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# Prudential Measures and Monetary Policy Impact Agricultural Loans in the Great Lakes Region of Africa

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#### Abstract

This research sheds light on the intricate relationship between monetary policies, prudential measures, and agricultural portfolios in the low-income countries of the Economic Community of the Great Lakes Region of Africa (CEPGL). Through a meticulous methodology blending quantitative analysis and econometric models, it discerns various factors influencing agricultural loans. The study reveals a negative correlation between agricultural credit and certain variables like monetary policy, total bank assets, and political stability. Conversely, indicators such as economic stability and the presence of commercial bank branches exhibit a positive impact on agricultural lending. Interestingly, prudential measures appear to have no discernible effect on agricultural loans, which contrasts with the negative influence of monetary policy. The findings emphasize the necessity for tailored monetary policies geared towards facilitating agricultural sector financing in the CEPGL region. Furthermore, they underscore the pivotal role of governments in instituting measures to expedite land inclusion, thereby enhancing access to agricultural credit. By integrating diverse variables such as political instability, financial inclusion, insurance coverage, institutional quality, and business environment, this study pioneers a comprehensive approach to evaluating the efficacy of monetary policy and regulatory measures for agricultural portfolios in the Great Lakes Region of Africa.

Keywords Agriculture Loan, Financial Inclusion, Monetary Policy, Prudential Measures

#### 1. Introduction

Salami et al. (2013) agreed that a strong and efficient agricultural sector can empower a country to nourish its growing population, create employment, earn foreign exchange, and provide raw

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materials for industries. However, it is ironic that, despite Africa's great potential for agricultural production, the continent is a net importer of food Salami et al. (2013). From this perspective, the livelihood of several households in sub-Saharan Africa depends on the agricultural sector. According to the World Bank (2022), Sub-Saharan Africa has a total population of 626 million, of whom 384 million (61%) are classified as agricultural. The agricultural sector accounts for 20% of the region's Gross Domestic Product (GDP), employs 67% of the total labor force, and is the main source of livelihood for poor people. In the Democratic Republic of Congo (DRC), there are estimated to be 80 million hectares of available arable land, and 10% of this land is currently being used. The agricultural sector contributes 18% of GDP and accounts for over 60% of new jobs. In Rwanda, the agricultural sector accounts for 33% of the national GDP, with 62.3% of total employment, whereas in Burundi, the sector contributes 30% of the country's GDP and employs approximately 90% of the labor force. Taskinsoy (2019), posited that economics is known to list several negative effects of market failures in the financial sector, and profit Ouazad et al. (2019), noted that banking sector activities remain risky because of the inevitable portfolio of agricultural loans, provided banks act as agents who must make a profit. Previous studies on the applicability of monetary policy and regulatory measures to agricultural portfolios have examined the degree of performance and applicability of monetary policy and regulatory measures to agricultural portfolios in high-income countries, that is, countries that have proven politically stable and financially inclusive. However, few are known concerning low-income countries such as Burundi, the Democratic Republic of Congo, and the Republic of Rwanda.

Apart from the trouble of negative get right of entry to land and present day technology, the predominant trouble of Africa's agricultural development, usually referred to with inside the literature. In recent decades, most African countries have adopted several agricultural policies. Most of these policies and reforms have aimed to increase agricultural financing salami et al. (2013) This study provides insight into the level of applicability of monetary policy and regulatory measures to agricultural portfolios and suggests a step forward, as there has been no appropriate study of monetary policy and regulatory measures on agricultural portfolios. China implemented Targeted Easing (TE) as an unconventional monetary policy tool to reduce the reserve requirement ratio of agricultural financial institutions Chaoying et al. (2020). However, few studies have been conducted in low-income countries. Several advanced studies have examined the degree of performance and applicability of monetary policy(Sindayigaya, 2023b, 2023a, 2024) and regulatory measures to agricultural portfolios in high-income countries, which are more politically stable and financially inclusive(David et al., 2023). For example, China has implemented a policy of TE as an unconventional monetary policy tool to reduce the reserve requirement ratios of agricultural financial institutions Chaoying et al. (2020).

