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Vulnerability Profile of Rural Households in South West Nigeria

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Abstract

This paper examined vulnerability to poverty of households among rural households in South West Nigeria using primary data from a two-wave panel survey (lean versus harvesting periods). Results showed that on the average there is a 0.56 probability of entering poverty a period ahead in the region and relatively high poverty rates were associated with much higher vulnerability while low poverty rates were associated with considerably low vulnerability. Vulnerable households are mostly large sized with high number of dependants and characterized by under aged or old, female headed, widowed household heads. They are mostly engaged in farming as their primary occupation, have no or low educational attainment and are landless. The findings underscore the centrality of social protection policy mechanisms as potent poverty reduction tools and necessary policy interventions to reduce consumption variability through reducing exposure to risk or improving the *ex post* coping mechanisms of the vulnerable.

Keywords: Vulnerability profile, Rural, South West, Nigeria

1. Introduction

Poverty is prevalent in large parts of the world and is one of the largest challenges of mankind in the 21st century. In Nigeria, poverty is largely a rural phenomenon with agriculture accounting for the highest incidence over the years and 54.4% of the population below poverty line in 2004 out of which 36.6 % of the total population are living in extreme poverty (NBS, 2005). In other words, about 76.6 million Nigerians are languishing in poverty out of an estimated population of about 140 million. Findings of a Core Welfare Indicator Questionnaire (CWIQ) survey conducted by the National Bureau of Statistics in 2006 also reveal that 67 per cent or two-thirds of Nigeria's rural population were poor compared to 57.9 per cent in urban areas. With only five years away from the target date for achieving the MDG goal on the reduction of poverty and hunger, the rural poverty situation remains a daunting challenge.

Various governments of Nigeria have however, tried several programmes, approaches and strategies aimed at improving the conditions of the poor and while some of the efforts are still on course, many have since gone moribund. Despite these various programmes and strategies, the incidence of poverty continues to rise. There are suggestions that the major issue is not that households are poor but the probability that a household if currently poor, will remain in poverty or if currently non-poor will fall below the poverty line (that is, household vulnerability to poverty). That vulnerability to poverty is one of the factors that explain the ever-increasing level of poverty. Given the increasing population growth, rapid urbanization, environmental degradation, frequency and

magnitude of natural disasters and the recent food, fuel and financial crises the concept of vulnerability can no longer be ignored.

Although the poor are commonly asserted as being among the most vulnerable in any society (World Bank, 2001), the overlap between poverty and vulnerability is not perfect. Clarifying the distinction between poverty and vulnerability is, therefore, important since social protection strategy is moving from ex-post poverty strategies to ex-ante vulnerability considerations (Holzman, 2001). The need for designing and targeting of forward-looking interventions further underscores the need for vulnerability assessments in Nigeria (Alayande and Alayande, 2004). While a number of studies have analyzed the status of poverty in Nigeria (FOS, 1999; Okojie *et al.,* 2000; Aigbokhan, 2000) very few have analyzed its dynamics: Alayande and Alayande (2004); Oni and Yusuf (2006); Oyekale and Oyekale (2007) using cross sectional data which involves the exclusive reliance on the strong assumption of the ability of cross-sectional variability to capture temporal variability. This is largely due to the lack of nationally representative panel data that track the poverty status of households over time. The attendant cost of collecting such data at the national level also provides basis for collecting data at the regional level. This justifies the choice of South Western Nigeria.

Apart from contributing to scarce literature on vulnerability to poverty in Nigeria, this study will also allow for a characterization of the importance of variations in household consumption at seasonal frequencies. Moreover, policies purely based on current poverty profile may not be effective for those vulnerable individuals and households therefore, by obtaining a vulnerability profile, both existing and future poverty can be targeted (Zhang and Wan, 2008). Since vulnerability analysis is also key to understanding the dynamics leading to and perpetuating poverty, an assessment of the dynamics of poverty in Nigeria will provide a deeper understanding of the linkages between vulnerability and poverty. This would also provide an empirical basis for social policy, thereby strengthening both the analytical and operational content of the Nigerian poverty reduction programmes. This paper therefore seeks to gain a thorough understanding of the poor and vulnerable, their characteristics and constraints which is crucial to formulating an effective strategy for reducing poverty and for designing social protection programmes in Nigeria.

