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The Relevance of Bank Lending Behavior for the Efficiency of Public Credit Guarantee: Evidence from Nigeria

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The Relevance of Bank Lending Behaviour for the Efficiency of Public Credit Guarantee: Evidence from Nigeria

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Abstract

The amount of credit additionality achieved by banks using public credit guarantees (PCGs) constitutes an important problem in policy concerns about the use of PCGs to fund credit rationed sectors. Policymakers and academic research evaluate PCGs as efficient methods for credit allocation to such sectors. The current evidence shows that bank lending behaviour, structured by the requirements of prudential risk guidelines determines the efficiency of PCGs. Studies find that banks using PCGs during the Covid-19 crisis adopted credit substitution, a practice of replacing unguaranteed credits with guaranteed credits which determines a lower credit additionality. This study used aggregate secondary data on the Agricultural Credit Guarantee Scheme Fund (ACGSF) and bank financial indicators in Nigeria and Non-parametric tests and the ARDL econometric models to analyse whether banks' use of PCGs implemented as development policy tools under normal economic conditions in developing economies such as Nigeria also involve credit substitution. The study finds that the guarantee coverage has a direct positive effect on credit additionality in both the short run and long run periods but bank size and the share of bank agricultural credits in bank total credits each has negative effects on growth of additional credit. The study concludes that the PCGs may be seen as effective development policy tools for sustained credit additionality to credit rationed groups, and that bank lending behaviour has important consequences for the impact of the PCGs on credit rationed groups. The study recommends that policymakers require that guarantee fund be additional to existing market-based credits and that policymakers should encourage the participation of smaller sized banks.

Keywords: *Public credit guarantees; banks; Credit additionality*

Introduction

This study seeks to identify the relevance of bank lending behaviour in the amount of additional credit relative to the guarantee coverage amount achieved by a public credit guarantee scheme (PCGs). Bank lending behaviour is structured by the restrictions of compliance with the government prudential risk guidelines on their financial indicators and they are characteristically, unwilling to lend to the credit rationed groups that are the target sectors of a PCG. Theoretical models of credit markets with asymmetric information predict that PCGs results in improvement in bank credits to rationed groups by increasing bank earnings from loans to the rationed groups (Gale, 1990; Mullin & Toro, 2018). This view encouraged a belief that PCGs schemes are cheaper and less market distorting mechanisms of government credit subsidy, relative to other policy instruments such as sponsored enterprise, tax subsidies, direct lending and interest

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subsidies (Gale, 1990; OECD, n.d) and informed governments' use of PGCs. However, current research based on PCGs used as counter-cyclical policy tools in developed economies, during the Covid-19 crisis evidence that banks may opportunistically practice credit substitution, a practice whereby, banks using a PCG substitute guaranteed credits for existing unguaranteed credits, resulting in negative credit additionality. Therefore, the view about PCGs in policy and academic circles is that the extent to which they result in bank credit additionality is uncertain and is in particular, conditional on bank financial indicators. Policymakers in developing countries, where PCGs have long been used as tools of economic development may need the evidence on how these schemes influences bank lending behaviour. This paper examines the role of public credit guarantee scheme in bank lending behaviour using data on the Agricultural Credit Guarantee Scheme Fund (ACGSF) in Nigeria.

The use of PCGs by Nigerian government is of long history dating back to 1977, with the implementation of ACGSF, a PCG scheme for enterprises in agriculture. The ACGSF is jointly owned by the Central Bank of Nigeria (CBN) and the Federal Government of Nigeria (FGN). It commenced operation in 1978, providing coverage rate of 75%, for loans by banks to agriculture. The initial capital base was N100 million in 1978, with paid up share capital of N85.6m, thus was upgraded first to N3 billion in March 2001 and again to N50b in 2019. The scheme remains active till date, with loans guaranteed that ranged in amount from an all-time low of N0.02b in 1984, and an all-time high of N12.46b in 2014. The government also, has in 2010, implemented the N200billion Small and Medium Enterprises (SME) Credit Guarantee Scheme (SMECGS). Nigerian policy makers' repeated use of PCGs as policy instrument to improve bank credits to target groups aligns with the global pattern. Indeed, PCGs are increasingly touted to be instruments for expanding access to bank credits to achieve financial inclusiveness and in particular, in the 2020 year, 41 countries initiated 57 credit guarantee schemes for SMEs based on World Bank data (Dreyer & Nygaard, 2020).

The empirical evidence on the effect of PCGs on bank behaviour is mostly for the Covid-19 crisis PCGs schemes which represent the use of PCGs as counter-cyclical policy instruments in developed economies in recent periods. These studies provide for unclear outcomes with respect to the extent that banks' use of PCGs will result in credit additionality. This ambiguity has its root in the notion that PCGs may be compromised by banks using the guaranteed credit as subsidies to reduce their cost of lending on the one hand, and that the features of the scheme such as the fraction of a loan amount it guarantees that is, the coverage ratio, has both direct and indirect effects on the extent of credit additionality that occurs (Bachas, Kim & Yannelis, 2021; Gurmessa, Ndinda, Agwanda, & Akiri, 2022; Uesugi, Sakai, & Yamashiro, 2020). These findings are critically based on the Covid-19 crisis PCGs, and specifically on the assumption that beneficiaries of the schemes have previous credit relationships with the participating banks. Since the indirect effect depends on how the guaranteed loans impact on bank financial indicators including, in particular, bank capital ratio, bank assets and earnings, and bank credit risk, it follows that a study based on developing financial system data can extend the findings on the phenomenon.

This study focuses on bank credit additionality by commercial banks using agricultural PCGs in Nigeria. It considers the proposition of credit markets models (Cascarino, et al, 2022; Gale, 1990), that PCG cause bank credit additionality to a credit rationed group targeted by the PCG. This outcome occurs because the guarantee improves the risk of the loan portfolio held by banks, and the low bank earnings on loans to the group, the factors in bank lending behaviour that determine banks' unwillingness to lend to the group. The study thus addresses the following research questions. (1) is there bank credit additionality from use of the Agricultural credit guarantee? (2) How much bank credit additionality is realized in response to the coverage amount of the guarantee loans? (3) Do banks' financial indicators mediate the extent to which the guarantee coverage amount causes bank credit additionality? To pursue this research questions, the study uses two methodologies. The first is a simple test of hypothesis using non-parametric Sample Signed Test and the Wilcoxon Signed Rank Test to pursue the first research question of the study. The procedure aims to ascertain whether the amount of bank credit additionality is statistically significant and whether it is proportional to the coverage amount (Cascarino, et al (2022). The second method is the application of the Auto-Regressive Distributed Lag (ARDL) econometric model to the time series data on indicators of the guarantee and bank characteristics to estimate the relationships addressed in research questions (2) and (3). The present study is related to studies of the performance of PCG schemes whose themes encompass the financial additionality, economic additionally and sustainability of PCG schemes.

