



Research article

Causal nexus between agricultural credit rationing and repayment performance: A two-stage Tobit regression

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Abstract: The probability that the beneficiary would default on future payments poses a great risk to extending agricultural credit. Also, previous research on farmers' repayment of agricultural credit emphasized that a high default rate is a growing concern, thereby becoming a tall order for financial institutions to lend to farmers. Similarly, past studies accentuate an increasing focus on socio-economic characteristics as factors that explain the repayment rate. The nexus between repayment rates and credit rationing has not been well analyzed. The effect of credit rationing on repayment rate was therefore investigated. The study, therefore, investigates the causal effects of credit rationing on loan repayment performance using a structured questionnaire to elicit information from selected 240 respondents via a three-stage method of sampling technique, and the instrumental variable Tobit technique to analyze the effect of credit rationing on repayment performance. The result showed that the majority (70.83%) of the respondents are males, the mean age was 51 years with an average education year of 12.65. The result of instrumental variable Tobit regression confirmed the endogeneity of rationing rate (Wald test of exogeneity = Wald Chi2 (1) = 67.26; Prob > chi2 = 0.000) at a 1% level of statistical significance. The result with a Log-likelihood function (265.62459) revealed that the ration rate, among others, with coefficients of 0.4335, was a crucial factor in ascertaining the rate of repayment at various significant levels of the arable crop farmers in the research area. The key finding is that credit rationing did have a significantly positive influence on agricultural credit repayment. The research concluded that the significance of credit rationing in influencing the likelihood of repayment rate, points to the vital significance of adequacy in rationing borrowers.

Keywords: agricultural credit; credit repayment; credit rationing; endogeneity; Tobit regression; productivity

1. Introduction

In boosting the agricultural development of a country, agricultural credit for farmers plays a major and vital role in promoting productivity [1] in both the short and long terms. It is a global belief that investing in agricultural enterprises through the provision of microcredit will continue to be seen as a potential means for improving the income of farmers. Agricultural or farm credit is defined as a vital input needed by farmers for establishing and expanding their farms with the target of enhancing food adequacy, increasing agricultural production, advancing national and household income, as well as augmenting each borrower's competence to pay back the borrowed funds. Credit is a veritable tool that grants farmers the driving forces to gainfully utilize fixed capital, working capital, and consumption goods [2].

The need for agricultural credit among farmers cannot be exaggerated [3,4], as it enables the establishment and expansion of their farms. The Nigerian Agricultural and Cooperative Bank was incorporated alongside other banks in 1999 to facilitate agricultural production and became an integrated banking structure called the Nigerian Agricultural Cooperative and Rural Development Bank (NACRB). It was intended to accept loans for marketing, distribution, and storage of agricultural commodities associated with such products to a state, collection of states or related institutions for lending to farmers, groups of agricultural practitioners, or business entities subject to the state or collection of states or related institutions assuring loan repayment. In October 2010, the bank took up the new name Bank of Agriculture Limited (BOA), following the rebranding of NACRB to give a reflection on its institutional change programme.

However, with these revived interests in enhancing the status of farmers through credit provision, a crucial issue that has popped up is the subject of credit repayment. Major problems confronting these agricultural loan projects, regardless of the funding channel, are low rates of credit retrieval and patronage. The primary outcome of default in paying back agricultural credit is that it diminishes the viability and vitality of credit or financial organizations. [5] stressed that if the impediments pertaining to the repayment of loans are eradicated, the resolution of the government to foster massive involvement of agricultural practitioners in credit plans is inclined to bear eligible outcomes. There is no agricultural credit available outside a few cost implications. Certain elements are taken into consideration prior to being accessible to the beneficiary, and one of those factors is the beneficiary's aptitude to pay back the borrowed fund, which in turn is having several other determinant factors. According to empirical studies on credit repayment, its performance could be persuaded by a multitude of factors including rate of interest, fluctuating prices of farm produce, and the social affinity and obligations of the borrowers. While several other elements abound, [5] revealed that institutional (lending institutions) factors such as the cost of obtaining a loan, disbursement lag, loan size, and supervision among many others, could significantly assist in boosting the repayment attitude of farmers [6]. The concerns of repayment of a loan that has a collateral bearing on the rate of default should be properly managed to evade misery and a feeble foundation for the establishment of fiscal institutions. One of the impediments to the Nigerian agricultural sector growth that has been carefully noticed is the non-repayment of agricultural credit, as it weakens the readiness of financial institutions to heighten the funding sector.