2. Materials and Methods

2.1 Study Area

South West of Nigeria falls on latitude 6^0 to the North and latitude 4^o to the south. It is marked by longitude 4^0 to the West and 6^0 to the East. It is bounded in the North by Kogi and Kwara states, in the East by Edo and Delta states, in the South by Atlantic Ocean and in the West by Republic of Benin. The zone comprises of six states namely Oyo, Osun, Ondo, Ogun, Ekiti and Lagos and is characterized by a typically equatorial climate with distinct dry and wet seasons. The mean annual rainfall is 1480mm with a mean monthly temperature range of 18^0 -24^0C during the rainy season and 30^0-35^0C during the dry season. The geographical location of South West Nigeria covers about 114, 271 kilometer square that is, approximately 12 percent of Nigeria's total land mass and the vegetation is typically rainforest. The total population is 27,581,992 and predominantly agrarian. Notable food crops cultivated include cassava, maize, yam, cowpea and cash crops such as cocoa, kolanut, coffee and oil palm (NPC, 2006).

2.2 Data and Sampling Technique

Primary data used in this study were collected from a two-wave panel survey undertaken at 5-months interval to allow measurement of seasonal variation in behaviour and outcome and to balance both the cross-sectional and time series requirements of panel data. The two periods corresponds to the lean and harvesting seasons of 2009. Data were collected (from the same households in the two rounds) on demographic characteristics, education, employment, housing and housing conditions, social capital, income, consumption expenditure as well as shocks and the economic infrastructure available to the community. This was supplemented with information from secondary sources such as Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS).

The frame for the study was the demarcated Enumeration Area (EA) maps produced by National Population Commission for the 2006 Housing and Population Census. However, the EAs selected were updated before the commencement of the study. Furthermore, the EAs used are part of the ones usually used by National Bureau of Statistics (NBS) for her regular household-based surveys. A multi-stage sampling technique was adopted for this study. The first stage was a random selection of two states of Oyo and Osun from the six states that make-up the South-West geo-political zone of the country. The second stage involved the random selection of three local government areas (LGAs) from each of the selected state. The third stage was the random selection of ten rural enumeration areas (EAs) from each of the selected LGA. The final stage of the sampling was the systematic selection of ten households from the households listed in each selected EA. Hence, in each state 300 households were interviewed giving a total of 600 households in the two selected states canvassed for the study in the first

period but only 582 households could be re-interviewed in the second round. Data from these 582 households were used for analysis in this study. These samples are representative and robust enough to give estimates at the LGA, State and Zonal levels.

2.3 Estimation Procedure

For the study, all the sample data were weighted using the inverse of the overall selection probabilities which were called Design Weights (DW). In addition, adjustment factors were applied to complete the weighting process for the study. The formula adopted in calculating the design weights for the study (sample results) is as follows:

Design Weight = $[(k/K) .(l_h/ L_h) .(n_h/ N_h) .(m_h/ M_{hi})]^{-1}$

Where

K=Total number of States in the South West Zone.

k =number of sampled States in the South West Zone.

L_h=Total number of LGAs in State h of the South West Zone

l_h = number of sampled LGAs in State h of the South West Zone

N_h =Total number of EAs in LGA of State h

n_h = number of sampled EAs in LGA of State h

$M_{hi=}$ number of listed households in i^{th} EA of State h

$m_{hi=}$ number of sampled households in i^{th} EA of State h

The design weight was obtained for each of the sixty EAs canvassed in the two states and applied accordingly to all the study units. Thereafter, adjustment factors were applied for the non-responses where necessary.

2.4 Analytical Techniques and Methods

The poverty measure that was used in this analysis is the class of decomposable poverty measures by Foster, Greer and Thorbecke (FGT). They are widely used because they are consistent and additively decomposable (Foster et al, 1984).

The FGT index is given by

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)^\alpha \quad (1)$$

Where;

Z is the poverty line defined as 2/3 of the Mean Per Capita Household Expenditure (MPCHHE) y_i is the value of poverty indicator/welfare index per capita in this case per capita expenditure in increasing order for all households; q is the number of poor people in the population of size n, and α is the poverty aversion parameter that takes values of zero, one or two. By setting the value of α to zero, one, two respectively, the FGT poverty measure formula delivers a set of poverty indices.