However, Raghuram, (2005) stated that the monetary policy rate increases the prices and collateral value of assets on banks' balance sheets. Furthermore, monetary policy influences bank risk through an increase in the "search for yield" from low interest rates, which may induce financial institutions to take on more risk for several additional reasons. Bank risk may also be influenced by a central bank's communication ex-ante policies and perceptions of possible future

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reaction functions of policymakers and changes in monetary policy; the perception of banks that the easing of monetary policy by the central bank in the event of poor economic performance could reduce expectations of major downside risks (Bernanke et al., 2005; Rajan et al., 2009; Raghuram, 2005).

Nevertheless, monetary policies and regulations can move in the same direction in some countries. For example, in the United Kingdom, De Marco et al. (2015) found that tightening monetary policy and capital requirements are mutually reinforcing, but only for small banks. The same results were found in Belgium by Wouter et al. (2020), who noted that there is a tradeoff between regulatory capital requirements and monetary policy. By contrast, Forbes, (2019) observed proof that economic coverage can extend the consequences of regulatory coverage. Everett, (2021) conducted a separate study on Irish and Dutch banks from 2003 to 2018 to assess the impact of monetary policy and regulatory measures on mortgage portfolios using panel regressions and found variables such as mortgages, bank balance sheet characteristics, and channel variables. However, the studies mentioned above were conducted in high-income countries that are different from low-income countries, such as the Great Lakes Region of Africa and the countries of the Economic Community of Great Lakes Countries (CEPGL), which included Burundi, the DRC, and Rwanda. Moreover, CEPGL countries are not low-income countries but are exposed to permanent political stability/insecurity caused by civil wars. Furthermore, the above studies did not include model variables such as political instability, financial inclusion, lack of insurance credits, institutional quality, and business environment to fill the gap in the literature review by updating and adding to Everett, (2021) model variables such as political instability, financial inclusion, lack of insurance credits and institutional quality. The objective of this study was to analyze the effects of prudential measures and monetary policy on agricultural loan portfolios. The researcher selected a quantitative research design since the measures of prudential measures and monetary policy, as well as the loan portfolio, are numerical.

## 2. Methods and Methodology

## 2.1. Target Population

The target population of this study included all financial statements, balance sheets and others financial statements established from national banks of CEPGL countries and World Bank. The sample of this study included all financial statements balance sheets and others financial statements from 1990 to 2020 established from national banks of CEPGL (Burundi, DRC and Rwanda), countries and World Bank.

## 2.2. Data collection instrument

The data collection instrument followed the logic of the instrument used by the World Bank and national banks of CEPGL countries. The data for this study is based on statistics from the World Bank, the Central Bank of Congo (BCC), the National Bank of Rwanda (BNR), and the Bank of the Republic of Burundi (BRB). These latter data sources are the monetary authorities of each

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country studied within the economic community of the Great Lakes countries. Data was collected for the sampling period (1990-2020).

This data has been converted to United States Dollars (USD) to provide a con-sistent monetary unit. This dataset was used to measure the main dependent and independent variables used in this task. The model developed takes into account the monetary policy of each country and the country-specific factors that are supposed to influence the monetary policy. What is important for these countries (Burundi, Democratic Republic of Congo, and Rwanda) is the need for more academic research in the areas of agricultural credit to help economies grow and strengthen investment opportunities in this sector.

The dataset will be used to test the effect of monetary policy and regulatory measures on a sample of agricultural loans from 1990 to 2020. A deductive approach is adopted. It is for testing rather than developing theory and is more appropriate to achieve the main objectives of this study. In order to understand a construct, it is important to consider how other studies have operationalized and measured similar constructs in their work.

