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Does Bank Agricultural Credit Reduce Poverty Level and Income Inequality in Ethiopia: Panel Corrected Standard Errors (PCSE) Approach

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ABSTRACT

Harshly, the problem of poverty and income inequality overwhelmed a significant portion of the world's population and remained one of the economic curses posing catastrophic consequences on society's economic as well as social well-being. Hence, this study investigated the effects of extending bank agricultural credit on Ethiopia's poverty level and income inequality. The study used unbalanced panel data from 2000 to 2021 collected from all 11 regional states in Ethiopia. The study also included other macroeconomic variables that affect poverty and income inequality to avoid the variable omission problem. When analyzing the relationship between agricultural credit granted by banks and poverty level and income inequality, the study adopted the Panel Corrected Standard Error (PCSE) method basing its robust feature on effectively controlling spatial correlation, heteroscedasticity, and cross-sectional dependence in panel data sets. Additionally, pre-estimation tests like cross-sectional dependence, co-integration, and unit root tests were conducted to identify the presence of associated problems. The study reveals that bank agricultural credit has a significant and negative effect on the poverty level in Ethiopia. Moreover,

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bank agricultural credit has a significant inverse relationship with income inequality. Therefore, renovating the credit distribution aimed at directing the magnitude towards the agricultural sector is vital to flourishing the society's economic well-being.

Keywords: Agriculture Sector; Credit Distribution; Income Inequality; Poverty Reduction; Panel Corrected Standard Error

1. Introduction

Poverty and income inequality remain hot macroeconomic issues for government and non-governmental organizations both at the national and international levels. Despite plenty of measures to reduce poverty, it continues to affect a significant portion of people at the world level. A tremendous population of more than 1.3 billion lived in nuanced poverty in 2020 at the world level[1]. In the past decades, the move towards reducing poverty has shown good progress. However, this progress was halted between 2020 and 2022 due to significant crises and shocks. In this specific period, poverty showed an increasing trend in low-income countries, and they were not able to recover from poverty. This condition puts a big doubt on the achievements of the Sustainable Development Goals (SDGs) of eliminating extreme poverty by 2030. In Sub-Saharan Africa, which is characterized by political turmoil, the majority of population who live in poverty are found in the rural part of Africa[2]. Similarly, Robilliard[3] indicates that income inequality remains high across African regions. In the Ethiopian context, the past two decades have shown good progress in poverty reduction and a slight increase in income inequality[4]. However, contrary to this progress, a recent United Nation Development Program[5] report shows that the poverty level indicates an increasing trend after 2020. According to the report, due to economic shocks and the prevalence of war, the poverty headcount ratio indicates a high figure of 27% in 2021 compared to 24% in 2016.

It is apparent that the agriculture sector plays a prominent role in Sub-Saharan African countries' economies, where most of their population lives in rural areas. The majority of least-developed countries rely on this sector since it provides livelihoods for most of the population in the region. Correspondingly, in Ethiopia, the agriculture sector plays a significant role and comprises the majority of the population, accounting for 79% of the total population in 2019. In line with this, the government aimed to apply the growth and transformation plan to support and increase national income and make Ethiopia become a middle-income country by 2025[4]. Plenty of literature argues that agricultural productivity has the potential to curb poverty and food insecurity. Agricultural finance has a significant role in strengthening the agricultural sector and rural development by enabling the sector to get access to technology, better soil fertility practices, better pest management, and high-yielding seeds, which enable farmers to utilize their full potential[6]. Promoting the private sector and non-governmental actors to increase mechanization, commercialization, irrigation, and better access to fertilizer, high-yielding varieties, and pesticides can be achieved through facilitating finance and increasing the allocation of foreign currency to generate optimum production and revolutionize the agriculture sector[7]. The provision of credit helps to reduce poverty in developing countries by adopting green revolution technologies which bring better productivity to the sector[8]. However, the pervasive poverty especially in Sub-Saharan African countries, coupled with erratic financial inclusion in the region, hampers smallholders' access to financial services. This problem remains a bottleneck for smallholders in utilizing the aforementioned inputs which leads to weak development of the sector and increased poverty[9].

Although agricultural credit plays a marvelous role in increasing agricultural productivity and breaking the cycle of poverty, the status of agricultural finance in Ethiopia shows a dwindling trend even after the 1991 economic reform. The worst characteristic of the credit provided by financial institutions is that the majority of smallholders in agricultural sectors were the most af-

fected when compared to other sectors in Ethiopia. The erratic provision of credit services to the sector is shown in the credit–to–aggregate value of total agricultural production, which was 6% for the last two decades[10]. Unequal financial services to economic sectors characterize the current credit provision system by banks in Ethiopia. For instance, of the total outstanding loans provided to economic sectors by commercial banks, only 9.3% went to agriculture, while the remaining huge amount was granted to sectors like domestic trade and services, exports, manufacturing, and construction[11].