Taking into account the dynamic dimensions of poverty, the measure of 'Vulnerability as Expected Poverty' (VEP), an *ex ante* measure proposed by Chaudhuri, Jalan and Suryahadi (2002) was adopted because of the advantage of the VEP approach especially in terms of its capability to identify households "at risks" who are not poor. The other vulnerability measures which are ex post measures Vulnerability as Expected Utility (VEU) or Vulnerability as Exposure to Risk (VER) can only be constructed with the availability of long panel data set where household response to shocks can be identified. In this approach, vulnerability is defined as the probability of being poor in the future and intrinsically can take on two forms. It is either the ex ante risk that a household that is currently not poor will fall below the poverty line or the risk that a household that is currently poor will remain poor. This can be formally expressed as:

$$V_t = \text{Prob}\ (C_{(t+1)} < Z) \quad (2)$$

where the vulnerability of a household during the current period V_t is dependent on the probability that future household consumption $C_{(t+1)}$ will be less than poverty line (Z**).** One of the limitations of this definition of vulnerability is that it is sensitive to the choice of Z. Accordingly, for this study following the approach by Gaiha et al (2007), poverty line was defined as (a) the relative poverty line for the study (b) 80% of (a) (c) the national poverty line defined by the National Bureau of Statistics and (d) the International poverty line of 1.25 dollars per day; in order to check the sensitivity of results to the choice of a poverty threshold.

Empirically, building upon the works of Chaudhuri, Jalan and Suryahadi (2002) and Gaiha *et al*. (2007) VEP was obtained by the following procedure: First, using record level household data, the FGT measure of headcount poverty (Foster, et al., 1984) was calculated. Second, household's expected consumption and its variance of the error term were estimated using Feasible Generalised Least Square (FGLS) estimation procedure. Household's vulnerability to poverty was then derived as the conditional probability of the household falling into poverty in the next period or the probability that a household's consumption will lie below the predetermined poverty line in the near future.

2.4.1 Consumption and Variance of the Disturbance Term

The Consumption model is given as:

$$\ln C_{i,t+1}=X_i\beta +e_i \quad (3)$$

Where C_i is per capita expenditure (i.e. food and non-food consumption expenditure) for

the *i-th* household at time t+1, X_i represents a bundle of observable household characteristics and other determinants of consumption, β is a vector of coefficients of household characteristics and e_h is a mean-zero disturbance term that captures idiosyncratic shocks that contribute to different per capita consumption levels. The consumption model in (3) assumes that the disturbance terms has a mean zero, but varies across households and is also assumed that the variance of the disturbance term depends on:

$$\sigma_{e,i}^2 = \mathbf{X}_i\theta \quad (4)$$

That is there is no constant variance of the disturbance term and this allows for heteroscedasticity. Hence, in correcting for this problem, the estimates of β and θ were obtained using a three-step feasible generalized least squares (FGLS).The estimates were then computed for each household as follows:

$$E\left[\ln C_i|X_i\right]= X_i\hat{\beta} \quad (5)$$

$$V\left[\ln C_i|X_i\right]= X_i\hat{\theta} \quad (6)$$

By assuming $\ln c_i$ as normally distributed, the estimated probability that a household will be poor in the future (say, at time t+1) is given by:

$$\hat{\text{VEP}}_i \equiv \hat{v}_i = \hat{\Pr}(\ln c_i < \ln z|X_i) = \Phi\left(\frac{\ln z - X_i\hat{\beta}}{\sqrt{X_i\hat{\theta}}}\right) \quad (7)$$

Adopting the standard vulnerability threshold of 0.5 following (Gahia *et al.,* 2007; Imai *et al.*, 2009; Oni and Yusuf, 2006) households were classified into their vulnerability status. Hence, those with a 50 per cent or more chance of falling into poverty in the future were identified as vulnerable. Households were finally classified based on selected socioeconomic variables to see how vulnerability and poverty differ among different segments of the population. This classification helps to provide some insights on the socio-economic characteristics of the poor and the vulnerable.