The remainder part of the study is structured in five additional sections. Sections 2 and 3 are respectively, the literature review and the theoretical framework and methodology. Section 4 presents the results of the non-parametric test of hypothesis. Sections 5 and 6 are the empirical results and the summary and conclusions.

Literature Review

Review of theoretical literature

A major concern in the study of bank use of PCGs is how well an implemented scheme produces bank credit additionality. Conceptually, a public credit guarantee scheme acts as an institutional guarantor for bank loans. The guarantee may be partial or full, that is, the institutional guarantor may insure part or whole amount of the loan in the case of borrower default. Credit additionality refers to improved amounts and/or terms of bank credit to beneficiaries of the scheme and funding of larger populations of the target group. The perspective is that PCG schemes are cheaper and less market distorting mechanisms of government credit subsidy, relative to other policy instruments such as sponsored enterprise, tax subsidies, direct lending and interest subsidies (Gale, 1990; OECD, n.d) Credit guarantee schemes feature widely in both developed and developing economies, as a policy tool to facilitate higher level of credits and/or lower cost of funds to credit rationed groups.

The lending behaviour of banks using PCGs is a component of theoretical credit market models of Gale (1990), and the stylized models of Cascarino et. al (2022) Cordella, Dell'Ariccia, & Marquez (2018) Gale's (1990) model assumes asymmetric information between banks and borrowers who fall in two classes, general borrowers and target borrowers who are rationed or refused credit and are the target of government credit subsidy. It shows that banks' decision to lend is determined by the expected bank returns from making the loan. However, banks derive larger maximum returns and lower default rates on loans to general borrowers than on the loans to target group. Banks therefore, prioritize the general borrowers demand for credit, and treat the demand for credit by the target group as residual. In consequence, equilibrium in the credit market may be characterized by rationing or denial of access to the target group. However, whether rationing or denial of access occurs depends on the condition of bank fund supply. Government intervention in credit markets in the form of PCGs, increase loan repayments, reduce credit risks, and hence bank lending costs. A PCGs is thus, effective to alleviate the low bank returns on loans to the target group, which is the cause of banks' unwillingness to lend.

Cascarino et al (2022) explicates on the nature of bank funds which affects bank lending behaviour. The authors develop a stylized model which describes the equilibrium level of credit additionality in terms of the coverage rate of the public loan guarantee scheme, and the characteristics of lending banks and borrowing firms. The model assumes two time periods, a pre-crisis and a crisis period. Government implements the PCGs in the crisis period, and beneficiaries of the scheme have previous loan exposures with participating banks. Bank funds are obtained either as equity or debt, and banks are required to maintain amount of equity that fund loans while staying compliant with prudential risk regulations. Guaranteed loans have lower expectation of loss and therefore, smaller prudential risk weight, that in turn, mandates less equity requirement to fund guaranteed loans. Extending guaranteed loans therefore, incurs lower lending costs for the bank and lower rate of interest for borrowers. Both banks and borrowers therefor, are willing to substitute guaranteed loans for pre-existing unguaranteed loans. However, banks earn less on guaranteed loans. A key contribution of the model is that bank credit additionality with the use of PCGs is the outcome of the trade-off between the cost to the bank of lower interest rates on guaranteed loans and banks' incentive to substitute pre-existing loans with guaranteed loans, thereby, reduce the risk of its loan portfolio and hence the cost of lending. The model predicts that credit additionality will increase with higher coverage ratios and better bank capitalization. This model's prediction explicates the funds supply factors in Gale (1990), its prediction that banks substitute crisis period guaranteed loans for pre-existing unguaranteed loans may or may not explain the occurrence or otherwise of credit additionality in the circumstances of the current study.

Review of empirical literature

Empirical studies provide support for credit additionality, but also indicate the tendency for credit substitution, which affects the effective volume of credits that banks make to the scheme's target sectors. Studies reviewed are categorized into two groups, distinguished by whether the type of PCG was a development policy instrument or a counter-cyclical policy instrument. The former type refers to usage of PCGs to influence bank lending under normal economic conditions in an era of economic deregulation. PCGs used in this mode are described as structural elements of the financial system (Cusmano, 2018). The latter type, in turn, describes government implementation of PCGs to counter credit crunch arising in crisis. In this latter case, the targets of government intervention may be general borrowers but a large number of the implemented schemes targeted SMEs, who are more likely to suffer credit rationing.

Similar to the present study, the first group including Bachas, Kim & Yannelis (2021), Cowan, Drexler, & Yañez (2015), Gurmessa, et al (2022), Rubin & Ben-Aharon (2021), Tang &Toro (2020), Uesugi, Sakai, & Yamashiro (2010), Zecchini & Ventura (2009) examine bank lending responses to PCGs policies implemented under normal macroeconomic conditions to improve the allocation of bank credits to credit rationed borrowers who are targets of the scheme.

Bachas & Yannelis (2021) was concerned by the extent to which banks deploy public loan guarantees towards credit additionality rather than to subsidize lending. The authors use the data on guarantee rates in the Small Business Administration (SBA) loans. The estimated results show higher intensive margins of bank loans at guarantee rates above an estimated threshold level. In particular, the paper established that a one percent increase in coverage rate cause a $19,000 growth in bank credit to beneficiaries.

Cowan, Drexler, & Yañez (2015) adopt a new dataset and derives evidence on the effect of the guarantee on credit additionality and total volume of credit to SMEs in the USA. The study finds that total credit to SMEs increased by 65% for every dollar increase in guarantee coverage. The study also derives results that support higher default rates among beneficiary firms and suggests that the finding indicates adverse selection.

In contrast to developed economy studies, Gurmessa, et al (2022) contributes to the literature, the outcome in bank lending to smallholder coffee farmers cooperatives, from the use of a partial credit guarantee scheme funded by the Common Fund for Commodities in Ethiopia. Also, in contrast to the use of secondary micro-level data in the developed economy studies, Gurmessa, et al's (2022) study used the mixed method approach and generated quantitative and qualitative data on the performance of the scheme, outcomes in bank lending, and impact on bank behaviour. The results from the analysis of the data shows that the volume of bank lending to the group increased, but banks achieved restricted reach. The paper also finds that a number of borrower, bank, and guarantee characteristics influenced the amount of credit additionality.

Rubin & Ben-Aharon (2021) examined data from surveys of Israeli government loan foundation (GLF) to identify the credit additionality of PCGs. The study identifies the guarantee's effect of signaling firms' early years' survival and reduced risks for commercial banks. It finds that more than half of the guaranteed bank loans extended to SMEs were additional loans.

