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Households' Responses to Adverse Income Shocks: An Empirical Investigation of Rice Farmers in North-Central Nigeria

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Abstract

This study examines household responses to adverse shocks among rice farmers in North-Central Nigeria. Specifically, it describes the characteristics of households in the study areas, shocks experienced by households, identify formal and informal credit sources/insurance markets available to the respondents, ascertain responses adopted by households to cope with shocks and identify risk coping institutions available in the study areas as well as the roles of these institutions in cushioning the effects of the shocks. The results of the study established that the shocks experienced in the study area are mainly idiosyncratic, that is most of the shocks affect individual households. The study found that burial societies and rotating savings groups are two main community level risk management groups that have greatly assisted households to manage the household specific shocks such as illnesses and deaths of family members. However, it was found that consumption smoothing strategies adopted by farmers vary in accordance to the type of shocks and the magnitude of their impact on household income as well as consumption. If a shock

has only a little impact on income, farmers choose to sell only their livestock to protect consumption. During other shocks with greater impact, farmers not only sell their livestock but also need remittance as an additional strategy. Farmers who experienced income shock due to sickness and death faced difficult and costly choices to protect their consumption as they are forced to sell their land. Nevertheless, economy wide shocks as well shocks that affect the whole region cannot be handled by these arrangements and this calls for widening access to loan markets to enable farmers easily protect their consumption. It is recommended that improved asset markets could help households to access formal ways of mitigating the effects of shocks.

Keywords: Rice farmers, Households, Coping strategies, idiosyncratic shocks, North-Central Nigeria

Introduction

A fundamental problem facing rural households in many developing countries is how to maintain satisfactory levels of consumption in the face of adverse income shocks (Morduch, 1995). These shocks can affect a household's welfare by negatively impacting on household income, existing household wealth and the health of household members. Shocks can be categorized as either idiosyncratic (for example, injury, illness, death, divorce, etc.) that affect an individual household or income earner only, or spatially covariant (for example, a floods, droughts, storms, pest infestation, crop disease and avian flu which affects all households in a particular location). Idiosyncratic shocks can be insured in the formal financial markets while spatially covariant shocks are non-insurable, thereby creating a theoretical motive for precautionary saving. Thus, during income crises, poverty and inequality surge, and educational, health and nutritional indicators deteriorate, especially among the poor. Additionally, the deterioration is often permanent in that it is not easily reverted when income rise again (Cunningham & Maloney, 2000). In developing countries, exposure to risk remains a significant cause of poverty for poor farmers (Fafchamps, 2009). The precise nature of the realized risk or shock incurred has implications for a household's ability to cope and its consequences (Dercon & Krishnan, 2000). Shock can be unanticipated by the recipient household and once suffered, the household engages in risk-coping strategies (whether anticipated or not). Shocks can also be categorized by their frequency and the magnitude of their impact. Dercon and Krishnan (2000) found that small frequent shocks can be easier to cope with than large infrequent shocks, while Alderman (1998) finds that successive shocks makes consumption smoothing more difficult to achieve. In addition, different types of shocks can have more long term effects on welfare, such as ill health. Crises are accompanied by adjustments by households. Some of the adjustments during crises include reduction of households' consumption or selling of productive assets and/ or luxury goods, moving abroad and cutting back on human capital investments. For instance, Rosenzweig and Wolpin (1993) found that in rural India, bullocks are sold to smooth consumption in the face of income shocks. Consumption is therefore smoothed at the cost of production efficiency. While some of these adjustments are of little consequence, others may have sizable long-term effects upon the socioeconomic outcomes of those involved. Thus, those who dropped out of school due to an income shock substantially reduce their socioeconomic prospects. Equally, those who leave their countries often have to cope with the sudden depreciation of a large part of their human capital.