3. Results and Discussions

3.1 Determinants of Rural Household Consumption in South West Nigeria

As indicated in the analytical frame work, a three stage Feasible Generalized Least Squares (FGLS) was used to estimate the variance and mean of the consumption function. The results of the third stage of the FGLS is presented in Table 1.

Controlling for all other characteristics, male headed households were found to be associated with significantly higher means of future consumption. This could be attributed to the fact that most men in Nigeria, apart from being involved in traditional agriculture are involved in other income generating activities and are advantaged because of their representation at all levels of society, especially in the decision making process. The coefficient of age of the household head is positive and that of its squared negative and significant, indicating the non linearity relationship with the log consumption per capita. Hence households with older heads fare better, that is have higher expectation of future consumption. The negative coefficient of household size suggests that large household size tends to decrease expectation of consumption, thereby increasing household vulnerability. However, this negative effect

weakens with the household size as the coefficient of household size squared is positive and significant confirming the non-linearity of relationship with log of consumption per capita. In general, analysis showed that the larger the dependency burden, the larger is a household's vulnerability, as manifested by a significantly lower expectation of future consumption. This implies that a household with many old or young members tends to have lower log consumption per capita. A dummy variable on whether the household head is married is negative and not significant implying that the marital status of the head is not much related to per capita household consumption.

Education can affect people's standard of living through a number of channels: it helps skill formation resulting in higher marginal productivity of labour that eventually enables people to engage in more remunerative jobs. Hence it is expected that education is positively correlated with consumption levels of households. With illiterate household as the base case, the dummy variables on secondary education and tertiary education of the household head had positive and statistically significant coefficients while that of primary education was not significant, the coefficient of the variables also gets larger for higher levels of education, which implies that consumption tends to increase as the household head's educational attainment rises. However, a higher level of education is more important as a determinant of log per capita consumption. This basically conforms to other studies concluding that literacy and education attainment decrease poverty (e.g. World Bank, 2002). The coefficient of share of female members is negative and significant and that of its square is positive and highly significant also confirming the non linearity. The negative and statistically significant coefficient of share of female members implies that larger share of female members tends to decrease household consumption which may suggest lower economic opportunities for female household members. An increase in the incidence of malaria in an household is associated with decrease in expectation of consumption especially via the indirect effect on labour productivity. In addition, the fact that malaria incidence tops the reported diseases cases in the study area shows that it might likely be an important variable affecting consumption. A dummy variable to capture infrastructure that is, whether the household has access to power supply, is positive and significant this implies that easier access to power supply is an important determinant of household consumption. Not surprisingly, the variables ownership of house and membership of association both have a sizeable positive effect on per capita consumption and the coefficients are also highly statistically significant.

3.2 Vulnerability Status of households based on Different Poverty lines

The summary of respondents' expenditure on food and other basic needs in the two periods is shown in Table 2. The mean per capita household expenditure (MPCHHE) for the respondents stood at ₦4970.36 while the two-thirds MPCHEE amounted to ₦3313.57 for the first survey round (on-season). Likewise, for the second survey (off-season), the MPCHHE stood at ₦6140.43 while the two-thirds MPCHHE amounted to ₦4093.21. Hence households were classified as being moderately poor if their mean per capita expenditure was below ₦3313.57 or ₦4093.21 for the first and second survey rounds respectively. The head count poverty indices of the respondents in the 2 periods showed that respondents were poorer off-season as the incidence of poverty was 35% in the on- season indicating that 204 households were below the poverty threshold and 44 % in the off-season indicating that 254 were moderately poor (Table 3).

Adopting the standard vulnerability threshold of 0.5, households were classified into their vulnerability status as shown in Table 4. The sensitivity analysis of classification of households into their vulnerability status based on four different poverty lines namely: relative poverty line, 80 percent of the relative poverty line, international poverty line of 1.25 dollars per day and the NBS (National Bureau of Statistics) national poverty line adjusted for 2009 prices revealed that about 324 (55.7%) households were vulnerable using the relative poverty line of ₦3313.57 estimated for the study. This implies that a large proportion of rural households in South Western Nigeria are vulnerable to poverty. The NBS poverty line showed a similar trend (55.8%) with the estimated poverty line for the study area. With eighty percent of the relative poverty line, the number of vulnerable households decreased to 238 (about 41 percent) suggesting that government policies that would lead to a reduction in inflation will lead to a reduction in the number of vulnerable households. However, using the international poverty line, a greater proportion of the respondents (63.1%) were also found to be vulnerable to poverty. The result of this sensitivity analysis shows the extent of vulnerability in the region as a larger proportion (except for when the poverty line was reduced) of the households were found to be vulnerable to poverty irrespective of the poverty line used. This suggests that poverty reduction efforts should include measures that will lower inflation and volatility of income.