The objective of Tang & Uchida's (2020) study was to examine variations in use of credit guarantees among Banks in Japan. The paper used firm level data and employed the rather novel of approach of Khwaja and

Mian (2008) (Cited in Tang & Uchida, 2020), to measure a controlled guarantee ratio derived as the residual of the guarantee ratio after controlling for firm and guarantor specific characteristics. The paper related the controlled guarantee ratio as a function of bank behaviour only. The study finds that conventional financial variables associated with bank financial soundness do not determine variation in the ratio across banks. The paper concludes that the variation in bank use of guarantees is caused by other bank characteristics. Uesugi, Sakai, & Yamashiro's (2010) study was motivated by the pervasiveness of Japanese government loan guarantee programs between 1998 and 2001, and sought to ascertain the extent to which the loan guarantee programs increased bank lending to firms and impacted the performance of participating firms. The authors used panel data methods and they obtained results that support increased bank lending due to loan guarantees. They also find that inadequate bank capitalization impacted sustainability of bank credit to beneficiaries.

Zecchini & Ventura (2009) conducts an in-depth evaluation of the impact of PCGs in increasing credit to SMEs. The study presented extensive econometric analysis, based on the comparative performance of beneficiary firms with similar but non-beneficiary firms. The findings show that public guarantees have positive impact on the beneficiary firms' access to credit and cost of loans.

The second group of studies include Altavilla, Ellul, Pagano, Polo, & Vlassopoulos (2021), Cascarino, et al, (2022) Jimenez, Laeven, Martinez-Miera, & Peydro (2022), Marsh & Sharma (2022). They analyse bank lending effects of PCGs implemented to counter the credit crunch in the Covid-19 crisis. In contrast to the current study's focus on bank lending behaviour in the developing country, Nigeria, these latter group makes findings based on counter-cyclical PCGs implemented in developed economies during Covid-19 crisis. Furthermore, in contrast to our use of publicly available macro-level data, most of the studies in this group use publicly available developed economy micro-level dataset.

Altavilla, et al (2021) sought to ascertain how PCGs affect bank lending for the Euro-area, using information in credit register data on firms guaranteed and non-guaranteed borrowings from both banks participating in the scheme as well as non-participating banks. The paper found that guaranteed credit extensions varied inversely with non-guaranteed credits and concludes that banks use PCG to substitute for private credits. Furthermore, it finds that bank guaranteed loans were biased towards firms with good credit standing, while larger sized and more capitalized banks extended more guaranteed loans. Cascarino, et al

(2022) used a similar dataset as Altavilla, et al (2021) to measure how well PCGs caused additionality in bank lending. The loan-level dataset on Covid-19 PCGs implemented in Italy, used in the study covers guaranteed and non-guaranteed bank loans assessed by firms after the pandemic. The paper focused on variation in additionally in bank loans across program coverage ratios and over time. The results of the study confirm that credit additionality varied across guarantee characteristics and bank characteristics, but not across levels of firm liquidity, size and risk characteristics. The study's finding that credit additionality first rose for a period of time but subsequently decreased in the case of partial coverage is similar to Uesugi, et al's (2020) finding of effect of low bank capitalization in non-sustained bank credit additionality.

Jimenez, et al (2022) analyses the impact of PCGs on bank credit in Spain in the Covid-19 crisis period using similar Covid-19 PCGs loan-level data as the studies of Altavilla, et al (2021) and Cascarino, et al (2022). He extends the previous studies with the impact of relationship lending on the effect of PCG on bank lending. The study contributes two key findings. It reports that the existence of a pre-covid relationship between beneficiary firms and banks has positive impact on credit additionality at the firm-bank level, and the effects occur with greater probability for less capitalized banks. Moreover, the study finds that PCG results in credit substitution, and decrease in the share of non-guaranteed loans in total loans. He interprets the result to show early payment of non-guaranteed loans. The writers conclude that their findings support that PCGs have important consequences for the structure of the banking system.

Marsh & Sharma (2022) extends the literature with findings based on the use of Paycheck Protection Program (PPP) in the USA. The paper was concerned about the efficiency of PCGs as a solution to credit contractions in periods of crisis. They find that the PCGs addressed the credit risk burden of bank loans and caused credit additionality.

Theoretical Framework and Methodology

Theoretical Framework

The theoretical framework of this study is the credit market model of Gale (1990). This theory is chosen because it describes the effect of PCGs on bank lending to groups who are credit rationed or denied access. Gale's (1990) model assumes asymmetric information between banks and borrowers. It specifies the supply of deposit funds (S) to the bank as a function of r_d, a certain rate of interest on deposits. That is,

$$S = S(r_d) \qquad (1)$$

Equation (1) say that the supply of deposit funds to banks depends positively on banks' rate of interest on deposits.

The model assumes two types of groups of borrowers given by i = (T, G). Where T = Target group for government lending and G = Non-targeted general borrowers. Target groups (T) are rationed or refused credit. In each group, borrowers are indexed by j = ∈[0,1] and the borrower's location along the interval, j, indicates borrower riskiness. A borrower is thus denoted by (i, j), and within a group, bank expected gross returns, $R_i(j)$, and the probability of project success, $p_i(j)$, is a function of project riskiness (j). Moves inversely with riskiness of borrower. T and G has in common that $R_i(j)$ and $p_i(j)$ moves inversely with j, the riskiness of borrower. Moreover, the decision to lend is based on the expected bank returns from the loan. For each group of borrowers, bank returns will first rise as interest rate rises with borrower riskiness and then fall with further increase in the rate of interest. But, the maximum bank return on the loans to general borrowers exceeds that on the loans to target borrowers.

On the side of borrowers, the assumption is that they are expected profit maximisers. The maximum expected profit from the investment in project j in group i is,

$$E\pi_i(j) = p_i(j)\big(R_i(j)\big) - r_i \qquad (2)$$

Where, $p_i(j)R_i(j)$ and r_i are the expected earnings on the project and the rate of interest paid on loans to the group. A borrower (i, j) only accepts a loan if $R_i(j) \geq r_i$. Observe that for the marginal borrower, J_i^* we have $R_i(j_i^*) = r_i$ so that only borrowers riskier than j_i^* choose to borrow.

The loan demand for group i is given by ,

$$L_i^D(r_i) = \int_0^{j_i^*} f_i(j)\,\partial_j - F(j_i^*) \qquad (3)$$

The loan demand function, Eq. (3) is downward sloping because ${}^{\partial j_i^*}\!/_{\partial}\, r_i < 0$

Banks expected gross return from lending to group i, (ρ_i) is,

$$\rho_i = \alpha_i(r_i) * r_i = \rho_i(r_i) \qquad (4)$$

Where, α_i is the overall probability of repayment, $\frac{d\alpha_i}{dr_i} < 0$.