According to Ugbajah [7], the availability of loans to peasant farmers poses a big problem. This is due to the rate at which defaulting cases among small farmers increase. This is often owned to factors like lack of bankable security, high administrative costs, and the high risks perceived to be connected with agricultural practices and small-scale farmers [8].

1.1. Credit markets and rationing

The credit market varies from the recognized markets for goods and services in two relevant ways. The first variations, as shown by the classical competitive theory, exists based on the fact that in recognized or rather standard markets, buying and selling a homogenous product involves many agents. The second dissimilarity dwells on the fact that the handing over of goods or services and their payment occur concurrently in such markets. Contrastingly, credit acquired currently by one person is used in exchange for an assurance of future repayment. Stiglitz (as cited in Abafita, [9]) opined that since promises vary individually, and are oftentimes broken, there is possibly no actual proof of ascertaining that an agreement will not be violated, implying that, moral hazard and contrary selection could determine the probability that the promise is upheld and hence that of loan repayment.

Since lenders cannot directly influence all decisions made by their borrowers, the condition of the loan contract is formulated in a manner that influences the beneficiary to behave for the benefit of the lender [5]. Due to this, the gain the lender looks forward to may move up less speedily than the interest rate, and farther than a level may assume declination. The demand for credit transcends the loan supply at such a rate of interest when the anticipated profit to the lender begins to decline. The lender would not give out a loan to a person who proposes a higher interest rate because its anticipated return is lesser. Therefore, there is an absence of competitive forces to equate supply with demand; and credit is rationed.

Credit rationing is widely explained as a condition where the loan demand exceeds the loan supply at the existing interest rate. In the literature, various forms of credit rationing were examined by [2] viewed via the viewpoint of the size of loan in which borrowers access a smaller loan amount than requested at a known loan rate. Also, 4 types of credit rationing: Quantity, Transaction cost, Price, and Risk rationing as mentioned in Figure 1 of Anh et al. [10]. Jaffe and Stiglitz (as cited in Abafita, [9]) further widened the classification by identifying three types of credit rationing. Firstly, it is a condition where a borrower obtains a loan of a lesser amount than wanted or requested. Secondly, it is a situation where a borrower is unable to borrow at the interest rate considered inappropriate based on the perception of their default likelihood. Lastly, it is a condition in which a borrower is denied credit when a lender perceives being unable to achieve the expected return regardless of the interest rate. The concept that this research considered is the type one of credit rationing.

1.2. Justification

Accordingly, many loan projects of agricultural credit organizations have broken down because of vast loan repayment arrears [11]. A low rate of credit recovery, such as is observed in many agricultural credit schemes, does not augur well for agricultural financing and likewise for lending institutions. Poor agricultural credit recovery rate generates caution in lending to the sector, and this has adversely affected the on-lending programme of several credit institutions. In Nigeria, the acclaimed importance of agricultural credit in improving the sector as well as affecting the economy positively has more than enough challenges. [12] affirmed that the acquisition, management, and

repayment of agricultural credit in Nigeria have been burdened with numerous challenges.

There is no uncertainty that in contemporary times, significant interest has been shown by researchers to look into the problems of agricultural credit repayment among farmers as well as its determinants. However, previous research efforts emphasized certain institutional characteristics such as collateral, cost of credit or rather rate of interest, and disbursement lag, among other several factors. Studies on the influence of loan rationing, as part of institutional characteristics on credit repayment, are scanty. Even rarer in previous work is the attempt to address the endogeneity problem of loan rationing when estimating factors determining credit repayment. For instance, Firafis, [13] examined credit rationing and repayment performance using a binary logit model. However, this study employed the Instrumental Variables (IV) regression method in examining the effect of credit rationing on repayment performance. This approach is more suitable due to its ability to control for the endogeneity of credit rationing in the model, thus eliminating the biasedness of the Ordinary Least Squares (OLS) method.