#### 2.3. Data collection Procedure

To collect the data, the researcher consulted the websites of BRB, BCC, and BNR, as well as the World Bank's site on global economic outlook. The data was in each country's national currency, which is Burundian Franc (FBU) for Burundi, Congolese Devise Franc (CDF) for DRC, and Rwandan Franc (FRW) for Rwanda. It was first converted into US Dollars (USD) and then into natural logarithm to reduce the number of digits representing a series, which effectively smoothed the data. Therefore, all the data were taken in absolute value because the logarithm varies from]  $0, +\infty$  [. For missing data, the median statistic was used to complete all observations.

#### 2.4. The inclusion and exclusion criteria of the study

In conducting this study, specific criteria were established to determine which data and variables were included or excluded. These inclusion and exclusion criteria were designed to ensure the relevance and reliability of the analysis.

Inclusion criteria included factors such as:

- Relevance to the topic: Only data and variables directly related to prudential measures, monetary policy, and agricultural loans in the CEPGL region were considered.
- Data reliability: Only data from reputable sources with demonstrated reliability were included in the analysis.
- Timeframe: Data within a specified timeframe, relevant to the study's objectives, were included.
- Consistency: Data and variables that were consistently reported across countries in the region were given priority.

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On the other hand, exclusion criteria included factors such as:

- > Irrelevance: Data or variables that were not directly related to the study's focus were excluded.
- Poor quality: Data from unreliable or questionable sources were excluded to maintain the integrity of the analysis.
- Inconsistency: Data or variables that exhibited inconsistencies or dis-crepancies across countries were excluded to ensure accuracy.
- Out of scope: Data or variables that fell outside the scope of the study's objectives were excluded to maintain focus.

By adhering to these criteria, the study aimed to conduct a comprehensive and robust analysis of the impacts of prudential measures and monetary policy on agricultural loans in the CEPGL region. A potential bias could arise due to the reliance on data from certain sources, such as official government sources like central banks, which may have inherent limitations or biases. These data sources might present a favorable portrayal of policies or underestimate certain aspects of the agricultural market. Efforts to address this potential bias included incorporating data from the World Bank to mitigate the influence of relying solely on one source. Additionally, conducting sensitivity analyses to test the robustness of results using different datasets or sources helped assess the extent to which findings might be influenced by data selection.

#### 2.5. The ethical considerations

The appropriate use of data in a quantitative study is crucial to maintaining research integrity and upholding the rights of participants. Therefore, the data collected was strictly used solely within the specific scope of the research for which it was gathered, without any other utilization. Additionally, when presenting the study's findings, meticulous attention was paid to accuracy, impartiality, and transparency. No deliberate or biased manipulation of the data was tolerated to ensure the scientific integrity of the study.

#### 2.6. Model

This study examines the effectiveness of monetary policy and regulatory measures against the volatility of agricultural loan portfolios in the CEPGL. A quantitative design and econometric analysis were used to achieve this objective, as well as panel data. This method has been utilized in previous studies, particularly in Ireland and the Netherlands (Marco, et al., 2021). This study used secondary source data for 1990-2020 from the World Bank, BCC, BNR, and BRB. However, it is important to note that the latter three sources of funding are the monetary authorities of each country studied in the economic communities of the Great Lakes. The data were converted to US Dollars to provide a consistent monetary unit. This dataset measured the main independent and dependent variables used in this task. The developed model takes into account the monetary policy of each country and specific country factors such as financial inclusion, institutional quality, and political stability, which are believed to influence monetary policy. Thus, econometric models measure the effects of monetary and monetary directives on agricultural loans.