Even though agricultural credit has a big role in strengthening the sector, the aforementioned evidence shows that the current status of agricultural credit disbursement indicates the little attention paid to the sector. However, studies show that the rural poverty level, as compared to urban poverty, shows little improvement which drags the poverty reduction objective of the government. Furthermore, keeping the relatively stable income inequality in Ethiopia until 2011, the recent spike in income inequality in the country emanated from the variation in welfare provision between urban and rural residents in favor of the urban population. The outstanding credit by commercial banks was mainly focused on other sectors rather than the agricultural sector. Moreover, the majority of previous studies, like Teklewold[12], Negussie and Ndinda[13], Amanuel and Degiye[14], and Adamu[15], focus on the credit provided to the agricultural sector by microfinance cooperatives and its implications for farmers living improvement on one hand and agricultural sector improvement on the other. This study was conducted from the demand side and they also disregarded the role of banks' agricultural credit service for the sector. Despite this, a huge amount of financial resources, which is more than 90% of outstanding loans in the economy is provided by banks[11]. However, the credit distribution for economic sectors is not inclusive where the credit supply neglects the agricultural sector. So far there is no empirical investigation aimed at unveiling the role of bank agricultural credit on poverty reduction and ensuring equitable income distribution in Ethiopia. This study was undertaken from the supply side to fill the aforementioned gaps. Undeniably, in sub-Saharan African countries like Ethiopia,

where the agricultural sector suffers from dwarfed financial constraints, it fails to acquire better inputs and improved technology used to increase productivity. Therefore, empirically determining how inclusive credit provision or channeling financial resources to marginalized sectors like agriculture, which employs the majority of Ethiopia's population, creates insight for policymakers and government organs to incorporate the outcome in their endeavor of poverty reduction and ensuring fair income distribution. Further, this study complements the government's objective of Sustainable Development Goals (SDGs) of ending extreme poverty in Ethiopia. Hence, this study investigated the role of agricultural credit granted by banks on the level of poverty and income inequality in Ethiopia. The study also incorporates economic and social factors together with agricultural credit that affect poverty and income inequality to avoid the problem of variable bias.

2. Literature Review

2.1. Theoretical Perspectives

The theoretical linkage between access to finance and its association with poverty level and income inequality is summarized under the following theoretical foundations.

Theory of credit constraint: postulates that the demand as well as supply constraint creates barriers for those who want loans and pulls them away from obtaining the funds. The constraint exposes the majority of debtors, especially economically vulnerable groups, to obtaining credit, which affects their productivity and exposes them to reduced income[16]. According to Guirkinger[17], credit constraints aggravate poverty and the income distribution gap especially in the rural economy through retarding allocation efficiency and their entrepreneurial capability. On the other hand, the theory of financial inclusion entails providing financial access to marginalized or economically vulnerable and disadvantaged groups in society and ensures balanced and inclusive growth[18]. This theory suggests that the financial services provided to society must consider the majority of unbanked and disadvantaged portions of society to ensure financial stability and equitable income distri-

bution. Although formal financial institutions like banks play a significant role in credit supply in the economy, the contribution to the masses is questionable. According to Isukul and Tantua[19], the prevalence of poverty and income inequality across the world is due to the segregation of many people from formal financial services. According to Bhandari[20], banking services play a pivotal role in poverty reduction through forging financial inclusion in the economy, which significantly helps the poor and women. Access to credit for the majority of the population who own small businesses benefits from the service by fulfilling their short-term capital requirements, which solves the problem of the income distribution gap and financial stability. Financial services provided by banks ease access to finance and help the poor to get rid of poverty, ensuring equitable income distribution by easily coping with short-term capital needs. As more of the population is included in this service, their entrepreneurial activity and investment improve their stream of income and capital accumulation[21]. The central aim of this theory is to provide financial services for the majority of society, enabling them to get out of poverty and ensure equitable income distribution. Further, this paper bases the theory of financial inclusion to investigate the role of availing agricultural credit through banks in reducing poverty levels and income inequality.

The third one is social capital theory, which got rampant four decades ago when authors like Bourdieu[22] and Putnam[23] propagated the importance of social capital. It encompasses components like social norms, social networks, trust, and institutions that guide how actors in society and individuals behave; well-being in society is built[22]. In line with this strong social capital is perceived as a method of poverty reduction. Poor people with limited finance and human capital can benefit from strong social networks to minimize their reliance on wealthy people and substitute private capital[24].

2.2. Empirical Review

Tremendous literature strived to empirically determine the association between credit supply and its effect on poverty level and equitable income distribution. The following section synthesizes the empirical findings of different literature conducted so far.

The study of Beck et al.[25], investigated the interlinkage between finance, inequality, and poverty using data starting from 1960 to 2005 in Peru. The study applies ordinary least squares and the Generalized Method of Moments (GMM) to analyze the data. The findings reveal that increasing access to financial services significantly reduces income inequality and poverty through better bridging of finance to the poor, which in turn helps the economy to grow. The investigations made by Bangoura et al.[26] on the implications of microfinance on income distribution in developing countries indicate that high-level participation of microfinance institutions is key to minimizing the disparity of income levels in society. Demirguc and Levine[21] collected cross-country data to determine the effects of financial access on income inequality and economic improvement. The results reveal that increasing financial accessibility for the poor is a mechanism used to increase income earned by the poor and to facilitate economic growth rates. Correspondingly, this finding is supported by the works of Rajan and Zingales[27] and Honohan[28], which suggested that increasing the provision of credit services significantly reduces poverty and income disparity.

According to Croppenstedt et al.[29] the provision of better agricultural credit helps to reduce the level of poverty and deprivation and helps to increase farmers' income by improving the level of productivity. The credit facilities provided for farmers can take place in different forms or credit products to improve agricultural crop production, fisheries, better access to markets, livestock, etc. The studies of Osabohien et al.[30] and Khan et al.[31] reported that curbing poverty incidence needs the adoption of credit policies to improve the return from agricultural outputs. However, according to, Zhuang et al.[32] a review undertaken in Pakistan assessed the impact of agricultural credit on the rural community, the success and failure factors in the sector, and the proper functioning and control of institutions in the sector. The study recommended that the provision of credit for the rural community must be accompanied by proper control and evaluation to bring the intended improvement.