Eq. (3) implies that increases in interest rate eliminates safer projects from the borrowers to whom banks are willing to lend. This further implies that expected bank returns increases and gets to a maximum and subsequently declines with increases in interest rate.

The equilibrium conditions for bank lending described as (P^*, r_i^*, S_i^*) are given by two conditions, viz,

$S_i^* > 0$ then $P^* = P_i(r_i^*)$, the zero profit condition, (5a)

If $0 < j_i^* < L_i^D(r_i)$ then, $r_i^* = r_i$, the rationing conditions. (5b)

Equation (5a) states the zero-profit condition, as the equilibrium condition for lending by banks to each group, under conditions of constant returns to scale in bank lending and free entry into banking sector. Equation (5b) states that credit rationing for a group can only take place at the optimum rate of interest that maximizes the bank's rate of return on loans to the group. Eq. (5b) implies that for a group, i, the effective demand for loans (the loan that banks are willing to supply, given cost of loans), S_i^*, is zero if optimum bank rate of return, p^*, is less than p_i, the expected rate of return on loans to the group, and it equals demand for loans, L_i^D, if p^* is greater than p_i. Furthermore, if p^* is greater than p_T, banks will not consider the loan demand by group T, because they will generate negative expected returns.

A government guarantee affects loan demand and the probability of repayment of target group (T) and thus the return to banks from lending to the group. Let us denote by ω, the coverage rate of a public credit guarantee scheme that charges a fee to provide coverage. The part of the cost of the guarantee to government that is not covered by the guarantee fee is denoted by, $\emptyset$. Where, $\emptyset = 1$ implies no fee is charged. In particular, the equilibrium total bank returns from loans to T is now given by,

$$\rho_T = \alpha_T(r_T) + (1 - \alpha_T(r_T) * \emptyset\omega r_T - \rho_T(r_T, \emptyset) \quad (6)$$

Where, the first term on the right hand side of Equation 6, $\alpha_T(r_T)$, is the proportion of bank's expected return from expected interest earnings on the guaranteed loan for a probability of loan repayment equal α_T. The second term, $(1 - \alpha_T(r_T)) * \emptyset\omega r_T$, is the expected interest earnings from government settlement of default claims. The last term, $\rho_T(r_T, \emptyset)$, is the earnings loss from lending to the target group at the target group's rate of interest. Equation (6) gives banks expectations of earnings from government guaranteed loans. Government intervention using PCGs serves as instrument to alleviate low bank returns which is the cause of banks' unwillingness to lend. Gale's (1990) model thus, predicts that PCGs will cause increase in the volume of bank credits, that is, credit additionality to the target group.

Empirical model specification

The empirical model of bank credit additionality from using a PCG, may be motivated by using Equation (6) to specify effective loan demand by the target group as a function of bank expected earnings. The study assumes a no fee PCG, so that in Equation (6) we have Ø = 1. Therefore, taking probability of repayment rate, α_T, as fixed on the average, the coverage rate or amount of the loan that is guaranteed, ω, determines the extent to which the bank lends to the target group at the optimal rate of interest (r_T^*) through its effect on banks expected earnings on the guaranteed loans as in equation (6). Symbolically, this may be written as,

$$L_T^D(r_T) = F(\rho_T^*(r_t^*,\ \omega,)) \qquad (7)$$

Equation (7) specifies the target group's effective demand as a function of the effect of the guarantee coverage on bank expected returns from the loans to the group. Generally, the PCG will yield a reallocation of credit to the target group, if it supports banks' responsibility to maintain amount of equity that funds loans while staying compliant with prudential risk regulations. Thus, the extent to which the coverage amount induces growth of L_T^D, that is, bank credit additionality is dependent on how it influences bank financial characteristics (Altavilla, et al, 2021; Cascarino, et al, 2022; Jimenez, et al, 2022). The study considers three bank financial variables, capital ratio, bank size, and interest rate. Capital ratio captures the bank loan portfolio risk factor in bank lending behaviour, bank size captures the effect of bank size, while interest rate is the lending interest rate and it captures the bank gross earnings factor in bank lending behavior.

The empirical model specifies bank credit additionality (Bl_t) as a function of the guarantee's coverage amount, Cov_t, and Bank total agricultural credits share of total bank loans, Bac_t. (Bl_t) is defined as the share of bank guaranteed loans to total bank credits to the target group This definition shows how much the annual growth of total amount of credits that banks allocate to the sector is due to the credit guarantee. Cov_t captures the direct effect of the PCGs on credit additionality. Bac_t captures the possibility that banks will engage in credit substitution, a condition where banks substitute existing loans with the target group for guaranteed loans. Credit additionality as measured by the study should be negatively affected by total bank credit to agriculture when banks practice credit substitution. Furthermore, the bank financial variables enter into the model as interactive terms with the coverage amount. Equation (7) is therefore re-written in the specific form as,

Lending Model: $Bl_t = \beta_1 Cov_t + \beta_2 Bac_t + \beta_3 IV1_t + \beta_6 IV2_t + \beta_5 IV3_t + \beta_6 IV4_t + \varepsilon_t (8)$

Where,

Bl_t = Guaranteed loans' share of Bank total agric. credits (credit additionality).

Cov_t = Coverage amount

Bac_t = Bank agricultural credits share of total bank loans

$IV1_t$ = Coverage amount*capital ratio

IV2, = Coverage amount*banksize

$IV3_t$ = Coverage amount*interest rate

ε_t = stochastic error term

And t indicates the variables are time series.

In Equation (8), the coverage amount variable (Cov_t) represents the direct effect of the PCG scheme on bank lending to the target group, bank total agricultural credits, and the interactive term variables, Coverage amount* capital ratio ($IV1_t$,) Coverage amount*banksize ($IV2_t$) and coverage amount*interest rate ($IV3_t$), give the indirect effect of the guarantee amount on bank credit additionality.

Cov_t should cause positive bank credit additionality. The effects of Bac_t is expected to be negative showing that credit additionality is achieved by reducing outstanding credits to the sector. The effect of $IV1_t$ on bank credit additionality is uncertain. With partial credit guarantee, banks with better capitalization should produce more bank credit additionality, but the empirical findings on this effect is inconclusive. Cascarino et al, (2022) finds that better bank capitalization increases credit additionality, Jimenez, et al (2022) finds a conditional effect, lesser capitalized banks may produce greater additionality at the firm-bank level, in instances of previous loan relationships. Tang & Uchida (2020) in contrast, finds no effect of bank capitalization on credit additionality the study however, starts out assuming that a positive effect exists. Several findings indicate that $IV2_t$ has a positive influence on credit growth. But, Tang & Uchida (2022) reported absence of effect of all bank financial variables on credit additionality, suggesting that a non-effect of this variable cannot be ruled out. $IV3_t$ should have a positive effect on credit additionality, banks earnings increase with higher interest rate given the coverage amount. The assumption however that is the relationship is non-linear (gale, 1990).

