Gender Gap and Credit Use in Smallholder Agriculture in Nigeria

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Abstract: **This study engaged National Bureau of Statistics 2015 Generalised Household wave 3 data was to examine the determinants of gender gap on credit access and loan size using Heckman two-stage selection model and the work was supported by African Economic Research Consortium (AERC) Results of the analysis confirmed the existence of gender gap of 6 per cent in credit access in favour of male headed households and a significant gender gap of 529,000 Naira in average loan size. The coefficient of gender in the estimated Heckman model (0.696) indicated a gender gap biased against female headed households. Some measures of human capital like literacy rate, formal education and post primary education as well as measure of wealth such as ownership of livestock were significantly biased against female-headed households and these seriously constraints their access to and use of credit.**

Key Words: **Gender, Credit, Access, Smallholders, Households.**

I. INTRODUCTION

The role of women in achieving sustainable agricultural growth is becoming increasingly recognized given their critical roles in agricultural production. In Nigeria, women contribute 70 per cent of agricultural work force (AfDB, 2015) yet; they have greater difficulty than men in accessing resources such as land, agricultural inputs and other financial services such as credit which can help in increasing their efficiency and productivity. For example, Oseni *et al* (2015) observed that women productivity was 28 per cent less than men in the North of Nigeria though no significant gender difference was found in the South. The observed gender differential in the North was traced to structural effects leading to constraint access to credit and other financial services. Against this backdrop, productivity enhancement and economic empowerment of women who are predominantly smallholder farmers have become a logical priority of agricultural policies and programmes in the Nigeria.

Other empirical literatures that have confirmed the difficulties of women in gaining access to resources such as land, credit and other productive services in Nigeria include Adamon and Adeleke (2015) which have traced gender inequality in agricultural productivity in Nigeria and some other countries in Africa to structural disadvantage of female managers in land size, labour and credit input and other household's characteristics. Also, Jeiyol *et al* (2013) confirmed the existence of gender gap particularly in amount of credit (loan size) received among rural small scale farmers in Benue State, Nigeria as the average loan size was biased against small scale female farmers. While these problems persist, many questions have arisen in policy circle on the reasons for advocating for gender friendly policy in agriculture given the fact that both men and women generally face the same external constraints in Nigeria. Though this assertions could be true; however, the reality is that men and women have an unequal access to human-controlled factors. Demirguc-Kunt *et al.* (2013 and 2015) have observed the existence of a gender gap particularly in financial inclusion (such as credit access) even after controlling for a host of individual characteristics.

Studies such as Agbor (2004) and Oboh (2010) have emphasized importance of credit as an essential input in production and that productivity growth have been found to be usually hindered by limited access to credit facilities by smallholder farmers in Nigeria. However, these studies did not considered gender gaps and the resultant effects on productivity. For example, Fengxia *et al* (2010) observed that the capabilities of farmers and the use of production inputs cannot be fully employed under credit constraints while Quisumbing, and Pandolfelli (2010) found that inequality in the distribution of resources between men and women is linked with production inefficiency and the gender gap thus created hinder women's productivity and reduce their contributions to agricultural sector. The study by Adre *et al* (2013) also revealed evidence of gender gap in productivity due to access to production resources and suggested active policies that support women access and participation. Meanwhile, the need to promote gender inclusive credit and financial policies has been further underscored by Benerie *et al.* (2015) along the lines of human right and capabilities arguments which were used to established the importance of ensuring gender equality and hence, eliminating the gender gap in credit use.

Against this background, this study evaluated the gender dimension in credit access and use among smallholder farming households in Nigeria. The analytical framework follows the adoption of the two-stage Heckman selection model for the estimation of the determinants of credit access and use. The adoption of the Heckman model is to allow for correction of sample selection bias (Heckman, 1979). Towards this ends, this study established the existence of

gender gap in credit access as well as factors that determine credit access and use among small scale farmers in Nigeria.

II. THEORETICAL ARGUMENT FOR GENDER FINANCIAL INCLUSION

Literatures on the theoretical connect between gender and credit constraints are fast growing. However, the theoretical framework for gender financial inclusion (credit access and use) hinges on two major lines of arguments; the human right and capability arguments (Beneria *et al*, 2015 and Fanta and Kingstone, 2016).