The study of Claudio and Guillermo[33] also as-

sessed the role of financial inclusion in containing poverty and income distribution by collecting panel data from 116 developing countries starting from 2004 to 2016. The result of the study indicates that a well-developed financial system has a significant implication in dwarfing poverty levels and ensuring fair income distribution in developing countries. Turégano and Herrero[34] also empirically determined whether financial inclusion reduces income distribution divergence. The findings of the study indicate that it is inclusion that matters in handling income inequality rather than the size of the financial system. The study of Claudio and Guillermo[33] investigated the importance of banks in terms of ensuring equitable income distribution in emerging and low-income countries using nineteen years of data. The findings entail that banking financial efficiency, together with availability and relevance significantly reduces income inequality and poverty in emerging and low-income countries. Similarly, Brei et al.[35] stated that at the early stage of economic development, the injection of credit helps to get rid of income inequality. Whenever the financial system in the economy becomes liquid relatively, fair income distribution among society takes place.

3. Materials and Methods

3.1. Description of the Study Area

Ethiopia has an administrative structure using a federal parliamentary republic governance system, and the prime minister is the head of government. During the study period, Ethiopia is subdivided into 11 regions, and Dire Dawa and Addis Ababa cities are under federal administration. In line with this, the study used data from all regions in Ethiopia, which represent the whole country[36]. The following **Figure 1** demonstrates all regional states in Ethiopia.

Although the history of the banking system can be traced back to 1905, the reign of the military regime (Dergue) in 1976 ended private ownership and forced the merger of private banks into the state bank. However, the downfall of the Dergue Regime in 1991 called for policy revision that liberalized and deregulated the financial sector under regulation 84/94. This condi-

tion gave rise to the establishment of several private banks and insurance companies. Currently, there are 2 state-owned banks and 29 private commercial banks in Ethiopia. The current banking environment is characterized by the domination of the banking sector by privately owned banks[11].
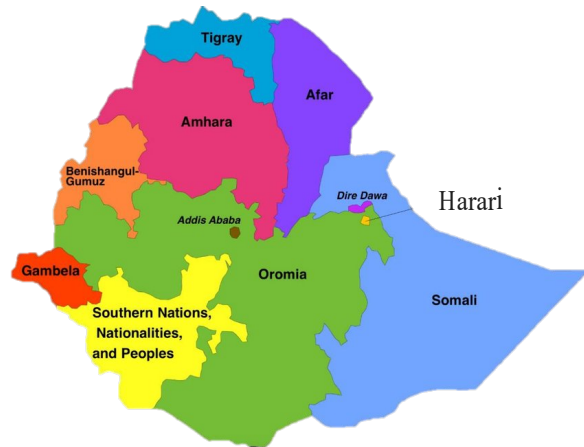

Figure 1. Map of the study area.

3.2. Data Type and Source of Data

This study used a secondary data set to empirically determine the effects of bank agricultural credit on the prevalence of poverty as well as the divergence of income distribution. The panel data from 2000 to 2021 collected from all regional states in Ethiopia was used. Bank agricultural credit and bank-specific variable data are collected from the National Bank of Ethiopia, and commercial banks in Ethiopia. The data for other variables in the study is collected from the Global Data Lab, UNDP, Ethiopian Statistical Service (ESS), and World Bank.

3.3. Methods of Data Analysis

The study adopted both descriptive and econometric analysis. Descriptive analysis depicts the trends of bank agricultural credit allocation to different sectors in Ethiopia for the study period. On the other hand, the econometric analysis part used the Panel Corrected Standard Error (PCSE) to analyze the panel data of the study.

3.4. Estimation Approach

Panel data analysis often starts with conducting pre-estimation tests to realize the absence of risks as-

sociated with estimation. Among these, cross-sectional dependence and ways of withstanding this shortfall in panel data analysis is the major one. The circumstances of cross-sectional dependence unleashed from conditions like economic distance, spatial correlation, and unobserved shocks. To overcome its effect and ensure the yielding of consistent estimation during data analysis, it is recommended to figure out existence of cross-section dependence [37]. The application of a cross-sectional dependence test is a precondition to adopting suitable unit root and co-integration tests that can consider the problem. This study adopted the cross-sectional dependence test proposed by [38] as follows:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{(T-K)\,\widehat{\rho}_{1j}^2 - E\left[(T-K)\,\widehat{\rho}_{1j}^2\right]}{Var\left[(T-K)\,\widehat{\rho}_{1j}^2\right]}$$

(1)

Hence, N stands for sample size, T represents time, K stands for identity matrix, and $\widehat{\rho}_{1j}^2$ represents pairwise correlation coefficient of all cross-sections i where $j = i + 1$.

The other pre-estimation test applied was the unit root test in the panel data settings. This study applied a second-generation unit root test for panel data models to take into consideration cross-sectional dependence. First-generation stationary tests like augmented Dickey-Fuller, Phillips-Perron and Pesaran, and Levin-Lin Chu don't consider circumstances of cross-sectional dependence in panel data analysis and they assume the existence of cross-sectional independence across the panel. The second-generation unit root test incorporates the issue of cross-section dependence across section units [39].

