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IMPACT OF CREDIT GUARANTEE SYSTEM OF GIRSAL[1] ON EMPLOYMENT BY AGRIBUSINESS FIRMS

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ABSTRACT

The study examined the impact of a major Credit Guarantee System - Ghana Incentive-Based Risk Sharing System for Agricultural Lending (GIRSAL) - on employment by agribusinesses in Ghana. Endogenous switching regression model was applied to survey data collected from 353 agribusiness firms (71 beneficiary and 282 non-beneficiary) across 12 administrative regions of Ghana. The study found that the beneficiary Agribusinesses fully engaged an average of five more employees than non-beneficiary Agribusinesses. This research was conducted in the middle of 2020, with all the ramification of COVID 19 on Agribusinesses, including slowdown in market activities. Findings from the endogenous switching regression model show that the main factors that affect agribusiness' participation in GIRSAL's credit guarantee system are education level of the agribusiness owner, membership of farmer-based association and years of experience in agribusiness. On average, every agribusiness firm participating in the system has the potential to increase employment by thirty-four full time workers per annum. To sustain the positive impact of GIRSAL's credit guarantee system, agribusinesses should be encouraged to join farmer-based associations for consistent learning. Policy makers should improve the agribusiness environment to encourage the formation and operation of more credit guarantee schemes.

Keywords: *Agribusiness, Credit Guarantee System, Farmer Association, GIRSAL Impact*

INTRODUCTION

Unemployment though a global challenge, is very rife in Sub-Saharan African. The unemployment rate in Sub-Saharan Africa in 2021 stood at 7.6 (ILOSTAT, 2022). Creation of decent jobs, especially from agribusinesses, is seen as key to attaining progressive and inclusive economic development (ILO, 2022). Evidence from literature suggest that access to finance has a direct and positive effect on job creation (Campello and Larrain 2015; Ayyagari et al., 2021). Agribusinesses, however, are often characterized by erratic and seasonal cash flow; are prone to sudden and unpredictable price changes of raw materials or produce (Gudger, 1998); inadequate access to appropriate financial resources; and disadvantageous loan terms and conditionalities. These limitations were identified as the main factors to the performance, growth, and development of agribusinesses. The main disincentives to lending to agribusinesses include high administrative costs of small-scale lending, asymmetric information, lack of credit history, proper financial records, and viable collateral (Green, 2003; Beck, Klapper and Mendoza, 2010; Tunahani and Dizkirici, 2012; Navajas, 2001; Saldana, 2010; World Bank, 1994).

Globally, agribusinesses collectively require around 240 billion United State Dollars in agricultural and non-agricultural finance (IFC, 2019). This capital would not only help them optimize their business operations by investing in high-quality raw materials or modern and improved technologies, it will also finance other household expenditures, like school fees, housekeeping expenditures, or life events. Lately, there has been a notable improvement in access to finance. Albeit the progress made in agribusiness finance, financial service providers are still unable to meet the 240 billion United State Dollars requirement. Currently, only 70 billion United State Dollars of the estimate amount is provided to smallholder households, which includes:

a) 30 billion United State Dollars financed by value chain actors, i.e., agribusinesses that work with farmers to secure their supply chain. This is noted for financing only agricultural needs and focused on cash crop farmers, like coffee or cocoa.
b) 21 billion United State Dollars financed by formal Financial Institutions (state banks, microfinance institutions, commercial banks, social lenders, NGOs and financial technologies or innovators).

[1] *Ghana Incentive-Based Risk Sharing System for Agricultural Lending*

This category of finance is also for agricultural activities.

c) 17 billion United State Dollars by informal and Community-Based Financial Institutions (mainly loan associations and local money lenders). Though the easiest and most flexible option and mostly used for both agricultural and non-agricultural activities, it has been classified as the lowest quality with highest interest rates.

That still leaves around 170 billion United State Dollars or 70% of the global demand for smallholder finance, unmet. This gap cuts across all geographic regions and financing types, but is particularly concentrated on long-term agricultural finance, where 86 billion United State Dollars or 98% of the global demand for this type of financing, remains unmet. In 2018, USAID estimated Ghana's annual agribusiness demand at 2 billion United State Dollars.

Agribusiness is, indispensable in economic development of most nations especially, developing countries including Ghana. However, while agribusiness remains a key economic activity in Africa employing about 55% of the population, only approximately 1% of bank lending goes to the sector. Furthermore, only 4.7% of adults in rural areas in developing countries globally have a loan from a formal financial institution and only 5.9% owns a bank account, according to Findex Data. The World Bank reports that rural credit from the formal financial institutions is less than 10% in most Sub-Sahara African countries. Restriction in access to institutional credit puts agribusinesses at a competitive disadvantage and eventually hampers investment, productivity, growth, and development. Lack of financing is a major constraint for the agribusiness sector in Ghana (Alliance for Financial Inclusion, 2018).

A credit guarantee is a financial product that agribusinesses can take as a partial substitute for collateral; it is a commitment by a guarantor to pay to the lender all or part of the loan if the borrower defaults' (Deelen and Molenaar, 2004: 11). At its simplest, a credit guarantee is an agreement whereby a guarantor shares the risk of borrower default with a bank (Hansen et al, 2012). Guarantees are often granted to agribusinesses who lack sufficient collateral or credit track records. Guarantee providers define target borrowers, loan features, often charge fees for the service and use one of the risk coverage models (Hansen et al, 2012).

It is contended that well performing Credit Guarantee Systems enhance agribusinesses' access to credit and assimilation into formal financial markets; assist in obtaining working capital, finance fixed assets and other investment, at reasonable conditions; and allows for increased competitiveness and extended economic activities. These advantages ultimately translate into improved business performance and job creation. Therefore, a better understanding of the challenges faced by agribusinesses in creating more and better jobs is essential to inform policies and decisions aimed at achieving shared prosperity in Africa.

