

# **Asset Ownership and Welfare Deprivation of Women in Rural Nigeria: A Bi-Causal Relationship**

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## **Authors' contributions**

*This work was carried out in collaboration between both authors. Author YOMO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors YOMO and KOA managed the analyses of the study. Author YOMO managed the literature searches. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

Women are an important segment of the human population and appropriate investment in their welfare would be of great benefit to the individual, household, and community levels. There has been an increasing incidence of welfare deprivation among women in rural Nigeria. However, information on the link between asset ownership and welfare deprivation of women in rural Nigeria is scanty. Thus, the relationship between the level of asset ownership and welfare deprivation of women in rural Nigeria was investigated. Data on 18,869 women living in rural Nigeria were sourced from Nigeria Demographic and Health Survey 2013. Data analysis was done using descriptive statistics, composite score analysis, fuzzy analysis and Instrumental Variable(IV) Tobit Regression at  $\alpha_{0.05}$ . A higher proportion of the rural women-owned physical assets such as mobile phone (68.7%) and radio (63.5%), while only 5.9% owned natural asset (land). Women in low-LAO, intermediate-LAO and high-LAO were 20.3%, 63.8% and 15.9%, respectively. Level of asset ownership ( $\beta=-0.31$ ), age ( $\beta=-0.01$ ), being a widow ( $\beta=0.04$ ), being a female household head ( $\beta=-0.08$ ), and Geo-Political Zone (North-East,  $\beta=0.04$ ; South-East,  $\beta=-0.05$ ; South-West,  $\beta=-0.07$ ) explained welfare deprivation of women. A unit increase in the level of asset ownership led to 30.8% decrease in welfare deprivation. An increase in the level of asset ownership decreased welfare deprivation. Asset ownership had a positive influence on women's welfare deprivation.

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## 1. INTRODUCTION

Assets are stocks of financial, physical, natural or social resources that can be acquired, developed, improved and transferred across generation; which generate flows, as well as additional stocks [1]. Assets include natural assets such as land, livestock [2,3]; physical assets such as housing, equipment, jewellery and consumer durables; as well as financial assets such as cash accounts of various kinds, stocks, bonds, trusts, public and private pensions [1-4]. Assets may represent a store of value, have current use value or provide services (as in the case of home ownership), so as to facilitate their conversion into cash, or be a source of generating financial incomes [5,6].

More than forty-nine percent of Nigeria's population are women and enhancing the ownership of assets among women is important for their welfare to enable them to care properly for their children and the family as a whole [7,8]. Business dictionary defines welfare as the availability of resources and presence of conditions required for reasonably comfortable, healthy and secure living. More so, women's welfare is viewed as an investment good because when physically, socially and economically stable, they will be able to work and earn income to cater for themselves, and their families [7]. Economically, empowering women is essential both to realise women's rights and to achieve broader development goals such as economic growth, poverty reduction, health, education and welfare [9].

It is increasingly being recognised by researchers that access to and ownership of assets is critical for increasing productivity, especially agricultural products, and for enabling people to move out of poverty [10]. Most research works have used the household as the unit of analysis. However, households are not static but are formed and dissolved, in part, due to economic circumstances. Thus, it is important to look both beyond and within the household as the unit of analysis to understand the relationships between deprivation and asset ownership. In particular, because women's access to assets is often tied to their relationships within the household and community, they are particularly vulnerable to losing this access when the household dissolves, either through divorce, desertion or death.

Household level analyses of asset ownership may not capture women's particular vulnerabilities [10,11]. Since individuals within households can experience different kinds of deprivations, a household level multidimensional analysis does not give enough information about the interventions that might be most suitable for individuals based on gender, age, and etcetera [12]. More importantly, a household level analysis does not allow an identification of individuals, both men and women, who might be experiencing severe deprivations.

Asset ownership among women in rural Nigeria is an important issue. For instance, culturally women are believed to be second-class citizens and so because of this rural women are poor and deprived [13,7]. An understanding of the link between owning asset and welfare may have been quite a driving force for welfare deprivation among the women folks which has warranted this study in order to inform adequate social protection policies in the country and also aid policymakers in the design and evaluation of anti-poverty and livelihoods creation programs [12]. Therefore this study disaggregated the household on an individual basis to examine the asset ownership and welfare deprivation of women in rural Nigeria. As a result, the study proffered answers to the following research questions:

- What are the assets owned by women?
- What is the level of asset ownership among women?
- What is the deprivation status of women?
- How does asset ownership affect welfare deprivation of women?

## 2. THEORETICAL FRAMEWORK

### 2.1 Capability Approach

The major constituents of the capability approach are functioning, capabilities, and agency. In this study, using [14] work for women's deprivation is a result of the reduction in their capabilities (one of which is their ownership of assets) and their agency that affects their functioning (which in this case could be conceptualised as welfare). [15] improves on Sen's account of human capabilities, not only by making them personal traits but also by locating them within the context of other human features; limits, vulnerabilities, and needs. Nussbaum views capabilities as

powers. If capabilities are powers, then they are also, in a sense, actualities that people can do [16]. The expansion of women's capabilities not only enhances women's own freedom and well-being but also has many other effects on the lives of all. Although culture plays a dominant role in socio-emotional development, individuals possess an innate capacity for autonomous choice, which is to some extent independent of culture [17].