Viewing from this backdrop, it is perceived that it is a necessity to examine the effect of agricultural credit rationing on repayment performance while controlling for the endogeneity of credit rationing using the two-stage Tobit regression approach.

1.3. Theoretical background

Extant studies have considered both the impact of agricultural credit on agricultural productivity [14] and how repayment rate can be affected by degree of loan rationing, group size, size of loans, and disbursement lag, among others [4,11,15–19] examined the impact of socio-demographic and loan-related variables using Tobit regression and confirmed the significant effect of land size, experience, income and contact with extension agents on loan repayment rate. [20] have illustrated that “education level, marital status, nationality, employment status, and business activity sector have a significant impact on borrowers’ repayment performance”. [21] asserted that the loan amount, purpose of the loan, marital status, education, and monthly income have effect which is significant on the probability of increasing the welfare of borrowers once they receive microcredit. [22] in their work, touched on the fact that borrowers’ loan size is being impacted by the cost of microfinance intermediation and recommended that to reduce cost, big loans should be extended to clients having a longer loan experience, high income, lower informal borrowings, assets, and land size.

More importantly is the work of [23] that investigated the effect of some variables such as gender, education, loan size, and training and/or a number of visits on repayment, and concluded a positive significance of education, employment, and high potential cash flow streams on repayment rate. In another related study, [24] asserted that training/professional experience has some positive impact. In a similar study, [25], indicated that a higher income decreases the probability of default in repayment. [26] observed that socio-demographic and loan-related factors can determine whether a borrower would repay a microcredit. It specifically indicated the positive significance of age, experience, amount of credit, and education on repayment performance.

2. Materials and methods

2.1. Area of Research

The research was conducted in Osun State, south-western Nigeria. The State has thirty (30) Local

Government Areas (LGAs) and is parted into three agricultural zones, namely: Iwo agricultural zone, Osogbo agricultural zone, and Ife/Ijesha agricultural zone. The LGAs covered in this study are enriched with agro-climatic and soil-type factors suitable for cultivating arable crops such as cassava, maize, yam, potato, and diver vegetables.

2.2. Source and type of data

The research utilized primary data gathered using a well-designed questionnaire that captured both socio-economic and farm features of arable crop farmers. These consist of age, household size, sex, years of education, farming experience, farm size, and some other relevant information on agricultural credit.

2.3. The population of the study

The population for this study was farmers' cooperative groups who obtained farm credit support from the Quick Impact Intervention Programme (QIIP), out of which farmers who cultivate arable crops were selected. The farmers' cooperative groups that cultivated arable crops and benefitted from QIIP credit support were 205 cooperative groups, 50 groups were selected for the study.

2.4. Sampling procedure and sample size

A three-stage sampling technique was used for this research. Firstly, five Local Government Areas (LGAs) noted for the highest number of arable crop farmers' and the cooperative groups who participated in the credit support scheme as recorded by QIIP were purposively selected. The selected LGAs are: Osogbo (47), Iwo (30), Ede North (27), Egbedore (23), and Ayedaade (20). Secondly, farmers' cooperative groups were randomly selected based on the proportion of the cooperative groups in each local government area. Using a proportionate-to-size sampling, 16 groups were randomly selected in Osogbo LGA, 10 groups in Iwo LGA, 9 groups in Ede-North LGA, 8 groups in Egbedore LGA, and 7 groups in Ayedaade LGA. Finally, 5 respondents were randomly sampled in each of the selected groups in the 5 LGAs to arrive at a total of 250 respondents.

It should, however, be noted that only two hundred and forty (240) copies of the questionnaire were used in the analyses. Inadequate information and inconsistency necessitated the rejection of others.