Nonetheless, the continuous inability of most of the financial institutions to adequately fund activities of key agricultural value chain actors, as demonstrated by low credit provision to the sector (Table 1), was clear evidence that Ghana needed a better financial tool that would catalyze the flow of institutional credit into the sector. This, among other critical incentives, provide justifications for the establishment of the Ghana Incentive-based Risk Sharing System for Agricultural Lending (GIRSAL). The aim of GIRSAL is to provide incentives and risk mitigation instruments to address the constraints that agricultural value chain actors face when accessing credit from financial institutions. This is to be achieved through six inter-related pillars including: Risk Sharing Fund; Technical Assistance Programme; Integrated Insurance Policy; Financial Institutions' Rating System; Bank Incentive/Reward Mechanism; and Digital Financing.

In 2019, Corona Virus pandemic, a global health crisis, struck and impacted negatively on agribusinesses and taken a toll on people's lives and livelihoods, global food trade, markets, food supply, etc. The social and economic ramifications of the pandemic are enormous and far-reaching including effects of food crisis and employment around the globe. The food crises have been exacerbated by emergence of conflict between two major agricultural powers; Ukraine and Russia. This has significant negative socioeconomic impact on agribusinesses especially for countries that rely on imports to meet their production demands, including Ghana. In some regions of the world, Credit Guarantee Schemes (CGSs) are one of the most accepted initiatives to minimize financing challenges faced by Small Micro and Medium Enterprises (SMMEs) at the COVID-19 pandemic era. This unfortunately is not the case in Sub-Saharan Africa (SSA) - only a small proportion of nations adopted CGSs as a response strategy.

Table 1: Yearly Distribution of Outstanding Credit to The Agricultural Sector (GH ₵million)

Sector	Periods									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	Ave (2016-2021)
Agriculture, Forestry & Fishing	7,079	9,467	14,651	14,694	16,381	19,025	19,562	22,531	18,451	19,190
Cocoa Marketing	601	744	757	1,210	3,887	5,743	0	3,583	1,941	3,031
Total Agriculture	7,679	10,211	15,408	15,904	20,268	24,767	19,562	26,113	20,392	22,220
All Sectors	180,359	260,573	305,795	389,042	443,621	461,857	484,137	1,041,033	1,116,630	709,456
% Credit to Agric / all sectors	4.26	3.92	4.06	4.09	4.57	5.36	4.00	2.51	1.83	3.13

Source: MoFA 2019 &2021 Annual Progress Report

The infinitesimal financial allocation to agriculture and agribusinesses was chiefly due to inability of the actors to access appropriate financial services. It is noteworthy that even when financing is available, lending is often informal and short-term, impeding longer-term investments - failing to meet fully the specific requirements of agribusinesses and often coming at excessive cost resulting in financial exclusion. These affect growth and development of agribusinesses and therefore the capacity to employ staff.

The foregoing show that there is limited and inappropriate credit to agricultural and agribusiness sector. Credit guarantee schemes overcome obstacles of lack of collateral or information asymmetry and enable access to agribusiness financing, thereby allowing agribusinesses to sustain and potentially expand their businesses and hence create more and better job opportunities. Above all, very pertinent issues arise that demand urgent consideration: what is the impact of the credit risk guarantee provided by GIRSAL on the employment of the beneficiary agribusinesses? Considering the important roles of credit guarantees in the flow of appropriate funds to critical sectors and ultimately employment creation, GIRSAL must deliver on its goal and must also be sustainable. This study was conducted to assess the impact of GIRSAL's Credit Risk Guarantee on employment of participating Agribusinesses.

Evidence suggests that agribusinesses' access to finance affects sustain growth and job creation. In South Africa, Nigrini and Schoombee (2002) report around 15,000 additional jobs created by SMEs benefiting from the guaranteed loans programme. The International Finance Corporation (IFC 2021) analyses the impact of access to credit on job creation and finds that on average 16.3 additional permanent jobs were created over two years for every million dollars loan from various banks and financial institutions to SMEs in developing countries. Cao and Leung (2020) investigate the effects of financial constraints on the employment growth of Canadian SMEs from 2008 to 2013 period and show that employment grows faster for firms that are less financially constrained. Ayyagari et al. (2021) report that firms with access to credit show employment growth between 1 and 3 percentage points higher than firms with no access to finance. Hence, improving access to finance appears to have a larger and more positive effect on SME growth and job creation.

There is a positive impact of credit guarantee schemes on access to finance and improved agribusiness performance (growth, investment, job creation, innovation). Credit guarantee protects the creditor against defaults. Option Pricing Theory (OPT) is a probabilistic approach to assigning a value to an options contract. The principle of OPT is centred on the factors considered in determining participation in a credit guarantee system (Black and Scholes, 1973; Merton, 1973&1977; Cox and Ross 1976; and Smith, 1976). Using the tools and techniques of option pricing theory, Merton (1977), postulated a concept which determines the cost of a loan guarantee. Sosin (1980) employs option pricing techniques to assess characteristics of loan guarantees to corporate organizations and estimated pecuniary value. He contended that organization with variances and capital structures approximating to those of the market, the cost of a loan guarantee is relatively small for five- and ten-year terms, but not negligible. The interests of organizations in the market will reduce, if the cost of the guarantee and the saving in interest increases, more importantly, for riskier businesses. Using a contingent claims valuation model, Selby et al. (1988), assessed the financial economics of loan guarantees. This was to evaluate credit guarantees and wealth transfers to the security holders of businesses. They contended that the value of a guarantee relates to the maturity structure of existing credit.