Following this approach, this study views rural woman in Nigeria as enterprising women who are capable, that is, they have agency and evolve strategies to ensure and improve their status. Capability here is viewed as the personal powers these women possess to take decisions on issues pertaining to their lives and to evolve strategies for achieving freedoms within the limits of the socio-economic and cultural context in which they live [13]. Assets enable people to think and behave in developmental ways that people without assets cannot. This developmental thinking and behaviour builds a set of capabilities and may ultimately lead to a sense of freedom in taking decisions [18].

In particular, these women are perceived as harnessing the "power within," that is, increasing their capacity to resist the power of others (especially over them) to gain more (economic) independence and space and hence become less prone to oppression and exploitation despite the obstacles they may face. While the bargaining literature seeks to unpack the determinants of intra-household inequality by focusing on alternative types of power and their material and non-material foundations, the capability approach is concerned with evaluating opportunities. If an unequal balance of power affects the intra-household distribution of goods and services (or, in the capability approach, "the means to achieve"), then interpersonal comparisons of opportunities must account for this. The decisions and actions of women within and outside of the household are shaped by the socio-cultural norms and practices that mediate their opportunities in the society.

Nevertheless, the women are not perceived as victims but as people who have agency, which they use to evolve strategies aimed at achieving their freedom of choice. The theoretical framework of this study rests on two premises. The first premise is that the gap between women's rights to assets and their actual ownership of assets suggests the significant role

social norms, local customs, and discriminatory institutional practices played in limiting women's actual freedom to own assets. The second premise is that women's claims to assets appear to enjoy little social legitimacy. To ensure women's actual ownership of assets, it is necessary to expand their bargaining position vis-à-vis men within and outside the household. The effectiveness of rural women's asset rights lies on the relationship of legal structures in Nigeria to the existing dialectical links between gender and ideology, and material reality [18]. The key to assessing the empowerment potential of property acquisition is the distinction between access to and control over the property. Control over or freedom to choose. What one has reason to value and the ability to define one's goals and act upon them shows more empowerment potential than simply having access.

In the context of this study, rural women are not capable of acquiring or owning assets. However, when they own assets, it is not enough, therefore cannot translate to improve their welfare status as well as their households, even if they want to, they must get their husbands' consent. Ultimately, rural women's autonomy to acquire assets is dependent on their husbands or any male figure around them, which invariably has not translated into equal gender relations.

### **3. METHODOLOGICAL FRAMEWORK**

#### **3.1 Scope of Study**

The scope of study for this research was rural Nigeria. It is highly endowed with human resources and despite the enormous wealth which the country possesses, it is paradoxical that its citizens are sliding progressively into poverty. Presently, Nigeria is made up of 36 states and a Federal Capital Territory, grouped into six geopolitical zones: North Central, North East, North West, South East, South South, and South West [8,19].

#### **3.2 Type and Sources of Data**

Secondary data from Nigeria Demographic and Health Survey [19] was used for this study. The 2013 Nigeria Demographic and Health Survey (DHS) was implemented by the National Population Commission. It is the fifth in the series of Demographic and Health Surveys conducted so far in Nigeria; previous surveys were conducted in 1990, 1999, 2003, and 2008. The

sample for the 2013 DHS was a stratified sample, selected independently in three stages from the sampling frame. The total number of household sampled was 40,680, with 16,740 from urban areas and 23,940 from rural areas. A total of 23,403 women from rural areas were interviewed. After sorting for missing data, 18,869 rural women data were used for this study.

### 3.3 Analytical Procedure

Descriptive statistics Composite score analysis, fuzzy set analysis and Instrumental Variable (IV) Tobit regression were used for analysis. STATA 12 software was used.

### 3.4 Descriptive Analysis

This involved the use of charts, frequency, percentages the construction of simple frequency distribution, and the measure of central tendency such as mean, median and standard deviation, range to outline the socio-economic characteristics and to profile the assets owned by women in rural Nigeria.

### 3.5 Composite Score Analysis

Methodologically, several studies that have considered the ownership of assets by women and household [20] have used descriptive statistics to profile the assets but this study went further to assess the level of asset ownership by women using composite score analysis. This was used to measure the level of asset ownership by women. This was done based on the number of assets owned by each woman. These assets include radio, television, fan, generating set, mobile telephone, bicycle, motorcycle/scooter, wrist watch, electric iron, and animal-drawn cart, a boat with motor, canoe, computer, air condition, cable television, telephone line, car/truck, refrigerator, land and house.

Binary scale, that is, scoring 1 point for Yes and 0 for No responses regarding the assets owned, was used to rate the respondents. A respondent owning assets can score a maximum of 20 points and a minimum of 0 points. The categorisation into the high, intermediate and low level of asset ownership was then achieved using a composite score as given below and as used by [21,22,23,24].

High category = between 20 points to (Mean + S.D) points

Medium (intermediate) = between upper and lower categories

Low Category = Between (Mean – S.D) points to 0 points.

