

Full Length Research Paper

Analysis of gender and poverty effects on loan defaults rate among arable crop farmers in Rivers State, Nigeria

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This study assessed possible differences in access to loans across gender lines and determined the factors influencing their repayment capacities among arable crop farmers in Rivers State. A stratified random sampling technique was employed to select 120 farmers who supplied data via a set of structured questionnaire and interview schedule. Tobit model was used to analyze the data gathered from the field. It was noted that mean repayment rate of loans in the area was relatively low (59%). The study found that gender was not a major determinant of loan default; rather, four variables to watch when disbursing loan to crop farmers in the area should include poverty status of the borrowers, sales volume of the farmers' products, extent of diversification of the farms and farm households' sizes. These four variables had slope coefficients that conformed to theoretical expectations and were statistically significant at 1% level. It was recommended that donors, commercial banks and credit institutions should aim at empowering farmers with loans (especially those who are well diversified to minimize risks of loan default). Government should encourage farmers to diversify their enterprises and improve their technologies to increase their sales and profit levels through a well-articulated agricultural extension programme.

Key words: Gender, poverty, farm credit, arable crop farming, loan default, credit rationing, Tobit model.

INTRODUCTION

Nigeria is the world's largest producer of cassava, yam and cowpea – all staple foods in sub-Saharan Africa. Yet it is a food-deficit nation and imports large amounts of grain, livestock products and fish (International Fund for Agricultural Development (IFAD), 2009). Despite Nigeria's plentiful agricultural resources and oil wealth, poverty is still a challenge in the country. Women play a major role in the production, processing and marketing of food crops. Women and households headed solely by women are often the most chronically poor groups within rural communities. Men have higher social status and as a result have more access to schooling and training even though women play significant roles in rural economic activities (IFAD, 2009).

It is no longer news that gender inequality is one of the most pervasive forms of inequality, particularly because it

cuts across other forms of inequality (Ogunlela and Mukhtar, 2009). In parts of West Africa, including Nigeria, women generally have usufruct rights to separate holdings through their husband's lineage. Given this matrilineal nature of Nigerian society there is a tendency to discriminate against women farmers even in credit administration by institutions involved in microfinance and agricultural finance in the absence of reliable data and knowledge of what actually determine loan repayments by credit institutions such as banks, government agencies and NGOs. Such development can stall the capacity of mainstreaming gender in agricultural development in Nigeria and thus worsening food insecurity and poverty problems which are already very contentious in Nigeria. It is therefore not surprising to note that the Central Bank of Nigeria (CBN), under the microfinance policy, regulatory and supervisory framework for Nigeria states as its target: to cover the majority of the poor of economically active population by 2020; increase the share of micro credit as percentage of

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total credit to the economy from 0.9% in 2005 to at least 20% in 2020; and the share of micro credit as percentage of gross domestic product (GDP) from 0.2% in 2005 to at least five percent in 2020; and most importantly to eliminate gender disparity by improving women's access to financial services by 5% annually *inter alia* (Microfinance Report, 2009). Despite these laudable goals, it is unfortunate to note that there are no sufficient data to guide decisions and policy implementation with regards to credit services administration to involve all farmers of different gender in Nigeria, hence the need for this study. The major objectives of this study therefore is to ascertain the extent to which poverty and other socio-economic attributes of the crop farmers influence their propensity to default on loans accessed.

LITERATURE REVIEW

Oke et al. (2007) found that income, distance between dwelling place and bank, amount of business investment, socio-cultural expenses, amount of loan borrowed, access to business information, penalty for lateness to group meetings, membership of cooperative society, number of days between loan application and disbursement and poverty indicator significantly influenced repayment. It was also noted that poverty was found to hamper repayment. Oni (1999) studied the amount of loan collected, expenditure on farm, interest rate, extent of farmers contact with bank, disbursement lag, cultivated land area and years of experience in farming's effect on loan repayment rates among farmers in Ondo State, Nigeria. It was indicated that amount of loan obtained by farmers, years of farming experience with credit use and level of education were the major factors that positively and significantly influenced loan repayment. However, age of farmers influenced loan repayment negatively but significantly. Orebiyi (2002)'s study on loan repayment focused on the South East Nigeria reported a repayment performance which showed an overall high repayment percentage of 78.33% with a default rate of about 21.67%. The repayment rate was adjudged to be very good according to the researcher when compared with results of similar studies which previously reported repayment performance rates as low as 1.05% (1990), 27% (1991) and 33.72% (1991) respectively. Furthermore, the study also showed that the major determinants of loan repayment of rural borrowers in the rural credit markets include; the amount of loan borrowed, age and the literacy level of the loan beneficiaries as well as the level of loan supervision.