The neoclassical theory for credit constraints presumed that both male and female smallholders face the same credit market and are confronted by the same degree of liquidity constraint (Feder, Lau *et al*, 1990; Singbo, 2012). This assertion is not always true and particularly in the case of Nigeria where empirical evidence have demonstrated that women farmers have limited access to credit and that even where credit is available, access requires collateral which is mainly land title to guarantee loans (Daniel, 2001; Okurut *et al*, 2005; Shultz, 2007; and Ogunlela and Muktar, 2009). The traditional land inheritance and ownership system in Nigeria mainly guaranteed male to inherit and take title to land. Since the smallholder female farmers are also poor to purchase land, the use of land as collateral further constraint their access to credit such that women typically receive less than 10 per cent of credit awarded to smallholders with very small loan size. Given the increasing participation of women in smallholder farming, there have been arguments to support gender inclusive agricultural credit and finance policy and these arguments have been established along two major lines in theory and these are the human right and capabilities arguments as put forward by Beneria *et al*, (2015).

The human right argument posits that women should enjoy equal access to financial services so that they have equal participation in social and economic activities while the capability argument emphasises the abilities of women in enhancing household welfare and hence reducing poverty as they manage resources better than men and this has been reported in a study by Pitt and Khandker (1998) where they found that microcredit has a larger effect on the behaviour of poor households in Bangladesh when women are the programme participants. The effect was captured in the form of a higher gain in annual household consumption expenditure for women compared to men. Similarly study by Swamy (2014) in India reported that women with access to microcredit experienced a higher income growth than men (8.40 per cent for women against 3.97 per cent for men). The study also reported that women use the resources in a manner that improves family well-being and contribute to significant increase in savings levels of the households. The financial inclusion of women also leads to their empowerment and as found by Pitt *et al*. (2006), where access to credit was found to lead women taking greater role in household decision making, having greater access to financial and economic resources, greater social networks, greater bargaining power vis-a -vis their husbands, as well as having greater freedom of mobility. This capability argument therefore, provided the drive for assessing gender gap in credit access and use among smallholder farmers in Nigeria.

III. EMPIRICAL LITERATURE

Several factors have been identified to influence household access to formal and informal credit facilities. These include household socio-economic characteristics, institutional factors, and production characteristics (Vaessen, 2001). At the household level, strength of borrowers 'previous business relationships, borrowers' reputation in the market, borrowers' acceptance of interlinked credit contracts, borrowers' debt-service capacity and borrowers' wealth status all influences a household's access to credit (Aleem, 1990) and smallholder households, with low levels of income and asset accumulation are often at high risk of default and are therefore less attractive to formal lenders such that, access to informal credit is limited to a small proportion of the population who can meet the stringent credit requirements (Okurut *et al.*, 2005) while low levels of collateral among the poor, to a great extent limit their access to financial instruments in the formal financial market (Daniel, 2001).

From the institutional perspective, the location of the lender and its conditions for credit allocation greatly influence the probability of access. Long distances and high transportation costs are major concerns which limit the poor rural household's access to formal financial services located in urban areas (Dallimore and Mgimeti (2003). The high costs of gathering information about poor rural households naturally impede financial markets from making contact with them (Schrieder, 2000). Besides, rural financial intermediation is expensive because participants are geographically scattered, financial transactions are small and rural incomes are often unstable. Formal lenders in the credit markets incur high costs in assessing the creditworthiness of small borrowers yet make low returns due to the small loan amounts involved. Despite copious literatures on the factors constraining access and use of credit, the gender dimension of the influence of these factors on credit access have not been widely exploited particularly in Nigeria. All though significant body of literatures exist in respect of gender inequality in access and use of credit specifically or in respect of gender and financial inclusion in general but these could be found mostly in developed countries of Asia and some part of sub-Saharan Africa. Some of these empirical literatures demonstrated that women farmers have limited access to credit and that even where credit is available, access requires collateral – either assets or reputation (land title or livestock) to guarantee loans such that women typically receive insignificant proportion of the credit awarded to smallholders.