The assets that were considered include

- Physical (Radio, Television, Refrigerator, Bicycle, motorcycle, mobile phone, house among others),
- Natural capital (land)

### 3.6 Fuzzy Set Analysis

Welfare deprivation of women was analysed using fuzzy set analysis. Studies such as [25,26,27] used Principal Component Analysis (PCA) to construct welfare indicators. However, for this study Fuzzy set analysis was used and asset ownership was considered vis-à-vis welfare deprivation. The Fuzzy set analysis provides more flexibility in terms of involving conceptual and theoretical inputs and also leads to outputs that are easier to visualise and interpret [28]. One of the strengths of fuzzy set theory is its ability to be used with other approaches to multidimensional deprivation, especially those that are seemingly vague conceptually. A highly efficient and rigorous method operationalize a multivariate analysis of deprivation makes use of the fuzzy set theory [29,30]. The Fuzzy set also avoids jumps between two extremes but rather a gradation from one end of an attribute to another, a kind of discrete arrangement. This means that women would not just fall into the traditional dichotomy deprived and non-deprived but take into consideration degree of deprivation. The degree of welfare is shown by the placement of the individual on the 0 or 1 value or other values in-between. The model is considered as follows:

Assume a population A of n individuals,  $A = (a_1, a_2, a_3 \dots a_n)$ . A fuzzy subset B includes all individuals with  $a_i \in B$ . The degree of the welfare of the  $i^{\text{th}}$  individual ( $i=1, \dots, n$ ) with respect to a particular attribute j given that ( $j = 1, \dots, m$ ) is defined as:

$$\mu_B[x_j(a_i)] = x_{ij}, 0 \leq x_{ij} \leq 1 \quad (1)$$

where:

$x_{ij}=1$ ; condition of total lack of welfare attribute (state of deprivation)

$x_{ij}=0$ ; condition of full possession of welfare attribute

$0 \leq x_{ij} \leq 1$ ; conditions within the range of lack and full possession

The variables that define indicators of welfare are either dichotomous or categorical in nature.

In specifying the deprivation index for the population of women, following [7,31,32], it is expressed as:

$$\mu\beta(a_i) = \sum_{j=1}^n x_{ij} w_j \sum_{j=1}^m w_j \quad (2)$$

Where  $w_j$  is the weight given to the  $j^{\text{th}}$  attribute.  $\mu\beta(a_i)$  measures the degree of deprivation of the  $i^{\text{th}}$  individual as a weighting function of  $m$  attributes/ indicators.

### 3.7 Estimating Membership Functions

The variables that define indicators of deprivation are either dichotomous or categorical in nature.

### 3.8 Dichotomous Variables

Dichotomous variables are answered by either 'Yes' or 'No'; with the Yes being a state of well-being and the No, a state of deprivation. According to [33], from a universal set of  $X$  households, we define the membership function of a fuzzy subset of  $P$  for the  $a_i^{\text{th}}$  household ( $i=1 \dots n$ ) that possess the  $j^{\text{th}}$  welfare attribute ( $j=1 \dots m$ ) as:

$$(\mu)p(a_i) = X_j(a_i) = X_{ij}$$

$X_j(a_i)$  is the  $m$  order of welfare attributes that will result in a state of welfare if totally or partially owned by the  $a_i^{\text{th}}$  household.

$X_j=1$ , if the  $a_i^{\text{th}}$  woman possess the  $j^{\text{th}}$  attribute (that is she completely has the welfare attribute)

$X_j=0$  if the  $a_i^{\text{th}}$  woman does not possess the welfare attribute.

### 3.9 Categorical Variables

Categorical variables present themselves in a range of values, rather than just two values. Expressing the membership function for these variables take the form:

$$(\mu)p(a_i) = X_j(a_i) = X_{ij}, \text{ and thus;}$$

$$X_{ij} = 1, \text{ if } 0 < C_{ij} \leq C_{max}$$

$$X_{ij} = \frac{C_{max} - C_{ij}}{C_{max} - C_{min}}, \text{ if } C_{min} \leq C_{ij} \leq C_{max} \quad (3)$$

$$X_{ij} = 0 \text{ if } C_{ij} \geq C_{min}$$

Where  $C_{max}$  is the value that depicts high level of deprivation in the  $j^{\text{th}}$  attributes, which translates to a lowest level of welfare; while  $C_{min}$  is the lowest level of deprivation in the  $j^{\text{th}}$  attribute which indicates the highest level of welfare in the  $a_i^{\text{th}}$  woman. Thus, the modalities are arranged in decreasing order of welfare attainment  $C_{ij}$  values are the intermediate values within the two thresholds, which depicts the position of the  $a_i^{\text{th}}$  woman within the modalities set forth. This assumes that the modalities in the data set are equally spaced. [34] specify this membership function as:

$$x_{ij} = \frac{C_i - C_{ij}}{C_i - C_{min}} - 1 \quad (4)$$

Where  $1 \leq C_i \leq C$ ,

so that  $0 \leq x_{ij} \leq 1$

In specifying the fuzzy welfare index for the population, as a ratio of the well-being index of the  $a_i^{\text{th}}$  household, the formula presented by [33 34] are adopted as follows:

$$\mu p = \frac{\sum_{i=1}^n \mu p(a_i) n_i}{\sum_{i=1}^n n_i} \quad (5)$$

$\mu p$  is the fuzzy deprivation index for the population of households studied.