There have been several recent studies looking at household responses to income shocks during economic downturns. Cunningham and Maloney (2000) and Neri and Thomas (2000) use longitudinal data to study the changing fortunes of a group of Mexican families before, during and

after the crisis of 1994-95, concluding that poorer families were better able to cope with the crisis, owing mainly to their greater ability to increase their labor supply in the face of an income shock. Gaviria (2001) uses a data set that relies on a series of retrospective questions about socioeconomic outcomes before and during the crisis of 1999 to study household responses to adverse income shocks in seven Latin American countries and found that households respond to adverse income shocks mainly by selling assets and disinvesting in human capital. The shocks experienced by the households are mainly idiosyncratic. This study examines household responses to adverse shocks among rice farmers in North-Central Nigeria. Specifically, it describes the characteristics of households in the study areas, shocks experienced by households, identify formal and informal credit sources/insurance markets available to the respondents, ascertain responses adopted by households to cope with shocks and identify risk coping institutions available in the study areas as well as the roles of these institutions in cushioning the effects of the shocks.

Methodology

The study covered three States of the North-central Zone of Nigeria namely: Benue, Plateau, and Nasarawa States. The geographical coordinates of North-Central Nigeria are longitudes 3^0E and 14^0 E and latitude 4^0 30N and 11^0 20N with a landmass of about 296,898km^2 (FAO, 2004). The population of the study consists of rice- farms households in North-Central Nigeria. The random and purposive sampling techniques were employed by the study. The purposive sampling procedure was adopted to select 9 Local Government Areas (LGAs) and three (3) from each State. Two (2) communities were randomly selected from each LGA making a total of 18 communities. From available records obtained at the States, there are 11,120 rice-farm households across the 18 sampled communities of the States. The study used simple random sampling to select 556 rice-farm households in the study area, i.e., 5% of the sample frame. The data set uses a series of retrospective questions about socioeconomic outcomes before and during the crisis that has been experienced over the last 10 years. This is in order to circumvent the lack of longitudinal data that has hindered most previous attempts to investigate the effects of an economic downturn on the fortunes of households. The data, however, has only qualitative information. It reveals, for example, whether a given household experienced a substantial reduction of its income in the face of the crisis, but it does not indicate the magnitude of these events. The questionnaire sought information on: the specific nature of the shocks experienced by the households, the reactions of the households to the purported income shocks (e.g., whether a member entered the labor market or physical assets were sold), and the socioeconomic characteristics of households.

Econometric model based on Rosenzweig (1988) and Berloffa and Modena (2009) was used to quantitatively estimate farmers' consumption smoothing strategies to recover from income shocks (Equation 1). Firstly, the households' consumption gap which is derived from the difference of consumption expenditure between those reported shocks and those in the absence of shock was calculated. Secondly, the econometric model (Equation 2) calculates the farmers' strategies in order to smooth their consumption.

Model specification

Household consumption gap is given as:

$$\Delta\hat{E}h = \frac{Eh}{i} - \hat{E}r \quad \text{..... (1)}$$

Where:

$\Delta\hat{E}h$ = is per-capita consumption expenditure gap of household-h

E_h = is consumption expenditure of household-h with family members-i who reported shock in North-Central Nigeria, h=1……556; i is the number of family, i=1…i,

$\hat{E}r$ = is the average consumption expenditure of poor rural households in absence of shocks with family members-i in region r, r=North-Central Nigeria and the surrounding regency in the Central region.

It is assumed that the positive gap means that the households are not affected by the shocks and hence those who have a positive consumption gap are categorized as non-poor based on ownership of assets and endowment indicators and consumption expenditure. Data for 2016 National Socio-Economic Survey was used to proxy the rural consumption expenditure in the absence of shocks. The farmers' strategies in order to smooth their consumption is given as:

$$\text{Log}|\Delta\hat{E}h| = \beta_0 + \beta_1 \log(\text{Land})_h + \beta_2\text{OTHJOB} + \beta_3\text{LOAN} + \beta_4\text{REMIT} + \beta_5\text{LNDSALE} + \beta_6\text{LIVSALES} + \beta_7\text{RECPRICE} + \beta_8\text{TRANSFER} + \beta_9\text{RECHLTINS} + \varepsilon hi \quad \ldots\ldots\ldots\ldots (2)$$