In Nigeria, Shultz (2007) and Ogunlela and Muktar (2009) found that in spite of the prominent role of women in the agricultural sector their access to farm resources is limited by

cultural norms and values among others such that in most communities gender differentials in access to credit is often observed. They submitted that in agricultural production generally, women are more constrained than their men counterparts as a result of which most women have less access to information technology, inputs and credit. These studies also did not establish the gender gap in credit use and the influence of the constraining factors on the male and female farmers. Several other studies have identified reasons for poor credit access among rural farmers in Nigeria. Ololade and Olagunju, (2013) observed a significant relationship between farmer's sex, marital status, lack of guarantor, high interest rate and access to credit in Oyo State, Nigeria. A study by Ajagbe (2012) showed that farmer's age, membership of social group, value of asset, education and the nature of the credit market are the major determinants of access to credit and demand among rural farmers in Nigeria. In addition, Akpan *et al.,* (2013) reported that farmers' age, gender, farm size, membership of social organization, extension agent visits, distance from the borrower's (farmer) residence to lending source, years of formal education and household size are important determinants of access to credit among poultry farmers in Southern Nigeria. Most of these studies are location specific such that the results cannot be generalized for the whole country while no attention was paid to gender issues in credit access. Nevertheless, this study offered a very useful foundation upon which the current study seeks to build on.

IV. METHODOLOGY

Data Requirements

This study utilized secondary data collected by National Bureau of Statistics in a nationwide survey conducted under the Generalized Household Survey (GHS-LMS) wave 3 in 2015**.** The survey was conducted in two periods; pre and post planting season. The wave 3 survey covered a total 5000 households and data sets provided an ambient for analyzing the gender dimension of credit use in Nigeria. The data set covered household variables, farms and farming characteristics as well location information and community characteristics.

The household component captures the socio-economic as well as the demographic information at the household levels and covers such information as sex of household members, education status of household head, assets, food and non-food consumption expenditure pattern, and farm and non-farm enterprise income and so on. Individual level data on saving and insurance, household level data on credit history (loans received, loans pending, loans refusals) are also captured. The agriculture component covered farm level activities as well as other post-harvest activities undertaken by farming households including input use such as farm size, family and hired labour use, fertilizer use, seed variety as well as other financial inclusion variables such as credit use for agricultural purposes, credit use for other purposes, access to financial services, access to information, commodity prices and marketing of outputs.

Determinants of Credit Access and Use

Heckman Two Step Selection Model

In empirical literatures, many studies such as Dube *et al,*. (2015) and Kiplimo *et al.*, (2015) have examined the determinants of credit access by specifying equations which were estimated through either binary logit or probit model. Studies that have examined jointly the determinants of credit access and use, however, have specified a two part model. The two part model is specified such that the first part is usually a binary outcome equation which specified the probability of households having access to credit Pr (y >0) using the probit model while the second part uses linear regression to model the loan size E(*In*y/y>0) .The two parts could bear the same regressors if there is no obvious exclusion restriction or different regressors in case there is exclusion restriction. This Model eliminates the twin problem of *heteroskedasticity* and normality as it assumes that the two parts – the decision to access credit and the loan size secured –are independent. This is a potential restriction on the model and the result of the second stage regression therefore, suffer from selection bias. To address this problem therefore, this study adopted a selection model which considers the possibility of such bias by allowing for possible dependence in the two parts of the model and this is also known as type-2-tobit model by Cameron and Travedi (2009).

Model Specification and Assumptions

Let y* be the variable denoting the outcome of interest (Loan size) such that it is observed if y_2*>0. We can introduce a second variable, y_1*, and the outcome y_2* is observed if y_1* >0. In this study, y_1* determines whether an individual household have access to credit and y_2* determines the loan size and $y_1^* \neq y_2^*$

The two equation model compromise a selection equation for y_1, where:

$$y_1 = \{1 \text{ if } y_1^* > 0 \text{ and } 0 \text{ if } y_1^* \leq 0\} \quad (1)$$