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Panel data modeling was applied to the samples to perform various statistical analyses and test the key research hypotheses. Various statistical analyses were performed using EVIEWS10, including descriptive statistics, correlation analysis, and regression models. These variables are the agricultural loan portfolio of banks (yat) as the dependent variable and the independent variables as the monetary policy (MPt) captured by its various aggregates, measures, and internal prudential policies before the monetary policy shock, measured by loans to non-financial corporations (PRU), total real bank assets (TRABt), domestic and global factors captured by GDP (NGT ), bank fixed effects at time t (BFEt), interest rates (IRt), and other claims on the economy (OCE). Financial inclusion is captured by commercial bank branches per 100,000 adults (CBB) and automated teller machines (ATMs) per 100,000 adults; the quality of institutions is measured by transparency, accountability, and corruption in the public sector (QI); political stability is measured by internally displaced persons and new disaster-related displacements (PS).

#### 2.7. Model specification

The basic specific model is that of Everett et al. (2021), presented as follows:

$$\begin{split} &Y_{(b,t)=\alpha_0+\alpha_1} \quad [Pru] \ _(t-4)^{home+\sum_ctry} \\ &a_2 \quad [MP] \ _(t-3)^{ctry+\sum_ctry} \\ &a_3 \\ \\ &[MP] \ _(t-3)^{ctry}. \quad [Pru] \ _(t-4)^{home+\alpha_4} \quad [Pru] \ _(b,t-4)^{home}. \quad [Channel] \ _(b,t-4)^{home}. \quad [Channel] \ _(b,t-4)^{home}. \quad [Channel] \ _(b,t-4)^{home}. \quad [Channel] \ _(b,t-4)^{home}. \quad [MP] \ _(t-3)^{home}. \quad [Channel] \ _(b,t-4)^{home}. \quad [Channel] \$$

where:

b,t is a new mortgage from bank b for period t

t,k is period t in country k,

yb,t: new mortgages through Irish/Dutch bank b in quarter t.

MPL: are EA monetary policy shocks,

Pru: denotes the domestic prudential policy stance (IE or NL) before a monetary policy shock.

Xh: is a vector of time-varying bank-level control variables,

Zhl: denotes domestic and global factors, including proxies for domestic economic activity (real GDP growth in the Netherlands and modified domestic demand in Ireland), domestic credit demand, and global risk.

FB: are unobserved time-invariant bank-fixed effects,

At this stage, we have presented in fin in the current context of the Congolese, Burundian, and Rwandan economies, specifying one model for agricultural loans for the DRC, Burundi, and Rwanda as

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where:

Ya = Bank agricultural portfolio MP = Monetary Policy PRU = Prudential policy TRAB = Total real assets of banks NGF= National and global factors BFE = Bank Fixed effects OCE = other claims on the economy. IR = Interest rate ATM = ATMs of Banks for 100,000 adults CBB = Commercial bank branches per 100,000 adults QI: Quality of institutions PS: Political stability U = Error term.

## 3. Analysis Results

Table 1: Descriptive statistics

		Mean	Median	Max	Min	Std.	J-B	Prob	Obs
						Dev.			
Bank	BUR	8,59	8,39	10,14	7,6	0,72	7,35	0,03	31
agricultural	DRC	16,65	16,76	18,24	14,15	0,99	3,12	0,21	31
Portfolio ( Y <sub>at</sub> )	RWA	14,45	15,97	17,23	6,97	3,49	8,49	0,01	31
Monetary	BUR	17,56	17,31	19,11	16,59	0,79	3,69	0,16	31
Policy ( $MP_t$ )	DRC	19,02	18,3	27,65	14,26	3,7	2,4	0,3	31
	RWA	18,15	17,91	19,75	17,33	0,65	5,16	0,08	31
Prudential	BUR	18,86	19,13	20,04	15,94	0,91	27,13	0	31
policies(	DRC	21,87	22,04	23,17	18,84	0,84	46,14	0	31
PRU <sub>t</sub> )	RWA	20,59	20,62	21,59	18,88	0,64	6,71	0,03	31
Total real	BUR	21,06	20,73	22,57	20,16	0,79	3,88	0,14	31
assets of	DRC	11,28	9,45	20,03	8,07	3,4	5,12	0,08	31
TRAB <sub>t</sub> )	RWA	12,28	12,03	13,91	11,49	0,65	5,37	0,07	31