A classification of respondents into their vulnerability status based on their initial poverty status (table 5) shows that not all the poor are vulnerable while a significant proportion of the non-poor are vulnerable (33.2 %). Thus, there may be some households whose vulnerability level may be high who are nevertheless observed to be non-poor; and conversely, there may be some households who are observed to be poor, whose vulnerability level

is, nevertheless, low enough for them to be classified as non-vulnerable. These estimates appear to support the often-stated (and vaguely defined) claim that the observed incidence of poverty underestimates the fraction of the population that is vulnerable to poverty and simply reflects the stochastic nature of the relationship between poverty and vulnerability (Chaudhuri *et al*., 2002).

3.3 Vulnerability/Observed Poverty Profile

The result of the decomposition of poverty and vulnerability by selected demographic, occupational and socio-economic characteristics in Table 6 revealed that poverty and vulnerability varied across these groups. Generally, a group with a relatively high poverty rate tends to have much higher vulnerability while low poverty rates are associated with considerably lower vulnerability. However, the predicted/observed poverty ratio was used to estimate the expected poverty incidence based on the static poverty estimate. Hence, a predicted/observed poverty ratio of 1.278 for persons aged 60 and above for instance, implies that for every 100 household heads within this age group that are poor now, 27 more are expected to be poor in the future. Also, a ratio of 1.217 and 0.542 for household heads with no formal and tertiary education implies that for every 100 household heads with no formal education, 22 more are expected to be poor while heads with tertiary education are expected to exit poverty in the future. The distribution of gender of household head reveals that female headed households are poorer but less vulnerable to poverty than their male counter parts although both groups have high levels of predicted and observed poverty. The ratio of predicted poverty to the observed poverty level of 1.027 and 1.018 implies that for every hundred male headed households that are poor now, 3 more are expected to be poor in the future while for female households, 2 more are expected to be poor respectively. With respect to household size, 29 more are expected to be poor for households with more than 15 members.

Decomposition by marital status indicates that widowed household heads have the highest level of both observed and predicted poverty while single household heads have the lowest level of both observed and predicted poverty. When classifying households by their occupational predominance, the incidence of poverty (observed and predicted) by primary occupation indicates a higher level of poverty for households whose heads were primarily engaged in farming activities than those engaged in non-farming activities. This implies that farming households are poorer and more vulnerable to poverty than non farming households. It is also an indication that non-farming livelihood activities reduce poverty incidence in rural South Western Nigeria. This is expected as agriculture in the rural areas of Nigeria is largely characterized by low capital involvement, use of crude implements, poor infrastructural and storage facilities and human drudgery, which ultimately leads to lower average earnings.

While vulnerability to poverty decreased with increase in income of household head, households with a large number of child and adult dependants were found to be poorer and more vulnerable to poverty. The categorization of vulnerability to poverty of households by land size reveals that households with less than 1 hectare of land are more vulnerable than those with more than 2 hectares of land. The incidence and likelihood of poverty also decreased as the number of rooms per person increased and was higher among households whose heads were non-members of any local group or association than those who were members (0.376 and 0.387) thus implying that improved access to social capital is a viable poverty reduction strategy. Thus a strong financial base for rural households might be a strong policy tool for poverty alleviation in Nigeria as it is expected to enhance the development of small and medium scale enterprises (SMES) in the rural areas, increase household income and consequently reduce poverty.