Using the option pricing theory in a discrete time setting, Lai (1992) derives a technique for assessing private credit guarantees. The basic structure of the applied credit has effect on eventual outcome of the guarantee (Lai, 1992). Lai and Gendron (1994) employed stochasticity of interest rates to assess both public and private guarantees. The technique makes use of continuous time option-pricing method, with potential default by the guarantor, considered as a variable. They assessed credit outcomes including the structure of interest rates in the valuation of the guarantee and concluded that guarantee valuations calculated under non-stochastic interest rate assumptions are biased estimates of the fair values. Mody and Patro (1996) adopting option theory methods for assessing guarantees, argue that estimates of the quantum of guarantees under different conditions ensure that the costs of guarantees are evident to decision makers and other stakeholders. Private guarantees are associated with substantial decrease in the default risk premium (Chang et al., 2015). This result was noted when they applied contingent claims analysis in a discrete time setting and the risk-free option valuation method in the assessment of the effects of private guarantees on the default risk premiums of new and junior credits.

Billings et al. (2009) suggested a technique to assess credit fees of international credit guarantees in a case the guarantee fee is treated as additional interest that cannot exceed the present value of interest savings from an unguaranteed credit. The technique was used on combined valuation of parent credit guarantees of financial statements. From a unique view, Kuo et al. (2011) established a technique for estimating guarantee fees reflecting the credit status of the applicant and the financial health of the guarantor. They employed actuarial pricing theory and treated guarantee fees as insurance premiums.

Demographic and socioeconomic characteristics of agribusiness owners such as age, education, agribusiness experience, income, and distance to the nearest market influence access to credit tremendously (Memdani et al., 2020; and Conrad et al., 2019). Following literature, socio-demographic variables such as education, membership of Farmer Based Organisation (FBO), access to extension services, agribusiness skills training, access to market information, experience of the agribusiness owner and tax payment are important factors that influence agribusinesses' access to credit and ultimately, employment creation.

The level of education of agribusiness operatives boosts their confidence to understand contractual terms. This increases their chances of requesting credit facilities and thus benefit from credit guarantees. Level of education captures changes in preference behaviour due to changes in the consumer's biogenic and psychogenic needs over the life cycle. It is expected that the more educated an agribusiness owners are the more information they have on varied issues including credit guarantee systems. This category of agribusiness owner's will therefore be more willing to benefit from Credit Guarantee Systems.

Similarly, acquisition of formal education enhances reading and interpretation of extension leaflets and other teaching and demonstration materials. Such agribusinesses can as well listen to radio programmes on business development in english and are able to interpret them to uneducated agribusiness owners in their communities. Formal education is a factor that can influence adoption of an innovation by an agribusiness, and this could influence agribusiness owner's appetite for CGS. This is because the more enlightened an agribusiness owner is, the higher his/her ability to weigh the advantages and disadvantages of an innovation and the more his or her likelihood to take risks (Udoh et al., 2008). Formal education is therefore expected to have positive influence on agribusinesses' use of Credit Guarantee Systems.

Membership of FBOs enhances social interaction and increases the chances of agribusinesses request for credit facilities and thus benefit from guarantees. Membership of a Farmer-Based Association provides a platform for agribusiness owners to meet, interact and share ideas on their agribusiness activities and their wellbeing. It is expected that membership of an association will have a positive effect on agribusinesses' request for Credit Risk Guarantees. Langyintuo et al. (2006), for example, established a positive and significant relationship between membership of an association and adoption of improved maize in Zambia.

Agribusinesses' access to extension services helps them to learn innovative technologies which increase their productivity, and hence interest in acquiring credit facilities and thus improves the possibility of benefiting from credit risk guarantees.

Acquiring skill training by agribusinesses enables them to improve production and increases their chances of securing credit facilities and thus benefiting from credit guarantees.

Increasing agribusinesses' access to market information enables them to sell their produce at the prevailing market price. This enhances their income and encourages them to access credit facilities and thus benefit from guarantees. Agribusinesses with established trading relationships have greater chances of securing credit facilities and thus benefit from guarantees.

Payment of tax reduces the revenue of agribusinesses which discourage them to expand their agribusinesses and reduces their appetite for credit facilities and thus benefits from guarantees. The purpose of this study is to establish the impact of credit guarantee schemes on employment by

agribusinesses. Literature on the history of CGS in Ghana has been very scanty. In Ghana, thus, there is limited study on the impact of the CGS on the agribusiness. The focus has been on the effects on financial institutions. Again, there is no assessment of GIRSAL since its inception.

METHOD

A list of beneficiary financial institutions of GIRSAL's credit guarantee was obtained from GIRSAL for the interview. The financial institutions largely provided the details of the beneficiaries of the credit guarantee for the interview. For non-beneficiaries, a multistage cluster sampling procedure was used to randomly select the total number of respondents. The country was clustered into regions within which the agribusinesses were selected, Table 2. The regions were pre-selected based on their participation in the GIRSAL's guarantee programme. At the time of the survey, activities of the GIRSAL cover 12 out of the 16 regions in Ghana. These include Ashanti, Bono, Central, Eastern, G. Accra, Bono East and Northeast regions. The rest are Northern, Savannah, Upper West, Volta and Western regions. Total number of beneficiaries currently (2022, second Quarter) is 71. All the seventy-one (71) beneficiaries have been interviewed.

