

Importance of Agricultural Credit in Ghana's Credit Sector: A Logit Model Analysis

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ABSTRACT

This study investigates the importance of agriculture, in terms of the volumes and trends of agricultural credit delivered by the state owned Ghana Commercial Bank. To achieve this objective, the time profile of the volume of agricultural credit delivered over the period, 1970 – 2003 is described. Both a Logit model analysis and a time profile analysis is adopted to further understand the importance of agricultural credit, considering the major contribution of agriculture to the Ghanaian economy. Results from the study show that there has been a decline in the volume of credit given to the agricultural sector over the period of the study. The share of Ghana Commercial Bank's agricultural credit in the bank's total credit, the shares of GCB in total commercial banks' agricultural credit and in total commercial and secondary banks' agricultural credit declined during the period. Results from the Logit model also indicate the impact of financial liberalization (structural adjustment) on agricultural credit delivery. The mean of the real volumes of GCB's agricultural credit and the shares of GCB during the post-financial liberalization period tended to be less than those for the pre- financial liberalization period, as demonstrated by the conventional t-test.

Keywords: agricultural credit; share; liberalization; time profiles

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Introduction

Agriculture has been the backbone of the Ghanaian economy since independence in 1957. Efforts have been made over the years to increase industrial production and employment in the manufacturing sector. Despite all these efforts, agriculture has maintained an enviable position as a major contributor to the national Gross Domestic Product (GDP), accounting for an average of 40.1 percent of the country's total GDP during the period 1996 – 2002 (ISSER, 2003). Agriculture creates employment for about 60 percent of the population, from production to marketing of various agricultural produce (World Bank, 1993). The sector's contribution to government tax revenue is enormous, contributing 16 percent of total tax revenue in 1996 (GSS 1997). Despite all these major contributions of agriculture towards the wealth of the Ghanaian economy, little credit facilities are available to the sector. Percentage credit provided by the Deposit Money Banks (DMB) to agriculture has been on a persistent decline compared to the volume of credit to the non-agricultural sectors of the economy (ISSER, 2003).

Credit is a very important component in the modernization of agricultural activities. Baker and Holcomb (1964) observed that increased productivity of farm resources comes from innovations that originate in the farm supply sector. However, most of these innovations that have the potential of instigating the modernization of agricultural activities require high capital investment, which cannot easily be provided by the informal credit sectors such as friends, money lenders and so on. Income obtained by subsistent farmers from both on-farm and off-farm activities is also not adequate for the needed agricultural transition or growth. As a result, most of these farmers grow crops and rear animals on smaller scales due to their financial constraints. Based on the tremendous contribution of agriculture to the economy of Ghana, the productivity of the agricultural sector has great implications for Ghana. It is observed that about 47.9 percent of the Ghanaian population are predominantly into farming (GSS, 2002). Agriculture is highly input intensive and agricultural products are used extensively by a number of agro-based firms in Ghana and as such a reduction in credit to the sector may have the potential of affecting both upstream and downstream firms. The importance of institutional credit as a source of finance to agriculture can therefore not be overemphasized (see Fosu, 1998). Thus, the persistent decline in credit to agriculture by DMBs and its trend must be checked to curtail any long-run adverse effects. It is for this reason, and others, that Ghana Commercial Bank was established. Ghana Commercial Bank (GCB) was established in 1957 out of the "Bank of the Gold Coast" to offer social services including the provision of credit to the indigenious Ghanaian business community. Since its establishment, the number of Ghana Commercial Bank's branches has increased from four in the mid-1960s to 137 branches in 2003. This large number of branches places the bank in a potential strategic position to deliver credit to farmers¹. The bank also has a substantial capital asset base which places them in a better position to grant loans (various issues of GCB Annual Reports).

¹ Bank size has been observed as a factor influencing commercial banks' performance (see Abdula, 1994).

As indicated earlier, agricultural credit can be obtained from both formal institutions and informal sources. Formal institutional agricultural credit is mostly obtained from deposit money banks (DMB) of which the Ghana Commercial Bank is one. Informal sources of agricultural credit include family, friends, money lenders, savings from farm and off-farm income (Brake, 1966). Numerous studies have examined these sources of credit supply from different perspectives. Some studies have examined credit market equilibrium (see Besanko and Kanatas, 1993), credit and aggregate demand (see Bernanke and Blinder, 1988), monetary policy and bank credit delivery (Kashyap *et al*, 1994) and the choice between bank loans and directly placed debt (see Diamond, 1991). In term of agriculture few recent empirical researches on credit have been carried out. Tilankaratna (1963) study on agricultural credit in Ceylon (now Sri Lanka) observed that despite the vital role credit plays in primarily agrarian economies such as Ceylon, the subject of credit to the sector has received little attention. Recent research in the Ghanaian context has revealed that the volume of credit given by banks in Ghana to agriculture is on the decline whilst that of the non-agricultural sector is on the ascendancy (ISSER, 2003). However, the factors which influence the share of Ghana Commercial Bank's agricultural credit in total commercial and secondary banks' agricultural credit, in total commercial banks' agricultural credit, and in GCB's total credit are largely unknown.

Monetary Policies and the Financial Sector Adjustment Programme

Ghana's post-independence budgetary performance has been characterised by chronic budget deficit, leading to macroeconomic instability and distortions resulting, in turn, in the reduction in investment, production and income, coupled with an upsurge in inflation. These factors necessitated the launching of the Economic Recovery Programme (ERP) in 1983 by the government. The financial sector prior to 1983 was in distress resulting from high inflation which averaged 40 percent on an annual basis in the 1970s (Aryeetey *et al*, 1991). The financial sector also had to deal with the problem of devaluation of the Ghanaian currency the cedi. Financial reforms were therefore introduced in 1986. These were later named, "Financial Sector Adjustment Programme" (FINSAP). The government of Ghana, in adopting the Economic Recovery Programme (ERP) of April 1983, realised the need to restructure the financial sector in order to play its role in mobilising and disbursing adequate funds in the economy in order to boost production. Low savings mobilisation prior to the 1986 FINSAP was as a result of low interest rates, credit controls, high reserve requirements, and monetary policies. Prior to the financial reforms in 1986, the perception was that low interest rates would induce investment, which in turn would increase output and employment and subsequently, lead to higher savings (Aryeetey *et al*, 1991). This resulted in the Bank of Ghana setting minimum rates for deposits and placing ceilings on lending rates. The policy of low interest rates did cause more distortions than the market imperfections which it was designed to overcome (Aryeetey *et al*, 1991). This low interest rate discouraged customers to save and made it more difficult for the financial system to mobilise enough funds. This therefore reduced the volume of loanable funds, leading to a reduction in the availability of credit for agriculture.