Provision of infrastructure like electricity and potable water are important elements of rural welfare as they have the potential of creating rural income generating capacities and gainful employment opportunities. This is indicated in the result in which both observed and predicted poverty were higher among households without access to electricity and potable water than those with access. This implies that provision of rural infrastructure is a viable tool for poverty reduction and corresponds to the findings of Kasirye (2007) and Gahia *et al.*, (2007) in which households that resides in communities with electricity and potable water were found to be less poor and vulnerable. The importance of malaria as a key risk factor is also indicated as the poverty and vulnerability rate of households increased with the increase in number of people that have suffered from the illness in the past one year. The vulnerability to poverty ratio indicates that for every 100 poor households having more than 5 members that have suffered from malaria in the past one year, 14 more are expected to be poor in the future while for households with not more than 2 malaria incidence in the last 12 months, only 1 more is expected to be poor. This is in line with intuitive suggestions that sickness can limit welfare enhancing opportunities and can have other implications such as damaging traditional social support networks and increasing heath care costs, all of which make breaking out of the cycle of poverty even more difficult (Christiansen and Subbarao 2004, Lawson 2004).

Hence, vulnerable households are large sized with high number of dependants and are characterized by under aged or old, female headed, widowed household heads. They are mostly engaged in farming as their primary occupation, have no or low educational attainment, are landless or have small landholdings of less than 1 hectare and hence are low income earners. They are not members of any local group or association and do not have access to any form of financial capital or infrastructural facilities (i.e. credit, remittance, electricity, health facilities, potable water and sanitary means of excreta disposal). Hence, vulnerability to poverty in the study area can be reduced or mitigated if policy interventions are targeted towards the group of people with these characteristics.

4. Conclusion

Nigeria at the turn of the twenty-first century continues to be one of the poorest countries in the world despite various efforts of government to reduce the incidence of poverty through different poverty alleviation programmes and strategies. This high level of poverty characterising the country therefore requires an urgent need to gain a better understanding of the persistence of poverty and poverty dynamics at the household level in Nigeria.

This study estimated vulnerability to poverty of households and found out that on the average there is a 0.56 probability of entering poverty a period ahead. Considering the high level of vulnerability in the study area, a lot needs to be done to improve the factors that reduce vulnerability to poverty. If it is possible to target the currently poor, a large proportion of the households will move out of poverty between one period and the other. However, with the imperfect overlap between the vulnerable and the poor, it cannot be assumed that policy interventions that help the currently poor will also lead to a reduced incidence of poverty in the next period ahead. This suggests that different policies may be needed for poverty reduction because focusing anti-poverty efforts on the correlates of current poverty status (which could be as a result of exposure to a shock at that time) may not have any significant impact on the probability of being poor in the future but forward looking anti-poverty interventions that aim to prevent rather than alleviate poverty could be embarked upon.

From a broad policy perspective, while there is a close correspondence between poverty and vulnerability, they are distinct concepts. In fact, there is a need for a broader focus in anti-poverty interventions in Nigeria, as those who are poor are not necessarily the most vulnerable and vice versa. The policy implications of the above findings are notable: a focus on vulnerability underscores the centrality of social protection policy mechanisms as potent poverty reduction tools.

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Table 1. Generalized Least Squares Regression Results (stage 3)

Variable	**Coefficient**	**t-value**
Sex	0.296	4.10***
Age	0.017	4.49***
Age squared	-0.001	-4.70***
Household size	-0.211	-4.05***
Household size squared	0.006	8.28***
Share female member	-1.431	-4.86***
Dependency burden	-0.22	-4.25***
Marital Status (dummy)	-0.112	-1.63
Primary Education Dummy	-0.023	0.36
Secondary Education Dummy	0.183	4.87***
Tertiary Education Dummy	0.336	4.73***
Primary Occupation Dummy	0.599	1.60
Land size	-0.001	-0.10
Membership of Local group	0.088	2.75***
House ownership	0.096	3.41***
Access to credit	-0.031	-1.08
Access to remittances	-0.057	1.51
Access to extension	0.215	0.36
Access to electricity	0.115	3.60***
Malaria	-0.04	-5.49***
Constant	8.831	72.10***

*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Observations -582 R. Squared - 0.8598 Adj R. Squared-0.8542