The beneficiaries of the guarantee from GIRSAL are in 40 Metropolitan, Municipal and District Assemblies (MMDAs) across the twelve regions, Table 2. These are MMDAs where agribusinesses that benefited from GIRSAL are located. These are thus determined by virtue of coverage of GIRSAL programme. From a Focus Group Discussion and expert opinions, MMDAs with similar defined characteristics have been identified to match each of the beneficiary MMDAs. Comprising the Focus Group for the discussion were 4 directors of decentralized department of Agriculture, 12 Regional Monitoring and Evaluation Officers and 3 Management and Information System Officers from the selected regions. The researcher developed a criterion which was discussed at the meeting, to which minor corrections were made. The criteria consider characteristics of the beneficiary MMDAs in selecting the non-beneficiary MMDAs. The key characteristics include similarity in the following;

a. Total Population (2020 Census)
b. Poverty Levels
c. Agro-Climatic Conditions
d. Agricultural/Agribusiness Endowment
e. Administrative Status - Metropolitan/Municipal/District

In all, 40 non-beneficiary MMDAs (Table 2) have been selected to match the beneficiary MMDAs, through the process enumerated above.

Table 2: Regions and Selected MMDAs

No	Region	No	Beneficiary MMDA	Non-Beneficiary MMDAs*
1	Ashanti	1	Afigya Kwabre South District	Afigya Kwabre North District
		2	Kumasi Metropolitan	Asokwa Municipal
		3	Sekyere East District	Kumawu District
		4	Adansi South District	Adansi Asokwa District
2	Bono	1	Dormaa Central Municipal	Berekum East Municipal
		2	Berekum West District	Berekum East Municipal
		3	Wenchi Municipal	Jaman South Municipal
		4	Jaman North District	Dormaa East District
		5	Sunyani Municipal	Sunyani West Municipal
		6	Techiman Municipal	Techiman North
3	Central	1	Ekumfi District	Owusu Senya District
		2	Assin Central Municipal	KEA
		3	Awutu Senya East Municipal	Cape Coast Metro
4	Eastern	1	Okere District	Ayensuano District
		2	Nsawam Adoagyiri Municipal	Suhum Municipal
		3	West Akim Municipal	Abuakwa South Municipal
		4	Akwapim South Municipal	Kwahu South Municipal
5	G. Accra	1	Tema West Municipal	Adenta Munipal
		2	Ningo Prampram District	Ada East District
		3	La Dade Kotopon Municipal	La Nkwatanan Municipal
		4	Tema Metropolitan	Krowo Municiap
		5	Shai Osudoku District	Ada west Dist
		6	Accra Metropolitan	Ablekuma Central Municipal
		7	Kpone Katamanso Municipal	Ga East Municipal
		8	Ga North	Ga South
6	Northeast	1	West Mamprusi Municipal	East Mamprusi
7	Northern	1	Savelugu Municipal	Nanton District
		2	Tamale Metropolitan	Tolon District
		3	Mion District	Karaga District
		4	Yendi Municipal	Gushiegu Municipal
8	Savannah	1	West Gonja Municipal	East Gonja
9	Upper West	1	Wa Municipal	Wa West District
10	Volta	1	South Tongu District	Central Tongu District
		2	Akatsi North District	Akatsi South District
		3	Adaklu District	Agotsime Zeopi District
		4	Adaklu District	Agotsime Zeopi District
11	Western	1	Tarkwa Nsuaem Municipal	Prestea Huni valley Municipal (PHM)
		2	Wassa East District	Shamaa District
12	Bono East	1	Techiman Municipal	Techiman North

For beneficiaries, the communities are given, depending on the location of the agribusinesses. In the case of non-beneficiaries, the management of the department of agriculture for the selected MMDAs supported by providing a list of all communities in the MMDAs engaged in the activities of the value chain in question. From the list, communities were selected randomly through balloting to reduce any biases. Similarly, individual agribusinesses were selected for interview through listing of the agribusinesses by value chain and actors in the various communities by the help of the Agricultural Extension Agents. Individual agribusinesses were then selected randomly to match the respective beneficiaries for interview.

According to Ghana Statistical Service, there are 138,098 agribusinesses in Ghana (GSS, 2021). Using the Slovin's formula, as explained by Ellen (2012) the sample size, that is, expected total number of respondents is three hundred and forty-six (346). However, in all, three hundred and fifty-three (353) questionnaires were administered. Mugenda & Mugenda (2003) maintain that a response rate of 50% is adequate for quantitative analysis and reporting, positing that a response rate of at least 70% is excellent. The response rate of 102% was therefore considered more than appropriate for making inferences and drawing conclusions from the research data, especially in relation to the impact of GIRSAL's credit guarantee system on employment of agribusinesses. Upper East Region recorded the least number of respondents, Table 3.

Table 3: Number of Respondents by Region

No	Region	Beneficiaries	Non-Beneficiaries	Total	%
1	Ashanti	6	22	28	7.93
2	Bono	10	23	33	9.35
3	Central	3	20	23	6.52
4	Eastern	13	54	67	18.98
5	Greater Accra	12	26	38	10.76
6	North-East	1	13	14	3.97
7	Northern	11	59	70	19.83
8	Savannah	1	12	13	3.68
9	Upper West	1	6	7	1.98
10	Volta	5	28	33	9.35
11	Western	4	11	15	4.25
12	Bono-East	4	8	12	3.40
	Total	71	282	353	100.00

Source: Field Data

As indicated, the researcher interviewed Three Hundred and Fifty-Three (353) agribusinesses from One Hundred and Seventy-Seven (177) communities, in Eighty (80) Metropolitan, Municipal and District Assemblies (MMDAs) across Twelve (12) administrative regions in Ghana. The number of respondents is made up of Seventy-One (71) beneficiaries and Two Hundred and Eighty-Two (282) non-beneficiaries (Table 3). The beneficiaries were from Fifty (50) communities across Forty (40) MMDAs while the non-beneficiaries were from One Hundred and Twenty-Seven (127) communities across Forty (40) MMADs. One out every five respondent was interviewed from Northern Region of Ghana and about 2% was from the Upper West Region.