Where:

$|\Delta\hat{E}h|$ = Absolute per capita consumption expenditure gap,

LAND = land ownership of household (in hectares),

OTHJOB = dummy variable of side jobs, (1: having side jobs, 0: otherwise),

LOAN = dummy variable of access to loan, (1: access to loan, 0: otherwise),

REMIT = dummy variable of receiving remittance, (1: receiving assistance, 0: otherwise),

LIVSALES = dummy variable of selling livestock, (1: sold livestock, 0: otherwise),

SALLAND = dummy variable of selling land, (1: sold land, 0: otherwise),

RECHRICE = dummy variable of selling cheap rice, (1: sold rice, 0: otherwise),

TRANSFER = dummy variable of receiving cash transfer, (1: received transfer, 0: otherwise)

REC HLT INS = dummy variable of receiving poor health insurance, (1: receiving poor health insurance, 0: otherwise)

ε: error term,

h: household-h, h=1,……..556.

The coefficients in the models were estimated using Ordinary Least Square (OLS) by dividing samples with four sub samples based on reported shocks such as crop loss (Model 1), price falls (Model 2), sickness and death (Model 3) and custom (Model 4). Separating samples helps to show how farmers respond to each shock.

Results and Discussion

Characteristics of households in the study areas

Table 1 presents the descriptive statistics for 556 of the sample households in the three States of North-Central Nigeria which all family structure and income information is available in the two periods, 2011 and 2019. The results indicated mean gross transfer income (defined net of dowry payments in or out or any gifts associated with marital events, whether contemporaneous to the marriage or not) in 2011 was about 12% of real full income with mean transfer income of ₦38880. Excluding transfers from relatives abroad the mean gross transfer income was ₦1634. When transfers that households make to others is considered, the mean net transfer income is almost nil. There was thus an overall balance of gross inflows and outflows over the period, to be expected in a stationary environment if transfers have a strong insurance component. In 2019 the mean gross transfer income was about 25% of real full income with mean transfer income almost ₦58700. When transfers from relatives abroad is excluded, the mean gross transfer income becomes ₦4402. When transfers that households in the respective villages make to others is considered, the mean net transfer income is about ₦12000. There was thus on overall, gross inflows over the period.

Table 1: Characteristics of Households in the Study Areas (n =556)

		States			
Characteristics	**Years**	**Benue**	**Nasarawa**	**Plateau**	**Total sample**
Number of households		206	217	133	556
Mean age of head		45.9	46.9	46.3	46.4
Mean number of co-resident females	2011	4.2	5.1	4.4	4.6
	2019	2.3	2.2	4.1	2.9
Mean number of co-resident daughters	2011	4.4	3.0	4.2	3.9
	2019	2.3	1.2	2.0	1.8
Mean number of co-resident males	2011	4.1	4.3	4.0	4.1
	2019	2.0	1.2	1.4	1.5
Mean number of household migrants	2011	2.2	3.1	2.1	2.5
	2019	4.2	3.3	4.1	3.9
Mean full income	2011	120000	108000	106000	324000
	2019	52066.7	46844.4	87288.9	186200

(₦)					
Mean real gross	2011	12860.6	11551.2	14468.2	38880
transfer income (₦)	2019	16332.7	15251.5	27115.8	58700

Source: Author's Computation, 2020.

Shocks experienced by households in the study areas

Shocks can be idiosyncratic or common. But other characteristics matter as well in causing hardship or exacerbating the effect of shocks to income. The nature of the shock has implications for the ability to cope. Households face substantial idiosyncratic and common risk. High income risk is prevalent in the study areas. Among these risks are; economic fluctuations, climatic risks and a large number of idiosyncratic risks such as illnesses and death of household members and common risks such as the outbreak of Lassa fever, Ebola and Severe Acute Respiratory Syndrome (SARS). Table 2 below gives details on the various shocks causing serious hardship in the study area in the last 10 years. Many households suffer from common or idiosyncratic shocks related to economic policy, or labor. The results revealed that economic decline was the most common cause of shocks followed by climatic events such as drought which resulted in a significant drop of crop output. Many households suffer from other common or idiosyncratic shocks related to labor and livestock. In particular, there was an outbreak of bird flu which resulted in the death of livestock.