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National and	BUR	21,08	20,88	21,86	20,48	0,48	3,63	0,16	31
global	DRC	23,44	23,39	24,64	22,27	0,75	2,42	0,3	31
Factors ( NGF <sub>t</sub> )	RWA	22	21,8	23,06	20,44	0,75	1,94	0,38	31
Bank fixed	BUR	10,42	9	31,11	-2,81	8,24	2,97	0,23	31
effects( BFE <sub>t</sub> )	DRC	1122,21	21,32	23773,13	0,74	4292,72	854,31	0	31
	RWA	7,21	7,45	19,64	-2,41	4,89	0,27	0,88	31
Other claims	BUR	17,63	17,37	19,17	16,65	0,79	3,7	0,16	31
on the	DRC	19,45	18,47	27,83	14,94	3,61	2,86	0,24	31
economy( OCE <sub>t</sub> )	RWA	18,19	17,96	19,89	17,36	0,66	5,7	0,06	31
Interest rate ( IR <sub>t</sub> )	BUR	4,8	5,05	18,25	-	7	5,13	0,08	31
	DRC	19,13	20,77	29,58	- 15,69	8,45	148,75	0	31
	RWA	10,16	11,44	22,63	-3,64	5,45	0,9	0,64	31
ATMs of	BUR	-0,86	-0,63	0,44	-3	1	8,16	0,02	31
Banks for	DRC	-0,17	-0,09	0,34	-2,3	0,46	264,52	0	31
100,000 adults ( ATM <sub>t</sub> )	RWA	0,91	1,45	1,75	-3,22	1,25	26,43	0	31
Commercial	BUR	0,85	0,85	1,19	0,47	0,17	0,35	0,84	31
bank	DRC	-0,46	-0,46	0,03	-0,8	0,2	0,4	0,82	31
branches per 100,000 adults (	RWA	1,43	1,67	1,84	-0,92	0,71	47,35	0	31
CBB <sub>t</sub> )									
Quality of	BUR	0,88	1,1	1,1	0,41	0,26	3,43	0,18	31
institutions (	DRC	0,69	0,69	0,69	0,69	0	NA	NA	31
$QI_t$	RWA	1,17	1,1	1,25	1,1	0,08	5,17	0,08	31
Political	BUR	8,45	7,94	10,84	7,31	0,91	9,29	0,01	31
stability (PS)	DRC	9,23	8,54	12,54	4,87	1,57	1,67	0,43	31
	RWA	8,48	8,52	10,76	6,91	0,64	30,69	0	31

Source: Data computed Bank from of the BCC, BNR, BRB, and WB data reports =\*\*\*: significant at 99%, \*\*: significant at 95% and \*: significant at 90%

Table I shows that the mean and standard deviation for agricultural loans are Burundi (Arithmetic Mean ( $\vec{x}$ )=8.59, Standard Deviation (SD) =0.72), DRC ( $\vec{x}$ =16.65, SD=0.99), and Rwanda ( $\vec{x}$ =14.45, SD=3.49). The DRC had a high average for bank mortgages compared to Burundi, which had the lowest average. However, in terms of standard deviation, Rwanda had

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the highest, and Burundi had the lowest. The results in Table I exhibit the following for monetary policy: Burundi (x =17.56; SD=0.79), the DRC (x =19.02; SD=3.70), and Rwanda (). However, the DRC had the highest mean and standard deviation. For prudential policies, the results in Table I reveal that Burundi (x =18.86; SD=0.91), DRC (x =21.87; SD=0.84), and Rwanda (x =20.59; SD=0.64). The DRC had the highest mean and Burundi had the highest standard deviation. Moreover, Table I illustrates the total real assets of banks in Burundi (x =21.06; SD=0.79), the DRC (x =11.28; SD=3.40) and Rwanda (x =12.28; SD=0.65). Burundi had the highest mean and DRC had the highest standard deviation. For national and global factors, Burundi (x =21.08; SD=0.48), the DRC (x =23.44; SD=0.75), and Rwanda (x =22.00; SD=0.75). The DRC had the highest mean and the same standard deviation as Rwanda. Table I presents the following results for ATMs: Burundi (x =0.86; SD=1.00); DRC (x =0.17; SD=0.46), and Rwanda (x =1.43; SD=1.25). Rwanda had the highest mean and standard deviation, while for commercial bank branches ATMs Burundi (x =0.85; SD=0.17), DRC (x =0.46; SD=0.20), and Rwanda (x =1.43; SD=0.71). Rwanda had the highest mean and standard deviation.