Method of data Analysis

This study uses Endogenous Switching Regression Model (ESRM) for analysis. ESRM corrects any potential endogeneity and sample selection bias which may have resulted from other interventions (Alene and Manyong, 2007) for agribusinesses and financial institutions.

Endogenous Switching Regression Model (ESRM) is an econometric technique used to analyse a decision process that involves choice of an option. It is used in the estimation of treatment effects when there is non-random allocation of subjects to treatment and non-treatment groups (Alene and Manyong, 2009). ESRM is chosen to correct for potential endogeneity and sample selection bias that may have been caused by other interventions (Alene et al, 2007) in the agribusiness. ESRM allows researchers to estimate what the outcome would have been for individuals if they had chosen the opposite treatment option, this provides valuable insights into the true causal effect. It also considers both observed and unobserved factors influencing the treatment choice, providing a deeper understanding of the mechanisms behind treatment effects, beyond simply comparing treatment and control groups.

The selection equation for innovation adoption (here, Credit Guarantee System) is specified as:

$$S_i^* = ax_i + u_i \text{ with } S_i^* = \begin{cases} 1 \; if \;\; S_i^* > 0 \\ 0 \; if \; S_i^* \;\leq 0 \end{cases} \text{.....} (1)$$

Where the Si* is the unobservable variable for participation in the GIRSAL's credit guarantee, Si is its observable counterpart (the dependent variable of participation in GIRSAL's credit guarantee, equals one, if the agribusiness participates and zero otherwise), Xi are non-stochastic vectors of observed characteristics of the agribusinesses determining participation in GIRSAL's credit guarantee and ui is random disturbances linked to unobserved factors that determine participation in GIRSAL's credit guarantee. Modelling of the impact of GIRSAL's credit guarantee on the outcome variable of interest, under the ESRM framework proceeded in two stages: The first stage is the decision to participate in GIRSAL's credit guarantee (Equation 1), and this was estimated using a Probit model; in the second stage an Ordinary Least Squares (OLS) regression with selectivity correction was used to examine the relationship between the outcome variable and a set of explanatory variables conditional on the adoption decision. The two stages or regimes employed helped to overcome the endogeneity and selection bias, using the ESRM framework. The two outcome regression equations, conditional on adoption can be expressed as:

Regime 1 (a = Participants) : $Y_{1i} = \beta_1 x_{1i} + \varepsilon_{1i}$ if S = 1 ……..……..(2)

Regime 2 (b = Non participants) : $Y_{2i} = \beta_2 x_{2i} + \varepsilon_{2i}$ if S = 0 ……..……..…(3)

Y_{1i}, and Y_{2i} are outcome variables, for regimes (1) and (2) respectively, x_{1i} and x_{2i} are vectors of exogenous factors that are thought to influence adoption of GIRSAL's credit guarantee; β_1 and β_2 are vectors of parameters to be estimated; and

u_{1i} and u_{2i} are random disturbance terms. These are assumed to have a trivariate normal distribution, with mean vector zero and non-singular covariance matrix shown in equation 4 (Wooldridge, 2002).

$$Cov\ (\varepsilon_{1i}, \varepsilon_{2i}, u_i) = \begin{pmatrix} \delta_{\varepsilon i}^2 & . & \delta_{\varepsilon 1u} \\ . & \delta_{\varepsilon 2}^2 & \delta_{\varepsilon 2u} \\ \delta_{u\varepsilon 1u} & \delta_{\varepsilon 2u} & \delta_u^2 \end{pmatrix} \ldots\ldots\ldots(4)$$

where $\delta^2_{\varepsilon 1}$ and $\delta^2_{\varepsilon 2}$ are variances of the stochastic disturbance terms in the regime functions in equation (3). δ^2_{u2} is the variance of the stochastic disturbance term in the selection equation shown as equation (2). $\delta_{\varepsilon 1 \varepsilon 2}$ represents the covariance of the stochastic disturbance terms in equation (3) while $\delta_{\varepsilon 1u}$ is the covariance of ε_{1i} and u_i . $\delta_{\varepsilon 2u}$ is the covariance of ε_{2i} and u_i. The covariance between ε_{1i} and ε_{21} is not defined because y_{1i} and y_{2i} from equation (3) are not determined simultaneously and it was assumed that δ^2_u =1 because α is estimable only up to a scalar factor (Maddala, 1983). A useful implication of the error structure is that the stochastic disturbance terms from the regime equations shown in equation (3) are correlated with the stochastic disturbance term in the selection equation. Therefore, expected values of the stochastic disturbance terms from the regime functions in equation (3) conditioned on sample selection are not equal to zero as shown in equations 5 and 6:

$$E(\varepsilon_{1i} \mid (S_i = 1) = \sigma_{\varepsilon 1u} \frac{\varphi(\beta xi)}{\emptyset(\beta xi)} = \sigma_{\varepsilon 1u} \lambda_{1i}$$

where $\lambda_{1i} = \frac{\varphi(\beta xi)}{\emptyset(\beta xi)}$ ……...……...(5)

$$E(\varepsilon_{2i} \mid (S_i = 0) = \sigma_{\varepsilon 2u} \frac{\varphi(\beta xi)}{1 - \emptyset(\beta xi)} = \sigma_{\varepsilon 2u} \lambda_{2i}$$