Apriori Expectations: $\beta_1 > 0, \beta_2 < 0.$ $\beta_{>}0,$ $\beta_3 > 0,$ $\beta_5 > 0,$

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Data and Estimation Methods

Data

The data for the study are secondary time series data obtained from the CBN statistical Bulletin (2021) and the CBN Statistical Database. Annual time series covering the period 1981 to 2021 was collected on Bank equity, Bank total assets, and Bank loans under the ACGSF, Bank total credit allocation to agriculture and bank total loans. The weighted average lending rate (WALR), was used as the proxy for Interest rate. The banking sector financial indicators are reported as Commercial Banks Accounts between 1981 to 2017 and Other Depository Corporations Accounts 2018 to 2021. The dependent variable, Bl_t, is measured as Bank ACGSF loans share of bank total agricultural credits. The explanatory variable, Cov_t, was measured as coverage amount. Coverage amounts rather than the coverage ratio is used, following Cascarino, et al (2022), to effectively capture the guarantee's effect on bank lending behaviour in terms of banks' expectations of the total return from guaranteed loans. To derive a measure of $IV1_t$, Bank Capital ratio was computed as the ratio of bank equity to bank total assets. Furthermore, bank size was measured as the natural logarithm of total bank assets (Cascarino, et al, 2022), and used to compute $IV3_t$ as the product of coverage amount and bank size. Also, the variable, $IV3_t$, is the product of the coverage amount and the WALR.

To implement the simple hypothesis tests in Section 4, the study used the raw data on BL_t which has a non-normal distribution. However, all the variables entered the time series analysis in their Natural log form.

Estimation methods

Non- Parametric and Parametric Simple Tests of Hypothesis: The study initially pursued the first objective of the study, namely to ascertain whether banks used the agricultural credit guarantee for credit additionality using simple statistical tests of hypothesis. This procedure involved use of the non-parametric One Sample Sign (OSS) test and the Wilcoxon Signed Rank (WSR) test to determine statistical significance of the parameters of the statistical distribution of the variable, Bl_t. In addition, the study also presents results using the parametric Z-test procedure the first approach is justified by the non-normality of the statistical distribution of Bl_t, which may have adverse effect on the reliability of results using parametric tests. However, parametric tests have more power. And also, by central limit theorem, the parametric test of means may appropriately be applied to non- normally distributed data in large samples.

Autoregressive Distributed Lag (ARDL) Model: The study estimated the Bank lending model specified in Section 3.2 using the ARDL Model. The ARDL is attributed to Pesaran and Shin (1999), Pesaran, Shin, & Smith (2001). It has the benefit of been able to capture the data generating process irrespective of whether the data is I(0), I(1) or a combination of both. It is also appropriate for small and finite sized data and is robust to endogeneity of the right hand side variable. The ARDL model of order (p, q) is applied to the data to generate estimatesof the short run and long run relationships in the Bank lending Model. Ignoring fixed exogenous variables, the m study implements an unrestricted ARDL of order (p, q_1, q_2, q_3, q_4, q_5,) given by,

$$Bl_t = \sum_{i=1}^{p} \beta_{0i} Bl_{t-i} + \sum_{t=1}^{q_1} \beta_{1i} cov_{t-i} + \sum_{t=1}^{q_2} \beta_{2i} Bac_{t-i} + \sum_{t=1}^{q_3} \beta_{3i} IV1_{t-i} + \sum_{t=1}^{q_4} \beta_{4i} IV2_{t-i} + \sum_{t=1}^{q_5} \beta_{5i} IV3_{t-i} + \varepsilon_t \quad (9)$$

Where, p is the optimal lags on the dependent variable and $q_1, \ldots, q_8$ are the optimal lag orders of the independent variables. The assumption is that the variables in (9) are either stationary in levels that is I(0) variables or integrated of order one, that is I(1) variables. The long run and short run relationships may be extracted from the unrestricted ARDL specification in Equation (9) conditional on the existence of cointegration among the variables of the model. The test for cointegration is conducted using the ARDL Bounds test for cointegration (Pesaran, Shin and Smith, 2001). The reparametisation of the unrestricted ARDL in Equation (9) gives the error correction model as,

$$DBl_t = \theta\left(B1_{t-i} - \varphi\left(\sum_{i=1}^{q} \alpha_{ji} cov_{t-i} + \sum_{i=1}^{q} \beta_{ji} Bac_{t-i} + \sum_{i=1}^{q} \Delta_{ji} IVj_{t-i}\right)\right) + \sum_{i=1}^{p-1} \beta_{0i} Bl_{t-i} + \sum_{i=1}^{q} \alpha_{ji} Dcov_{t-i} + \sum_{i=1}^{q} \beta_{ji} DBac_{t-i} + \sum_{i=1}^{q-1} \beta_{ji} DIV1_{t-i} + \sum_{i=1}^{q-1} \beta_{ji} DIV2_{t-i} + \sum_{i=1}^{q-1} \beta_{ji} DIV3_{t-i}\epsilon_t \quad (10)$$

The prefix D in the error correction model, Equation (10), denotes the first difference of the variable. The first term on the right hand side in parenthesis is the error correction term (ECT). The coefficient, θ, is an estimate of the speed with which the dependent variable adjusts in period t, to a change in the regressors in period t-1. In the ECM, the t-values on the coefficients indicates the existence or otherwise of short run causality. The t-Statistic on the ECT indicates the existence or otherwise of long-run Ganger causality.

Non Parametric and Parametric Tests Results

Table 1 shows the results of the test of bank credit additionality from the use of the agricultural credit guarantee (Bl_t). Panel (a) of Table 1 present the parametric Z-test results. The non-parametric One Sample Sign (OSS) and Wilcoxon Signed Rank (WSR) tests results are in Panel (b). The estimated Z- statistic value of 9.60E-08 and probability value of 1.0000 show that the null hypothesis that the mean of additional bank credit is equal 2.988 cannot be rejected. The study gets similar results from the two non-parametric tests

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using the median value of $Bl1_t$. The OSS test-Statistic has a value of -0.158 with probability value of 0.874 and the WSR Statistic has a value of about 0.208 and probability equal 0.835. The results show support for the view that banks improved the volume of credit to agriculture in association with their use of ACGSF credit guarantee and is in accord with Cascarino, et al (2022), Cowan, Drexler & Yañez (2015).

A second approach (Cascarino, et al, 2022) to determine whether there is credit additionality is to compare the value of additional bank credit generated with the guarantee scheme's coverage rate. Figure 1 shows plots of the additional bank agricultural credit generated through guaranteed loans (Guaranteed loans share of total bank agric. credit) and the guarantee coverage rate of 75%.