Chirwa (1997) specified a Probit model to assess the determinants of the probability of credit repayment among smallholders in Malawi. In their findings only five factors (sales of crops, size of group, degree of diversification, income transfer and the quality of information) were consistently significant determinants of

agricultural credit repayment. The explanatory power of the model is plausible with the log likelihood statistically significant at 1%.

In Ningaye et al. (2011), the hypothesized determinants of poverty included household size, age, marital status, location, farm enterprise type (whether formal, informal or forma). Dekker (2003) found that age, occupation or employment status, health status and marital status were major determinants of poverty in Europe. However, it is not clear whether these are also determinants of poverty level in developing countries like Nigeria. Dekker (2003) concluded that results of both measures of poverty very seldom contradict, so financial poverty can indeed be used as a proxy of multidimensional poverty. However, that the position of some groups in terms of their risk of poverty is underestimated by the financial poverty measure: this is notably the case for those who are single with children, and those with a precarious health situation.

Theoretical and analytical frameworks

Since 1988, the debate as to how best to ensure that women farmers and women rural labourers benefit from project interventions has led to "gender mainstreaming" which involves taking to heart the need to reach women farmers with all project services and resources (IFAD, 1998). This approach focuses on gender roles and relationships rather than on women only. According to IFAD, mainstreaming is designed to provide men and women both with access to all project resources and services, proportional to the importance of the activity to them and to their livelihoods. IFAD added that credit can help alleviate poverty when loans are used to finance sound investments with cash-flow prospects, allowing for profit and margins for loan repayment. If the increased incomes translate into an increase in household assets, then the project has laid the foundations for a sustainable escape from poverty. IFAD (1998) noted that studies have indicated that women are more reliable borrowers than men and have often performed better in loan repayment than men. Moreover, if properly-managed, flexible savings and credit services to groups of rural poor women can contribute to their economic and social advancement.

Poverty occurs when an individual or household experience a number of cumulative deprivations. These deprivations need to occur in different fields or dimensions of the life of the subject, and they need to be expressed in relation to an implicit or explicit norm set by society as a whole (Dekker, 2003). Measuring multi-dimensional poverty usually involves the construction of an index incorporating the information from the indicators. Examples of such indicators may include income, education level, amount spent on food per day, level of access to hospital, shelter, type of toilet facility used,

access to safe drinking water etc. However, one still has to decide when a household or individual is said to be poor. If the index variable is below this threshold, the household or individual is considered poor. The choice of what threshold value to adopt is even more arbitrary than the choice of the weights. Tsakloglou and Papadopoulos (2002) cited in Dekker (2003) set the cut-off point equal to 70 or 80% of the median of the index. Layte et al. (2001 in Dekker, 2003) set it so that the proportion of poor equals the proportion of financially poor. This, however, only replaces the problem of the choice of the income-threshold. An ingenious solution to this problem combines the index with a question of the perceived welfare level of the household. The cut-off point is then determined as "the average consumption welfare level of those households who rate their current living conditions with the school mark 5.5" (Muffels and Dirven, 1998 cited in Dekker, 2003). Another interesting solution is brought forward by Townsend (1993) who used discriminant analysis to find the threshold that maximizes the difference between two subgroups in the sample.

Yet all of the above approaches to measuring poverty implicitly assume that the population can be divided into poor and non-poor households or individuals. As straightforward as this may be when one measures financial poverty or some sort of deprivation, the fact that deprivation scores are combined into a poverty measure implicates that the assumption of two separate groups may no longer be valid, since deprivation scores may or may not compensate each other. For instance, it could be that different groups show arrears on different dimensions of poverty, but that there is no group that is deprived on all dimensions. The assumption that such a group exists, should therefore be made explicit, if not tested in some way.

RESEARCH METHODOLOGY

Study area

The state lies between longitude $6^{\circ} 50^1$ E and Latitude $4^{\circ} 45^1$ N (Rivers State Government, 2007). bounded on the South by the Atlantic Ocean, to the North by Imo and Abia States, to the East by Akwa Ibom State and to the West by Bayelsa and Delta states (Rivers State Government, 2007). The state is made up of 23 Local Government Areas (LGAs). Total annual rainfall decreases from about 4,700 mm on the coast to about 1,700 mm in extreme north of the State. Rainfall is adequate for all year round crop production in the State. The mean monthly temperature is in the range of 25 to 28°C. The main root crops are yam, cassava and cocoyam; while the grains are maize, lowland rice and beans. Other crops grown for food include vegetables, melon, pineapples and plantain. The major cash crops are oil palm products, rubber, coconut, raffia palm and jute.