Table 2: Shocks Faced by Households in the Study Areas (n = 556)

Events causing hardship	**Percentage of households reporting hardship episode in last 10 years**
Economic shock	100
Livestock problems (Bird flu and other diseases)	77
Harvest failure (drought etc.)	94
Labor problems (illness or death)	45

Source: Author's Computation, 2020

Table 3 gives further details on different events and shocks experienced by households in the study area. The State level variance as a percentage of total variance was calculated to establish the extent to which a shock is idiosyncratic. The lower the contribution of the State level variance to the total variance the more idiosyncratic the shock. The State level variance shown in Table 3 is the R^2 of a regression on a set of time varying State level dummies. The results showed that the idiosyncratic part of shocks is relatively large.

Table 3: Further Analysis of the Shocks faced by Respondents in the Study Areas

Shocks	Percentage of households affected in the last 10 years	State level variance as percentage of total variance
Livestock affected by diseases (e.g. flu)	62	71
Livestock affected by lack of water and grazing land	51	20.6
Rain shock	90	100
Pests and diseases on crops	98	62
Lower harvest linked to insufficient labor supply due to illness	12	14.2
Lower harvest linked to insufficient labor supply due to labor migration	55	21.8
Lower harvest due having lost livestock	5	12.2

Source: Author's Computation, 2020

Formal and informal credits and insurance markets

Several income-based strategies are only invoked when a crisis looms (Besley, 1995). These income 'coping' or 'survival' strategies are especially important when the shock is economy wide. Formal or informal insurance transfers from outside the community are necessary in protecting consumption from income shocks (Eswaran & Kotwal, 1989). This involves remittances from relatives abroad. Inter-temporal transfers (e.g. depletion of individual or community level savings) are also found. Most credit was provided by either local money lenders or through informal arrangements with employers, shopkeepers etc. The supply of credit appears to depend predominantly on local sources and thus on the transitory fortunes of the local economy. Table 4 indicated that formal credit and insurance markets do not contribute to reducing the risks faced in the community and their consequences. Informal credit and insurance, however help to cope with risky incomes. The lack of support from formal credit and insurance markets reflects the underdevelopment of the financial system. When a large negative (such as drought and large economic shocks) occurs, the usual informal credit may not yield sufficient income.

Table 4: Formal and Informal Credits and Insurance Markets

Years	Percentage of households using formal credit and insurance markets	Percentage of households using informal credit and insurance markets
2011	**0**	25
2019	0	38

Source: Author's Computation, 2020

Sources of outside assistance to households

Table 5 shows the extent to which households received outside assistance from government, non-governmental organizations and private individuals (e.g. local businessmen). The results showed that, on average 89.4% and 34.0% of households received assistance from the government and NGOs respectively. The average of households that received assistance from individual is very small (16.3%). This is because as almost all households in a community or region are affected by a shock, households' abilities to assist others are greatly limited. In such cases intervention from outside is important. The government assisted the households through the input support program where they provided them with free agricultural inputs. The agricultural inputs provided were hoes, ploughs and tractors. The government also supplied households with rice seed that are significantly below market prices.

Non-Governmental Organizations (NGOs) assisted household by giving them food aid. Private individuals like local businessmen assisted by providing food aid and providing local school children with scholarships. The scholarships were awarded to the best students.

Table 5: Sources of Outside Assistance to Households in the Study Areas (n=556)

Sources of Assistance	States			
	Benue	**Nasarawa**	**Plateau**	**Total sample**
Government	93	89.2	86	89.4
NGOs	73	25	04	34.0
Private individuals	14	29	06	16.3

Source: Author's Computation, 2020

Risk coping institutions available to respondents in the study areas

Households in the study area faced a number of risks with several risk coping institutions available in the study areas. These include formal and informal groups.