Table I presents the following results for the quality of institutions: Burundi (x =0.88; SD=0.26), DRC (x =-0.69; SD=0.00), and Rwanda (x =1.17; SD=0.08). Rwanda had the highest mean and Burundi had the highest standard deviation. For Political stability: Burundi (x =8.45; SD=0.91); DRC (x =9.23; SD=1.57), and Rwanda (x =8.48; SD=0.64). DRC had the highest mean and standard deviation.

	BUR	DRC	RWA
Variable	Coefficient	Coefficient	Coefficient
С	19.91	-21.45	-25.11
Monetary Policy (MPt)	-1.60	0.02	-12.25
Prudential policies (PRU <sub>t</sub> )	-0.52***	0.18	1.88**
Total real assets of banks (TRABt)	1.91	0.27***	14.59
National and global Factors (NGF <sub>t</sub> )	-0.46	1.45***	1.13
Bank fixed effects (BFE <sub>t</sub> )	-0.02	0.00	0.04
Interest rate (IR <sub>t</sub> )	-0.01	-0.01	-0.06
ATMs of Banks for 100.000 adults (	0.53	-0.33	-0.13
ATM <sub>t</sub> )			
Commercial bank branches per 100.000	-0.73	0.82	2.38
adults (CBB <sub>t</sub> )			
Quality of institutions (QIt)	-3.01**		12.12
Political stability (PSt)	0.01	0.03	0.24
R-squared	0.55	0.78	0.72
Adjusted R-squared	0.32	0.68	0.58
S.E. of regression	O.60	0.56	2.27
Sum squared resid	7/13	6.59	102.99

Table 2:Model Estimation

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Log likelihood	-21.20	-19.99	-62.60
F-statistic	2.40	8.10	5.10
Prob(F-statistic)	0.05	0.00	0.00
Mean dependent var	8.59	16.65	14.45
S.D. dependent var	0.72	0.99	3.49
Akaike info criterion	2.08	1.93	4.75
Schwarz criterion	2.59	2.40	5.26
Hannan-Quinn criter.	2.24	2.09	4.91
Durbin-Watson stat	0.95	1.48	1.49

Source: Data computed Bank from of the BCC, BNR, BRB, and WB data reports =\*\*\*: significant at 99%,\*\*: significant at 95%, and \*: significant at 9

The results in Table III show that the following regression equation can be ex-pressed for each country:

Burundi: YatB = 19.91 - 0.52 PRU - 3.01QI (1). From (1), ceteris paribus, if the next variable has taken by a prudential policy (PRU) and the quality of institutions (QI) increases per unit, agricultural loans decrease to 0.52 and 3.01, respectively.

DRC : YatD= -21.45 + 0.27 TRAB + 1.45 BFE (2). According to (2), if ceteris paribus, if the following variable is taken each by the total real assets of banks (TRAB) and the bank fixed effects (BFE) increase per unit, then agricultural loans increase respectively by 0.27 and 1.45. Rwanda: YatR= -25.11 + 1.88 PRU (3). From (3), if, ceteris paribus, the next variable taken by a prudential policy (PRU) increases per unit, agricultural loans increase by 1.88.