Credit control prior to the liberalisation of the banking sector took the form of credit ceilings and sectoral credit controls. These instruments constituted one of the major instruments of the Bank of Ghana's financial policy until 1989. The Bank of Ghana prescribed credit ceilings for productive sectors of the economy. Thus, every bank within the country gave a percentage increase in the outstanding credit to a given sector. Credit controls were aimed at controlling inflation and subsequently promoting investment and growth in the priority sectors. The priority sectors of the economy at the time were the export, agriculture and manufacturing (BOG, Annual Report, 1983). The government adopted policies which were aimed at increasing the level of credit to the agricultural sector by impressing on all commercial banks to lend at least 20 percent of their total portfolio to agriculture. Credit controls tended to reduce competition, as credit was allocated not on the basis of opportunities in the economy and also discouraged banks in the collection of savings once they had attained their ceilings.

The Bank of Ghana also had the authority of setting the level of reserve requirements. Reserve requirements prior to 1986 were relatively higher than those in most industrialised nations at the time. The reserve requirement averaged over 50 percent by 1983 and about 32 percent between 1987 and 1989. According to Aryeetey and Gockel (1991), the high reserve requirements had two effects. First, a substantial amount of the available funds was directed away from potential borrowers. Moreover, when banks are forced to hold large amounts of low or zero yielding assets, distortions in interest rates arise. Bad policies initiated by government also affected the mobilisation, of funds thereby leading to a reduction in loanable funds and a loss of confidence. One of such policies was the demonetization of the existing currency on 27 March 1979 and the demonetization of ₵50 notes in circulation in 1982, resulting in a rush to exchange old currencies for new ones before the deadline. The Financial Sector Adjustment Programme (FINSAP) therefore was aimed at resolving the inefficiencies in the financial sector existing prior to 1986. The major components of FINSAP are banking sector restructuring, corporate restructuring, money and capital development, enhancement of professional competence of workers (accountants and bankers). Liberalisation led to a decontrol of both commercial and secondary banks. Thus, individual banks were free to set their own interest rates and the subsequent removal of credit control instrument. It is therefore also important to empirically analyse the impact of financial liberalization in the Ghanaian economy on agricultural credit delivery.

Conceptual Framework

The supply of credit in general is affected by monetary policies, and these policies are likely to affect the supply of agricultural credit delivered by GCB (see Swinnen and Gow, 1999). Monetary policy instruments which could affect the supply of agricultural credit include agricultural interest rate, interest rates on loans to other sectors, total reserve requirements, mandatory sectoral credit allocation if any, ceiling on rate of credit expansion, open market operations, savings deposit rate and moral suasion (Melitz and Pardue 1973). Theoretically, lender vitality index which is the ratio of the amount of loans recovered to the amount of credit

delivered, together with the rate of loan recovery may also influence credit allocation to the agricultural sector. All these instruments and factors exert potential effects on the volume, as well as the share of credit delivered to the agricultural sector. It is expected that, an increase in agricultural interest rate would lead to an increase in the supply of GCB'S agricultural credit, *ceteris paribus* (see Hoff and Stiglitz, 1990). An increase in agricultural interest rate constitutes an incentive for GCB to grant more credit to the agricultural sector. On the contrary, increases in the non-agricultural interest rate tend to reduce the supply of credit to the agricultural sector, *ceteris paribus*² (see Von Pischke and Adams, 1980).

An increase in the reserve requirements by the Bank of Ghana (BOG) would to a large extent decrease the volume of agricultural credit supplied by the bank, *ceteris paribus*. This is because, an increase in reserve requirements reduces the volume of liquid assets of the bank, which in turn reduces the volume of credit delivered to the agricultural sector (see Calvo *et al*, 1996). An increase in the interest rate on government treasury bills tend to reduce the volume of agricultural credit supply, *ceteris paribus*, because banks would now find investment in treasury bills more lucrative than lending to the agricultural sector. An increase in interest rate on savings deposits could lead to an increase or a decrease in the volume of credit granted to the agricultural sector, *ceteris paribus*. This is because an increase in interest rate on savings deposits would lead to an increase in the volume of loanable funds which in turn increases the volume of agricultural credit, *ceteris paribus* (see Bottomley, 1975). On the other hand, an increase in interest rate on savings is essentially an increase in cost (deposit liability) to the bank and may lead to a reduction in the volume of agricultural credit supply. An increase in the discount rate tends to exert a negative effect on agricultural credit supply, *ceteris paribus*. This is because, a high discount rate discourages banks from borrowing from the BOG and as a result, it affects the amount of loanable funds available to the commercial bank. This, in turn, precipitates a fall in the volume of agricultural credit supply.

Moral suasion by a central bank, on behalf of government, can exert a positive or negative effect on agriculture. If these policies are in favour of agriculture, then the supply of agricultural credit would increase and vice versa (see Romans, 1966) . The lender vitality index serves as an indicator of the capacity of the bank to supply credit. An increase in the lender vitality index increases the volume of agricultural credit, *ceteris paribus*. The present study assumes that GCB is a rational net returns maximising firm. The bank lends to agriculture, non-agricultural and also purchases government treasury bills. It is also assumed that GCB may be constrained in the delivery of credit by the discount rate and the reserve requirements. Therefore, the share of Ghana Commercial Bank's agricultural credit in total commercial and secondary banks' agricultural credit, in commercial banks' agricultural credit, and in the GCB's total credit is a function of monetary policy instruments such as agricultural interest rate, non-agricultural lending rate, interest rate on government treasury bills, interest rate on government treasury bills, discount rate, interest rate on savings deposits and total reserve requirements.

² Specifically, in order to induce granting more credit to the agricultural sectors $NR_a(\cdot) \geq NR_b(\cdot)$, where $NR_a(\cdot)$ denotes net returns from granting loans to agriculture and $NR_b(\cdot)$ denotes net returns from granting loans to non-agriculture.