$$\frac{1}{n} \sum_{i=1}^n \mu p(a_i) n_i \quad (6)$$

Equation 7 and 8 express the degree of attainment of the selected welfare attribute

This could also be conceptualised as:

$$\mu p = \frac{\sum_{j=1}^m x_{ij} w_j}{\sum_{j=1}^m w_j} \quad (7)$$

Where  $w_j$  is the weight given to the  $j^{\text{th}}$  attribute

$$w_j = \log \frac{n}{\sum_{i=1}^n x_{ij} n_i} \quad (8)$$

Table 1 showed the selected dimensions and method of evaluation.

**Table 1. Selected dimensions and method of evaluation**

<b>Indicator</b>	<b>Selected criteria</b>	<b>Deprivation</b>
<b>Housing and sanitation</b>		
Source of drinking water	Pipe borne water and treated 1= improved,0= otherwise	0=non deprived,1=deprived
Toilet facility	1= improved,0= otherwise	0=non deprived,1=deprived
Main floor material	1= improved,0= otherwise	0=non deprived,1=deprived
Main wall material	1= use of finished material,0= otherwise	0=non deprived,1=deprived
Main roof material	1= use of finished product, 0= otherwise	0=non deprived,1=deprived
Electricity	1= no electricity, 0= otherwise	0=non deprived,1=deprived
<b>Autonomy</b>		
Final say on travel to market and outside village/community	Husbands take decisions alone=4 Women and husband take decision =3 Women take decisions with another perso =2 Women take decisions alone = 1	0=non deprived,1=deprived
Final say on own health	Same as above	0=non deprived,1=deprived
Final say on visit to friends and relatives	Same as above	0=non deprived,1=deprived
Final say on making large household purchases	Same as above	0=non deprived,1=deprived
Final say on money spending.	Same as above	0=non deprived,1=deprived
Final say on husband's earnings	Same as above	0=non deprived,1=deprived
<b>Health and nutrition</b>		
Place of delivery	Deliver in health facility=1.0= otherwise	0=non deprived,1=deprived
Antenatal care	Receive ante natal care from skilled attendant =1, 0 = otherwise	0=non deprived,1=deprived
Skilled attendant during delivery	Attended to by skilled attendant during delivery =1, 0 = otherwise	0=non deprived,1=deprived
Body Mass Index (BMI)	18.5 kg/m <sup>2</sup> to 25.0 kg/m <sup>2</sup> = 1 <18.5 kg/m <sup>2</sup> and >25.0 kg/m <sup>2</sup> =0	0=non deprived,1=deprived
<b>Education</b>		
level of educational attainment	woman with no formal education =4 woman with primary education =3 woman with secondary education =2 woman with tertiary education= 1	0=non deprived,1=deprived
Literacy	Women who can read part of a sentence or a whole sentence will be regarded as literate. A value of 1 will be assigned, 0= otherwise	0=non deprived,1=deprived
<b>Employment</b>		
Employment status	Currently employed=1, 0= otherwise	0=non deprived,1=deprived
Employment type	Unemployed = 6 Unskilled manual employment =5 Skilled manual sector = 4 Agricultural and allied sector =3 Service sector = 2 Professional/Managerial = 1	

Source: Authors' computations, 2013 DHS data

### 3.10 Instrumental Variable Tobit

The Instrumental Variable (IV) Tobit regression was used in determining the causal relationship between welfare deprivation and asset ownership in this study. Many researchers [7,35], used asset ownership as one of the dimensions of wellbeing but in this study, the relationship between asset ownership and welfare deprivation was examined using IV Tobit. IV Tobit provides an extensive categorization of women into the various degree of deprivation being censored rather than a dichotomous categorization which doesn't provide details of women deprivation. Also, this also circumvents the problem of choice of viable instrument encounter in IV Tobit and ordinary 2SLS. In order to test whether there is a bi-causal relationship between asset ownership and welfare deprivation, instrumental variable (IV) was used. According to Many researchers [36,37], the method of the instrumental variable is applied to one equation of a model at a time. It is applicable to over-identified models and hence applicable to structural equations. Since assets can be assessed at a cost (time and resources), therefore the causality between deprivation and asset ownership runs in both direction and thus leads to biasness in the ordinary least square regression (OLS) estimates.

In order to address the endogeneity problem, it was necessary to isolate the exogenous impact of asset ownership on deprivation. Variables such as husband's total years of education, husband's occupation, husband's age and time to get to the nearest source of drinking water were considered as potential instruments for asset ownership variable. The IV Tobit reduces the correlation of the explanatory endogenous variable with the error term as much as possible [37]. Hence, the regression parameters were better enhanced.