Table 1. Parametric and non-parametric tests results for Bank credit additionality

(a)		(b)		
Sample Statistic (Value)	**Z-Stat. (Probability)**	**Sample Statistic (Value)**	**One Sample Sign Test Stat. (Probability)**	**Wilcoxon Signed Rank Test (Probability)**
Mean (2.988178)	9.60E-08 (1.0000)	Median (2.348100)	-0.158114 (0.8744)	0.208340 (0.8350)

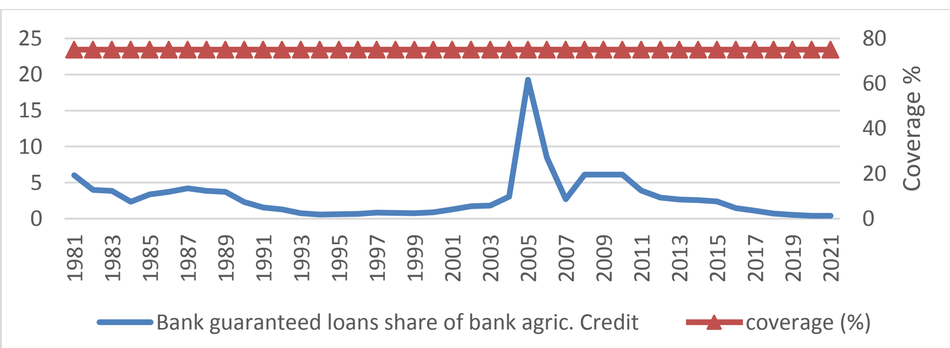

Figure 1. Guaranteed loans' share of Bank Agric. credits ($B1_t$) and Coverage rate (%).

Credit additionality, (Guaranteed loans' share of total bank agric. credits) varied from an all-time low of 0.397% in 2021 to the maximum value of 19.288% in 2005. The implication is that bank credit additionality was never equal but was lower than the coverage value of 75% in the period under study. An implication of the observed pattern is that each Naira of the guarantee amount only induced banks to generate a ₦0.26 growth in credit.

Presentation and Discussion of Results

Summary Statistics

The descriptive statistics, Table 2, shows that all the variables have positive means except Bank agric credit's share of total bank loans which has a negative mean value equal -2.756. The standard deviations vary across the variables, where coverage amount*capital has the largest std dev value of 2.720 and the lowest was 0.074 for coverage amount*interest rate All the variables are normally distributed based on the computed Jarque-Bera Statistics and the probability values, which are all significant at the 1% level of statistical significance and support the null hypothesis of normally distribution Variables.

Table 2. Descriptive statistics of the variables of the study

	Mean	Median	Max	Min	Std. Dev.	Jarque - bera	Prob.	Obs
Guaranteed loans' share of total bank agric. credits	0.691	0.854	2.959	-0.924	0.909	0.627	0.731	41
Coverage amount	13.201	13.211	16.050	9.825	2.133	4.417	0.110	41
Bank agric. Loans share of total bank loans.	-2.756	-2.677	-1.628	-4.295	0.753	1.773	0.412	41
Coverage amount*Capital ratio	15.058	15.249	18.613	10.993	2.720	4.562	0.102	41
Coverage amount*Bank size	101.622	101.955	168.306	30.268	50.074	4.423	0.109	41
Coverage amount*Interest rate	16.264	16.271	19.298	12.39	2.3026	3.653	0.160	41

Correlations of the variables of the Study

Estimated coefficients of correlation among the variables of the study and the t-values (in parenthesis) are in Table 3. The computed coefficients of correlation show that Bl_t has positive correlations with all the other independent variables of the study with the exception of Bank agri. Credits share of total bank loans (Bac_t) which shows a negative correlation. Also, based on the t-statistic value of -2.89, Bl_t's correlation with Bac_t is statistically significant at the 1% level. Remarkably, based on the values of coefficients and t-statistics, all the other independent variables have positive and statistically significant correlations with one another. The negative correlation between Bl_t and Bac_t may indicate that banks practice credit substitution. In line with the findings based on counter-cyclical PCGs in developed economies.

Table 3. Correlation matrix

Correlation (t-Statistic)	Bl_t	Cov_t	Bac_t	$IV1_t$	$IV2_t$	$IV3_t$
Bank guaranteed loans share of total Bank agric. loans (Bl_t)	1.00 -----					
Coverage amount (Cov_t)	0.091 (0.57)	1.0000				
Bank agric. credit's share of total bank loans (Bac_t)	-0.420*** (-2.89)	-0.832*** (-9.27)	1.000			
Coverage amount*Capital ratio ($IV1_t$)	0.095 (0.59)	0.993*** (52.20)	-0.834*** (-9.448)	1.0000		
Coverage amount*Bank size ($IV2_t$)	0.043 (0.269)	0.998*** (112.86)	-0.798*** (-8.281)	0.992*** (48.20)	1.0000	
Coverage amount*Interest rate ($IV3_t$)	0.017 (0.104)	0.993*** (54.09)	-0.7843*** (-7.895)	0.860*** (10.54)	0.865*** (10.76)	1.0000

Source: Author. (***), (**), (*) indicates Statistical significance at the 1%, 5% and 10% levels respectively.

5.3 Augmented Dickey Fuller (ADF), Phillip-Perron (P-P) and Zivot-Andrew Breakpoint Tests for Unit Roots

The ADF and P-P unit root tests are in Columns (2) and (3) of Table 4. Table 4 also includes the Zivot-Andrew (Z-A) Breakpoint unit root test results in Column (4). The levels of all the variables are not stationary based on both the ADF and PP test results, with the exception of interest rate that is stationary in levels but at the 10% level of significance. All the variables are however, stationary in first differences, at the 1% level. We interpret the results to mean that all the variables are I(1). However, the conventional ADF and P-P tests may be biased towards the null of unit root in cases where the data is trend stationary with a structural break. We therefore, also present results from the Zivot-Andrew (1992) (Z-A) breakpoint test of the null that the data is unit root with a break against the alternative of trend stationary with a break. The results are in Column (4), they confirm that all the variables except interest rate which is stationary in levels at the 10% level, are all unit roots. Moreover, the Zivot-Andrew results confirm that the variables are stationary in first differences. The results imply that the ARDL method is an appropriate econometric specification of the theoretical model of the study (Pesaran, Shin, & Smith, 1999).