A. *Informal groups*

i. Burial societies

Table 6 shows that in the sample at least 80% of households were members of at least one burial society in 2011. The proportion of households belonging to at least one household has increased to 96%. Membership is virtually comprehensive. Burial societies were found across the sampled areas. The widespread membership across the population suggests that these groups are quite inclusive. Thus people can choose to have more insurance coverage by joining more groups, or by joining groups offering higher insurance linked to higher contributions.

In 2011 about 80% of the groups were charging a regular contribution, usually monthly, from the members. 22% only expected the members to provide a cash contribution to the member experiencing a death when the funeral actually takes place. In 2019, about 54% of the groups charge a regular contribution, usually monthly, from the members. The payout is approximately ₦30000 (US$83) on average per group. This figure does not include the in kind benefits. Some of these groups ask for additional contributions at the time of the funeral to cater for unforeseen expenses. 38% only expect the members to provide a cash contribution to the member experiencing a death when the funeral actually takes place. The study found that groups do not

have particular restrictions on gender or age. Most of them consist of married people. There is a membership fee to be paid when joining. Payments are made when members incur costs related to funerals, related to the death of a well-defined set of relatives. The actual payout is conditional on the relationship of the member to the deceased. Payouts to close relatives are different from payouts to distant relatives: for example, the payment for the spouse or child of a member is typically different from the payout for a child or for uncles and aunts. Payouts occur in cash and in the form of labor services as well as in kind (food). There are written rules and records of contributions and payouts. The rules define membership procedures, payout schedules, contributions and also a set of fines and other measures for nonpayment of contributions, or for matters such as not showing up at funerals or not contributing enough in terms of labor on these occasions. People can and usually are members of more than one association for funeral insurance. Hence, burial society groups provide funeral insurance to members.

Additional insurance coverage offered by burial societies include hospitalization insurance. This involves a fixed payout usually in terms of cash and sometimes some labor whenever the member or close family is admitted to hospital and a relative has to stay with the person. The average payout is about ₦5000 (US$14) per instance, well below payouts in case of funeral but still significant. About 37% of groups offer loans to members, provided the funds are available with clear and strictly enforced rules governing repayment. Members have to present a case for obtaining a loan and the most commonly accepted reasons are additional funeral spending and illness (short term credit is offered to provide additional cover, mainly for shocks).

Funeral costs are very substantial and are a significant proportion of a household's monthly income. Monthly consumption as measured by the family basket costs ₦42000 (US$117) on average. Thus, payouts of ₦20000 (US$56) are approximately 48% of monthly household consumption. On the other hand, monthly payments to the burial society are about 1.2% of total monthly consumption. Given that the average household is a member of more than one burial society it means that burial societies are crucial to allow households to cover these expenses required for socially acceptable funerals, and hence, the burial societies perform a crucial role in the study areas.

Table 6: Households' Membership of Burial Societies

Variables	2011	2019
Percentage of households not belonging to any burial society	20	4
Percentage of households belonging to one burial society	66	51
Percentage of households belonging to more than one burial society	18	56
Highest number of burial societies of which one family is a member	1	6
Number of burial societies	82	124
Percentage of burial societies charging a regular contribution (e.g. monthly)	80	54
Percentage of burial societies charging a cash contribution when funeral occurs	20	38
Average monthly contribution (₦'00)	2	5
Average payout (₦'000)	15	20
Percentage of burial societies offering burial insurance only	92	40

Percentage of burial societies offering other products in addition to burial insurance	26	84
Percentage of burial societies that offered hospitalization insurance	15	45
Average payout per hospitalization (₦'000)	5	10
Percentage of burial societies that offered loans to members	10	37
Percentage of burial societies that offered harvest assistance to members	12	18
Percentage of burial societies that offered wedding assistance to members	55	84

Source: Author's Computation, 2020.

ii. Rotating savings

The results of the study showed that participation by households in rotating savings is widespread. Table 7 showed the proportion of households who are members of rotating savings in the different States and the amounts of money that are put into the pot. The amounts tend to reflect demands for fairly small needs, such as the purchase of a household appliance.