Where $\lambda_{2i} = \frac{\varphi(\beta xi)}{1 - \emptyset(\beta xi)}$ ……(6)

Endogenous Switching Regression Model can be used to compare the following: The expected outcome variables of agribusinesses that participated (a) with respect to agribusinesses that did not participate (b). It also, investigates the expected outcome variable in the counterfactual hypothetical cases (c) that the participated agribusinesses did not participate, and the counterfactual hypothetical case (d) that the non-participated agribusinesses participated. The conditional expectations for the outcome variables in the four cases are presented in table 4 and defined as follows:

Where Φ is the standard normal cumulative density function and φ is the standard normal probability function. If the estimated $\sigma_{\varepsilon 1u}$ and $\sigma_{\varepsilon 2u}$ are statistically different from zero, the null hypothesis of absence of self-selection is rejected. This means that the decision to participate in GIRSAL's credit guarantee and the outcome variable are correlated (Maddala and Nelson, 1975).

Full Information Maximum Likelihood Estimation (FIMLE) is used to estimate the Endogenous Switching Regression Model (Shiferaw et al., 2008). FIMLE estimates the decision criterion and the regime regression equations at the same time. Given the assumption with respect to the distribution of the stochastic disturbance terms, the FIMLE of equations (1), (2) and (3) is given as:

$$InL = \sum_{I-1}^{N} \{S_i W_i \left(In \left\{ \emptyset e_{1i} + In \frac{f(\varepsilon_{1i}}{\sigma_{\varepsilon 1}} \right\} \right) + (1 - S_i) W_i (In\{1 - \varphi(e_{2i})\} + In \left\{ \frac{f\left(\frac{\varepsilon_{2i}}{\delta_{\varepsilon 2}}\right)}{\delta_{\varepsilon 2}} \right\} \ldots\ldots\ldots\ldots...(7)$$

Where $e_{ji} = \frac{(\gamma Z_i + \rho_j \varepsilon_{ji} / \delta_j)}{\sqrt{1-\rho^2}}$ j = 1, 2. φ is the standard normal cumulative distribution function, f is the standard normal probability density distribution function, w_i is an optional weight for observation i, σ_1 and σ_2 are standard deviations of the error terms from the two regime equations. Again, ρ_1 and ρ_2 are correlation coefficients between u_i and respective stochastic disturbance terms from the two regime equations. After the parameters are estimated, the study then estimated the outcome variable of agribusinesses that participated in GIRSAL's credit guarantee and those that did not participated.

$$E\left(Y_{1i} \mid S_i = 1\right) = \beta_1 x_{1i} + \delta_{e1u} \lambda_{1i} \ldots\ldots\ldots\ldots\ldots (8)$$

$$E\left(Y_{2i} \mid S_i = 0\right) = \beta_2 x_{2i} + \delta_{e2u} \lambda_{2i} \ldots\ldots\ldots\ldots\ldots (9)$$

$$E\left(Y_{2i} \mid S_i = 1\right) = \beta_1 x_{1i} + \delta_{e2u} \lambda_{1i} \ldots\ldots\ldots\ldots\ldots (10)$$

$$E\left(Y_{1i} \mid S_i = 0\right) = \beta_2 x_{2i} + \delta_{e1u} \lambda_{2i} \ldots\ldots\ldots\ldots\ldots (11)$$

Table 4: Treatment, Heterogeneity and Transitional Heterogeneity Effects

Sub Sample	Decision Stage		Treatment Effect
	To adopt	Not to adopt	
Agribusinesses that Participate	(a) $\left(Y_{1i} \middle\| S_i = 1\right)$	(c) $\left(Y_{2i} \middle\| S_i = 1\right)$	On the Treated (ATT_i)
Agribusinesses that do not participate	(d) $\left(Y_{1i} \middle\| S_i = 0\right)$	(b) $\left(Y_{2i} \middle\| S_i = 0\right)$	On the Untreated (ATU_i)
Heterogeneity Effects	(BH_{1i})	(BH_{2i})	TH

Where outcomes (a) and (b) represent observed employment while (c) and (d) represent the counterfactual of expected employment.

D_i = 1 if an agribusiness i adopted GIRSAL's credit guarantee and 0 otherwise.
Y_{1i} = employment levels, if an agribusiness i adopted GIRSAL's credit guarantee.
Y_{2i} = employment levels, if an agribusiness i did not adopt GIRSAL's credit guarantee.
ATT_i = the effect of the treatment (i.e. GIRSAL's credit guarantee) on the treated (agribusinesses that adopted).
ATU_i = the effect of the treatment (i.e. GIRSAL's credit guarantee) on the untreated (agribusinesses that did not adopt).
BHi = the effect of base heterogeneity for agribusinesses that adopted (i = 1) and did not adopt (i = 2).
TH = (ATT_i – ATU_i) is the transitional heterogeneity.