In this study, the cross-sectional augmented Im, Pesaran, and Shin (CIPS) introduced by Pesaran [38] is adopted since it considers cross-sectional dependence across units.

$$CIPS\,(N,T) = \bar{T} = N^{-1} \sum_{i=1}^{N} t_i\,(N,T)$$

(2)

Where N represents the number of cross sections and T denotes time. The left-hand side of the equation denotes the heterogeneous panel's unit root test and t_i on the right-hand side denotes the OLS t ratio cross-sectional averaged ADF regression.

The next pre-estimation test undertaken in the study is the panel co-integration test to determine the long-run association of variables. Considering the existence of cross-sectional dependence across units, the study adopted the second-generation panel co-integration test introduced by [40]. This test is applicable when CSD prevails across units. The following equation is formulated for the test:

$$\Delta y_{it} = \delta_i d_t + \lambda_i y_{it-1} + \beta_i' X_{i,t-1} +$$
$$\sum_{j=1}^{pi} \lambda_{ij} \Delta y_{i,t-j} + \sum_{j=-qi}^{pi} y_{ij} \Delta X_{i,t-j} + \epsilon_t$$

(3)

Where i represents several cross-sections, d represents model residuals and t denotes the time period. The presence of a long-run association can be determined by rejecting the null hypothesis of no co-integration at 1%, 5%, and 10% significance levels.

Moreover, the study also conducted correlation analysis to avoid the problem of collinearity and multi-collinearity between variables in panel data analysis.

Finally, to meet the study's objective aimed at determining the role of agriculture credit granted by banks in reducing the level of poverty and income inequality using unbalanced panel data from 2000 to 2021 in Ethiopia the study adopted the PCSE model. The study made a deep investigation by incorporating other important determinants of macroeconomic variables that affect poverty level and income inequality. The following equations were formulated to achieve the above-explained objectives of the study together with other macroeconomic variables as follows:

$$lnPOVHC_{it} = \beta_0 + \beta_1 lnAGRIC_{it} + \beta_2 lnPOP_{it}$$
$$+ \beta_3 lnINF_{it} + \beta_4 lnLR_{it} + \gamma_5 lnGDPPC_t$$
$$+ \gamma_6 lnTO_t + \gamma_7 lnUNE_t + \gamma_8 IQ_t + \epsilon_{it}$$

(4)

Where: β_0 is the intercept term, $\beta_1,\ \beta_2,\ \beta_3, \beta_4, \gamma_5,\ \gamma_6,\ \gamma_7$, and, γ_8, are coefficients of the model and ϵ_t is the error term. $lnPOVHC_{it}$= log of poverty headcount ratio at region i and time t, $lnAGRIC_{it}$ = log of agriculture credit provided by banks through their branches in Ethiopian regions at time t, $lnLR_{it}$, log of literacy rate at region i and time t, $lnINF_{it}$ log of inflation at region i and time t and the remaining variables are control variables like: $lnTO_t$ = log of trade openness at time t, IQ_t = institutional quality at time t, $lnGDPPC_t$ = log of gross

domestic product per capita at time t, and $lnUNE_t$ log of unemployment at time t are taken at the national level.

The second equation of the study was formulated to indicate the implication of agriculture credit on income inequality as follows:

$$lnGINI_{it} = \beta_0 + \beta_1 lnAGRIC_{it-1} + \beta_2 lnINF_{it} \\ + \beta_3 lnPOVHC_{it} + \gamma_4 lnGDPPC_t + \gamma_5 lnUNE_t \\ + \gamma_6 lnTO_t + \gamma_7 IQ_t + \epsilon_{it}$$

(5)

Where $lnGINI_{it}$ = log of Gini coefficient to measure income inequality at region *i* and time *t*, and the rest of the variables and coefficients were explained above.

4. Results

This section presents detailed descriptive statistics as well as econometric results.

4.1. Descriptive Statistics of Sectorial Credit Distribution

The following **Figure 2** shows the trend of sectorial credit disbursement from 1990 to 2021 in Ethiopia. The main reason behind the demonstration of agriculture credit trend starting from 1990 is to better show how the disbursement to the sector is highly neglected after the financial sector is liberalized. The trend of credit disbursement in Ethiopia shows that a significant portion of the loan was granted to the service sector, followed by industry and the least portion goes to the agriculture sector. After the introduction of financial liberalization, the total loans going to the service sector showed an increasing trend and credit provision to the industry sector tended to decrease until 2010. The credit provision going to the industry sector shows an improvement between 2010 and 2014 but onward from 2014, it was overtaken by the service sector.

However, the agriculture sector remains the least recipient of credit in Ethiopia and has a flat trend in credit disbursement as compared to other sectors. In countries like Ethiopia, where the majority of the population relies on the agriculture sector, constrained credit facilities to the sector have their implications on the societies. The sector plays a fundamental role in export performance, playing a decisive role in foreign cur-

rency earning capability and providing input and labor for other economic sectors in Ethiopia. Unfair credit disbursement at the national level restricts the majority of the population who reside in agriculture and agri-business from exploiting their maximum potential in terms of production efficiency, investment, and entrepreneurial capability.
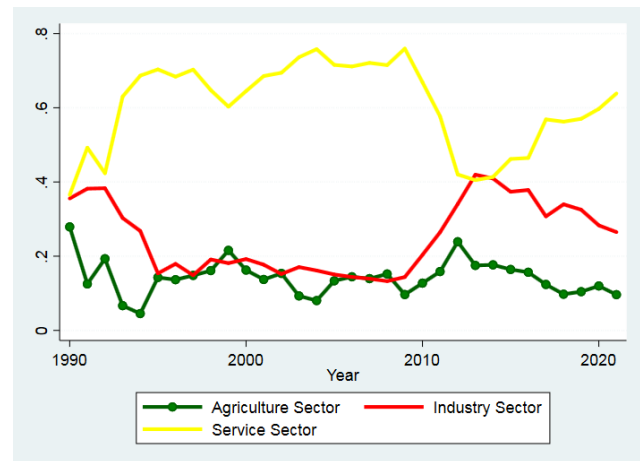
Figure 2. Trends of sectorial credit disbursement.
Source: National Bank of Ethiopia.