And a resultant outcome equation for y_2, where:

$$y_2 > 0 \text{ if } y_1^* > 0 \quad (2)$$

That is y_2 is observed only when y_1* >0 and the linear version of the model with additive error is given as:

$$y_1^* = X'_1\beta_1 + \varepsilon_1 \text{ and } y_2^* = X'_2\beta_2 + \varepsilon_2 \quad (3)$$

With ε_1 and ε_2 possibly correlated. This tobit model is a case where $y_1^* = y_2^*$ and it is assumed that the correlated errors are jointly normally distributed and is can estimated through a method of maximum likelihood estimation (Cameron and Travedi, 2009). However, in order to achieve more robust estimates, a two-step estimation following the Heckman selection two stage regression model was adopted Using the Heckman selection model required that first, the probability of

households having access to credit be estimated. Then the estimation of determinants of access to credit is carried out while accounting for the possible presence of selection bias such that the problem of non-participation in credit scheme can be approached as an issue of sample selection bias (Heckman, 1979). Being able to borrow and the inability to borrow represent sub samples of the entire households. Sampling based on the categorisation of respondents into borrowers and non-borrowers can yield a non-random sample. For example, exclusion from borrowing and non-willingness to borrow can result in sample selection bias. In other words, those households who were able to access credit could be different from those who lacked access. Thus, Heckman devised a two-stage estimation method that yields consistent parameter estimates (Heckman, 1979). The Heckman's two-step method, therefore, treats the censored sample problem as a specification error and showed that it is possible to correct for the above problem by first estimating an omitted variable $i\lambda$. This omitted variable is consistently estimated as the inverse Mill's ratio (IMR) using a probit analysis.

Two-Step Estimation

The two-step is based on the conditional expectation

$$E\,(y_2/X,\ y_1^* > 0) = X'_2\beta_2 + \sigma_{12}\,\lambda(X'_1\beta_1) \qquad 4$$

Where;

$$\lambda\,(.) = \phi\,(.) / \Phi\,(.) \qquad 5$$

The motivation is such that:

$$y_2^* = X'_2\beta_2 + \varepsilon_2,\ E\,(y_2/X,\ y_1^* > 0) = E\,(\varepsilon_2 / y_1^* > 0) \qquad 6$$

And given normality of the errors;

$$E\,(\varepsilon_2 / y_1^* > 0) = \sigma_{12}\,\lambda(X'_1\beta_1) \qquad 7$$

The second term in equation 4 can be estimated by;

$$\lambda\,(X'_1\hat{\beta}_1) \qquad 8$$

Where $\hat{\beta}_1$ is obtained by probit regression of y_1 on X_1 and the OLS regression of y_2 on X_2 and the generated regressor, $\lambda\,(X'_1\hat{\beta}_1)$, called the inverse Mills'ratio or the non-selection hazard, yields a semi-parametric estimate of $(\beta_2\ ,\ \sigma_{12})$. The hypothesis of independence of ε_1 and ε_2 can be tested directly by using the coefficient of *lambda* from equation 4; this is the error covariance $\sigma_{12.}$ The standard errors of the two-step estimator may be larger than those of ML estimator. This is likely possible if $X_1 = X_2$ as would be the case when there are no exclusion restriction. As such, having exclusion restriction, so the $X_1 \neq X_2$ will reduce the collinearity problem. Therefore, in this study, the two-step Heckman selection regression with exclusion restriction approach was adopted. The analytical approach adopted in this study built on the earlier work of Benjamin *et al.*, (2015) and Fanta and Kingstone (2016).

Thus, the empirical model that was estimated in this study specified;

$$y_1^* = X_{11}\beta_{11} + X_{12}\beta_{12} + X_{13}\beta_{13} + \ldots + X_{18}\beta_{18} + \varepsilon_1 \qquad 9$$