A group of individuals gets together periodically and allocates a pot of funds to one group member. The allocation of funds is rotated from one group member to another. The process continues until each member has been allocated the pot of funds once. This type of institution serves to enhance household capital accumulation of indivisible items, since the pot of funds can be given to one member who can invest before he would have if he were left to accumulate on his own (Alderman, 1998). Rotating savings may also serve a risk sharing function if individuals receive unexpected shocks to their health or incomes during the rotation cycle.

Table 7: Households' Membership of Rotating Savings Groups in the Study Areas (n=556)

Variables	**2011**	**2019**
Percentage of households not belonging to any rotating savings group	26	18
Percentage of households belonging to one rotating savings group	60	65
Percentage of households belonging to more than one rotating savings group	14	11
Highest number of rotating savings group of which one family is a member	4	7
Average contribution per round (₦'000)	15	20
Average value of items bought with the payouts (₦'000)	150	220
Numbers of families that received assistance for shocks	30	42
Number of households affected by shocks over the last 10 years	302	51
Number of households that received assistance from the rotating savings groups from this shocks	104	33
Type of assistance received	Money	Money

Source; Author's Computation, 2020.

B. *Formal groups*

i. Food for work programs and food aid

Households provide labor services in exchange of food in government programs. These programs involve building dams and roads. Non-governmental organizations (NGOs) and the government provide food aid to households who need it during shock crises. On the average, 60% households

had members participating in food for work in government program while 75.7% received food aid from non-governmental organization. The percentage households who had members participating in a food for work program and who received food aid in the last 10 years are shown in Table 8.

Table 8: Percentage Household's Benefit from Government Program and NGO and Government Food Aid

	States			
Sources of food aid	**Benue**	**Nasarawa**	**Plateau**	**Total sample**
Government program (Food for work)	53	65	62	60.0
Non-governmental and government food aid	83	78	66	75.7

Source: Author's Computation, 2020

Average per-capita consumption gap and farmers' response to different income shocks

Table 9 shows a descriptive analysis of data used in the econometric model. The results showed that the average per-capita consumption gap varies depending on the shocks. The average per-capita consumption gap of farmers who experienced crop loss was ₦142, 823.41 while that of farmers who experienced sickness-death was ₦116, 384.90. Table 1 also showed that rice farmers in North-Central Nigeria are dominated by small and subsistence farmers with average landholdings of 2.5 hectares. This implies that the productivity of such land might not be enough to cover the daily cost of farmers and hence, most farmers engaged side jobs to augment their income to avoid solely dependent on agricultural activities.

Consumption smoothing strategies chosen by farmers are quite different depending on shocks. Selling of livestock was the most favorite strategy to cope with income shocks and this agrees with the findings of Rosenzweig and Wolpin (1993) found that in rural India, bullocks, while also used as source of mechanical power in agricultural production, were sold to smooth consumption in the face of illness shocks. The second strategy was asking family members to send remittance. This findings is in consonance with Jiang and Braun (2005) who reported that household strategies in coping with ill-health shocks include: selling livestock, selling other assets, borrowing from friends and relatives, borrowing and receiving in-kind help from friends and relatives. The third strategy was access to loan from financial institutions which was chosen by 66.7% of farmers in order to cope price falls. However, most farmers combined many strategies responding to shocks because a single strategy might not be enough to cover the consumption gap. More so, farmers faced demographic shocks related to birth, family marriage and religious events were forced to sell land. Table 5 further showed that households receiving cheap rice as government social safety net was 82.4% (crop loss), 75.3% (price falls), and 90.4% (sickness-death). The percentage of those receiving cash transfer was lower than that of those receiving cheap rice since the stick conditions must be satisfied to receive cash transfer. The result showed that more than half of the household experienced sickness-death shocks received poor health insurance. This insurance is distributed to the poor in order to improve their access to health facilities.