4.2. Correlation Analysis

Correlation analysis is often undertaken to avoid the problem of collinearity and multi-collinearity between variables in panel data analysis. **Table 1** presents the correlation result of equations that use panel data. The correlation results for all panel data models were less than 0.8, which serves as a rule of thumb to detect the problem, whereby the problems of multi-collinearity as well as collinearity are non-existent in the data.

4.3. Econometric Results

This section starts with presenting basic pre-estimation tests like CSD test, second generation unit root test, and panel co-integration test of Equations (4) and (5) together and discusses the PCSE regression results. Dealing with panel data often begins with CSD test to identify its presence and to select suitable econometric models that can handle the problem. In this study, the widely used cross-sectional dependence test proposed by Pesaran[41] was used. The result demonstrated on **Table 2** comprises of findings of two-panel data models

Table 1. Correlation analysis.

Variables	lnPOVHC	lnAGRIC	lnPOP	lnINF	lnLR	lnGDPPC	lnTO	lnUNE	IQ
			Correlation Analysis: Equation (4)						
lnPOVHC	1								
lnAGRIC	−0.2884	1							
lnPOP	0.2531	0.6197	1						
lnINF	−0.1890	0.1372	0.0169	1					
lnLR	−0.0692	0.2109	0.2638	0.0882	1				
lnGDPPC	−0.5744	0.4192	0.0446	0.1803	0.028	1			
lnTO	−0.3561	−0.1200	−0.0249	0.0850	0.046	−0.2349	1		
lnUNE	0.1269	0.0706	0.0165	−0.0724	−0.040	0.1792	−0.5389	1	
IQ	−0.6113	0.3915	0.0746	0.1420	0.019	0.6032	−0.2823	0.2487	1

Variables	lnGINI	lnAGRIC	lnINF	lnPOVHC	lnGDPPC	lnUNE	lnTO	IQ
			Correlation Analysis: Equation (5)					
lnGINI	1							
lnAGRIC	−0.3149	1						
lnINF	0.0103	0.1372	1					
lnPOVHC	0.2624	−0.2884	−0.1890	1				
lnGDPPC	−0.3845	0.4192	0.1803	−0.5744	1			
lnUNE	0.2169	0.0706	−0.0724	0.1269	0.179	1		
lnTO	−0.3290	−0.1200	0.0850	−0.3561	−0.234	−0.5389	1	
IQ	−0.3979	0.3915	0.1420	−0.6113	0.603	0.2487	−0.2823	1

indicating that all variables in the two models are cross-sectional dependent.

Existence of cross-sectional dependence in panel is a precondition that serves as criteria in selecting regression models, and pre-estimation tests that can take into account difficulties of CSD.

Second-generation unit root test was introduced in this study for panel data models by considering occurrence of cross-sectional dependence problem. The study used the second generation panel unit root test specifically the cross-sectional augmented Im-Pesaran-Shin (CIPS), panel unit root test for panel data analysis since they can withstand in circumstances where the problem of CSD prevailed.

The result from CIPS in **Table 3** shows that lnAGRIC, lnGDPPC, lnPOP, and lnLR are integrated at first difference I(1) and the remaining variables namely, lnTO, lnINF, lnUNE, IQ, lnPOVHC, and lnGINI are integrated at the level I(0) at one, five and ten % level of significance.

To affirm association of variables in the long run, the study undertook a co-integration test. This study adopted the second-generation co-integration test which is Westerlund [40] due to its capability to deal with

occurrence of CSD in panel data analysis. **Table 4** shows the panel long-run co-integration test results of the two equations.

The demonstration of **Table 4** indicates existence of co-integration in the two-panel models and the study rejects the null hypothesis of no co-integration at a one % level of significance.

Table 5 presents the regression results of the effects of bank agricultural credit on the level of poverty in Ethiopia. The result indicates that bank agricultural credit has a negative and significant effect on the poverty level in Ethiopia at a 10% significance level. The coefficient of lnAgric (−0.0428566) indicates a 1 percent increase in the disbursement of bank agricultural credit reduces the poverty level by 0.043 percent revealing that as banks inject more agriculture loans into the economy, the level of poverty at the national level tends to dwindle. The provision of agriculture credit has the potential to bridge the short-term financial needs of the mass of the population that base their livelihood on agriculture production and agri-business. This finding is supported by Croppenstedt, et al. [29, 30, 42]. **Table 5** shows that population size positively contributes to the prevalence of poverty level in Ethiopia. This reveals that as the size of

Table 2. Pesaran (2004) cross-sectional dependence analysis.

