households receive credit from these informal associations in the event of an adverse shock experience was considered in Table 5. The result suggests that there is a negative conditional probability of receiving credits from these associations for households that experiences shocks. However, these conditional effects become positive when interacted with membership of the informal association. The result suggests that there is a 2.265 likelihood of receiving credits for households that are members of informal associations compared to non-members in times of shock.

Next, we analyze the effect of an adverse shock on household reliance on credit/borrowing from other individuals that may be likely members of the association. The result in Table 5 also suggests that households that are exposed to adverse shocks can borrow from other individuals who may be members of the association. This effect is not statistically significant.

These findings are consistent with the literature (see Agrawal, McSweeney, and Perrin, 2008; Pain and Kantor, 2012; Abebaw and Haile, 2013; Verhofstadt and Maerstens, 2015; Ma and Abdulai, 2016; Mubaya and Mafongoya, 2017), and suggest that a clear pathway through which informal association help households cope with

shock is access to finance directly from the association and not from other individuals who may be members of the association. Further, since other members of these associations are vulnerable and rural poor, they may not have sufficient financial capacity to help fellow members who experience shock.

Table 5: Mechanism through which Informal Association Improve Household Outcome

Variables	Credit access from the association	Borrowing from other individuals
Shocks	-1.399***	-0.221
	(0.361)	(0.160)
Inform. Assoc. × Shocks	2.265***	0.655
	(0.377)	(0.215)
Gender of Hh_head	-0.086***	-0.112
	(0.019)	(0.243)
Hh_age	-0.008*	-0.010
	(0.005)	(0.007)
Dependency ratio	0.754	2.702***
	(0.492)	(0.494)
Hh_size	-0.167***	-0.097***
	(0.050)	(0.028)
Asset owned	-0.004	-0.015**
	(0.004)	(0.006)
Farmland owned	-0.526	0.142
	(0.478	(0.673)
Hh_income	0.061	0.065
	(0.073)	(0.058)
Constant	-2.435***	-1.215**
	(0.504)	(0.509)
Clustering at Community level	Yes	Yes
Year fixed effects	Yes	Yes
Pseudo R2	0.147	0.115
Observation	1983	1984

Notes: The direct effect of informal association was not included in Table 5 because it significantly interferes with the main estimates (i.e. shocks and the interaction terms). The estimates include the covariates as earlier explained in the third section of the paper. Standard errors are in parenthesis. The first outcome variable is measured using the survey question "Have you used any informal groups (adashi/esusu/ajo) to borrow money in the past 6 months?" The second is measured using the question "Have you borrowed any money from friends, relatives or money lenders in the last 6 months?" The superscripts '***', '**', and '*' indicates significant level at 1, 5, and 10 per cent.

5. Conclusion

Shocks, such as social, economic, and even farm related unexpected events, are those experiences that severely hamper the welfare of vulnerable households, especially those that live in rural areas. Likewise, informal associations are those associations that may have a significant effect in helping vulnerable groups overcome

such events. We test this relationship on an important welfare outcome – food consumption, which is measured as household expenditure (measured in logarithm form) and dietary diversity score. We also test the channel through which such impact exists. Therefore, relying on the Nigerian General Household surveys dataset for 2010/2011, 2012/2013, and 2015/2016 period, we find the following:

First, shocks have a negative impact on the indicators of household food consumption. Second, informal associations have a shock mitigating effect on household food consumption. Third, borrowing from informal association could be an important channel through which this effect exists. However, despite that borrowing from other individuals who may be members of the same association is a possibility, the relationship is not significant. Therefore, while our findings depict that informal associations are important intervention in rural setting to help vulnerable households maintain their food consumption in the presence of shock, we emphasize that such association should be strengthened since the main mechanism through which they improve the outcome of members of their group is the ability to provide credit.

Some important caveats should be carefully considered when interpreting our result, and they include: first, in the light of high fertility, especially in rural Nigeria, consumption smoothing may be difficult in the face of shocks despite households belonging to informal associations. These associations generally give out small credits, and with high fertility, we are not certain about the exact shock cushioning impact of informal associations. Therefore, policy consideration should not neglect the issue of rising fertility, especially in rural Nigeria. Second, although the activities of formal financial institutions in rural Nigeria is very low (about 27.6 percent adult engage in formal banking)[3], we did not consider the shock ameliorating effect on

[3] Enhancing Financial Innovation & Access (2018).

households. Future studies can compare our result with those of formal institutions to understand which membership matters more for households in coping with shock experiences.

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Appendix

Table A1: Shocks on Household Food Consumption (Including Community Covariates)

	Food expenditure		**Dietary diversity**	
	1a	1b	2a	2b
Shocks	-0.266***	-0.258***	-0.010***	-0.088***
	(0.056)	(0.062)	(0.001)	(0.014)
Inform. Assoc. × Shocks	0.255***	0.119***	0.191***	0.167***
	(0.100)	(0.011)	(0.019)	(0.025)
Gender of Hh_head	-0.013	-0.013	-0.550***	-0.509***
	(0.088)	(0.097)	(0.159)	(0.175)
Hh_age	-0.003*	-0.003	-0.007**	-0.008**
	(0.002)	(0.002)	(0.004)	(0.003)
Dependency ratio	-0.591***	-0.591***	-0.571*	-0.649*
	(0.185)	(0.183)	(0.335)	(0.367)
Hh_size	0.007	0.006	0.059***	0.052**
	(0.009)	(0.010)	(0.018)	(0.021)
Asset owned	0.007***	0.007***	0.004*	0.002
	(0.001)	(0.002)	(0.002)	(0.002)
Farmland owned	0.027	0.026	0.374	0.381**
	(0.157)	(0.169)	(0.284)	(0.189)
Hh_income	0.588***	0.587***	0.172***	0.240***
	(0.018)	(0.030)	(0.031)	(0.045)
Distance to Market	-0.002*	-0.002*	-0.009***	-0.009*
	(0.001)	(0.001)	(0.002)	(0.004)
Distance to Health Centers	-0.004***	-0.004**	-0.007***	-0.007**
	(0.001)	(0.002)	(0.002)	(0.002)
Constant	1.327***	1.846***	2.746***	2.261***
	(0.153)	(0.516)	(0.265)	(0.321)
Clustering at Community level	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Observation	1076	1076	1081	1081
R-squared	0.603	0.746	0.132	0.481

Notes: Same as Table 3.