2.5. Instrumental variable Tobit regression analysis

Agricultural credit repayment or rather repayment performance of farmers has been diversely studied and reported in the literature, but there is very little evidence of a possible endogeneity of loan rationing and its influence on repayment performance. The problem of endogeneity encountered in studying the influence of loan rationing on agricultural credit repayment performance is outlined. Thus, following [27], and Ben [28], the recommended approach to deal with the problem of endogeneity in any econometric model is through instrumental variable techniques. Instrumental variable Tobit regression (ivtobit) fits models with censored dependent variables as well as endogenous covariates. It is used to fit a Tobit model when it is suspected that there is a correlation between the error term and one or more of the covariates.

Formally, the model is:

$$Y^*_{1i} = Y_{2i}\beta + X_{1i}\gamma + u_i \quad (1)$$

$$Y_{2i} = X_{1i}\Pi_1 + X_{2i}\Pi_2 + v_i \quad (2)$$

Where: $i = 1, \dots, N$; $Y_{2i} = 1 \times p$ vector of endogenous variables; $X_{1i} = 1 \times k_1$ vector of exogenous variables; $X_{2i} = 1 \times k_2$ vector of additional instruments; β and γ = vectors of structural parameters; and Π_1 and Π_2 = matrices of reduced-form parameters; Y^*_{1i} is unobserved.

The log likelihood is of the form:

$$\ln L_i = w_i \{ \ln f(Y_{1i}|Y_{2i}, X_i) + \ln f(Y_{2i}|X_i) \} \quad (3)$$

Where w_i is for observation “in” or one if no weight specifications were made.

2.5.1. Model specification

In analyzing the effect of credit rationing on repayment performance, the specification for the instrumental variable tobit model is specified as:

$$\text{RPYMNT}(Y) = \beta_0 + \beta_1 \text{SEX} + \beta_2 \text{EDUC} + \beta_3 \text{HHS} + \beta_4 \text{FARMEXP} + \beta_5 \text{AMTGRANTED} + \beta_6 \text{COC} + \beta_7 \text{DBMTLAG} + \beta_8 \text{NFI} + \beta_9 \text{VST} + \beta_{10} \text{RATION} + \ell \quad (4)$$

Where: $\text{RPYMNT}(Y)$ = Repayment rate (proportion of loan repaid as at when due) explained as Amount repaid/Total amount of loans obtained; SEX = Sex of the beneficiary (male = 1, and female = 0); EDUC = Education (years); HHS = Household size (Numbers); FRMEXP = Farming experience (years); AMTGRANTED = Amount granted (Naira); COC = Cost of credit (percent); DBMTLAG = Disbursement lag (days); NFI = Net farm income (Naira); VST = Number of visits by QIIP officials (number); RATION = Rationing rate; ℓ = Error term.

However, it is supposed that the ration rate is endogenous to the repayment rate, and failure to control for the problem of endogeneity leads to biased parameter estimates. An instrumental variables approach was therefore used to account for the possibility that the rationing rate is endogenous to repayment performance. The study assessed the validity of the instruments and then used age, farm size, previous farm income, saving habits, and extension services as the instruments for rationing rates. Based on this thought, the empirical model is given as:

$$\text{RATION}(Y) = \beta_0 + \beta_1 \text{AGE} + \beta_2 \text{FRMSIZE} + \beta_3 \text{PREVINC} + \beta_4 \text{SAV} + \beta_5 \text{EXT} + \ell \quad (5)$$

Where: $\text{RATION}(Y)$ = Ration rate (proportion of loan sized ration) defined as $1 - (\text{Amount granted}/\text{Amount requested})$ or 0 otherwise; AGE = Age of the farmer (years); FRMSIZE = Farm size (hectares); PREVINC = Previous Income of the farmers in the previous season (Naira); SAV = Saving habit (Yes = 1, otherwise = 0); EXT = Extension (Yes = 1, otherwise = 0); ℓ = Error term.

3. Results and discussion

3.1. Socio-economic characteristics

As shown by the results in Table 1, male farmers accounted for 70.83 percent, while the remaining

29.17% were females, implying that men engaged more in farming practices than women in the study area.