Table 4. ADF, PP and Zivot-Andrew Breakpoint unit root test results

(1) Variables	(2) ADF		(3) P-P		(4) Z-A (Breakpoint)		(5) Remarks
Bank guaranteed loans share of total agric. Credit	-1.416		-1.476		-3.181 (2003)		Not Stationary
D(Bank guaranteed loans share of total agric.credit)	-5.740***		-5.744***		-6.79***		Stationary
Coverage amount	-1.037		-1.037		-3.2537 (2000)		Not Stationary
D(Coverage amount)	-5.655***		-5.66***		-8.272*** (2005)		Stationary
Bank agric. loans share of total bank credit	--1.211		-1.87		-3.417 (1996)		Not Stationary
D(Bank agric. loans share of total bank credit)	--6.970***		-6.95***		-7.976***(1997)		Stationary
Coverage amount *Capital ratio	-1.133				3.087 (2000)		Not Stationary
D(Coverage amount *Capital ratio)	-6.434***		-6.433***		-6.950***(2005)		Stationary
Coverage amount *Bank size	-0.522		-0.523		-1.786*** (2018)		Not Stationary
D(Coverage amount *Bank size)	-4.343***		-4.341**		-- 5.998***(2005)		Stationary
Coverage amount *Interest rate	-1.319		-1.133		-3.551(2000)		Not Stationary
D(Coverage amount *Interest rate)	-6.459***		-6.491***		-8.448***(2005)		Stationary
Critical Values	Level	1st Diff.	Level	1st Diff.	Level	1st Diff.	
10%	-2.612	-3.610	-2.607	-2.608	-4.19	-4.19	
5%	-2.948	-2.94	-2.937	-2.939	-4.44	-4.44	
1%	-3.630	-3.62	-3.606	-3.610	-4.95	-4.95	

Source Author

Note: (1): (*), (**) , (***) denotes Statistical Significance at the 10%, 5%, and 1% levels respectively. (2) D(.) denotes first difference of the variable. (3): (year) is the structural break year chosen based on the Dickey-Fuller t-statistic.

Bounds test for Cointegration

The study estimated an ARDL (1,1,0,0,3,0) regression model of Bank lending was estimated. A lag order of 4 was chosen by the Bayesian Information Criteria. However, the implemented lag order was employed to correct high collinearity among the variables at lag order 4.

The bounds test for cointegration results for the bank lending model in Table 5 show F-Statistic values of 21.267 and t-statistic value of -8.144. These F-statistic and the t-statistic values are more extreme than the Kripfganz and Schneider (2020) critical values of 6.232 and -5.156 respectively, for I(1) variables even at the 1% level of statistical significance. The study thus, rejects the null hypothesis of no level relationship among the variables at the 1% level. Given the existence of cointegration among the variables, the study can present the short run and long run results of the estimation exercise.

Table 5. Result for Bounds test of cointegration

Test-statistic	**Kripfganz and Schneider (2020) critical values**					
	10%		**5%**		**1%**	
	I(0)	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
F = 21.267 t = -8.144	2.439 -2.511	3.811 -3.819	3.022 -2.877	4.522 -4.258	4.302 -3.627	6.232 -5.156

Estimated regression results and discussions

Presentation of estimated results

The estimated results in Table 6 are the parsimonious error correction model of bank lending showing the direct and indirect effects of the public credit guarantee on bank lending. The short run estimates are in panel (a), and the long run in panel (b).

Short run results: The results in panel (a) show that in the short run results, the first differences of coverage amount D(Cov_t), Coverage amount*capital ratio, D($IV1_t$) and Coverage amount* interest rate D($IV3_t$) as well as the one-period lag of the first difference of Coverage amount*bank size, D($IV2_{t-1}$) all have positive coefficients in the equation for first difference of bank credit additionality, D(Bl_t). On the other hand, the first difference of Coverage amount*bank size, D($IV2_t$), its 2 period lag, D($IV2_{t-2}$), as well as the first difference of Bank agric. credits' share of total bank loans D(Bac_t) all have negative coefficients in the equation. The positive signs on the variables are in accordance with apriori expectations. Also, the negative sign on D(Bac_t) is also in accordance with the apriori expectations. Only, D(Cov_t), D(Bac_t), D($IV2_t$) and D($IV2_{t-2}$) have statistically significant effects on D(Bl_t) based on the t-values of 8,47, -9.05, -5.57, -5.91 and -5.91 respectively, indicating each of them is highly statistically significant at the 1% level. An implication of these results is that a 1% increase in first difference of coverage amount leads to a 1.19% increase in Bank credit additionality while 1% increase in the first differences of Bank agric. credits' share of total bank loans, coverage amount*bank size and its 2-period lag value each leads to a decrease in bank credit additionality by -0.068%, -0.634%0 and 0.035% respectively.

The intercept term is negative with a value of -7.63 and is significant at the 1% level. The Error correction term is correctly negatively signed, with an estimated coefficient of -0.4489. It has a t-value of -8.14 which is significant at the 1% level. The estimated R^2 is 0.96 and the adjusted R^2 is 0.95. The model is therefore, able to explain 95% of the variation in the first difference of Bank credit additionality.

Long run results: The results in panel (a) show that in the long run, the first difference of bank credit additionality, $D(Bl_t)$, is explained by the one-period lags of the variables of the model. The coefficients on Cov_{t-1}, $IV1_{t-1}$, $IV3_{t-1}$ have positive signs, while $Bac_{t-1}$and $IV2_{t-1}$, are each negatively signed.

Table 6. Results from estimated ARDL (1, 1, 2, 0,0,0, 3) model of bank lending

Dependent Variable: D(Guaranteed loan's share of total bank agric. credits) $D(Bl_t)$		
Explanatory Variables	**(a) Short run coefficients**	**(b) Long run coefficients**
ECM	-0.4489 (-8.14) [0.000]	
Coverage amount(-1)		1.181*** (2.89) [0.008]
D(Coverage amount)	1.197*** (8.47) [0.000]	
Bank agric. credits' share of total bank loans(-1)		-1.411*** (-7.78) [0.000]
D(Bank agric. credits' share of total bank loans)	-0.634*** (-9.05) [0.000]	
Coverage amount*capital ratio(-1)		0.159 (1.05) [0.303]
D(Coverage amount*capital ratio)	0.071 (1.09) [0.285]	
Coverage amount *Bank size(-1)		-0.009*** (-15.42) [0.000]
D(Coverage amount *Bank size)	-0.068*** (-5.57) [0.000]	
D(Coverage amount *Bank size)(-1)	0.078 (1.10) [0.28]	

D(Coverage amount *Bank size)(-2)	-0.346*** (-5.91) [0.000]	
Coverage amount*Interest rate(-1)		0.308 (1.13) [0.267]
D(Coverage amount*Interest rate)	0.138 (1.21) [0.237]	
Intercept	-7.63 (-8.05) [0.0000	
R-squared 0.96		
Adjusted R-squared 0.95		
Root MSE 0.1089		