The shares of Ghana Commercial Bank's agricultural credit in total commercial and secondary banks' agricultural credit, in commercial banks' agricultural credit, and in GCB's total credit theoretically, is conceptualized in this paper and presented as equation 1, 2 and 3:

$$S_1 = f(D_n, B_t, D_y, N_{sc}, R_{st}, R_{dt}, R_{rt}) \quad (1)$$

$$S_2 = f(B_n, B_t, D_y, N_c, R_{st}, R_{dt}, R_{rt}) \quad (2)$$

$$S_3 = f(D_r, B_t, D_y, R_{st}, R_{dt}, R_{rt}) \quad (3)$$

where S_1 denotes GCB's agricultural credit in total commercial and secondary banks' agricultural credit, D_n denotes the difference between the agricultural lending rate of GCB and the average agricultural lending rate of commercial and secondary banks, B_t denotes the difference between the agricultural lending rate of GCB and the interest rate on government treasury bills, D_y denotes dummy variable representing Pre-liberalization (D=1) and Post-liberalization (D=0) period of the financial sector. N_{sc} refers to the number of commercial and secondary banks in Ghana, R_{st} denotes savings deposit rate, R_{dt} refers to the Bank of Ghana discount rate, R_{rt} denotes reserve requirements, S_2 denotes the share of GCB's agricultural credit in commercial bank's total agricultural credit, B_n denotes the difference between the agricultural lending rate of GCB and that of other commercial banks, N_c refers to the number of commercial banks in Ghana, S_3 denotes the share of GCB's agricultural credit in GCB's total credit, and D_r denotes the difference between the agricultural lending rate of GCB and non-agricultural lending rate of GCB.

Empirical Framework

In many empirical analyses involving a limited dependent variable, a qualitative dependent response model such as the logit or probit model is used. Johnston and DiNardo (1997) noted that the difference between the logit and probit models is rarely large enough to discriminate between the two models, since the models seem to produce similar results. For the purpose of this study, the logit model is employed. The logit framework accommodates both the trend and the shares of GCB's agricultural credit (see Greene, 2000). Thus, the logit function guarantees that the estimated probabilities of the shares lies between 0 and 1 (see Gujarati, 1995).

The linear probability model (LPM) for the share of agricultural credit can be written as: $S_i = E(Y=1|X_i) = \beta_0 + \beta_1 X_i$, where S_i is the share of GCB's agricultural credit, X_i denotes variables thought to influence the share of GCB's agricultural credit, β denotes parameter estimates capturing the relationship between the share of GCB's agricultural credit and the explanatory variables. In the case of the share of GCB's agricultural credit in total commercial and secondary banks' agricultural credit, the logistic distribution function can be written as:

$S_i = E(1 | X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}}$. Observe that as $\beta_0 + \beta_1 X_i$ ranges from $-\infty$ to $+\infty$, S_i ranges

between 0 and 1 (Gujarati, 1995). The logistic function as presented above even though it captures the trend in the shares, the function is nonlinear both in independent variables as well as parameter estimates. There is therefore the need to transform the logistic function into a form that specifies a linear relationship between the shares and the independent variables. A linear relationship specification would also allow for linear prediction of the probable effect of independent variables on the shares. The logistic function for the sake of illustration is specified earlier on in terms of the share of GCB's agricultural credit, in commercial and secondary banks' agricultural credit (S_1). However, it can also be specified in terms of commercial banks' agricultural credit and GCB's total credit. If the share of GCB's agricultural credit in total commercial and secondary banks' agricultural credit is given by $S_1 \left(\frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}} \right)$, then the

share of all other commercial and secondary banks' agricultural credit is $(1 - S_1)$. Therefore, the ratio of the share of GCB's agricultural credit in total commercial and secondary banks' agricultural credit and the algebraic difference between 1 and the share is given by:

$$\frac{S_1}{1 - S_1} = \frac{1 + e^{(\beta_0 + \beta_1 X_i)}}{1 + e^{-(\beta_0 + \beta_1 X_i)}} = e^{(\beta_0 + \beta_1 X_i)} \quad (4)$$

Equation 4 represents the odd ratio in favour of the share of GCB's agricultural credit in total commercial and secondary banks' agricultural credit. Taking the natural logarithm of equation 4 yields equation 5:

$$\ln \left(\frac{S_1}{1 - S_1} \right) = \beta_0 + \beta_1 X_i \quad (5)$$

Equation 5 represents the linear relationship between the log-odds ratios of the shares and the independent variables as well as the parameter estimates. β_1 measures a change in the log-odds in favour of the share of GCB's agricultural credit, in total commercial and secondary banks' agricultural credit as X changes by a unit. As indicated earlier, the illustration applies also to GCB's agricultural credit in commercial banks' agricultural credit (S_2) and GCB's agricultural credit in GCB's total credit (S_3). The respective estimated Logit functions for the share of GCB's agricultural credit in total commercial and secondary banks' agricultural credit, in commercial banks' total agricultural credit, and in GCB's total credit are specified as equation 6, 7 and 8, respectively. The variables in equation 6, 7 and 8 have the same meanings as described already in this paper³.

$$\ln \left(\frac{S_1}{1 - S_1} \right) = \beta_0 + \beta_1 D_n + \beta_2 B_t + \beta_3 D_y + \beta_4 N_{sc} + \beta_5 R_{st} + \beta_6 R_{dt} + \beta_7 R_{rt} + \varepsilon_t \quad (6)$$

³The apriori expectations of the effects of the variables are:

$\beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 < 0, \beta_5 < 0, \beta_6 < 0, \beta_7 < 0, \alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 < 0, \alpha_5 < 0, \alpha_6 < 0, \alpha_7 < 0, \omega_1 > 0, \omega_2 > 0, \omega_3 > 0, \omega_4 < 0, \omega_5 < 0$ and $\omega_6 < 0$.

$$\ln\left(\frac{S_2}{1-S_2}\right) = \alpha_0 + \alpha_1 B_n + \alpha_2 B_t + \alpha_3 D_y + \alpha_4 N_c + \alpha_5 R_{st} + \alpha_6 R_{dt} + \alpha_7 R_{rt} + \mu_t \quad (7)$$

$$\ln\left(\frac{S_3}{1-S_3}\right) = \omega_0 + \omega_1 D_r + \omega_2 B_t + \omega_3 D_y + \omega_4 R_{st} + \omega_5 R_{dt} + \omega_6 R_{rt} + v_t \quad (8)$$

In the estimation of the various parameters of the empirical models in this study, the ordinary least squares (OLS) method is employed. The OLS method is used because it is BLU (Best, Linear, Unbiased). Thus, among all linear unbiased estimators, it yields the lowest variance (Koutsoyiannis, 1996). It must be said that, the OLS method is simple to use and estimates have desirable properties which include unbiasedness and minimum variance. Validation of the hypotheses which guide this study is conducted by using the conventional t-test. Autocorrelation is checked using the Breusch-Godfrey second order serial correlation Lagrangian Multiplier (LM) Test: the F-ratio version. The incidence of heteroscedasticity is checked using the White Test. Normality of the error term in the model is tested using the Jarque- Bera Test.