Pesaran (2004) CSD Result					
Equation (4)			Equation (5)		
Variables	**CD-Test**	**P-Value**	**Variables**	**CD-Test**	**P-Value**
lnPOVHC	14.352***	0.000	lnGINI	5.933***	0.000
lnAGRIC	28.41***	0.000	lnAGRIC	28.41***	0.000
lnPOP	33.739***	0.000	lnINF	23.609***	0.000
lnINF	23.609***	0.000	lnPOVHC	14.352***	0.000
lnLR	14.043***	0.000	lnGDPPC	31.906***	0.000
lnGDPPC	31.906***	0.000	lnUNE	34.766***	0.000
lnTO	34.785***	0.000	lnTO	34.785***	0.000
lnUNE	34.766***	0.000	IQ	34.779***	0.000
IQ	34.779***	0.000			

Note: ***indicates a 1% level of significance.

Table 3. Pesaran (2007) second generation panel unit root test.

CIPS Panel Unit Root Test			
Variables	**At Level**	**At First Difference**	**Order of Integration**
lnAGRIC	−2.401	−4.874	I(1)
lnTO	−2.679		I(0)
lnGDPPC	−1.522	−4.758	I(1)
lnINF	−3.903		I(0)
lnUNE	−5.070		I(0)
lnPOP	−1.402	−4.898	I(1)
IQ	−3.187		I(0)
lnLR	−1.489	−5.428	I(1)
lnGINI	−5.783		I(0)
lnPOVHC	−5.299		I(0)

Source: Authors' calculations.

the population rises, it drives up the level of poverty in Ethiopia.

The coefficient of lnPOP (0.1434668) depicts that a 1 percent increase in population size leads to an increase in the poverty level by 0.143 percent at a 1% significance level. The condition of high population growth puts a lot of pressure on family resources, and this condition reduces per capita income and limits access to employment. With increasing family size, children's access to education at an early stage is low due to the high pressure on family income to be spent for survival. The result is supported by the findings of Hilmi et al.[43], which state that high population growth leads to the prevalence of unemployment and reduces wage rates, especially for those who earn low income.

The negative and significant implication of GDP per capita on the level of poverty in Ethiopia is demonstrated in **Table 5** above. The coefficient of lnGDPPC

(−0.1983597) shows that a 1 percent increase in GDP per capita reduces the poverty level by 0.198 at a 1% level of significance. The revival of the economy helps to get out of the poverty cycle through its role in reinitiating private sector investment. The increased output level fuels the demand for labor, creating employment opportunities for the mass labor force. The finding is confirmed by the results of[44, 45]. Trade openness also negatively and significantly affects the poverty level in Ethiopia at a 5% significance level. Trade openness is one mechanism that stimulates economic growth. Trade liberalization paves the way for domestic producers to compete in the international arena with their existing resource endowment and improve their income. With better market access increased export diversification, and volume increase the return for producers domestically. Countries with cheap and abundant labor get better employment opportunities from trade liberalization, and this in turn

Table 4. Westerlund (2007) co-integration test.

| | Westerlund Test for Co-Integration | | | |
| | Equation (4) | | Equation (5) | |
	Statistics	P-Value	Statistics	P-Value
Variance ratio	5.3781	0.000	6.6203	0.000

Table 5. PCSE regression result of bank agricultural credit effect on poverty level.

| | PCSE Regression Result | | | |
Variables	Coefficient	S. Error	Z	P-Value
lnAGRIC	−0.0428566*	0.0232172	−1.85	0.065
lnPOP	0.1434668***	0.0243837	5.88	0.000
lnINF	−0.0592007	0.0364985	−1.62	0.105
lnLR	−0.0183763	0.041665	−0.44	0.659
lnGDPPC	−0.1983597***	0.0681524	−2.91	0.004
lnTO	−0.2094955**	0.0848451	−2.47	0.014
lnUNE	0.4788348***	0.1089413	4.40	0.000
IQ	−2.582459***	0.6525102	−3.96	0.000
Constant	4.628556	0.3895807	11.88	0.000

Dependent Variable lnPOVHC
R-Squared = 0.6691
Wald Statistics = 537.32
Prob > Chi2 = 0.0000
Note: ***, **, and * indicate a 1%, 5% and 10% level of significance respectively.
Source: Authors' calculations.

increases the income level from being employed. The gain from better market access and employment opportunities helps to earn improved income and alleviate the poverty level. The finding is consistent with the results of [46–48].

Table 5 indicates that the unemployment level significantly contributes to the rise of the poverty level in Ethiopia at 1% significance level, indicating that as the unemployment rate increases it significantly intensifies the poverty level in Ethiopia. The coefficient of lnUNE (0.4788348) indicates that a 1 percent increase in the unemployment rate in Ethiopia brings a 0.48 percent increase in the poverty level at a 1% significance level. The majority of the population who earn reduced income utilize their highest proportion of income for consumption purposes and easily fall below the poverty line due to their incapability to generate income from other sources amid losing their job. The finding is consistent with the results of Mbongeni, et al. [45, 49, 50]. Finally, the prevalence of institutional quality has a negative and significant effect on the poverty level in Ethiopia suggesting that adherence to institutional quality halts the prevalence of the poverty level. The coefficient of institutional quality (−2.582459) indicates that a 1 percent increase in institutional quality will drag the level of poverty down by 2.58 percent at a 1% significance level. The poverty level reduction role of institutional quality works through the government's capability to improve the enforcement and making of rules where people get better service, which is fundamental to reducing the poverty level. The result is congruent with the findings of [51]. The Wald Statistics demonstrated in **Table 5** indicate the result is statistically significant at the 1% level of significance revealing that the data fitted the adopted model.