Data collection and sampling technique

Primary data used was obtained through a set of structured

questionnaire administered on sampled crop farmers in the study area. A list of crop farmers in the state who obtained loans from financial institutions were obtained from selected Microfinance banks as well as Nigerian Bank for Agriculture (formerly known as Nigerian Agricultural Cooperative and Rural Development Bank, NACRDB). From this list, a stratified random sampling procedure was used to select a total of 120 arable crop farmers across two Local Government areas (LGAs). In each of the LGAs 60 farmers split equally between those male and female farmers with access to institutional farm credit were selected as the sample of the survey. The secondary data sources include articles in learned journals, institutional publications, online publications and text books.

Analytical method

Poverty proxy derivation

The first step in this analysis was to determine the household poverty index (HPI) for all farm household sampled. To achieve this, the researchers applied the annual consumption expenditure approach. The approach uses the amount of money households spend on consumer items to ascertain their levels of poverty. In estimating the household poverty index, Oke et al. (2007) used the annual consumption expenditure as a proxy for poverty in a model to find the determinants of loan repayment in a state in South West Nigeria. Consumption expenditure in their survey included expenditure on food, transportation, clothing, education, house rent, health care and energy consumption (electricity, kerosene or fuel wood), association/club activities, religious obligations, remittances and ceremonies. After determining the mean level of household consumption expenditure, the mean will form a threshold to classify those who are poor (1) or not (0). This variable, HPI for each household or borrower will serve as one of the explanatory variables in determination of default rate among borrowers in the survey. Since the variable is an endogenous variable (with its own determinants we still used it in another equation in the Tobit Regression model that was applied as the main econometric model of this survey. Poverty in the context of this study is represented by the estimated household poverty index (HPI).

The Tobit regression model assumes that the observed dependent variables are:

$$Y_j \text{ for observations } j = 1, \dots, n \text{ satisfy } Y_j = \max(Y^* j, 0), \quad (1)$$

where the $Y^* j$'s are latent variables generated by the classical linear regression model

$$Y_j^* = \beta' X_j + U_j \quad (2)$$

with X_j a vector of regressors, possibly including 1 for the intercept, and β the corresponding vector of parameters. The model errors U_j

are assumed to be independent $N(0, \sigma^2)$ distributed, conditional on the X_j 's and denoted by

$$f(z) = \exp(-z^2/2) / \sqrt{2\pi} \quad (3)$$

The model supposes that there is a latent unobservable variable y^*i . This variable depends linearly on x_i via a parameter vector b . In addition, there is a normally distributed error term u_i to capture random influence on this relationship. The observable variable y_i is defined as being equal to the latent variable whenever the latent variable is above zero and to be equal to zero otherwise.

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases} \quad (4)$$

where y_i^* is a latent variable:

$$y_i^* = \beta x_i + u_i, \quad u_i \sim N(0, \sigma^2) \quad (5)$$

the density of the $N(0, 1)$ distribution, with corresponding cumulative distribution function

$$F(z) = \int_{-\infty}^z f(v)dv, \quad (6)$$

the conditional c.d.f. of Y_j given $Y_j > 0$ and X_j is

$$\begin{aligned} H(y|Y_j > 0, X_j, \beta, \sigma) &= P(y_j \leq y | Y_j > 0, X_j) \\ &= \frac{P(0 < Y_j^* \leq y | X_j)}{P(Y_j^* > 0 | X_j)} = \frac{P(-\beta'X_j < U_j \leq y - \beta'X_j | X_j)}{P(U_j > -\beta'X_j | X_j)} \\ &= \frac{F((y - \beta'X_j)/\sigma) - F(-\beta'X_j/\sigma)}{F(\beta'X_j/\sigma)}, \end{aligned} \quad (7)$$

and the corresponding conditional density is

$$h(y|Y_j > 0, X_j, \beta, \sigma) = \frac{dH(y | Y_j > 0, X_j, \beta, \sigma)}{dy} = \frac{f((y - \beta'X_j)/\sigma)}{\sigma F(\beta'X_j/\sigma)}, \quad y > 0. \quad (8)$$

Thus, the conditional distribution of Y_j given $Y_j > 0$ and X_j is continuous.