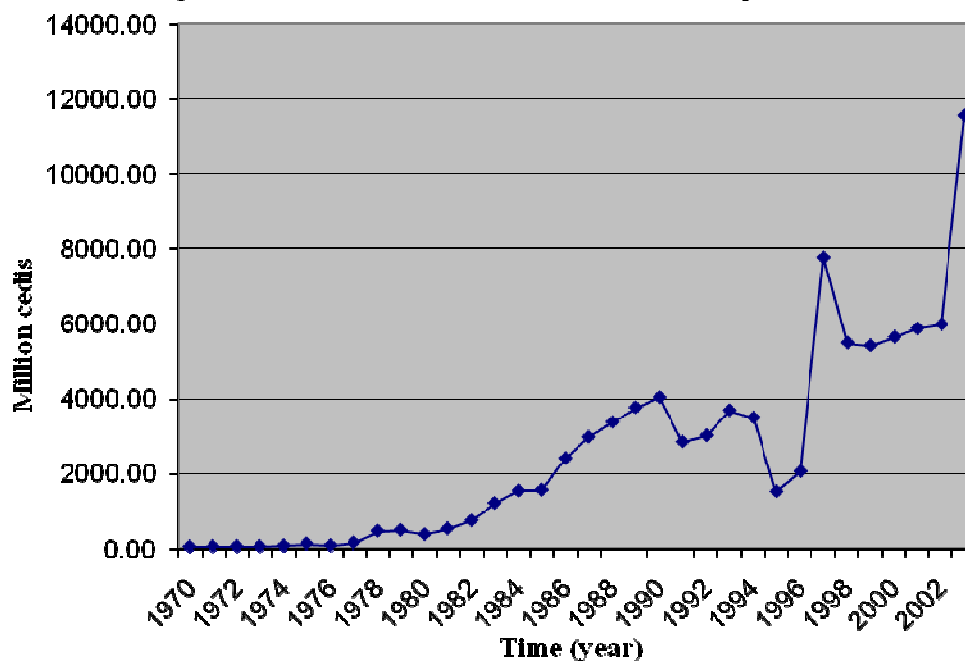
In terms of data used in this study, annual time series data on the volume of agricultural credit supplied by the Ghana Commercial Bank (GCB) covering the period, 1970 to 2003 were obtained from the Research Department of GCB are used in the present study. Annual time series data on the volume of agricultural credit supplied by commercial banks, commercial and secondary banks combined and covering 1970-2003 were obtained from Bank of Ghana (BOG) data files. These nominal values were deflated with the time series on the GDP deflator which was obtained from the data files of Ghana Statistical Service (GSS) and the *Quarterly Digest of Statistics* published by the GSS. Annual time series data on the agricultural lending rate, non-agricultural lending rate and savings deposit rate were obtained from various issues of the *GCB Annual Reports* and data files of GCB and BOG. Annual time series data on interest rate on government treasury bills and discount rate covering 1970-2003 were all obtained from the data files of the Bank of Ghana. Real interest rates were computed using the growth rate in the GDP deflator. The number of commercial and secondary banks' was obtained from various issues of *Bank of Ghana Annual reports*. Information on GCB's credit policy was obtained from interacting with the relevant staff of the planning and research department of Ghana Commercial Bank and from various issues of *GCB Annual reports*.

Results

Volume of Agricultural Credit Delivered by GCB, 1970-2003

The volume of agricultural credit delivered by Ghana Commercial Bank increased gradually in nominal terms from 1970 to 1982 (Figure 1). This was followed by a sharp increase in volume from 1983 to 1990. The volume of agricultural credit declined in 1991, whereas it rose gradually till 1993. This was then followed by a sharp decline from 1994 to 1995. A sharp increase in the volume of agricultural credit was recorded from 1996 to 1997. The volume of agricultural credit decreased sharply in 1998, which was then followed by a gradual increase in credit till 2002. The volume of agricultural credit delivered by the bank rose to a peak in 2000. Even though the volume of agricultural credit increased in nominal terms from 1977 to 1979, it increased at a decreasing rate. Thus, the growth rate of agricultural credit reduced from 90.4 percent in 1977 to 10.9 percent in 1979. The growth rate of agricultural credit delivered by GCB however increased from 4.2 percent in 2000 to 93.3 percent in 2003.

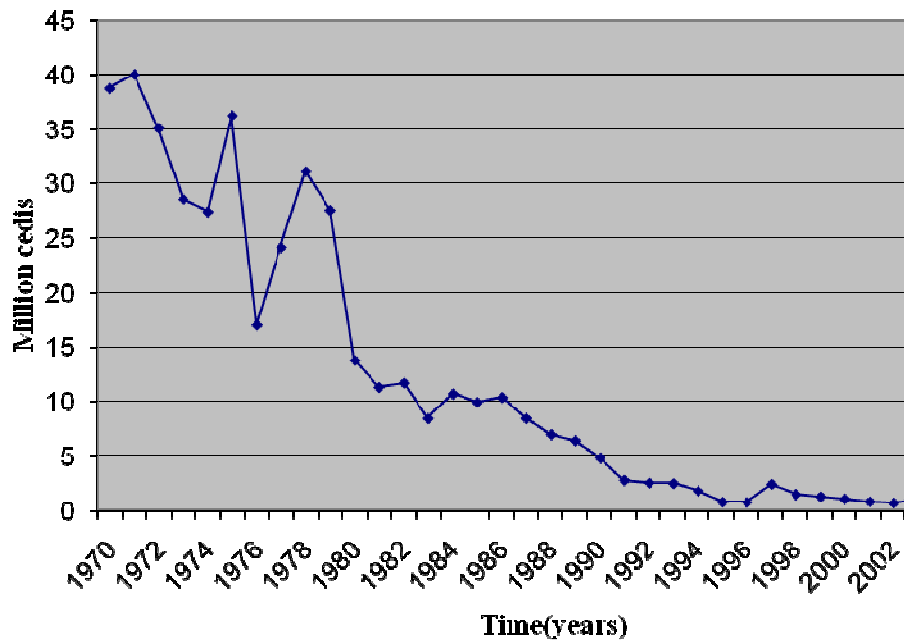
Figure 1: Ghana Commercial Bank's Nominal Agricultural Credit, 1970-2003



It must be noted, however, that the volume of agricultural credit delivered by GCB in real terms has generally declined from 1970 to 2003 (see Figure 2). The decrease in the real volume of GCB's agricultural credit was very sharp from 1975 to 1977, but gradual afterwards. The gradual decline in GCB's real agricultural credit presupposes that the increase in GCB's nominal agricultural credit could mainly be due to inflationary pressures. The nature of the time profile of GCB's agricultural credit could be attributed to GCB's policies or government policies including monetary policy instruments. For example, in 1975, the policy of GCB with regards to credit was re-oriented, with the view to giving additional impetus to government efforts towards self-sufficiency in food and raw material production resulting from the disturbing developments in