The influence of age in conventional agriculture is relevant in two suppositions. The first is higher productivity, whereas the second is concerned with a better adoption level of innovations. Aged farmers are probably to be more conservative and fortify themselves to the unresistant influence of change engaging young farmers. The average age was 51.05 years which indicates that farmers are beyond their economic active or productive age. The result corresponds to the findings of Afolabi [29] who had earlier reported that age groups above 50 years are beyond their economic active or productive age.

The importance of education in agriculture cannot be overemphasized, since the years of education of a farmer are not only important for increased productivity but also positively affect the adoption of new agricultural techniques and likewise enhances the ability to understand and evaluate new production techniques. The level of literacy among the sampled farmers contained in the study is high with an average education year of 12.65 as shown in Table 1.

Table 1. Socio-economic characteristics of the beneficiaries.

Characteristics	Frequency	Percentage (%)
Age (Years)		
<40	29	12.08
40–50	86	35.83
51–60	89	37.08
>60	36	15
Total	240	100
Average age = 51.05		
Std. Dev = 9.14		
Sex		
Female	70	29.17
Male	170	70.83
Total	240	100
Education Years		
6	32	13.33
7–12	72	30
13–17	129	53.75
>17	7	2.92
Total	100	100
Average = 12.65		
Std. Dev = 3.57		
Household size		
3–5	113	47.08
6–8	127	52.92
Total	100	100
Std. Dev = 1.22		
Average = 6		

Source: Field Survey, 2016.

From the results in Table 1, the majority (52.92%) of the beneficiaries have a household size of six to eight. This implies that a higher percentage of the respondents have household sizes that have

the chance of raising their total expenses. On the other hand, bigger households could function as a labour source which could increase the output of the farmers, reduce cost, and hence increase the income level. However, engagement in farm work depends on the age structure of household members. The average household size stood at approximately 6 persons per household during the study. [17] accounted for an average farming household size of 7 persons in their study area.

The number of years spent in farming practices could indicate the knowledge and technical ideas on how to tackle farm production problems. Farmers with more years of farming experience may achieve efficiency via trial and error. As revealed in Table 2, the sampled beneficiaries have gained the necessary experience needed in arable crop production with an average year of 22.35.

3.2. Instrumental variable Tobit Regression results in credit rationing on repayment performance

Table 3 presents the second-stage results of the instrumented variable Tobit model. A total of 10 exogenous variables were considered in the econometric model, of which 7 were statistically significant at various levels. The significant variables are ration rate, farm experience, household size, the amount granted, disbursement lag, cost of credit, and net farm income. The variables used as instruments for ration rate were age, farm size, previous farm income, extension, service access, and saving habits. The Wald chi-square of 139.69 with a p-value of 0.0000 reveals the model fitness, and it has a log-likelihood of 265.62459.

The result of the Wald test of exogeneity of the instrumented variable with $\chi^2(1) = 67.26$ and $\text{Prob} > \chi^2 = 0.0000$ was statistically significant and at 1% level of significance. This goes on to suggest that the null hypothesis that the rationing rate is exogenous in the repayment performance equation is rejected at a 1% significant level. Thus, justifies the use of instrumental variable Tobit (ivtobit) regression.

Table 2. Descriptive for years of farming experience and rationed borrowers.

Characteristics	Frequency	Percentage (%)
Farm experience years		
<5	5	2.08
5–15	70	29.17
16–25	77	32.08
26–35	53	22.08
>35	35	14.58
Average = 22.35		
Std. Dev = 10.72		
Total	240	100
Loan Ration		
Non-rationed beneficiaries	62	25.83
Rationed beneficiaries	178	74.17
Total	240	100

Source: Field survey, 2016.

The coefficient for ration rate was positive and at 1% level of statistical significance. The result implies that increasing the rationing rate by one percent raises the likelihood of higher repayment

performance by 0.4335 among the sampled crop farmers in the research area. This suggests that rationing agricultural credit beneficiaries effectively and extending adequate loan size as per their credit needs enables the farmers to put the credit to effective use, curbs misappropriating credit, and hence ups the repayment performance of the sampled beneficiaries. The result agrees with the discovery of Firafis [13] who found that credit rationing positively influences loan repayment performance.