In table 4, cases (a) and (b) along the diagonal represent the actual expectations observed in the sample. Cases (c) and (d) represent the counterfactual expected outcomes. In addition, we can calculate the effect of the treatment (GIRSAL's credit guarantee) on the treated (agribusinesses) as the difference between cases (a) and (c) (Heckman et al., 2001).

$$(ATT_i) = E\left(Y_{1i} - Y_{2i} \middle| S_i = 1\right) = \beta_1 x_{1i} + \delta_{e1u}\lambda_{1i} - \beta_1 x_{2i} - \sigma_{e2u}\lambda_{1i} = \beta_1(x_{1i} - x_{2i}) - (\sigma_{e1u} - \sigma_{e2u})\lambda_{1i} \quad \text{.....(12)}$$

Equation (12) represents the effect of GIRSAL's credit guarantee on employment of the agribusinesses that actually adopted GIRSAL's credit guarantee. Similarly, the effect of GIRSAL's credit guarantee of the untreated (ATU) for the agribusinesses that actually did not adopt GIRSAL's credit guarantee was calculated as the difference between (d) and (b);

$$(ATU_i) = E\left(Y_{1i} - Y_{2i} \middle| S_i = 0\right) = x_{2i}(\beta_1 - \beta_2) + (\sigma_{e1u} - \sigma_{e2u})\lambda_{1i} \quad \text{..... (13)}$$

Finally, the study investigates the "transitional heterogeneity" (TH), that is, if the effect of participating in GIRSAL's credit guarantee on agribusinesses' employment is higher or lower for the agribusiness that actually participated or for the agribusiness that actually did not adopt in the counterfactual case that they did adopt, that is, the difference between equations (12) and (13) i.e., (ATT) and (ATU).

The factors of access to credit, that determine participation of GIRSAL's credit guarantee were estimated by ESRM model. The linear representation is specified as:

$$Ei = \delta + \delta_1 \text{Training} + \delta_2 Education + \delta_3 Experience + \delta_4 Extension + \delta_5 \text{Market Info Access} + \delta_6 FBO + \delta_7 \text{Tax} + \varepsilon \quad \text{.....(14)}$$

Table 5: Variables Definition and Apriori Expectations

No	Outcome Variable	Description	Apriori Expectations
1	Employment	Number of full-time employees	n/a
No	Explanatory Variables	Description	Apriori Expectations
1	Education (Edu)	Formal educational level attained by respondents, measured in years	+
2	Farmer Based Organisation (FBO)	Agribusiness owners are assigned 1 if they are members of FBO and 0 otherwise	+
3	Extension Services	Agribusinesses are assigned 1 if they have access to extension services and 0 otherwise	+
4	Skill Training	Agribusinesses are assigned 1 if they have acquired additional skill training and 0 otherwise	+
5	Market Information	Agribusinesses are assigned 1 if they have access to market information and 0 otherwise	+
6	Experience	Respondent's experience in agribusiness, in years	+
7	Established buyer	Agribusinesses are assigned 1 if they have established buying relationship with off takers and 0 otherwise	+
8	Tax	Amount of tax paid measured in cedis	-

RESULTS AND DISCUSSION

This section presents the results on impact of GIRSAL's credit risk guarantee on employment of agribusinesses. The section begins with a discussion of the results on agribusinesses' employment levels and followed by discussion of the results that emerged from the estimated ESR model.

The beneficiary respondents were asked if the credit guarantee enjoyed from GIRSAL through the Participating Financial Institutions has improved their employment numbers. From results 71.00 percent responded in affirmation that they recorded increased employment numbers. According to the results, an average of five (5) more employees have been employed by each agribusiness. This shows that, at least 355 new employees have been engaged by all the 71 beneficiary agribusinesses per annum. In the four years of its existence, the credit guarantee thus indirectly employed at least 1,420 workers. This finding is supported by Craig, Jackson, and Thompson (2008) and Asdrubali and Signore (2015), who independent found that guaranteed loans have increased employment in the United States and Central and Eastern Europe respectively.

Estimates of factors of beneficiaries of Credit Guarantee System and impact of Credit Guarantee System on employment are presented in table 6. The first column depicts the estimated variables used in the model. The second, third and subsequent columns show the coefficients of factors of selection equation on beneficiaries of the Credit Guarantee System or not affecting employment levels for beneficiaries and non-beneficiaries of Credit Guarantee System respectively. The Wald Chi^2 Test for the Endogenous Switching Regression Model is significant at 1% confidence interval. This indicates that the model is a good fit for the explanatory variables.

The correlation coefficients rho_0 and rho_1 are both negative and are significant for the correlation between the Credit Guarantee System participating choice equation and agribusinesses who actually participated in the Credit Guarantee System (Table 6). Since rho_1 is negative and significantly different from zero, the model suggests that agribusinesses who participate in Credit Risk Guarantee have a higher employee number than what a random agribusiness in the sample would have obtained. The finding is consistent with those of Craig et al (2008) who found that guaranteed loans have increase employment in the United States. Similarly, Asdrubali and Signore (2015) found that guaranteed loans have increased employment in Central and Eastern Europe. Agribusinesses who are non-participants of the Credit Risk Guarantee are not better or worse than a random agribusiness. The likelihood-ratio test is statistically significant at 1%, indicating that the null hypothesis which states that Credit Guarantee System has no significant effect on agribusiness' employment level can be rejected in favour of the alternative. In other words, GIRSAL's Credit Guarantee System has a positive effect on employment.

Table 6: Endogenously Switching Regression on Employment

	Beneficiaries = (1)		Non-Beneficiaries = (0)		Selection = (1/0)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Education	0.514**	0.215	-0.198	0.277	0.765***	0.037
FBO Member	0.240**	0.178	-0.048	0.207	0.032***	0.008
Extension	0.226	0.406	-0.878**	0.382	0.287***	0.061
Skills Training	0.071	0.255	0.369	0.365		
Experience	0.019	0.013	0.033***	0.013	0.011***	0.008
Est Buyers	0.234	0.148	0.829***	0.305	0.287***	0.061
Tax	-0.311	0.192	1.398***	0.282	-0.448***	0.120
Constant	1.009	0.669	0.136	0.637	-3.642***	0.537
/lns0	*0.133 (0.112)*					
/lns1	*-0.640 (0.112)***					
/r0	*-0.325 (0.141)***					
/r1	*-17.967 (0.316)****					
sigma0	*1.143 (0.128)*					
sigma1	*0.527 (0.059)*					
rho0	*-0.314 (0.127)*					
rho1	*-1.000 (0.000)*					