Table 2. Average Monthly Expenditure of Respondents on Food and some Basic Needs

Item	Average Monthly Expenditure ₦(1st round)	Share in total expenditure	Average Monthly Expenditure ₦(2nd)round	Share in total expenditure
Food	11788.08	62.98	13730.1	63.21
Clothing and footwear	884.88	4.72	855.85	3.94
Rent	495.64	2.64	532.35	2.45
Health care	472.03	2.52	552.29	2.54
Education	1366.49	7.3	1635.21	7.52
Transportation	1218.4	6.5	1105.37	5.08
Communication	540	2.88	613.68	2.82
Fuel and Power	540.77	2.88	766.88	3.53
Others	1410.19	7.53	1926.25	8.86
Total(Non-food)	6928.42	37.02	7987.87	36.78
Total Expenditure(food+non-food)	18,716.50	100	21,717.98	100
Mean per Capita household Expenditure(MPCHHE)	4970.36		6140.43	
2/3 MPCHHE(Poverty line)	3313.25		4093.21	
Field Survey, 2009				

Table 3. Poor/Non-Poor Transition Matrix

1st period		**2nd period**		**Total**
		Non poor	**Poor**	
	Non Poor	288	90	378
		(49.5)	(15.5)	(65.0)
	Poor	40	164	204
		(6.9)	(28.1)	(35.0)
	Total	328	254	582
		(56.4)	(43.6)	(100)

Top number is cell frequency and number in parenthesis is cell percentage

Soutrce: Authors Computation from Field Survey 2009

Table 4. Vulnerability Distribution of Households based on Different Poverty Lines

Vulnerability status of the household	**Relative Poverty line**		**80% of Relative Poverty line**		**International Poverty line (PPP $1.25 per day)**		**NBS Poverty line adjusted for 2009 prices**	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Not Vulnerable	258	44.3	344	59.1	215	36.9	257	44.2
Vulnerable	324	55.7	238	40.9	367	63.1	325	55.8
Total	582	100	582	100	582	100	582	100

Source: Field Survey, 2009

Table 5. Vulnerability Distribution of Households based on Initial Poverty Status

	Vulnerability Status of the household		
Poverty status of household in the first period	Non-vulnerable	Vulnerable	**Total**
Not Poor	185 (31.8)	193 (33.2)	378 (65)
Poor	73 (12.5)	131 (22.5)	104 (35)
Total	258 (44.3)	324(55.7)	582(100)

Number in parenthesis is cell percentage
Source: Authors Computation, 2009

Table 6. Vulnerability /Observed Poverty Profile in Rural South Western Nigeria

Variables	**Vulnerability Index**	**Poverty Incidence**	**Predicted /Observed Poverty Ratio**
Sex			
Male	0.667	0.649	1.027
Female	0.663	0.651	1.018
Age			
< 20	0.569	0.507	1.122
20 – 29	0.416	0.446	0.932
40 – 59	0.454	0.451	1.006
≥ 59	0.656	0.513	1.278
Marital Status			
Single	0.521	0.512	1.017
Married	0.613	0.546	1.122
Separated/Divorced	0.662	0.578	1.145
Widowed	0.721	0.615	1.172
Household size			
1 – 5	0.442	0.454	0.973
6 – 10	0.487	0.505	1.162
11 – 15	0.696	0.558	1.247
> 15	0.732	0.564	1.297
Educational Status			
No formal Education	0.722	0.593	1.217
Primary Education	0.718	0.599	1.198
Secondary Education	0.328	0.312	1.051
Tertiary Education	0.167	0.308	0.542
Primary Occupation			
Farming	0.691	0.635	1.088
Non Farming	0.525	0.598	0,877
Income Level			
< N10,000	0.782	0.637	1.227
10,001 – 20,000	0.719	0.616	1.167
20,001 – 30,000	0.558	0.512	1.089
>30,000	0.453	0.498	0.909
Land Size			
<1	0.714	0.679	1.051
1 – 2	0.572	0.567	1.008