Household size has a negative effect on the repayment performance of the arable crop farmers in the study area and is statistically significant at the 5% level of significance. Increasing the size of farmers' households by one person decreased the likelihood of credit being repaid by 0.0163. The household size coefficient conforms with *a priori* expectation in that a larger household size probably increased the financial obligations of the sampled farmers in the research area. Hence, the responsibility imposed by a larger household size was probable to compress the agricultural resources from which loan repayment could be made. The result corroborates with the findings of Afolabi [29] and [5,30] who in their separate studies discovered that household size has a negative impact on farmers' repayment performance in their respective study areas.

Moreover, the variable years of farming experience of the sampled arable crop farmers conform to the *a priori* expectation that the more experienced farmers have played a vital role in enhancing their farming activities and practices, which can raise their income level and hence credit repayment performance. The result in Table 3 shows that farming experience influences the repayment rate positively at the 5% level of statistical significance. This depicts that increasing years of farming experience by year raises the likelihood of credit repayment by 0.0025 among the sampled arable crop farmers in the research area. This confirmed the findings of Afolabi [29] in his study "analysis of loan repayment among small-scale farmers in Oyo State, Nigeria".

Amount granted significantly influenced the repayment rate positively at 1% level of statistical significance. An increase in the amount granted by one Nigeria naira increased the likelihood of repayment rate by $1.61e-06$ among the sampled arable crop farmers in the research area. This connotes that the bigger the loan size, the more money the farmers have to invest in farming activities, which could as well lead to higher chances of adopting advanced technology which could heighten the income capacity generation of the farmers, and hence lead to more loans being repaid. A similar positive influence of the amount granted on repayment performance was reported by Ojiako and Ogbukwa [30].

The cost of credit significantly influenced the repayment rate negatively at the 1% level of statistical significance. As shown by the results in Table 3, an increase in the cost of credit by one unit decreased the likelihood of repayment rate by $-1.18e-09$ among the sampled respondents in the study area. The negative sign conforms to *a priori* expectation in that the higher cost of the loan will reduce the repayment rate of borrowers. The result corroborates those of [31]; and [30]; who in their separate studies found that the cost of loans impacted negatively farmers' loan repayment performance in their study area.

The variable disbursement lag had a negative effect on the repayment rate at 1% percent level of statistical significance. The estimates in Table 3 show that an increase in the cost of credit reduced the likelihood of repayment rate by 0.0045 among the sampled arable crop farmers in the study area. This goes on to buttress the fact that farm operations, as well as agricultural production, are time-bound, and if loans meant for agricultural production are not disbursed timely and delayed beyond the critical production period, such will be irrelevant for production and underutilized, thus stimulating a low repayment rate. The result is in agreement with the findings of Oke *et al.*, [32] who in their study discovered that disbursement lag impacted the repayment rate negatively.

Meeting *a priori* net farm income influenced the repayment rate positively at 5% level of

statistical significance. An increase in net farm income by one Nigeria naira increased the likelihood of higher repayment rates by $1.29e-07$ among the sampled farmers in the study area. This implies that farmers who earn better income from their farm products give more consideration to loan repayment. The results buttress the findings of [33] who in their study found that the net farm income of farmers impacted the repayment performance positively.

Table 3. Second stage result of instrumental variable Tobit parameter estimates of the effects of rationing on repayment rate.

Variables	Coefficient	Robust std. error	z-stat	P > z
Rationing rate	0.4335***	0.0444	9.76	0.000
Sex	0.0183	0.0234	0.78	0.434
Education years	0.0034	0.0026	1.33	0.184
Household size	-0.0163*	0.0085	-1.92	0.055
Farm experience	0.0025**	0.0012	2.01	0.044
Amount granted	$1.61e-06$ ***	$2.84e-07$	5.65	0.000
Cost of credit	$-1.18e-09$ ***	$3.41e-10$	-3.47	0.001
Disbursement lag	-0.0045***	0.0008	-5.81	0.000
Net farm income	$1.29e-07$ **	$5.66e-08$	2.27	0.023
Supervision	0.0073	0.0167	0.44	0.663
Constant	0.2817	0.0846	3.33	0.001

Source: Field survey, 2016. ***, ** and * significant at 0.01, 0.05, and 0.1 levels, respectively. Wald chi2 (9) = 139.69; Prob > chi2 = 0.0000; Log likelihood = 265.62459; Wald test of exogeneity of instrumented variables (corr = 0): chi2 (1) = 67.26; Prob > chi2 = 0.0000. Instrumented: Rationing rate.