Given the linear regression

$$Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \dots + \beta_nx_n + \varepsilon \tag{9}$$

Where

$x_1$  is an endogenous variable  
Regress  $x_1$  on  $Z_n, x_2, x_3, \dots, x_n$  to obtain  $\underline{x}_1$

$$x_1 = y_0 + y_1z_1 + y_2x_2 + y_3x_3 + \dots + y_nx_n + v \tag{10}$$

Where  $z_n$  is the instrumental variable

the fitted values of  $\underline{x}_1$  derived is introduced into the original regression equation

$$Y = \beta_0 + \beta_1\underline{x}_1 + \beta_2x_2 + \beta_3x_3 + v \tag{11}$$

where  $v$  is a composite error term that is uncorrelated with,  $X_2$  and  $X_3, \dots, X_n$

$Y$ =dependent variable (deprivation index)

$X_1$ =Level of asset ownership (2=high, 1=intermediate and 0=low),  $X_2$  =Age (in years),  $X_3$  = Married (yes =1, 0 otherwise),  $X_4$ =Widowed (yes =1, 0 otherwise),  $X_5$ =Divorced (yes =1, 0 otherwise),  $X_6$  = Sex of household head (Male =1, 0 otherwise),  $X_7$ =Household size (number),  $X_8$  =No formal education(yes =1, 0 otherwise),  $X_9$  = Primary education(yes =1, 0 otherwise),  $X_{10}$  =Secondary education(yes =1, 0 otherwise),  $X_{11}$  = Tertiary education(yes =1, 0 otherwise),  $X_{12}$ = North- Central geopolitical zone (yes =1, 0 otherwise),  $X_{13}$  = North- East geopolitical zone (yes =1, otherwise =0),  $X_{14}$  = North- West geopolitical zone =(yes =1, otherwise =0),  $X_{15}$ = South- East geopolitical zone =(yes=1, otherwise =0),  $X_{16}$  = South- South geopolitical zone =(yes=1, otherwise =0),  $X_{17}$  = South -West geopolitical zone =(yes=1, otherwise =0),  $z_1$  =husband's occupation ,  $z_2$  = husband's total years of education (years),  $z_3$  = husband's age,  $v$  = error term.

## 4. RESULTS AND DISCUSSION

### 4.1 Profile of Assets of Women in Rural Nigeria

In Table 2, 62.7% of rural women owned radio. Information accessed over the radio can be a great relief to women who cannot afford to buy newspapers or access the internet. In other words, ownership of radio has implications for women's deprivation status because the deprivation status of women may reduce when they get information that is beneficial to their welfare. Communication is one of the major driving forces of economic development in Nigeria since the inception of democratic governance in 1999. It is also expected to ensure better welfare in terms of creating opportunities for income generation and growth [38].

The percentage of women who had television was 27.6%. The percentage of women who own

radio is more because radios do use the battery in the absence of electricity. Lack of access to television limits the volume of information they receive, 67.8% of the women have mobile phones, more than having a radio which could help to improve their welfare status through information assessed. More than 80% of these women do not have productive assets like generator, refrigerator, car/truck which could improve their welfare. This is in line with [39] who claimed that, women's access to and control of productive assets are seriously constrained by various social, cultural, economic, political and psychological factors in the household. The percentage of women that had mobile phones was 67.8% implying that these women have mobile phones than they have a radio. The percentage of women that own fan is 19.6% and 16.7% own a generator. According to [40], owning these physical assets could enhance good health, peace of mind and high development that can enhance proper planning and improving household welfare (that is, making life comfortable during or after a tedious labour). Beyond women's physical welfare, productive assets play an important role in reducing deprivation [41]. In other words, greater access to productive assets can increase women's productivity in their various activities and translate to higher returns in the form of income and other measures of well-being [39].

**Table 2. Distribution of women by asset ownership across Geo-Political Zones (GPZs)**

<b>Assets</b>	<b>Percentage</b>
Radio	62.71
Television	27.57
Bicycle	24.64
Motorcycle/scooter	40.28
Mobile telephone	67.78
Watch	56.28
Fan	19.75
Electric iron	14.00
Animal drawn cart	7.62
Boat with a motor	1.18
Generator	16.73
Canoe	3.99
Computer	1.07
Air conditioner	0.55
Cable Television	4.24
Telephone line	1.96
Car or truck	5.09
Refrigerator	7.45
House	4.27
Land	5.95

*Source: Authors' computations, 2013 DHS data*

A larger percentage of women own motorcycle (40.3%) compared to those who own car (5.09%), this is probably because several state governments have, in the past few years, promoted access to motorcycles (popularly called okada) by granting them as loans to some community groups and members of certain political parties and also because of bad road network in the rural areas [38]. [42] found out that the construction or rehabilitation of rural road was the major key to rural development. This intervention may also potentially usher in public and private transport, for example by making it more profitable as well as feasible to supply transportation services on roads that were previously either non-existent or not easily passable for vehicles. Women with assets could have edge over others in the provision of basic needs and make investments in future generations through health care, education, and training, while those lacking assets are more vulnerable to poverty and less able to recover from periodic disasters.