>2	0.433	0.553	0.783
Room Ratio			
<0.5	0.615	0.558	1.102
0.5 – 0.9	0.563	0.534	1.054
>0.9	0.328	0.319	1.028
Distance to Health Facility			
<1km	0.455	0.446	1.02
1 – 2km	0.564	0.526	1.072
2.1 – 4km	0.674	0.599	1.125
>4km	0.712	0.618	1.152
Membership of Association			
Yes	0.387	0.376	1.029
No	0.499	0.452	1.103
Access to Credit			
Yes	0.465	0.457	1.017
No	0.563	0.5	1.126
Access to Electricity			
Yes	0.389	0.372	1.045
No	0.595	0.536	1.11
Access to Remittances			
Yes	0.465	0.447	1.04
No	0.643	0.608	1.057
Malaria (Number)			
0 – 2	0.547	0.542	1.009
3 – 5	0.651	0.611	1.065
> 5	0.731	0.639	1.143
Dependency Burden			
0 – 2	0.526	0.509	1.033
3 – 5	0.563	0.534	1.054
> 5	0.674	0.612	1.101
Years of Farming Experience			
0 - 10	0.638	0.62	1.029
11 – 20	0.512	0.517	0.99
21 – 30	0.407	0.414	0.983
> 30	0.313	0.358	0.874
Access to Sanitary means of Excreta Disposal			
Yes			
No	0.452	0.468	0.965
	0.548	0.514	1.066
Access to Potable water			
Yes	0.417	0.495	0.842
No	0.692	0.551	1.255
Source: Authors Computation, 2009			

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Appendix

Following Chaudhuri (2000) and assuming that the stochastic process generating the consumption of a household h is given by:

$$\ln c_{ht+1} = X_h\beta + e_h \quad (1)$$

stage 1

where c_{ht+1} per capita consumption expenditure in time t+1, X_h represents a bundle of observable household characteristics, characteristics such as household size, location, educational attainment of the household head, etc., β is a vector of parameters, and e_h is a mean-zero disturbance terms that captures idiosyncratic factors (shocks) that contribute to different per capita consumption levels for households that are otherwise observationally equivalent. The variance of e_h is assumed to be given by

$$\sigma^2_{e,h} = X_h\theta \quad (2)$$

β and θ are estimated using a three-step feasible generalized least squares (FGLS) procedure suggested by Amemiya (1977).Equation (14) is estimated using an ordinary least squares (OLS) procedure. The estimated residuals from equation (14) are used to estimate equation 15

$$\hat{e}^2_{OLS}, h = X_h\theta + \eta_h \quad (3)$$

using OLS. The predictions from this equation were used to transform the equation as follows:

$$\frac{\hat{e}^2 OLS,h}{X_h\hat{\theta}_{OLS}} = \left(\frac{X_h}{X_h\hat{\theta}_{OLS}}\right)\theta + \frac{\eta_h}{X_h\hat{\theta}_{OLS}} \quad (4)$$

Stage 2

This transformed equation was estimated using OLS to obtain an asymptotically efficient FGLS estimate, $\hat{\theta}_{FGLS}$. Note that $X_h\hat{\theta}_{FGLS}$ is a consistent estimate of $\sigma^2_{e,h}$ the variance of the idiosyncratic component of household consumption.

The estimates:

$$\hat{\sigma}_{e,h} = \sqrt{X_h\hat{\theta}_{FGLS}} \quad (5)$$

Were then used to transform equation (13) as follows

$$\frac{In_{ch}}{\hat{\sigma}_{e,h}}t+1 = \left(\frac{X_h}{\hat{\sigma}_{e,h}}\right)\beta + \frac{e_h}{\hat{\sigma}_{e,h}} \quad (6)$$

stage 3

OLS estimation of equation (13) yields a consistent and asymptotically efficient estimate of β. The standard error of the estimated coefficient, $\hat{\beta}_{FGLS}$, was then obtained by dividing the reported standard error by the standard error of the regression.

Using the estimates $\hat{\beta}$ and $\hat{\theta}$ that was obtained; the expected log consumption and variance of log consumption was directly estimated:

for each household h. By assuming that consumption is log-normally distributed, these estimates were used to form an estimate of the probability that a household with the characteristics, X_h, will be poor that is, to estimate the household's vulnerability level. Letting Φ denote the cumulative density of the standard normal, this estimated probability was given by:

$$\hat{v}_h = \hat{\Pr}(In_{ch^{t+1}} < Inz|X_h) = \Phi\left(\frac{Inz - X_h\hat{\beta}}{\sqrt{X_h\hat{\theta}}}\right) \quad (7)$$

Where

c_{ht+1}	=	Consumption level of household h in period t+1
X_h	=	Vector of independent variables
β	=	regression coefficients of idiosyncratic variables
$\hat{\sigma}_{e\cdot h}$	=	Variance of idiosyncratic and covariate variables
e_h	=	Error term