Ghana's import-export trade. The institution of Commerbank Farmers Association by the bank in the early 1970s through the 1980s also gives an indication that, agriculture was a priority sector to the GCB at the time. During the 1984/85 financial year, about 250,000 farmers benefited from loans under the Commerbank Farmers Association. Thus, the increasing trend in the volume of agricultural credit delivered between 1979 and 1990 could also be attributed to the GCB's policy which favoured agriculture. Internal factors of GCB also influenced the time profile of agricultural credit delivered by the bank between 1991 and 1995. These internal factors included the re-organisation of the credit administration function of the bank which included funds for small and medium enterprises development (FUSMED) loans sponsored by the World Bank. It is worth noting that the FUSMED loans required security as compared to the Commerbank Farmers Association loans. The bank also had to step up the recovery of the commerbank loans as a result of the increasing default rate. The general increase in nominal agricultural credit from 1997 to 2003 could be attributed to the gradual reduction in the discount rate. The discount rate was reduced from 45.0 percent in 1997 to 21.5 percent in 2003. The volume of agricultural credit delivered by GCB in real terms generally declined from 1970 to 2003 (see Figure 2). Real agricultural credit was at a peak in 1971, indicating that the bank gave a significant amount of credit to the agricultural sector despite rising inflation. Figure 2 also shows that, the high nominal agricultural credit delivered by GCB from 1983 to 2003 was mainly due to inflation over the period.

Figure 2. Ghana Commercial Bank's Real Agricultural, 1970-2003



Share of GCB's Agricultural Credit in Commercial and Secondary Banks' Agricultural Credit

Figure 3 detailed the share of GCB's agricultural credit in commercial and secondary banks' total agricultural credit. There was a consistent decline in the share of Ghana Commercial Bank's agricultural credit in commercial and secondary banks' agricultural credit over the period of the study. The share of the bank's agricultural credit reduced from 44.0 percent in 1970 to 0.074 percent in 2003. The average share of GCB's agricultural credit in commercial and secondary banks' agricultural credit declined. From an average share of 23 percent between 1970 and 1979, the share decreased to 0.08 percent between 2000 and 2003 (see Table 1). This declining time profile in the share of GCB's agricultural credit can be attributed to the increase in the number of commercial and secondary banks in Ghana during the period of the study. Since 1970, the number of commercial and secondary banks has been changing due to addition of banks or liquidation of banks.

Figure 3: Share of GCB's Agricultural Credit in Total Commercial and Secondary Banks' Agricultural Credit, 1970- 2003

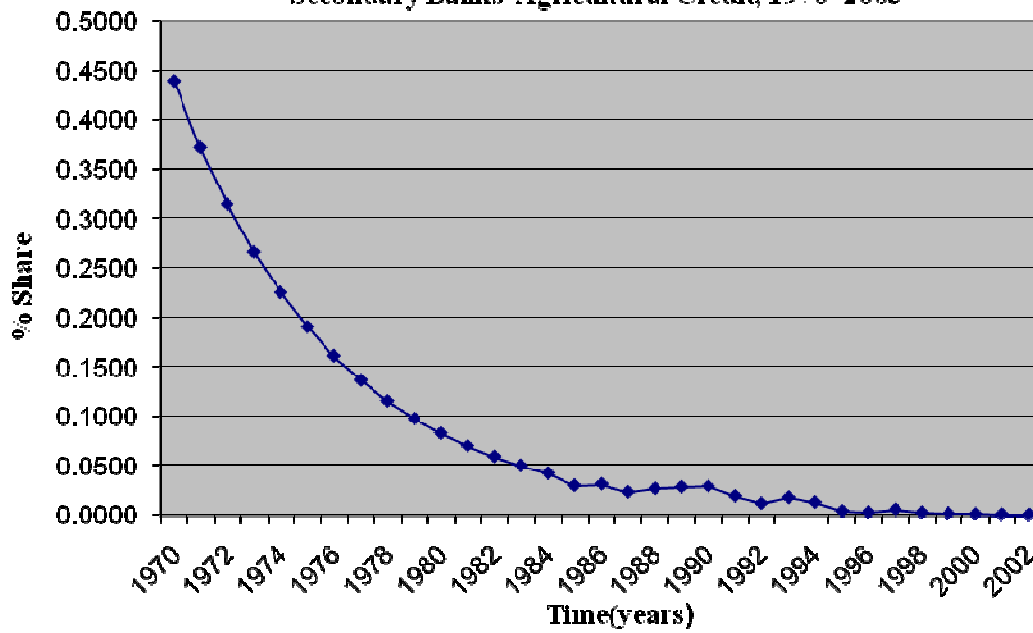


Table 1: Average Share of GCB's Agricultural Credit in Total Commercial and Secondary Bank's Agricultural Credit

PERIOD	SHARE (%)
1970 – 1979	23
1980 – 1989	4.4
1990 – 1999	1.1
2000 – 2003	0.08

Table 2 indicates the empirical results of the Logit model of the share of GCB's agricultural credit in total commercial and secondary banks' agricultural credit. The Jarque-Bera Chi-Square Statistic is not significant even at the 10 percent level, implying that the residuals of the estimated model are normally distributed. The White's heteroscedasticity F- ratio shows that no heteroscedasticity problem. The Breusch-Godfrey LM F-ratio is not significant even at the 10 percent level, implying that there is no second order serial correlation problem in the model. The F- statistic of 12.3723 is significant at the 1 percent level. Thus, the difference between the agricultural lending rate of GCB and that of the other commercial and secondary banks, the difference between agricultural lending rate of GCB and interest rate on government treasury bills, financial liberalisation period dummy, number of commercial and secondary banks combined, savings deposit rate, discount rate and reserve requirements exert a significant joint effect on the log odds of the share of GCB's agricultural credit supply in the total agricultural credit of commercial and secondary banks. It is observed that about 65 percent of the variation in the log odds of the share of GCB's agricultural credit in the total agricultural credit delivered by commercial and secondary banks in Ghana is explained by the independent variables in the model (Table 2).

The pre-financial liberalisation dummy variable and the savings deposit rate are significant at the 5 percent level, whereas the number of commercial and secondary banks, the discount rate and the reserve requirements are significant at the 1 percent level. The significant positive sign of the coefficient of the pre- financial liberalisation dummy variable shows that the share of GCB's agricultural credit has been higher during the pre- financial liberalisation period, than in post-financial liberalisation period. Thus, a unit increase (decrease) in the number of secondary and commercial banks in Ghana leads to a 0.0378 unit decrease (increase) in the log odds of the share of GCB's agricultural credit in the total volume of credit delivered by commercial and secondary banks in Ghana , *ceteris paribus*. A one percent increase (decrease) in the savings deposit rate leads to a 0.0172 unit decrease (increase) in the log odds of the share of GCB's agricultural

credit. A one percent increase (decrease) in the discount rate leads to a 0.0166 unit decrease (increase) in the log odds of the share of GCB's agricultural credit. Finally, a one percent increase (decrease) in reserve requirements leads to a 0.0063 unit decrease (increase) in the log odds of the share of GCB's agricultural credit.