The majority (94.1%) of the women do not own land, while 95.7% do not own house, and this is in consonance with Africa culture where women are not allowed to own land through empirical evidence indicates that access to land is positively associated with higher incomes [43]. However, land tends to be distributed unevenly between men and women with the former owning by far the largest share. [44], for example, find that in some Latin American countries the male share of owners of farm land ranges between 70 and 90%. Moreover, female land owners commonly possess less land than their male counterparts. Underlying factors causing this inequality include inheritance and land titling laws in favor of men [45]. Ownership of house can help women to obtain credit from the bank. In Nigeria, the customary and formal tenure systems have marginalised women rights (whether as daughters, sisters, wives and mothers) who now tend to have subordinate roles in relation to land [46]. Women farmers are forced to determine and derive their livelihood while operating within the customary tenure systems which are patriarchal and biased against them [47,48]. Land remains a key means of claiming identity as a full person throughout rural India [49]. [50] from the survey data in 2014, reported that it becomes apparent that insecure property rights are key areas that constrain women's autonomy in farming communities in the Eastern Gangetic Plains region.



#### 4.2 Level of Asset Ownership by Women

The categorization of women according to their levels of ownership of assets was based on responses to 20 items that represent different assets owned (Table 3). Thus, a composite score analysis was used to categorize asset ownership into three groups, as low, intermediate and high level. The mean score of ownership 3.8 with a standard deviation of 2.7. The high category was between 20-6.4 points, the intermediate category between 6.3-1.2 points while the lower category was between 1.1 -0 point.

As for the level of asset ownership by women, 63.8% of the women fall into the intermediate level, 20.3% were in the low level while 15.9% were in the high level. This implies that majority of the women in the study area were in the intermediate category of asset ownership. The mean value of 3.8 (approximately 4.0) implies that an average woman had about four assets out of a total of 20; they have a minimum of 0 and maximum of 17 assets. Assets can be seen as one of the major concerns of the first Sustainable Development Goals, which is to eradicate extreme poverty and hunger. Regarding the gender equality perspectives addressed by the fifth Sustainable Development Goals, the Organization for Economic Cooperation and Development [51] suggested considering asset ownership. In fact, the ownership of physical assets can decrease the probability of being monetarily poor [52]. Given that the poor in developing countries often experience income volatility, assets are helpful for smoothing consumption [53] and thus they are likely to capture more closely the permanent part of consumption for households or individuals [54, 55]. Therefore, according to [54] inadequate asset ownership could be considered to be a good proxy for chronic poverty. In theory, analysing the ownership of assets is an important way to explore inequality and gender inequality issues among household members.

#### 4.3 The Multidimensional Welfare Deprivation Index

Welfare deprivation is conceptualised as multidimensional and measured through the aggregation of the different welfare attributes (housing and sanitation characteristics, employment, health and nutrition, autonomy and education) experienced by an individual. In order to assess the deprivation status of women in

rural Nigeria, their average deprivation status was estimated. The multidimensional welfare deprivation index for all the women was obtained by aggregating it across dimensions and indicators. Table 4 shows the distribution of women based on their Deprivation Index (DI). The DI for rural women ranges from 0.0259 to 0.9999 with a mean value of  $0.5430 \pm 0.1999$ . Most of the women had their deprivation index between 0.3001-1.0000 (88.2%) while few had low deprivation index between 0.0000-0.3000 (11.8%). On the average, women in rural Nigeria are deprived; this is in line with studies using one-dimensional and multidimensional approach carried out in Nigeria [56] where women are believed to have low well-being which is synonymous with their high deprivation status. Using a multidimensional approach, the result is more pronounced with a larger number of women found to be worse off [7].

**Table 3. Level of asset ownership**

	Level of asset ownership		
	Low	Medium	High
Frequency	3837	12033	2999
Percentage	20.33	63.77	15.89

*Source: Authors' computations, 2013 DHS data*

#### 4.4 Decomposition across Dimensions

The contribution of each welfare dimension to women's deprivation is presented in Fig. 1. Among the five dimensions considered, housing and sanitation had the highest absolute and relative contributions of 0.2 and 39.5% and thus contribute the most to deprivation. This is because rural areas in Nigeria lack improved sanitation and housing characteristics [57].

**Table 4. Distribution of women by their deprivation status**

Deprivation index	Frequency (n=18869)	Percent
0.0000-0.3000	2229	11.82
0.3001-0.6000	9296	49.27
0.6001-1.0000	7343	38.93