Number of observations = 200 Wald Chi^2(13) = 429.78
Log pseudolikelihood = -513.18997 Prob > Chi^2 = 0.0000

*Figures in parenthesis are standard errors; *Significant at the 10% level; **Significant at the 5% level; ***Significant at the 1% level*

Table 7: Expected Employment, Treatment and Heterogeneity Effect of CGS

Employment Levels	Decisions Stage		Treatment Effect
	To Participate	Not to Participate	
Agribusinesses who Participated	(a) 9.017	(c) 5.309	3.708 (1.649) ***
Agribusinesses who did not Participate	(d) 4.858	(b) 6.120	-1.262 (1.254) ***
Heterogeneity Effects	BH1 = 4.159	BH2= -0.811	TH = 4.834

*Source: Field Data, September 2022; Figures in Parenthesis are Standard Errors; *Significant at the 10% level; **Significant at the 5% level; ***Significant at the 1% level*

The impact of Credit Guarantee System on employment is further shown by results presented in table 7. The expectation of recruitment by beneficiary agribusinesses is higher than non-beneficiaries by 3 employees (a - b). The results also show that if the beneficiaries decided not to benefit, they would have recruited 4 less employees (a - c).

Again, if the non-beneficiary agribusiness (d) decided to benefit, they would have recruited one more employee. These results testify that benefiting in the Credit Guarantee System significantly increased employee numbers by agribusinesses both in terms of desire to recruit and actual employment.

The results on heterogeneity effects disclose that, agribusinesses who benefitted in Credit Guarantee System would have recruited 4 more employees than non-beneficiary agribusiness, even if the non-beneficiary agribusiness had decided to benefit in the Credit Guarantee System. Conversely, had the beneficiary agribusiness decided not to benefit, their number of employees would have reduced by one, than non-adopters. Finally, there is a positive transitional heterogeneity of about 5 employees. This means that the impact of Credit Guarantee System on agribusinesses' level of employment is significantly higher for agribusinesses who actually benefited than agribusinesses who did not benefit.

CONCLUSIONS

The study assessed the impact of GIRSAL's credit risk guarantee on employment by agribusiness firms. The study was conducted in Fifty (50) beneficiary communities across Forty (40) MMDAs while the non-beneficiaries were from One Hundred and Twenty-Seven (127) communities across Forty (40) MMADs in Ghana.

Seventy-one percent (71%) responded in affirmation that they recorded increased employment numbers. An average of five (5) more employees has been employed by each agribusiness. This shows that, at least 355 new employees have been engaged by all the 71 beneficiary agribusinesses per annum. In the four years of its existence, the credit guarantee

thus indirectly employed at least 1,420 workers. The above results show that there has been enough evidence that GIRSAL's Credit Risk Guarantee induced financial and economic additionalities.

Education and experience of the agribusiness owner, FBO membership and access to extension, all affect access to credit and hence employment. Similarly, beneficiaries recorded about 34 more employees than non-beneficiaries. The result with positive estimates shows that GIRSAL's credit guarantee system has positive effect on beneficiaries.

Agribusinesses who participate in the GIRSAL's Credit Risk Guarantee System have a higher employee number than what a random agribusiness in the sample would have obtained. Agribusinesses who are non-participants of GIRSAL's Credit Risk Guarantee System are not better or worse than a random agribusiness. In other words, Credit Guarantee System has a positive effect on employment.

The agribusinesses who benefitted in CGS would have recruited 4 more employees than non-beneficiary agribusiness, even if the non-beneficiary agribusiness had decided to benefit in the CGS. Conversely, had the beneficiary agribusiness decided not to benefit, their number of employees would have reduced by one than non-adopters. The impact of CGS on agribusinesses level of employment is significantly higher for agribusinesses who benefited than agribusinesses who did not benefit.

The study also found that membership of Farmer-Based Organization and years of experience in Agribusiness, influence agribusinesses' participation in the credit guarantee systems. The government through the Ministry of Food and Agriculture and its decentralized departments must as a matter of fact encourage agribusinesses to join or Form Farmer-Organizations. This will enable the agribusinesses to access more credit to support their agribusiness operations and then employ more workers and contribute to reducing unemployment in the country.

There is a positive relationship between access to extension services and agribusinesses' resolve to benefit from credit guarantee support. Greater access to extension services improves the agribusinesses' willingness to participate in the credit guarantee systems. Efforts should be made by Directorate of Agricultural Extension Service of the Ministry of Food and Agriculture to improve extension delivery to the agribusinesses. Regional and District Departments of agriculture are also encouraged to prioritized extension delivery to agribusiness within their jurisdictions. For a very effective extension delivery, a good collaboration between the Ministry of Food and Agriculture and the private extension delivery approach could be exploited.

Evidence of financial and economic additionalities observed is an indication of positive effects of GIRSAL's intervention. This intervention covers only a small fraction of agribusinesses in Ghana. Efforts must be made to encourage more agribusinesses to benefit from the credit risk guarantee facility. GIRSAL should be encouraged to sign on board all other financial institutions in the country including all Rural and Committee Banks. The financial institutions should also be incentivised and encouraged by government through the Bank of Ghana and the Ministry of Finance to educate and introduce more agribusinesses to the availability of credit risk guarantee support. The intervention can be upscaled to or replicated in other sectors of the economy and other countries. To hexpand credit guarantee offerings by financial institutions, Bank of Ghana should share the potential credit risks to incentivize lending institutions. This will ultimately improve access to appropriate credit and profits and reduce the rate of unemployment in the country.

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