Table 2: Estimated Logit Function for the Share of GCB's Agricultural Credit in total Commercial and Secondary Bank Agricultural Credit

Variable	Coefficient	Std Error	t-Statistic
DBANNON	0.0117	0.0102	1.1487
DBAGGTB	0.0094	0.0058	1.6304
DMMY	0.1577	0.0656	2.4090**
NUMSECCOM	- 0.0378	0.0110	- 3.4391 ***
SAVDEPRAT	- 0.0172	0.0059	- 2.9255 **
DISCRAT	- 0.0166	0.0047	- 3.5981 ***
RESERV	- 0.0063	0.0017	-3.9840***

$R^2 = 0.6545$ Adjusted $R^2 = 0.613$ F-Statistic = 12.3723*** (0.0000)

Breusch – Godfrey Serial Correlation LM: F = 0.21 (0.2341)

White Heteroscedasticity Test: F = 1.3294 (0.4172)

Jarque – Bera Statistic = 18.4324 (0.2245)

*** denotes significance at the 1 percent level, ** denotes significance at the 5 percent level while * denotes significance at the 10 percent level. *DBANNON* denotes the difference between the agricultural lending rate of GCB and the average agricultural lending rate of commercial and secondary banks. *DBAGGTB* denotes the difference between the agricultural lending rate of GCB and the interest rate on government treasury bills. *DMMY* denotes dummy variable representing Pre- liberalisation (*DMMY*=1) and Post liberalisation (*DMMY*=0) period of the financial sector. *NUMSECCOM* refers to the number of commercial and secondary banks in Ghana in a particular year. *SAVDEPRAT* denotes savings deposit rate whereas *DISCRAT* refers to the Bank of Ghana discount rate. *RESERV* denotes reserve requirements.

Share of GCB's Agricultural Credit in Total Commercial Bank Credit

Figure 4 shows the share of GCB's agricultural credit in total commercial banks' agricultural credit. The share generally declined during the period. Notably, the three major commercial banks in Ghana during 1970-2003 were Barclays Bank, Standard Chartered Bank and Ghana Commercial Bank. Between 1970 and 1979, the average share was 27.3 percent and between 1980 and 1989, the average share reduced to 10 percent. The average share further

reduced to 4.8 percent during 1990 to 1999. The general decline in the share of GCB's agricultural credit in commercial banks' total agricultural credit may be attributed to the increase in the volume of agricultural credit delivered by the other commercial banks.

Figure 4: Share of GCB's Agricultural Credit in Total Commercial Banks' Agricultural Credit, 1970-2003

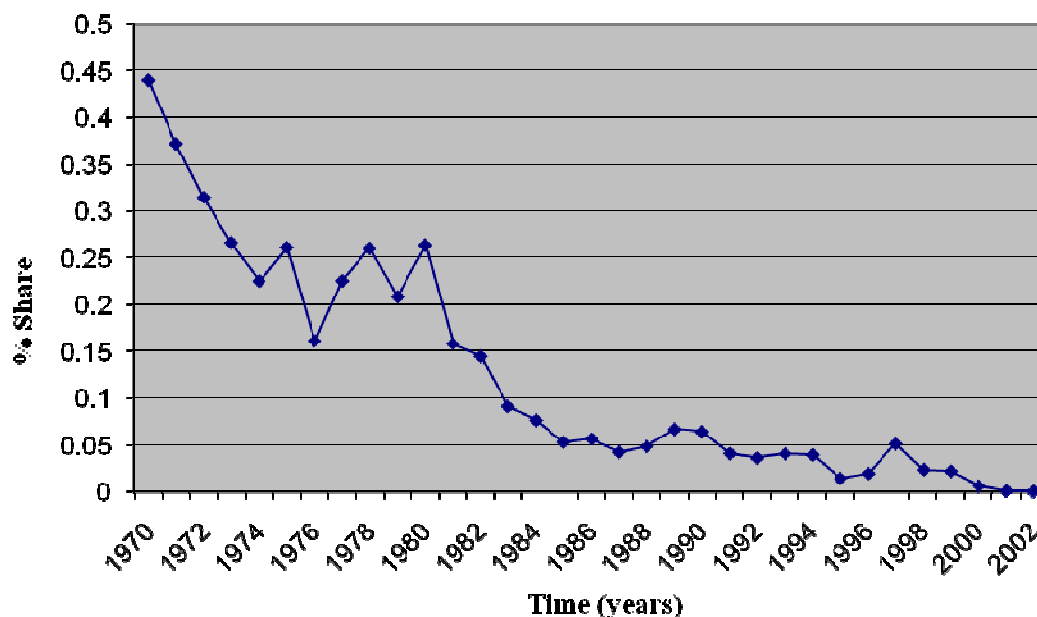


Table 3 indicates the empirical results obtained relating to the share in favour of GCB's agricultural credit in total commercial bank's agricultural credit. The Jarque-Bera Chi-Square Statistic is not significant even at the 10 percent level, implying that the estimated residuals are normally distributed. The White's heteroscedasticity F- ratio shows that there is no heteroscedasticity problem. The Breusch-Godfrey LM F-ratio is not significant even at the 10 percent level, implying that there is no second order serial correlation problem.

The R^2 value is 0.6418 means that about 64.18 percent of the variation in the log odds of the share of GCB's agricultural credit in total agricultural credit delivered by commercial banks in Ghana is explained by the independent variables (Table 3). The F- statistic of 11.4264 is significant at the 1 percent level. Thus, the difference between the agricultural lending rate of GCB and that of the other commercial banks, the difference between the agricultural lending rate of GCB and the interest rate on government treasury bills, the pre-financial liberalisation period, the number of commercial banks in Ghana, savings deposit rate and reserve requirements exert a significant joint effect on the log odds of the share of GCB's agricultural credit supply in total agricultural credit of commercial banks.

The pre-financial liberalisation dummy variable and reserve requirements are significant at the 1 percent and 5 percent level respectively. The discount rate is significant at the 10 percent level, whereas the difference between the agricultural lending rate of GCB and that of the other commercial banks, the difference between the agricultural lending rate of GCB and the government treasury bill rate, the number of commercial banks and savings deposit rate are not significant even at the 10 percent level. The positive sign and significance of the coefficient of the pre-financial liberalisation dummy variable shows that, the share of GCB's agricultural credit is higher in pre-financial liberalisation period. A 1 percent increase (decrease) in the reserve requirements leads to a 0.0429 unit decrease (increase) in the log odds of the share of GCB's agricultural credit in commercial banks agricultural credit. A 1 percent increase (decrease) in the discount rate leads to a 0.0095 unit decrease (increase) in the log odds of the share of GCB's agricultural credit in commercial banks' total agricultural credit.