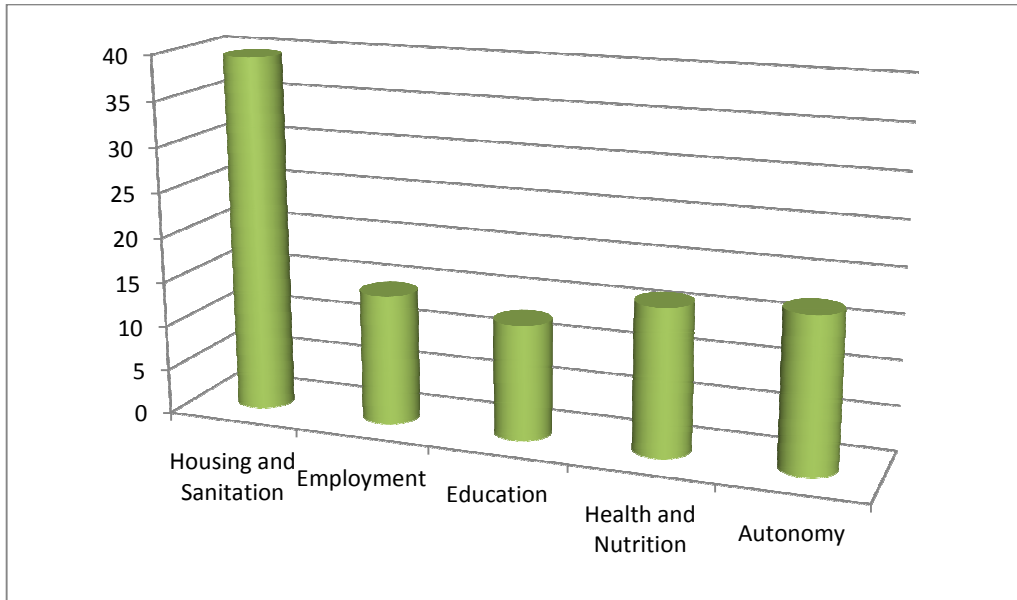
*Source: Authors' computations, 2013 DHS data*

This is followed by autonomy with 0.09 and 17.0%. Women are deprived of autonomy because culturally women do not have the right to make decisions; their husbands make decisions for them. This means that rural women are more deprived in these dimensions

compared to the other dimensions. Health and Nutrition's absolute and relative contributions to deprivation were 0.09 and 16.3% and for employment, its contributions to deprivation were between 0.08 and 14.5%.

The lowest absolute and relative contributions of 0.069% and 12.8% respectively are recorded in education, a dimension that contributes less to

deprivation. In descending order of contribution to welfare deprivation, the five dimensions considered are arranged as follows: housing and sanitation, autonomy, health and nutrition, employment, education. Fig. 1 shows these orderings. The Levene's test shows that the variances of multidimensional welfare deprivation indices across dimensions are significantly different ( $p= 0.0000$ ).



**Fig. 1. Contribution of different dimensions to the welfare deprivation of women in rural Nigeria**

\*x-axis: Welfare deprivation dimensions y-axis: Percentage relative contributions  
Source: Author's computations, 2013 DHS data



**Fig. 2. Map of Nigeria showing the six geopolitical zones**

Source: DHS, 2013

#### 4.5 Determine the Relationship between Asset Ownership and Welfare Deprivation of Women

This objective was examined using the IV Tobit regression. Asset ownership is at a cost i.e. time and other resources. It, therefore, becomes important to isolate the exogenous impact of the level of asset ownership on welfare deprivation. Hence asset ownership was treated as an endogenous regressor. The likelihood of this characteristic was examined with aid of IV Tobit regression. IV Tobit was used as against two-stage least square (2SLS) because of the censored nature of the dependent variable (deprivation index). In choosing appropriate instruments for the level of asset ownership, a partial correlation analysis was carried out and the result was presented in Table 5. The result of the correlation analysis revealed that all the instruments that were tested were statistically significant and all were used. The instruments were husband's occupation, husband's total years of education and husband's age. The estimates of the second stage regression with and without bootstrapped standard errors are presented in Table 6. The correlation between the errors of the two equations was statistically significant (The likelihood Ratio Test for  $H_0: \rho \neq 0$  gave a p-value of 0.0000), thus rejecting the hypothesis that the two dependent variables are not jointly determined. Hence justified the use of IV Tobit technique. However, the second stage regression with bootstrapped standard errors was discussed because they presented more legitimate standard errors. The likelihood function of IV Tobit was statistically significant (Wald  $\chi^2(12) = 4235.46$ , Prob>  $\chi^2 = 0.0000$ ) indicating the strong explanatory power of the model. The result of the wald test of exogeneity (at the bottom of Table 6) of the instrumented variable ( $\theta = 0$ ):  $\chi^2(1) = 78.74$  Prob> $\chi^2 = 0.0000$  was statistically significant at 1% level. Hence, the rejection of the null hypothesis of no endogeneity. That is the hypothesis that the level of asset ownership is exogenous is rejected at

1% level of significance, which also justifies the use of IV Tobit.

The deprivation index formed the dependent variable while 14 explanatory variables were considered in the model. Eleven variables were significant at various levels.

#### 4.6 Level of Asset Ownership

The coefficient of the level of asset ownership was negative and statistically significant at 1% ( $p < 0.01$ ), meaning that a unit increase in the level of asset ownership would bring about a 30.8% decrease in deprivation thereby improving their welfare. Implying that decrease in the level of asset ownership affects the welfare of women negatively. This shows that asset ownership plays a key role in reducing the welfare deprivation of women in rural Nigeria.