Variables	Pooled least squares	Fixed effects	Random effects
С	-38.15	-27.94	39.92
Monetary Policy (MP <sub>t</sub> )	-4.75***	-3.42	-5.07**
Prudential policies (PRUt)	0.35	0.45*	0.001
Total real assets of banks (TRA <sub>t</sub> )	-0.35***	-0.38	-0.93***
National and global Factors (NGFt)	1.59***	1.06***	-1.23
Bank fixed effects (BFE <sub>t</sub> )	0.001	0.001	0.001
Other claims on the economy ( $OCE_t$ )	5.49***	4.03	5.80**
Interest rate (IRt)	0.001	0.001	0.04
ATMs of Banks for 100.000 adults (	-0.24	-0.05*	-0.43
ATM <sub>t</sub> )			
Commercial bank branches per	2.36***	3.54***	3.05***
100.000 adults ( CBB <sub>t</sub> )			
Quality of institutions ( QIt)	-0.71	0.45	2.04

Table 3: Panel analysis

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Political stability (PS <sub>t</sub> )	-0.12	-0.05	-0.46**
R-squared	0.85	0.87	0.75
Adjusted R-squared	0.83	0.84	0.55
S.E. of regression	1.65	1.59	1.44
Sum squared resid	219.29	199.64	105.09
Log likelihood	-171.84	-167.48	
F-statistic	42.54	39.16	3.70
Prob(F-statistic)	0.00	0.00	0.00
Mean dependent var	13.23	13.23	13.23
S.D. dependent var	4.02	4.02	2.13
Akaike info criterion	3.95	3.90	
Schwarz criterion	4.28	4.28	
Hannan-Quinn criteria.	4.09	4.06	
Durbin-Watson stat	0.66	0.78	0.86
Hausman-test			10.004

Source: Data computed Bank from of the BCC, BNR, BRB, and WB data reports =\*\*\*: significant at 99%, \*\*: significant at 95%, and \*: significant at 90%

With the pooled technique, the results from panel regression analysis in Table III reveal that of the three countries which are Burundi, the DRC, and Rwanda, the variables such as monetary policy (MPt) and total real assets of banks (TRAt) were negatively associated with agriculture loan while National and global Factors (NGFt), Commercial bank branches per 100,000 adults (CBBt) and Other claims on the economy (OCEt) were positively associated with agriculture loan. With the fixed technique, the results in Table III show that only the ATMs of Banks per 100,000 adults (ATMt) are negatively associated with agricultural loans. In contrast, prudential policies (PRUt), national and global factors (NGFt), and commercial bank branches per 100,000 adults (CBBt) were positively associated with agricultural loans. The pooled method revealed that the variables: prudential measures negatively affected the agricultural portfolio, national and global factors; other claims on the economy and commercial bank branches per 100,000 adults positively affected agricultural credit, while the following variables monetary policy (Coeficient (b) =-4.75, Probability (p) <1%), total bank assets (b=-3.35, p<1\%) negatively affected agricultural loans. The results of the fixed effects method revealed that the following variables: prudential policies (b= 0.45, p<10%), national and global factors (b= 1.06, p<1%), and commercial banks (b=3.54, p<1%) positively affect agricultural loans. The results of the random effects method revealed that the following variables: monetary policy (b = -5.07, p < 5%), total real bank assets (b = -0.93, p < 1%), and political stability negatively affected agricultural credit, whereas other claims on the economy (b=5.80, p<5%) and commercial bank branches per 100,000 adults (b=3.05, p<1%) positively affected agricultural credit.