Where y_1^* is a dummy variable representing household access to credit and $X_{11\ \ldots}X_{18}$ are the exogenous variables affecting y_1^*. Although y_1^* is unobservable, it can be observed if a household had access or not and $\beta_{11\ \ldots}\beta_{18}$ are the parameters to be estimated. In the data set, access to credit was measured by a binary response (Yes if the household access credit during the year and No if not). The exogenous variables used in estimating equation 9 can be categorized into three- the socio-economic characteristics of households, the farm characteristics and the institutional factors (Vaessen, 2001). Under the socio-economic characteristics four variables were used and these include; the age of the household heads as measures in years, the sex of the household which is a dummy variable (1 if household head is a male and 0 otherwise), the level of education (also a dummy measuring 1 if household head had post primary education and 0 otherwise), and secondary occupation which was also measured as dummy variable (1 if the household head have income generating secondary occupation and 0 otherwise). The farm characteristics consists of two variables; crop commercialization which is measure as dummy variable and assumed the value of 1 if the household offered part of the harvested crop for sale and 0 otherwise, and technology adoption which measured the planting of improved seed varieties by the household and assumed the value of 1 if the household planted improved seed varieties and 0 otherwise. The institutional factor is also captured by two variables which include access to extension services as measured by dummy which assumed 1 if the household received any extension services during the year and 0 otherwise and having a bank account. Since having a bank account used to be one of the pre- conditions for accessing formal credit, it thus appeared that this will create a potential endogeneity problem. Thus, this variable was captured by by substituting it with if the household head operated a bank account within the last six month prior to the survey (and was measured by a dummy variable 1 if Yes and 0 if No). This is particularly so since banks are always interested in the active account holders as a pre-condition for awarding loans. Though the choice and number of variables adopted in this model are by no mean exhaustive, the selected variables are based on what obtained in the theoretical and empirical literatures on factors determining access to credit (Vaessen, 2001; Duy et al, 2012; Ololade and Olagunju, 2013, Akpan et al, 2013 and Benjamin et al, 2015) and as captured by the available data set.

And similarly,

$$y_2^* = X_{21}\beta_{21} + X_{22}\beta_{22} + X_{23}\beta_{23} + \ldots + X_{26}\beta_{27} + \varepsilon_2 \qquad 10$$

Where y_2^* represent the loan size (log) received by each household as measured in Naira (N) and $X_{21\ \ldots}X_{27}$ are exogenous variables which determine the loan size while $\beta_{21\ \ldots}\beta_{27}$ are the estimated parameters. To implement model 10, three socio-economic, three farm characteristics and one institutional variable were employed. The socio-economic variables included sex of the household head measured by dummy (1 if household head is male and 0 otherwise),

household size as captured by the number of persons in the household and education type as measured in dummy representing 1 if household head had formal education and 0 otherwise. The farm characteristics variables include farm size measured in hectare of land cultivated by the household, crop commercialization also measured in dummy assuming the value of 1 if the household sold part of their crops and 0 otherwise and technology adoption which is also captured by a dummy and assumed the value of 1 if the household planted improved seed varieties and 0 otherwise. Cost of credit (transaction cost plus interest rate payment) was used as an institutional variable to capture amount paid on loan. Thus, the loan size equation was estimated with the variables that directly affect credit access but do not necessarily influence amount of loan received (Benjamin *et al*, 2015). These include age, access to extension, operate account in the last six month and having secondary income generating activitie

V. RESULTS AND DISCUSSIONS

Descriptive Analysis of variables

The descriptive analysis of the socio-economic, farm and institutional variables were carried out while the tests of difference of mean or proportion between male and female headed households were also determined and the results presented in Table 1 for the discrete variables

Table1. Test of Gender Differences in Mean of Discrete Variables

Variables	Male (n= 2,094)	Female (n= 564)	Difference	t-values
Mean Age (years)	52.378	62.211	(9.833)***	9.923
Mean household size (No)	8.238	4.957	3.280***	13.391
Mean farm size (ha)	5. 160	2. 102	2.454**	7.579
Mean loan size (N,000)	1248.08	719.30	529.77**	7.610
Mean distance to the market (km)	7. 69	5..264	2.905	1.669

Source: NBS GHS-Survey, 2015: *** significant at 1%; ** significant at 5% and figures in bracket are in favour of female smallholders

Gender differences were found to be significant for age, household size, farm size and loan size. It was not significant with respect to distance to the market. This is, however, not unexpected as both male and female headed households live within the same neighborhood. Apart from the fact that the difference in the mean loan size was significant, it indicated that male smallholders received twice more than the average loan size of their female counterparts. The reason could be traced to the fact that loan of higher magnitude require collateral such as land which in most cases can only be provided by men. The area of land cultivated by male smallholders was also more than double that of their female counterparts a situation that could be traced to limited access to and ownership of land by the female headed households. Land ownership is very important in smallholder farming as it determines the type of crops, the crop mix as well as other cultural practices engage by farmer.