Notes: (1) Source: Author's Computations. (2) D( ) stands for first difference of variable. Figures in parenthesis ( ) and box brackets [ ] are t-statistics and probability values respectively. (3): (*), (**) , (***) denotes Statistical Significance at the 10%, 5%, and 1% levels respectively

The estimated sizes of coefficients are 1.181, -1.411, 0.159, -0.009 and 0.308 for Cov_{t-1}, Bac_{t-1} and $IV1_{t-1}$, $IV2_{t-1}$ and $IV3_{t-1}$ respectively. The implication is that a 1% increase in Cov_{t-1}, and $IV1_{t-1}$, and $IV3_{t-1}$ leads to an increase in $D(Bl_t)$ by 1.181%, 0.159% and 0.308% respectively. Also, an increase in Bac_{t-1} and $IV2_{t-1}$ by 1% each is associated with a decrease in Bank credit additionality by -1.411% and -0.009% respectively. The variables in the long run, Cov_{t-1}, Bac_{t-1} and $IV2_{t-1}$ are statistically significant at the 1% levels, but $IV1_{t-1}$ and $IV3_{t-1}$ are not significant at any conventional level. The long run results thus show that bank credit additionality is positively determined by the coverage amount but is negatively determined by Bank agric. credits' share of total bank loans and coverage amount*bank size in the long run.

Model diagnostics

The study also presents model diagnostic tests results in Table 7. The Breusch–Pagan/Cook–Weisberg test for heteroskedasticity tests the null hypothesis of normality of the of regression residuals. The estimated chi^2 value is statistically insignificant and indicate that the null of normality can be accepted. There is no problem of Heteroskedasticity in the estimated model based on the White's Test and the Breusch-Pagan-Godfrey test results. Furthermore, the Breusch–Godfrey LM test for autocorrelation and the Durbin's alternative test for autocorrelation indicate that there is no problem of autocorrelation up to lag 4. In addition, the Cusum test statistic for test of the null of no structural break indicates acceptance of the hypothesis, and thus support parameter stability for the estimated model.

Table 7. Model diagnostics test results

Diagnostic Test	Chi^2	Prob.>Chi^2
Normality: (Breusch–Pagan/Cook–Weisberg test for heteroskedasticity) $Chi^2(1)$	0.23	0.6344
White's Test for Heteroskedasticity $Chi^2(37)$	38.00	0.4236
	0.488	0.621
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.414	0.221
Durbin Watson d-Statistic (11, 38)		2.18

Breusch–Godfrey LM test for autocorrelation

lags(p)	F	df	Prob > F
1	1.273	(1, 26)	0.2695
2	1.208	(2, 25)	0.3157
3	0.821	(3, 24)	0.4953
4	1.615	(4, 23)	0.2045

Durbin's alternative test for autocorrelation

lags(p)	F	df	Prob > F
1	0.901	(1, 26)	0.3511
2	0.849	(2, 25)	0.4400
3	0.554	(3, 24)	0.6503
4	1.177	(4, 23)	0.3468

Cusum test for parameter stability : H_0 No Structural Break

Test Type	statistic	Critical value 1%	Critical value 5%	Critical value 10%
Recursive	0.1956	1.1430	0.9479	0.8499

Discussions of results

The findings of the study establish the direct and indirect effects of the coverage amount of the credit guarantee over the short run and long run. The key findings on the causal effects on bank credit additionality in the short and long run are as follows. First, a 1% increase in the growth of coverage amount, representing the direct effect causes increased bank credit additionality growth by 1.197% in the short run and 1.181% in the long run. The finding of a positive effect of the guarantee amount is consistent with the developed economy studies of Cowan, Drexler & Yanez (2015), Bachas & Yannelis (2021) as well as the developing economy study of Gurmessa, et al (2022) for Ethiopia. The amount of credit additionality is however, small relative to the amounts reported in these studies. One explanation for the amount of credit additionality achieved is that banks using the ACGSF do not grow guaranteed credit in proportion to the coverage offered by the scheme.

The second finding is that a 1% decrease in the growth of Bank agric. credits' share of total bank loans leads to an increase in the growth of bank credit additionality by -0.634% in the short run and a long run decrease of -1.411%. This finding shows that banks using the ACGSF appear to practice credit substitution. This is in accordance with Attavilla, et al (2021), Jemenez, et al (2022) and Marsh and marsh (2022). The finding that banks reduce unguaranteed loans or market determined loan outcomes, to produce guaranteed loans over the long run as well as in the short run periods contends with the schemes' objective of additionality in the sense of funding larger populations of the credit rationed group.

The study also finds that growth of additional credits is decreases by -0.068% in the short run and by -0.009% in the long run when the growth of coverage amount*bank size increases by 1%. This finding does not accord with Attavilla, et al (2021). This effect may arise because while it is the case larger banks tend to dominate in the use of the ACGSF, the lower interest rates on guaranteed loans may act as disincentives to their willingness to reallocate credits to the guaranteed borrowers. This unwillingness in turn may be because their large asset base requires high earnings to achieve targeted returns on assets.

Generally, the study's findings establish the direct and indirect effects of the guarantee coverage amount on credit reallocation to the ACGSF's target group. An implication of this finding is that the PCG has been an effective policy tool for achieving sustained credit additionality for the target groups.

Conclusions and Recommendations

This study focused on the relevance of bank lending behaviour on the effect of a public credit guarantee on funds to credit rationed groups using data on the ACGSF, and bank financial variables in Nigeria. It considered the theoretical proposition that PCGs cause additionality of bank credit, because the scheme averts low bank earnings on loans to the group, and hence permit banks to maintain required amount of equity that fund loans while staying compliant with prudential risk regulations. The findings of the study are as follows, one, the coverage amount of the PCGs has direct and indirect effects on additional credit to the target group over the short run and long run periods. Second, the coverage amount offered by the AGCSF has direct positive short run and long run effects on additionality of credits to the target group of the scheme. Third, bank credit additionality is adversely affected by banks practice of credit substitution Third, bank size has an adverse influence on the effect of amount of bank credit additionality achieved in response to the guarantee's coverage amount. The conclusion of the study is that one, the PCGs may be seen as effective development policy tool for sustained credit additionality to groups that are vulnerable to credit rationing and two that bank lending behaviour has important consequences for the impact of the public credit guarantee scheme on credit rationed groups. The study recommends that policymakers enact measures to ensure that the guarantee funding is additional to existing market-based credits. For example, the PCG may require that guaranteed credit be made only to members of the target group that could not get loans otherwise. The study also recommends that policymakers should encourage the participation of smaller sized banks in PCGs. The smaller bank has a smaller asset base and so it requires less earnings to relative to the larger bank in other to meet targeted returns on earnings. The study recommends as further area of studies, which of the loan portfolio risk effect or bank profitability effect is the key channel of effect of credit guarantee on bank credit additionality.

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