The elasticity decomposition of the value expected for credit repayment for QIIP in the area of study is revealed in Table 4, The estimated elasticities from the model revealed that the marginal alteration in diver characteristics raises the expected value of credit repaid more than it increases the probability for credit repayment.

Table 4. Elasticity of repayment rate.

Variables	Probability of loan repayment	Expected value of repayment rate	Total Elasticity
Rationing rate	0.0004	0.0050**	0.0054
Sex	0.0000	0.0001	0.0001
Education years	$7.37e-06$	0.0001	7.3705
Household size	-0.0001	-0.0009***	-0.001
Farm experience	0.0000	0.0001**	0.0001
Amount granted	$2.83e-09$	$3.35e-08$ **	6.1817
Cost of credit	$-3.22e-12$	$-3.81e-11$	-7.0323
Disbursement lag	-0.0000	-0.0002***	-0.0002
Net farm income	$5.58e-10$	$6.60e-09$	12.1819
Supervision	0.0000	0.0003	0.0003

Source: Field survey, 2016. ***, ** and * significant at 0.01, 0.05, and 0.1 levels, respectively.

4. Conclusions

Justifying the notion that credit rationing rate should not be an exogenous variable in the loan repayment performance model but rather should be viewed as endogenous; using the instrumental variable to bit regression the Wald exogeneity of instrumented variables turned out to be significant at 1% level of statistical significance.

Contrary to the *a priori* expectation and widely held beliefs, the results showed that credit rationing did have a significantly positive influence on agricultural credit repayment rate, although the sex of the beneficiaries, education years, and the number of visitations from the lending agency did not have significant influence. Years of farming experience, the amount granted, and net farm income positively impacts repayment performance at different levels of significance; while variables like household size, disbursement lag, and cost of credit tend to reduce the likelihood of credit repayment. Traditional variables like sex and education years were not significant in the repayment performance model and hence should not be used as a determinant for credit size. The current research, using fitting model specifications under the assumption that every estimated parameter would stay constant over time, reveals that the type of estimated model will greatly impart information for the assessment of both prospective lending institutions and farmers for loan advantage.

Decomposition of credit repayment elasticity showed that the elasticity of loan value repaid as when due was higher than the elasticity of the probability of loan repayment since the amount of credit size recouped can make significant progress in beseeching the lending competencies of the institutions.

5. Recommendations

The fact that the research confirmed the significance of credit rationing in increasing the likelihood of credit repayment signals the vital importance of adequacy in rationing borrowers, i.e., not, demanding more than what is needed and not giving less than the needed credit size. When credit rationing is done to perfection, beneficiaries will receive a sufficient amount as regards their credit needs and potency to utilize the credit judiciously and therefore are reckoned upon to have high repayment performance. However, it should be noted that, when credit rationing is done for imperfection, borrowers may receive credit amounts that are contrary to their credit needs and their ability to utilize credit, thus resulting in low credit being repaid.

The fact that the study confirmed disbursement lag in reducing loan recovery and loan repayment reflects the effective significance of timeliness in loan negotiation and disbursement. There is a tendency for loan diversion into activities that are relatively less productive or totally unproductive when loan disbursement fails to meet up with farmers' critical time of use. The barriers of inadequately skilled staff, bureaucratic protocols, and rigid requirements for fulfillment before disbursement and disbursement in installment, which is often causes of delay, must be eliminated to permit an effective functioning of the credit market. Hence, lending institutions should imbibe timely discharge of funds, acknowledging the fact that farming activities are extremely time specific

Conflict of interest

All authors declare no conflicts of interest in this paper.

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