Table 3: Estimated Logit Model of the Share of GCB's Agricultural Credit in Commercial Banks Agricultural credit.

Variable	Coefficient	Std Error	t-Statistic
DBGCNC	0.0043	0.0075	0.5737
DBAGGTB	0.0025	0.0016	0.1594
DMMY	0.3322	0.1024	3.2447***
NUMCOM	- 0.0077	0.0063	- 1.2280
SAVDEPRAT	- 0.0082	0.0122	- 0.6754
DISCRAT	- 0.0095	0.0054	- 1.7450*
RESERV	- 0.0429	0.0153	- 2.8082**

$R^2 = 0.6418$ Adjusted $R^2 = 0.5975$ F – stat = 11.4264*** (0.0000)

Breusch – Godfrey Serial Correlation LM, F = 1.4738 (0.3284)

White Heteroscedasticity Test : F = 1.8268 (0.5395)

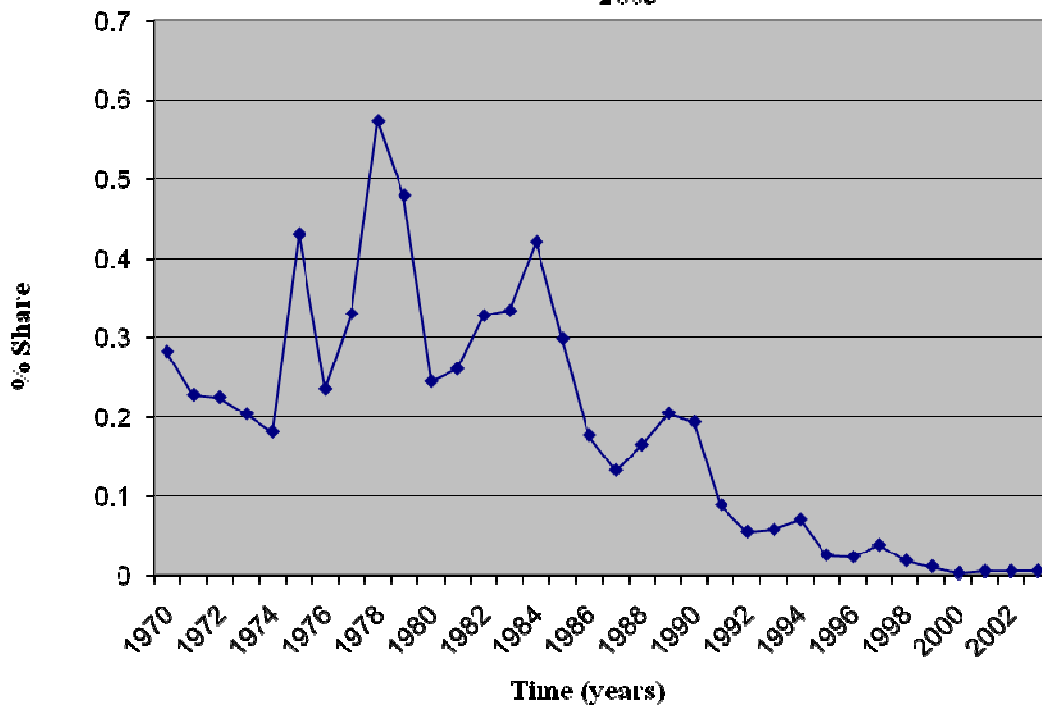
Jarque-Bera Statistic = 8.5249 (0.6278)

*** denotes significance at the 1 percent level, ** denotes significance at the 5 percent level while * denotes significance at the 10 percent level. *DBGCNC* denotes the difference between the agricultural lending rate of GCB and that of the other commercial banks. *NUMCOM* denotes the number of commercial banks in Ghana. *DBAGGTB* denotes the difference between the agricultural lending rate of GCB and the interest rate on government treasury bills. *DMMY* denotes dummy variable representing Pre- liberalisation (*DMMY*=1) and Post liberalisation (*DMMY*=0) period of the financial sector. *SAVDEPRAT* denotes savings deposit rate whereas *DISCRAT* refers to the Bank of Ghana discount rate. *RESERV* denotes reserve requirements.

Share of GCB's Agricultural Credit in the Total Credit of GCB

Figure 5 shows the time profile of the share of GCB's agricultural credit in GCB's total credit. This share declined from 1970 to 1974. The share reduced from 28.2 percent in 1970 to 18.1 percent in 1974. The share increased sharply to 42.9 percent in 1975 and reached a peak of 57.3 percent in 1979 and subsequently declined. The share reached a minimum of 0.27 percentage in 2000 and then increased afterwards to 0.54 percent in the 2003 financial year. Table 4 shows the average share of the volume of agricultural credit delivered by Ghana Commercial Bank during 1970-2003. The share has declined from the 1970s through the 2000s, with the share being less than 1 percent during the 2000s.

Figure 5: Share of GCB's Agricultural Credit in GCB's Total Credit, 1970-2003



Source: Based on Data obtained from GCB

Table 4: Average Share of GCB's Agricultural Credit in Total GCB Credit

PERIOD	SHARE (%)
1970 –1979	31.5
1980 –1989	25.6
1990 – 1999	5.8
2000 – 2003	0.18

Table 5 indicates the empirical results concerning the share in favour of GCB's agricultural credit delivered by GCB in GCB's total credit. The Jarque-Bera Chi-Square Statistic is not significant even at the 10 percent level, implying that the estimated residuals are normally distributed. The White's heteroscedasticity F- ratio shows that there is no heteroscedasticity problem in the model. The Breusch-Godfrey LM F-ratio is not significant even at the 10 percent level, implying that there is no second order autocorrelation problem in the model.

The R^2 value is 0.7763 which means that, about 77.63 percent of the variation in the log odds of the share of GCB's agricultural credit in total GCB's credit is explained by the independent variables in the model (Table 5). The F-statistic of 14.4789 is significant at the 1 percent level. Therefore, the difference between the agricultural lending rate of GCB and the non-agricultural lending rate of GCB, the difference between the agricultural lending rate of GCB and the interest rate on government treasury bills, the pre-financial liberalisation period, savings deposit rate and reserve requirements exert a significant joint effect on the log odds of the share of GCB's agricultural credit in total GCB credit.