Define the dummy variable D_j by

$$D_j = 1 \text{ if } Y_j > 0; \quad (9)$$

$$D_j = 0 \text{ if } Y_j = 0;$$

Then

$$\begin{aligned} P[D_j = 1 | X_j] &= F(\beta'X_j/\sigma), \\ P[D_j = 0 | X_j] &= 1 - F(\beta'X_j/\sigma), \end{aligned} \quad (10)$$

$$\text{and } Y_j = D_j Y_j \quad (11)$$

$$\text{Now the conditional expectation of } Y_j \text{ given } X_j \text{ and } D_j = 1 \text{ is } E(Y_j | X_j; D_j = 1) \quad (12)$$

If the relationship parameter b is estimated by regressing the observed y_i on x_i , the resulting Ordinary Least Squares estimator is inconsistent. Maddala (1983) has proven that the likelihood estimator suggested by Tobin for this model is consistent. The likelihood function of the model (2) is given by L , as follows: The log-likelihood function of the Tobit model is

$$\mathcal{L}(\beta, \sigma) = \sum_{j=1}^n \ln [g(Y_j | X_j, \beta, \sigma)] \quad (13)$$

Since the two equations (5) are non-linear, the maximum likelihood estimators must be obtained by an iterative process, such as the Newton-Raphson or Davidson-Fletcher-Powell (DFP) or Berndt-Hall-Hall-Hausman (BHHH) algorithm (Greene, 2003). The explanatory power of the model is explained by this LR test which can also be expressed as:

$$LR = -2(\log L_r - \text{Log}L_u) \quad (14)$$

where $\text{Log}L_u$ is the log-likelihood for the unrestricted model and $\log L_r$ is the log-likelihood for the model with k parametric restrictions imposed. The likelihood ratio statistic follows a chi-square distribution. STATA 11 automatically estimates this feature and conducts this test. The variables used in the analysis are as follows. Y represents the probability of loan default which is proxied by amount of loan repaid by December, 2011 for those who took loans that was expected to be fully repaid by December, 2011 (in naira). X_1 = age of farmers in years; X_2 = marital status of the borrower (discrete variable where 1 = X_3 = volume of credit borrowed; X_4 = past experience in borrowing (yes = 1, "No" = 0.0001); X_5 = years of formal education (in years); X_6 = occupational status (whether engaged in full time farming or have another employment); X_7 = poverty status (that is, 1 = poor, 0.0001 = Non poor); X_8 = household size of the farmer (count); X_9 = gross sales of crops in naira and degree of diversification (that is, no of crops grown in a year). And X_{10} = gender (1 = male, 0.0001 = female).

However, before conducting the analysis with Tobit model, the model was diagnosed for violation of assumption of normality of the residuals distribution and the hypothesis of possible violation of this assumption was rejected based on the estimated p values applying the Jarque-Bera Test (Appendix 2: Figure 1) which gave a statistic of 0.22, a value that was not significant even above 89% statistical level of significance (estimated p value = 0.89, too high). Having established that the residual's distribution is normal the model's log likelihood ratio estimated (129.31) was tested using Chi-square test and it was found to be statistically significant at 1% (with p value = 0.0000). The foregoing tests and results point to the fact that the estimated model is very right for economic analysis as the explanatory powers are very good.

RESULTS AND DISCUSSION

Determinants of loan repayment by male and female arable crop farmers in the Rivers State

Results of model estimates on determinants of loan repayments by male and female arable crop farmers in Rivers State are presented in Table 1 and Appendix 1. It was observed that the mean repayment rate of the loans borrowed by both male and females in the study area was 58.95% (that is, approximately 59%). This finding implies that loan repayment rate in the study area is fairly reliable but not really encouraging for lenders or banks who expect 100% recovery rate on their loans. It actually implies also that only about 41% of borrowers do not repay promptly or default. The need to find out why a large percentage (as 41%) are defaulting on their loans is hereby underlined. This performance contrasts with results obtained in South East Nigeria by Orebiyi (2002) who noticed a loan repayment rate of 78.33% in the area. The reasons for this contrast may not be unrelated to the more urbanized nature of Rivers State where cost of

Table 1. Results of maximum likelihood estimates of the Tobit regression model specified for the loan repayment determinants' equation.