With respect to the categorical variables presented in Table 2, most of the differences were in favour of male smallholders and were statistically significant. Only three of the variables; the use of informal savings, use of credit for farm purposes and the sale of crop (crop commercialization) were statistically significant in favour of female headed households. Measures of human capital such as literacy rate, proportion that received formal education and the proportion that had post primary education were biased against female-headed households and their test of differences were statistically significant. Ownership of livestock and having secondary income generating activities was also significantly biased against female headed households. The differential in access to extension agents was statistically significant in favour of male smallholders. Meanwhile, the differences in the practice of mixed cropping and the use of improved seed were in favour of female smallholders, they were, however, not statistically significant while the difference in credit access was biased in favour of male headed household but was also not significant

Table4.2. Test of Difference of Categorical Variables by Gender

Variable	Percentage of males (n=2, 094)	Percentage of females (n= 564)	Difference	Chi2 value
Marital status	95.69	93.82	1.87	1.3e+03
Literacy rate	72.30	29.19	43.11***	63.128
Formal Education	47.57	39.23	8.34*	5.243
Post pry Education	24.14	12.44	11.7***	14.531
Access to extension	16.68	5.74	10.94***	17.075
Access to credit Use irrigation	85.98 1.58	80.02 1.00	5.96 0.58*	0. 005 3.351
Cropping pattern	73.02	75.12	(2.10)	0.420
Own livestock	51.34	38.76	12.58***	11.876
Use of improved seed	13.46	13.86	(0.40)	0.028
Crop commercial	9.07	4.76	5.69***	8.917
Secondary income/activity	47.90	33.49	14.41***	15.662
Use informal savings	25.68	44.44	(18.76)***	32.782
Use of credit for farm purpose	46.96	59.51	(13.45)***	8.827

Source: NBS, GHS-LMS Survey 2015: *** significant at 1% ; ** significant at 5%; * significant at 10% and figure in bracket are in favour of female headed households

The two- step Heckman selection model was estimated for the determinants of credit access (equation 9) and the loan size (equation 10). The result of the determinants of credit access is presented in Table 3 and that of loan size in Table 4. The determinants of credit access indicated an increasing trend in access with male headed households though not significant which means that having access does not automatically

translate to getting loan. Age of household head does not exert significant influence on credit access an indication that there is no age barrier to access to credit in Nigeria. Factors that were found to have significant influence on credit access include the level of formal education of the household head. This is an indicator of human capital and very important factor in enhancing business transaction between the farming households and formal financial institutions. The variable was significantly biased against female headed households. The effect of secondary income generating activity by household head was also found to significantly influence credit access but the combination of farming with domestic activities limit the female headed farming households to further engage in other secondary income generating activities. The drive towards output commercialisation (i.e. offer crop for sale) was equally significant as this is likely to trigger the quest for seeking loan while technology adoption (i.e. planting improved seed varieties) and having access to extension services also affect credit access significantly. Farming households that planted improved seed varieties are usually classify as venturesome innovators and are likely to seek for credit while credit access is expected to improve with adequate information provision through the services of extension agents.

Table 3: Determinants of Credit Access

Variables	Coefficient	Standard error	Z	P>|z|
Credit Access				
Gender	1.108	0.807	1.37	0.315
Age of household head	0.003	0 .002	0.13	0.164
Education level	0.208***	0.065	3.18	0.001
Secondary income activity	0.144***	0.051	2.78	0.006
Output commercialization	0.221***	0.051	2.78	0.000
Improved seeds (tech. adoption)	0.282***	0.088	3.20	0.001
Access to extension services	0.195***	0.066	2.95	0.000
Constant	-1.091	0.158	-6.88	0.000
Mill_ lambda | (iλ)	-1.829***	0.550	-3.32	0.001