#### 4.7 Marital Status

The coefficients of women who are widowed and divorced were positive and statistically significant at 1% ( $p < 0.01$ ) and 5% ( $p < 0.05$ ). A unit change in the marital status of women in these categories would increase their deprivation index by 4.22% and 2.36% as against those that are married. Women who are widowed and divorced are the heads of their households and they have to take care of members of their families thus they have little or nothing left to take care of themselves

#### 4.8 Sex of Household Head

The coefficients of women in male-headed households were negative and statistically significant at 1% ( $p < 0.01$ ), therefore being a woman in male-headed household would decrease deprivation by 8.4%. This is in line with the findings of [31] and [7]. From their studies women in male-headed households had higher well-being compared to their counterparts in female-headed households.

**Table 5. Partial and semi-partial correlations of instrumental variables to level of asset ownership**

Variable	Partial correlation	Semi- partial correlation	Partial correlation2	Semi- partial correlation2	Significance value
Husbands' occupation	0.0326***	0.0309	0.0011	0.0010	0.0000
Total years of education	-0.1041***	-0.0991	0.0108	0.0098	0.0000
Husbands' age	0.0423***	0.0401	0.0018	0.0016	0.0000

Source: Author's computations, 2013 DHS data; Level of significance \*\*\* $p < 0.01$ (1%)

**Table 6. Effect of asset ownership on deprivation status of rural women**

Second stage variables	Dependent variable =deprivation index					
	Without bootstrap standard error			With bootstrap standard error		
	Coefficient	Standard error	Z stat	Coefficient	Standard error	Z stat
Age of women	-0.0126***	0.0012	-10.40	-0.0126***	0.0012	-10.57
Marital status (married)	0.0423***	0.0098	4.31			
Widowed				0.0423***	0.0109	3.88
Divorced	0.0237**	0.0097	2.44	0.0237**	0.0094	2.52
Sex of household head(b:Male) Female	-0.0837***	0.0072	-11.67	-0.0837***	0.0068	-12.37
Household size	0.0043***	0.0007	6.37	0.0043***	0.0006	6.74
Geopolitical zone(North cental) North east	0.0386***	0.0089	4.31	0.0386***	0.0082	4.70
North west	-0.0049	0.0078	-0.64	-0.0049	0.0072	-0.69
South east	-0.0498***	0.0089	-5.56	-0.0498***	0.0095	-5.22
South south	-0.0059	0.0069	-0.87	-0.0059	0.0069	-0.87
South west	-0.0694***	0.0071	-9.78	-0.0694***	0.0079	8.72
Level of Asset ownership	-0.3079***	0.0225	-13.65	-0.3079***	0.0199	-15.43
Constant	1.3356***	0.0484	27.58	1.3356***	0.0426	31.37
/alpha	0.2012***	0.0227	8.87	0.2012***	0.0203	9.92
/lns	-1.7859***	0.0051	-346.87	-1.7859***	0.0049	-359.89
/lnv	-0.5771***	0.0051	-112.08	-0.5771***	0.0050	-114.74
S	0.1676	0.0009		0.1676	0.0008	
V	0.5615	0.0029		0.5615	0.0028	

Wald test of exogeneity (/alpha =0):  $\chi^2(1) = 78.74$  Prob> $\chi^2 = 0.0000$

Source: Author's computations, 2013 DHS data

\*\*\* P<0.01 significant at 1%, \*\* P<0.05 significant at 5%, \* P<0.1 significant at 10%

#### 4.9 Household Size

For the household size, the coefficient was positive and statistically significant at 1% implying that a unit increase in household size brought about 0.43% increase in their deprivation as shown in Table 6.

#### 4.10 Geopolitical Zone

Also for the Geo-political zones, the coefficients of women in the North-East, South-East and South-West were statistically significant. For women in the North-East their coefficient was positive and significant at 1%. Thus being a woman in this zone will increase deprivation, this is in line with the result in Table 6 where women in the North-East are the second most deprived. For women in the South-East and South-West, their coefficients were negative and significant at 1%. Thus women in these zones are less deprived. This is also in line with the result in Table 6 where women in the South East are the least deprived and women in the South West are the second least deprived.

#### 5. CONCLUSION

The relationship between asset ownership and welfare deprivation was ascertained using IV Tobit regression analysis. Husband's age, occupation and husband's total years of education were used as instrumental variables for the level of asset ownership and the IV Tobit regression analysis result ascertained the bi-causality between asset ownership and welfare deprivation. Thus, asset ownership has a significant effect on women's welfare and is a key input in achieving improved welfare of rural women. Interventions should be put in place for women to own assets as this plays a key role in reducing their deprivation. Also, the Sustainable Development Goals (SDG) underscores the multidimensional nature of welfare deprivation as it dominates the goals set by the United Nations. The first SDG reflected the income dimension of welfare, to end poverty in all its forms everywhere from 2015-2030 while the other SDGs focused on non-income dimensions of well-being: education, health, access to water and sanitation. Reducing women's deprivation through the ownership of assets needs the contributions of both the public and private sectors of the economy and international partners, and also adequate social protection policies should be put in place in the country.

Therefore, the study provided empirical evidence on the extent of women's asset ownership and their deprivation status. This is geared towards proffering necessary intervention strategies to reducing the inherent deprivations experienced by women.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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