Tobit regression		Observation	=	120
Log likelihood = 454.976		LR chi ² (10)	=	129.31
		Probability > chi ²	=	0
		Pseudo R ²	=	0.1244
Variables				
Default rate = Dependent variable	Coefficient	Standard error	t	P> t
Age	0.117NS	0.114	1.03	0.303
Marital status	-1.168NS	1.004	-1.16	0.247
Experience	0.190NS	0.229	0.83	0.41
Years of formal education	-0.161NS	0.333	-0.48	0.629
Occupation	0.813NS	0.769	1.06	0.293
Poverty	-21.383***	3.138	-6.81	0
House hold size	-1.804***	0.588	-3.07	0.003
Sales	0.000***	0	3.84	0
Diversification	4.288***	1.596	2.69	0.008
Sex	-0.782NS	3.262	-0.24	0.811
Intercept	34.362***	8.902	3.86	0
Coefficient of variation	11.459	0.754	9.965	12.954
Observations		Summary:		
200		0 left-censored observations		
		Uncensored observations		

Source: Field data (2011) analysis by the authors using STATA 11 software. NB: NS = Coefficients do not have significant t values at 10% and below: "****" = Coefficients have t values significant at 1 % alpha level.

living appears to be a major challenge for poor farmers. The possible reasons why loan repayment rate is not impressive in the study may be gleaned from the results of determinant of loan default or repayment which can be seen from the estimated maximum likelihood results of the determinants of loan repayment Tobit regression model in the study shown in Table 1. The model had a Pseudo R² of 0.12 approximately implying that the observed explanatory variables in the model explained about 12% of the variation in the model. From the E-views estimates in Appendix 1, it was noted that convergence was attained after 4 iterations and that the error distribution scale (11.21602) was statistically significant at 1% justifying the need to use the Tobit regression model. The slope coefficients of the explanatory variables estimated indicated that four variables actually determined the probability of observing loan default among arable crop farmers who took loans from the lending institutions in the study area. These include: poverty status of the borrowers, sales volume of the farmers' products, extent of diversification of the farms and farm household's sizes. The four variables had slope coefficients that were properly signed with respect to theoretical expectations and were statistically significant at 1% level.

The fact that poverty index (proxied by household

consumption index) was found to be a significant factor while borrower's sex indicated no significant influence on loan default rate in the study shows evidence which debunks the school of thought advanced by several gender lobbyists and microfinance institutions (for example, Grameen Bank cited in Morduch, 2005; Fernando, 2006; Weber, 2006 cited in Julius and Azeez, 2011) which held that advancing micro credits to women will enhance better loan repayment than when advanced to men. The findings also corroborates the assertion of Armendariz and Morduch (2005) who noted that most of such studies which advanced theoretical arguments concerning female targeting in loan advancement were not backed up by empirical evidence. The finding in this work which indicated that poverty level is a negative function of loan repayment rate is rational. There could be a high tendency for poorer borrowers to divert their loans to other teething problems such as payment of children's school fees, health of the children and even feeding the households instead of utilizing it for the growth of the business under whose title the loan was obtained. This probably explains why most banks check the poverty status of borrowers (by examining the level of collateral or security owned) before advancing loans to them. The finding is in tandem with that of Oke et al. (2007) who found poverty was a significant determinant

of loan repayment in Nigeria. Another factor worth mentioning is level of diversification of the farms. In fact, the more the farm is diversified (probably by planting many different crops) the lower the tendency of risk in the farm business could be and this can translate to the extent of loan repayment of the borrower. Hence it is clear to see why this factor could be a determinant of loan default in the study. Earlier studies have also indicated that increased household size may reduce the tendency to pay back loans promptly thus leading to default. This is associated with increased population which also implies more financial responsibilities in the household that may increase the risk of loan diversion thus worsening the default case of such a household. The finding agrees with Chirwa (1997).

Conclusion

It was observed from the study that loan repayment rate among farmers in the study area was not quite impressive (approximately 59%). This was, probably because of their poverty levels and nature of agricultural business that are filled with uncertainties and risks. This implies that donors and credit institutions need to exercise patience with farmers even when it seems the expected loan repayment due date had lapsed. The study also found that poverty was a major determinant of loan repayment rate in the study area. This finding appears to be the reason why most commercial banks often discriminate against small scale farmers who supposed to be encouraged by microcredit programmes and institutions. This finding and the observation that sex was not a major determinant of credit default calls for a paradigm shift from targeting women in microcredit schemes to empowering both male and female farmers so that they can be productive and at the same time be able to pay back loans advanced to them on time. Only then can such farm credit programmes be development oriented and sustainable. Farmers should also be encouraged to diversify their enterprises and improve their technologies to increase their sales and profit levels via a well articulated agricultural extension programmes.