Source: NBS, GHS-LMS Survey 2015

LR test of indep. of eqns.(rh=0). Chi2 (1) = 52.57. Prob > Chi2 = 0.000

Number of obs = 2063; Censored obs = 1683; Uncensored obs = 380 ; Wald chi2(7) = 38.83; Log likelihood = -1546.703 ; Prob > chi2 = 0.0000 *** significant at 1% ; ** significant at 5%; * significant at 10%

In the outcome equation, gender along with four other variables such as cost of credit, household size and formal education by household head were significant determinants of loan size. The significance of gender further confirmed the result of the descriptive analysis that loan size greatly gender constrained. The descriptive statistics of average loan size was significantly biased against female-headed household. The major problem could be traced to the limitation on the part of female headed household to mobilise the required collateral for them to be granted high volume loan such that they are faced with the available option of small and non-collaterised loan. Large household size pose the benefit of availability of family labour with the potential to increase farm size and output of smallholder farming household and this will invariably enhance the drive by the household to seek for high volume loan in order to procure other necessary inputs. The cost of credit is also significant factor. This is estimated as the interest paid on loan plus other associated cost (administrative and other transaction cost). High cost of credit reduces the capacity of farming household to seek for high volume loan. Other significant factor is education of the household head which has been shown to be biased against female headed households.

Farm size, crop commercialisation and technology adoption were not statistically significant. The non-significant of farm size can be understandable since all the farmers are smallholders with an average area of less than five hectares. The adoption of improved technology is expected to induce higher production cost thereby leading to increasing need for capital injection and higher demand for credit but in the case of smallholders in Nigeria, technology adoption was very low (average 13%) and could not exert significant influence on loan size. Though a sizeable proportion of the farmers commercialized their output, the proportion of the output offered for sale was very insignificant and therefore, could not exert any significant influence on loan size. The significance of the LR test confirmed the fitness of the model while the significance of the inverse Mill's ratio (iλ) indicated the presence of selection bias. Also, the significance of lambda confirmed the hypothesis of independence of ε_1 and ε_2.

Table 4: Determinants of Credit Use (Loan Size)

Variables	Coefficient	Standard error	Z	P>|z|
Gender	0.696***	0.259	2.69	0.007
Cost of credit (Interest and other cost)	0.008***	0.003	2.68	0.007
Household size	0.047***	0.018	2.60	0.009
Formal Education	0.405***	0.077	3.08	0.002
Farm size	0.007	0.093	0.09	0.927
Output commercialization	0.112	0.184	0.61	0.543
Improved seeds	0.144	0.208	0.70	0.487
Constant	11.504	0.363	31.66	0.000
rho	-0.922	0.022	41.90	0.000
sigma	2.036	0.143	14.23	0.000
Lambda	-1.878	0.172	10.91	0.000

Source: NBS, GHS-LMS Survey 2015

LR test of independence of eqns.(rh=0). Chi2 (1) = 52.57. Prob > Chi2 = 0.000 Number of obs = 2063; Censored obs = 1683; Uncensored obs = 380 ; Wald chi2(7) = 38.83; Log likelihood = -1546.703 ; Prob > chi2 = 0.0000 *** significant at 1% ; ** significant at 5%; * significant at 10%

TC = transaction cost

VI. CONCLUSION

The study critically examined gender gap in credit access and use as well as their determinants among smallholder farmers in Nigeria. The results indicated the existence of gender gap of 6 per cent in credit access and a significant gender gap of (N529, 000) in average loan size in favour of male headed households. Descriptive analysis revealed that male headed households received twice average loan size of their female counterparts. Socio-economic analysis of gender gap for most measures of human capital development such as literacy rate, access to formal education, having post primary education and access to extension services were significantly biased against female-headed households. All these factors were found to be major and significant determinants of credit access and loan size in the two-stage Heckman model analysis. Though the use of critical efficiency induced inputs such as fertilizer and improved seeds were found to be generally sub-optimum, gender gap analysis confirmed that it was biased against female-headed households. This may not be unconnected with the gender gap biased in average loan size. Nevertheless, evidence revealed that gender gap in the use of credit for farm purpose was significantly biased in favour of female headed households.

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