#### 4. Discussion of the Results

This study's results provide insight into how agricultural mortgage management is affected in CEPGL countries, including Burundi, the DRC, and Rwanda, by predicting monetary policy,

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prudential policy, total bank assets, bank fixed effects, other credits to the economy, domestic and global factors, interest rates, ATMs, commercial bank branches, quality of institutions, and stability policy. The results by country show that for Burundi, prudential policy (PRU) and the quality of institutions (QI) increased per unit, and agricultural loans decreased. Moreover, for the DRC, the total bank assets (TRAB) and the national and global factors (NGE) affect agricultural loans positively. In addition, for Rwanda, prudential policy (PRU) increases agricultural loans. Furthermore, the panel data analysis results reveal that monetary policy, total bank assets, and political stability are negatively correlated with agricultural credit, while other claims on the economy and bank branches' trade positively affect agricultural credit. However, prudential policy, domestic and global factors, bank fixed effects, interest rates, ATM, and institutional quality do not affect mortgage credit. Regarding the results on monetary policy, we notice a negative correlation with agricultural loans; however, the results on monetary policy corroborate those of Zhiguo, et al. (2014), who showed that the default probabilities of agricultural loans are significantly higher than those of non-agricultural loans. Monetary policies have had a direct impact on default risk. Similarities between CBB and mortgage results are evident, as in Mohsin, et al. (2022), who showed that the Financial to Commerce (FTC) scale can increase the share of agriculture-related loans in financial institutions. However, the share of loans decreased slightly due to factors related to agriculture and e-commerce.

Consequently, an increase in commercial bank branches increases agricultural lending. This may be because most banks use technology and informatics. With the return on CEPGL and prudential policy, there is no statistically significant effect on agricultural credit. This result contradicts Lombe, (2019), findings, which showed that agricultural loan levels decline as liquidity reserve requirements increase. This could indicate that banks are turning to other sectors deemed less risky even as liquidity levels increase. Lombe, (2019), results were confirmed by Kim, (2020), who added that while agricultural credit growth has slowed, the volume of agricultural credit composition remains positive. Upon closer inspection, regulated agricultural banks reduced both their agricultural lending volume and their exposure to lending in the agricultural sector, a possible sign of a credit crunch.

Similarly, the results revealed that the quality of institutions in the panel analysis was insignificant; however, it was negatively significant in the Burundi model. These results contrast with those of salami et al. (2013) a, who find that the four governance variables included in the model (the corruption index, rule of law index, regulatory quality index, and government effectiveness index) negatively impact agricultural credit in the continental market. The results generally reveal that political stability is negatively significant in the Great Lakes. Therefore, this study attempts to inform stakeholders on how to improve their monetary and prudential policies, interest rates, and other conditions related to agricultural credit.

## 5. Conclusion

In conclusion, this study investigated the impact of prudential measures and monetary policy on agricultural loans in the CEPGL region. The findings indicated that monetary policy, total real bank assets, and political stability had a negative impact on agricultural credit. However, other

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variables such as other claims on the economy and commercial bank branches per 100,000 adults had a positive effect on agricultural credit. Conversely, other variables such as prudential measures, interest rates, inflation, bank ATMs, quality of institutions, bank fixed effects, and total bank assets had no significant effect on agricultural loans. Nonetheless, the study also revealed some challenges and limitations associated with implementing these policies in the context of the CEPGL. Economic, political, and regulatory differences among member countries hindered the effectiveness of common policies, emphasizing the need for increased coordination and policy harmonization at the regional level. Additionally, further efforts are needed to improve data collection and quality, as well as to strengthen institutional capacities in the region to better assess and monitor the financial risks associated with agricultural loans. Ultimately, this study underscores the crucial importance of effective prudential and monetary policies in promoting financial stability and supporting the development of the agricultural market in the CEPGL region. By recognizing these challenges and capitalizing on opportunities, policymakers can work together to create a regulatory environment conducive to sustainable and inclusive growth in the agricultural lending sector, thereby contributing to improved living conditions and poverty reduction in the region.

The limitations of this study include its focus on low-income countries in the Great Lakes Region of Africa, without considering potential disparities in the implementation of monetary and prudential policies. While it incorporates various variables such as political instability and financial inclusion, other relevant factors may exist. Additionally, the quantitative methodology used might overlook essential qualitative aspects for fully understanding the effectiveness of policies in agricultural portfolios.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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