The pre-financial liberalisation dummy variable and the reserve requirements variable are both significant at the 5 percent level. The difference between the agricultural lending rate and the non-agricultural lending rate of GCB, the difference between the agricultural lending rate of GCB and the treasury bill rate, savings deposit rate and the discount rate are not significant even at the 10 percent level. The significant positive sign of the coefficient of the pre-financial liberalisation dummy variable shows that, the share of GCB's agricultural credit in GCB's total credit is higher in pre-financial liberalisation period than in the post-financial liberalisation period. A 1 percent increase (decrease) in the reserve requirements leads to a 0.0278 unit decrease (increase) in the log odds of the share of GCB's agricultural credit in GCB's total credit.

Table 5: Estimated Logit Function for the Share of GCB's Agricultural Credit in GCB's Total Credit.

Variable	Coefficient	Std Error	t-Statistic
DBGCBNB	0.0079	0.0103	0.7650
DBAGGTB	0.0056	0.0099	0.5645
DMMY	0.0373	0.0129	2.8964**
SAVDEPRAT	- 0.0242	0.0195	- 1.2372
DISCRAT	- 0.0043	0.0038	- 1.1043
RESERV	- 0.0278	0.0113	- 2.4587**

$R^2 = 0.7763$ Adjusted $R^2 = 0.7124$ F - statistic = 14.4789 ***(0.0000)

Breusch – Godfrey Serial Correlation LM: F = 0.9212 (0.2783)

White Heteroscedasticity Test : F= 1.42 (0.4871)

Jarque – Bera Statistic = 13.4651 (0.5178)

*** denotes significance at the 1 percent level, ** denotes significance at the 5 percent level while * denotes significance at the 10 percent level. **DBGCBNB** denotes the difference between the agricultural lending rate and non – agricultural lending rate of GCB. **DBAGGTB** denotes the difference between the agricultural lending rate of GCB and the interest rate on government treasury bills. **DMMY** denotes dummy variable representing Pre- liberalisation (DMMY=1) and Post liberalisation (DMMY=0) period of the financial sector. **SAVDEPRAT** denotes savings deposit rate whereas **DISCRAT** refers to the Bank of Ghana discount rate. **RESERV** denotes reserve requirements.

Share of GCB's Agricultural Credit: Pre-Liberalisation versus Post- Liberalisation

Comparing the average share of GCB's agricultural credit in GCB's total credit in the pre-liberalisation period with that in the post-liberalisation period, it is seen that whereas the former mean share is 29 percent, the latter mean share was 5.3 percent. The calculated t-ratio (tcal) relating to the difference between these two average shares is 7.06, whereas the critical t-statistic at the 5 percent level is 2.05. Since $t_{cal} > t_{crit}$, the null hypothesis that the share in the pre-liberalisation period is equal to the share in the post-liberalisation is rejected in favour of the alternative hypothesis. Thus, the share of GCB's agricultural credit in GCB's total credit is greater in the pre-liberalisation period than in post-liberalisation period.

Comparing the mean share of GCB's agricultural credit in total commercial banks' agricultural credit in pre-liberalisation and post-liberalisation period, it is seen that whereas the former share is 19.3 percent, the latter share is 2.8 percent. The calculated t-ratio (tcal) relating to the difference between these two average shares is 5.43, whereas the critical t-statistic at the 5 percent level is 2.05. Since $t_{cal} > t_{crit}$, the relevant null hypothesis is rejected in favour of the alternative hypothesis. Thus, the share of GCB's agricultural credit in total commercial bank agricultural credit in the post-liberalisation period is lower than that of the pre-liberalisation period.

The mean share of GCB's agricultural credit in total commercial and secondary bank agricultural credit in pre-liberalisation period is 14.4 percent whereas the corresponding share in the post-liberalisation period is 0.93 percent. Whereas the relevant computed t-ratio (tcal) is 4.11, the critical t-statistic (tcrit) at the 5 percent level is 2.042. Since $t_{cal} > t_{crit}$, the null hypothesis is rejected in favour of the alternative hypothesis. Thus, the share of GCB's agricultural credit in total commercial and secondary bank agricultural credit is lower in the post-liberalisation period than that in the pre-liberalisation period.

Conclusion

This article has described the time profile of the volume of agricultural credit delivered by Ghana Commercial Bank (GCB) over the period 1970-2003. The shares of GCB's agricultural credit in the bank's total volume of credit, commercial bank's total volume of agricultural credit, and commercial and secondary banks' total volume of agricultural credit have also been described in this article. An econometric model of the share of GCB's agricultural credit in the bank's total volume of credit, commercial bank's total volume of agricultural credit, and commercial and secondary banks' total volume of agricultural credit is constructed and analysed in this article.

The results based on the data over the period 1970 – 2003 show a general increase in the nominal volume of agricultural credit delivered over the period. However, the real volume of

agricultural credit delivered by GCB declined over the period of the study. The increase in the nominal volume therefore could be due to inflationary pressures. The share of GCB's agricultural credit in the bank's total volume of credit, commercial bank's total volume of agricultural credit, and commercial and secondary banks' total volume of agricultural credit recorded a persistent decline from 1970-2003.

The estimated Logit models show the impact of financial liberalization on the shares of GCB's agricultural credit delivery. Specifically, the estimated coefficient of the pre-financial liberalization dummy variable has a positive and significant effect in all three GCB's agricultural credit share models. These results are consistent with results obtained from the t-test for significance of difference between the shares in the pre-financial and post-financial liberalization periods. Thus, financial sector liberalization in Ghana has had an adverse effect on the share of GCB's agricultural credit in the bank's total volume of credit, commercial bank's total volume of agricultural credit, and commercial and secondary banks' total volume of agricultural credit. The Logit results of the shares show that reserve requirement have a significant negative impact on the shares. Other variables that negatively and significantly influence the share of GCB's agricultural credit in commercial and secondary banks' total volume of agricultural credit are the number of secondary and commercial banks, savings deposit rate and discount rate. Discount rate also influences share of GCB's agricultural credit in commercial banks' total volume of agricultural credit. This article has demonstrated the impact of monetary policy instruments and financial liberalization on the share of credit delivered to the agricultural sector by the state owned Ghana Commercial Bank (GCB) over the period 1970-2003. Considering the significant contribution of the agricultural sector to GDP and employment, GCB should be encouraged by the central bank to give a significant real volume of credit to the sector. Monetary policy instruments such as savings deposit rate, discount rate and reserve requirements should be manage within reasonable ranges in order to order to instigate an increase in the flow of credit to the agricultural sector. Mandatory credit allocation to agriculture may also be implemented so that the agricultural sector is not crowded out of the credit market. Future studies could analyse the demand side factors or consider internal bank factors which have the likelihood of affecting the supply of agricultural credit.

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