The second regression result from the panel-corrected standard error in **Table 6** demonstrates whether the provision of agricultural credit by banks ensures fair income distribution in Ethiopia.

Bank agricultural credit has a negative and significant effect on the income distribution gap in Ethiopia. The coefficient lnAGRIC (−0.0131191) represents that a percentage increase in bank agricultural loan provision reduces income inequality by 0.013 at a 1 percent level of significance. This shows that as the amount of bank agricultural credit disbursement increases, the tendency

Table 6. PCSE regression result on effects of bank agricultural credit on income inequality.

Variables	PCSE Regression Result			
	Coefficient	S. Error	Z	P-Value
lnAGRIC	−0.0131191***	0.0046989	−2.79	0.005
lnINF	−0.0129122	0.0489257	−0.26	0.792
lnPOVHC	−0.0795879	0.059169	−1.35	0.179
lnGDPPC	−0.073244*	0.0416141	−1.76	0.078
lnUNE	0.2264065**	0.0946488	2.39	0.017
lnTO	−0.1107675*	0.057853	−1.91	0.056
IQ	−0.9388634*	0.4785698	−1.96	0.050
Constant	4.784606	0.3204928	14.93	0.000

Dependent Variable lnGINI
R-Squared = 0.3105
Wald Statistics = 1519.46
Prob > Chi2 = 0.0000
Source: Authors' calculations.
Note: ***, **, and * indicate a 1%, 5% and 10% level of significance respectively.

for fair income distribution improves. The majority of people employed in the agriculture sector who earn reduced income get benefits from loans provided in the sector to improve their productivity as well as their returns. This finding is similar to Rajan and Zingales[27]; Demirguc and Levine[21]; Beck et al.[25] and Claudio and Guilherme[33], who suggested that access to finance and bank credit to the poor significantly reduces income distribution disparity.

The result from **Table 6** demonstrates the per capita GDP significantly reduces income inequality in Ethiopia at a 10% level of significance. The coefficient of lnGDPPC (−0.073244) suggests that a 1 percent improvement in GDP per capita at the national level reduces income inequality by 0.073 percent, *ceteris paribus*. Economic growth is often associated with improvements in investment and high employment creation which increases the demand for labor, thereby creating a way to generate improved income for the majority of the poor. This result is similar to the findings by Henry and Panotani[52], Akinbode et al.[53] and Majumdar et al.[54], who argued that economic growth has a significant and negative effect on the income distribution gap.

The demonstration in **Table 6** reveals that the unemployment level significantly contributes to the income distribution gap in Ethiopia. The coefficient of lnUNE (0.2264065) shows that a 1 percent increase in the unemployment level drives up the income distribution gap by 0.23 percent at a 5% significance level. This shows that as the level of the unemployed labor force

spikes, it aggravates income inequality at the national level. Through dragging down the bottom income distribution, those who earn wages lose their income because of unemployment which further intensifies the divergence of income distribution in the society. The result is congruent with previous studies[54–57]. Trade openness also negatively and significantly affects income inequality in Ethiopia. The coefficient of lnTO (−0.1107675) shows that a 1 percent increase in trade openness decreases income inequality by 0.11 percent in Ethiopia at a 10% significance level, demonstrating that as countries' involvement in international trade increases, the income distribution gap decreases. Ethiopia is characterized by an abundance of cheap labor and agricultural items dominating export volume which creates a favorable arena for most unskilled laborers to benefit from access to international trade. Corresponding findings by Jaumotte et al.[58], Bergh and Nilsson[59] and Dorn et al.[60] have confirmed the result.

Finally, the result of institutional quality shows a negative and significant effect on the income distribution gap in Ethiopia at a 10% level of significance. The coefficient of IQ (−0.9388634) shows that a unit improvement in institutional quality drags the income inequality gap by 0.93, ceteris paribus. This reveals that the prevalence of a good institutional framework helps the country to realize fair income distribution among the nation. A strong institution creates a favorable environment in an economy to efficiently utilize human capital through healthy competition in the labor market, thereby reduc-

ing the divergence of wealth distribution. The result corresponds to literature by Acemoglu and Johnson [61], Asamoah [62] and Adams and Akobeng [63] who suggested that the gap between poor and rich narrows and fair distribution of resources takes place when nations are able to build efficient and strong institutions. The demonstration in **Table 6** suggests that Wald Statistics is statistically significant at a 1% level of significance which conveys that the data fit the adopted model.

5. Discussion

The prevalence of poverty and uneven distribution of income is considered as one of the macroeconomic curses in most parts of the world. Government organs and policymakers strive to halt these problems which highly erode the welfare of society. In line with this, this study empirically determined the role of financing the agriculture sector in poverty reduction and equitable income distribution in Ethiopia.