Table 9: Average Per Capita Consumption Gap and Framers' Responses to Different Income Shocks

Variables	Crop Loss	Price Falls	Sickness-Death	Customs
Dependent Variable				
Average Per Capita Consumption Gap (₦)	142823.4	126482.3	116384.9	120894..2
Independent Variables				
Control Variables				
Average Land Owing (hectares)	2.32	2.53	2.51	2.30
Having Side Jobs	81.0%	90.7%	94.8%	96.9%
Smoothing Strategies				
Access to Loan	9.4%	18.7%	5.2%	12,4%
Remittance	10.2%	11.9%	11.7%	13.2%
Livestock Sales	77.8%	70.4%	90.5%	85.5%
Land Sales	0%	0%	5.3%	3.0%
Government Policies				
Cheap Rice	89.4%	74.1%	90.6%	-
Cash Transfer	67.3%	55.4%	58.8%	-
Poor Health Insurance	-	-	-	51.4%

Source: Author's Computation, 2020.

Responses adopted by households to cope with income shock in the study areas

The results of regression analysis (Table 10) showed that the F-statistics for all the models were statistically significant. The R^2 of four models are 0.50 (Model 1), 0.52 (Model 2), 0.71 (Model 3) and 0.55 (Model 4). Model 1 measures farmers' consumption smoothing strategies to cope with crop loss. The results showed that farmers who experienced this shock relied on remittance and livestock sales as a buffer for consumption smoothing. About 10.2% of households experienced this shock reported receiving remittance from family members were able to narrow their consumption gap by 0.483 while those selling livestock narrowed their consumption gap by 0.329. This study agrees with the findings of Kazianga and Udry (2006) and Mcpeak (2004) who found the sale of assets for smoothing consumption in Burkina Faso.

Model 2 evaluates farmers' consumption smoothing strategies in coping with price falls. The estimates of OLS revealed that selling livestock played a central role to cope with price falls by narrowing consumption gap to up to 0.862. Approximately 71% of households reported selling

livestock to deal with this shock. Selling livestock might be enough to cover the gap because price falls affects consumption smaller than crop loss. The degree of impact is different since farmers suffering from price falls are still able to harvest crops meanwhile those suffering from crop loss are not. This implies that households may not need to utilize neither remittance nor loan as an alternative to smooth consumption in the face of price falls. In similar with model 1, land ownership significantly reduced the consumption gap. On the other hand, neither model 1 nor model 2 showed access o loan as an alternative to cope with shock. The difference between model 1 and model 2 was the ineffectiveness of side jobs and remittance in narrowing the consumption gap shown in the second model.

Model 3 analyzed farmers' consumption strategies to deal with demographic shocks related to sickness and death. The death of a productive family member reduces income as well as consumption due to loss of labor input in agricultural activities. Sickness is closely related to an unexpected expenditure withdrawing a larger share of household income due to absence of health insurance system in Nigeria. Model 3 showed that farmers respond to sickness and death quite differently. The coefficients of model 3 indicated that access to loan is the first alternative chosen to smoothen sickness shocks while remittance and selling land are the next alternatives. Under these conditions, the consumption gap narrows by 3.55, 0.88 and 0.41, respectively. This confirms that selling land is a costly option selected only when other alternatives are not feasible. This is in consonance with the findings of Kochar (1995) who reported that farm households, due to the lack of other alternatives are forced to protect consumption from idiosyncratic income shocks through relatively costly methods. Neither land ownership nor side jobs are significant in narrowing consumption in sickness-death shock. This is contrary to *a priori* expectation. The possible explanation may be that those reported for these shocks were only 84 samples, thus standard error would be high due to large variance. Government policies seem to be effective, which is shown by negative coefficients of both cheap rice and poor health insurance in assisting rice farmers to cope with the demographic shocks associated with sickness and death. Although the negative coefficient of poor health insurance is not statistically significant in narrowing the consumption gap.