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APPENDIX

Appendix 1. Results of model estimates on determinants of loan repayments by male and female arable crop farmers in Rivers State.

Dependent variable: DEFAULTRATE

Method: ML - Censored Normal (TOBIT) (Quadratic hill climbing)

Date: 02/01/12 Time: 21:38

Sample: 1 120

Included observations: 120

Left censoring (value) at zero

Convergence achieved after 4 iterations

Covariance matrix computed using second derivatives

Variable	Coefficient	Standard error	z-Statistic	Probability
C	35.90094	8.674498	4.138676	0.0000
Age	0.123586	0.1110975	1.113645	0.2654
Diversification	3.970025	1.552642	2.556947	0.0106
Experience	0.185388	0.224084	0.827314	0.4081
Years of formal education	-0.147340	0.324206	-0.454463	0.6495
Sex	-0.595268	3.189369	-0.186641	0.8519
House hold size	-1.782149	0.574136	-3.104056	0.0019
Marital status	-1.044583	0.980402	-1.065464	0.2867
Occupation	0.692753	0.747939	0.926215	0.3543
Poverty	-21.49081	3.071048	-6.997873	0.0000
Sales value	6.84E-05	1.83E-05	3.730114	0.0002

Error distribution

Scale: C(12)	11.21602	0.724000	15.49175	0.0000
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Mean dependent variable	58.95000
S.E. of regression	11.76790
Sum squared residual	15094.69
Log likelihood	-460.3538
Average log likelihood	-3.836282
Standard deviation dependent variable	19.44173
Akaike info criterion	7.872564
Schwarz criterion	8.151313
Hannan-Quinn criterion	7.985765

Left censored observations	0
Right censored observations	0
Uncensored observations	120
Total observations	120

Appendix 2

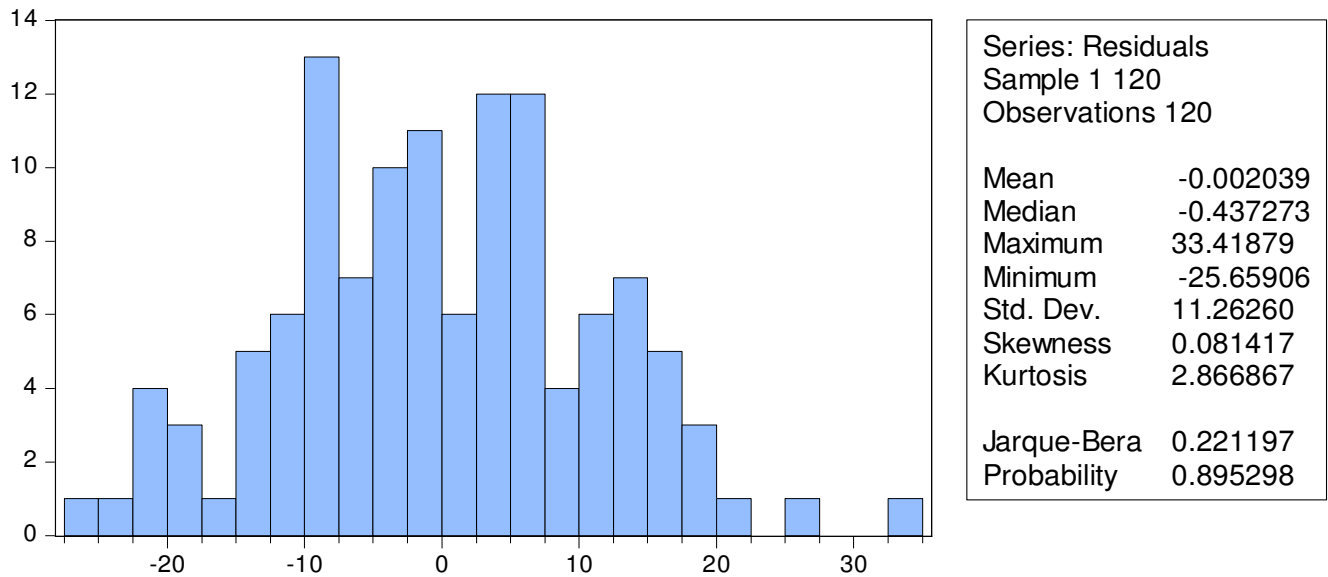


Figure 1. Results of test of normality of the estimated Tobit model's residuals' distribution.