Model 4 investigates the farmers' strategies in coping with expenditure related to customs such as birth, marriage, culture and religion. The coefficients of model 4 indicated the condition where selling land is the first chosen, while access to loan and selling livestock are the next alternatives. Under these alternatives, the consumption gap narrowed by 2. 65, 0.58 and 0.34, respectively. This confirms that custom shocks need a large source to finance the gap. Thus, sales of land becomes the first alternative. The implication is that farmers experiencing selling land might have a serious future consequence since all models showed that farmers holding large land size are relatively resilient to any type of income shocks. Remittance is statistically insignificant to narrow the consumption gap in this model.

Table 10: Ordinary Least Square Estimates Showing Farmers' Responses to Shocks

	Log Consumption Gap			
Variables	**Crop Loss (1)**	**Price Falls (2)**	**Sickness-Death (3)**	**Customs (4)**
Constant	12.000***	12.662***	16.332***	13.667***
	(16.277)	(13.642)	(6.108)	(15.877)
Land ownership	-0.267**	-0.338***	-0.337	-0.335***
(LAND)	(-2.443)	(-3.120)	(-1.667)	(-4.088)
Side job(OTHJOB)	-3.66**	-0.059	-0.685	0.118
	(-2.251)	(-0.441)	(-1.208)	(0.391)
Access to loan	-0.771	-0.482	-3.552***	-0.581**
(LOAN)	(-1.008)	(-6.618)	(-17.667)	(-2.661)
Remittance	-0.483**	-0.267	-0.883***	-0.138
(REMIT)	(-2.355)	(-1.266)	(-3.004)	(-0.679)
Livestock Sales	-0.329*	-0.862***	0.448	-0.348*
(LIVESALES)	(-1.842)	(-3.288)	(1.455)	(-1.559)
Land Sales	-	-	-0.412***	-2.655**
(LNDSALES)	-	-	(-4.056)	(-2.158)
Cheap Rice	-0.088	0.665*	-0.816***	-
(RECCHEAP	(-0.304)	(1.543)	(-2.616)	-
RICE)				
Cash Transfer	0.310*	0.149	0.441	-
(CASHTRANSF)	(1.801)	(0.744)	(1.512)	-
Poor Health	-	-	-0.154	-
Insurance	-	-	(-0.552)	-
(POORHLT INS)				
R^2	0.571	0.582	0.792	0.621
F-statistics	8.979	11.962	8.649	11.374
Observations	291	359	84	259

Source: Author's Computation, 2020. Figures in parentheses are t-statistics, *** (P < 0.01), ** (P = 0.05) *(P < 0.1).

Conclusion

This paper studies household responses to adverse income shocks in North-Central Nigeria with particular reference to rice farmers. It shows that the shocks are mainly idiosyncratic and thus, there is scope for the shocks to be managed within the community. There are a number of community level risk management groups that have greatly assisted households to manage the household specific shocks such as illnesses and deaths of family members. These include burial societies and rotating savings groups. Farmers respond differently to income shocks depending on their ownership of assets, access to loan, family assistance such as remittance and the type of shocks.

Consumption smoothing strategies adopted by farmers vary in accordance to the type of shocks and the magnitude of their impact on household income as well as consumption. If a shock has only a little impact on income, farmers choose to sell only their livestock to protect consumption. During other shocks with greater impact, farmers not only sell their livestock but also need remittance as an additional strategy. Farmers who experienced income shock due to sickness and death faced difficult and costly choices to protect their consumption as they are forced to sell their land. Widening access to loan markets enables farmers to easily protect their consumption. In all the models, statistical evidence does not exist to support that government policies such has cheap rice, cash transfer and poor health insurance are effective as an instrument of consumption smoothing policy. The study revealed that rice farmer households holding large land size are relatively resilient to any type of income shocks. The study concludes that adverse income shocks can have deteriorating effects on human capital accumulation, especially among poorer households.

Recommendations

The following recommendations are pertinent to the study:

1. Improved asset markets could help households to access formal ways of mitigating the effects of risks.
2. Macroeconomic stability would contribute to the ability of the informal insurance arrangements to help manage the risks experienced.

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