The effect of bank agricultural credit on poverty levels has a negative and significant outcome in Ethiopia indicating that channeling huge financial resources to the agriculture sector enables the mass population to get out of poverty. The disbursement of agricultural loans encompasses those who present better seeds, pesticides, fertilizers and related agricultural inputs which strengthen farmers' access to improved inputs. Those customers that work in farming, selling agricultural inputs and technologies, selling of agricultural products, agro-processing, and distribution channels are all categorized under agricultural credit. The injection of this credit into the sector helps those who participate in the aforementioned areas by alleviating their capital bottleneck and catalyzing their involvement in entrepreneurial activities. The provision of loans in the sector also strengthens farmers by enabling them to easily get agricultural inputs and technologies and realize mechanized farming. Apart from these, farmers' access to agricultural credit helps that portion of society that works in agriculture-related businesses by equipping them with capital and alleviating short-term capital shortfalls. This finding is consistent with Croppenstedt, et al. [29, 30, 42]. On the other hand, the spike in population

growth has a positive effect on increasing the poverty level in Ethiopia. The increase in family size due to lack of family planning puts significant pressure on resources owned by families, which erodes their financial strength.

The result from **Table 5** indicates that GDP per capita and poverty level have an inverse relationship revealing that the revival of the economy fosters better employment creation through increased investment which in turn improves the income level. According to Thorbecke [44] the fastest way to reduce poverty levels is through ensuring fast economic growth. Economic growth initiates job opportunities and drives up the demand for labor, which in turn improves the income level. According to Fernández [47] and Gnangnon [48] the tremendous capital inflow to developing countries due to trade liberalization has the potential to reduce the rampant poverty level in the region. Better trade liberalization has a direct implication on the income level of farmers since it reduces uncertainty and distortions in the international markets. Trade openness creates employment opportunities and efficiency in rural areas which helps farmers to earn better income. Contrarily, the unemployment rate has a significant and positive effect on the prevalence of poverty in Ethiopia. This result conveys that the increase in unemployment, especially for those who earn reduced income, fastens the probability of falling below the poverty line. This suggests that as more individuals lose their jobs, the majority of people are forced to live in poverty (See: [45, 49, 50]. Finally, improved institutional quality has a significant negative effect on the poverty level in Ethiopia. This indicates that adherence to institutional quality and good governance is a requirement to drag the level of poverty down. According to Kaufmann et al. [51], an improvement in institutional quality components serves as a means to fair income distribution, poverty reduction, and economic development.

The second regression result from **Table 6** reveals the presence of a positive and significant effect of bank agricultural credit on income inequality. Unlike the conventional credit provision trend that grants high or concentrated amounts to limited customers in the service and industry sectors, extending of bank credit to the agriculture sector is inclusive and increases the portion of so-

ciety that participates in credit services. This condition pulls up the income of the marginalized mass society and thereby reduces the income gap. Partial credit provisions that are inclined to other economic sectors leave the majority of individuals employed in the agriculture sector. This condition further aggravates the income gap by specifically benefiting a small portion of society involved in other economic sectors. However, the extension of this agricultural credit helps the majority of the population to generate extra income through capital accumulation and better returns. Correspondingly, Beck et al.[25] and Claudio and Guilherme[33] indicated that providing credit to the marginalized portion of society helps to reduce income distribution disparity in the economy. Similarly, the increase in GDP per capita is inversely related to income inequality revealing that improved economic conditions help to narrow income inequality. Expanded economic conditions increase demand for labor to facilitate the increased production of goods and services in the economy. Contrarily, the results from **Tables 4** and **6** show a positive effect of unemployment on income inequality. The increase in layoffs and unemployment seriously impedes the low-income group or working population with relatively low-income recipients.

The result from **Table 6** demonstrates that trade openness is negatively and significantly related to income inequality in Ethiopia. This suggests that trade openness reduces income inequality in developing countries by creating efficiency and returns to relatively abundant and cheap factors. Similarly, Feenstra[64] argues that developing countries get better benefits to narrow their income distribution gap if their volume of exports is overwhelmed by agriculture or primary goods since it benefits unskilled labor involved in the production of primary goods. Congruently, institutional quality is also negatively and significantly related with income inequality in Ethiopia. This shows that when the country experiences adherence to improved institutional quality, it creates a competitive working environment backed by fair property rights in the economy. According to Asamoah[62] and Adams and Akobeng[63] better institutional quality facilitates competitive working conditions and ensures fair distribution of resources, which narrows income disparity in society.

6. Conclusions and Policy Recommendations

6.1. Conclusions

The paper used unbalanced panel data from 2000 to 2021 to investigate the roles of agricultural credit disbursed by banks on poverty level and distribution of income in Ethiopia, analyzed using the Panel Corrected Standard Error (PCSE) model. The result from the first objective indicates that bank agricultural credit negatively and significantly affects poverty level and income inequality in Ethiopia. This implies that better disbursement of agricultural credit helps the masses alleviate the capital constraints they face in agricultural activities. The majority of societies residing in the agricultural sector gain better access to credit; hence, the welfare disparity between rural and urban areas narrows, which further reduces the income distribution gap at the national level. Other macroeconomic variables were introduced to avoid the problem of variable bias, and the result reveals that GDP per capita, trade openness, and institutional quality are significantly and negatively related to poverty level. On the other hand, the unemployment rate and population size are positively associated with the poverty level. With regard to the second equation GDP per capita, trade openness, and institutional quality significantly reduce income inequality. However, the unemployment rate has positively contributes to income inequality.

6.2. Policy Recommendations

It is imperative for the National Bank of Ethiopia and government organs to formulate a credit policy in favor of agricultural credit to strategically support economically vulnerable groups and maximize the welfare of society. Implementing inclusive credit policies that balance loan disbursement between economic sectors and encourage formal financial institutions in Ethiopia to increase their inclination towards supplying credit to this important sector is decisive. Inclusive credit supply in favor of the agricultural sector enables neglected groups to solve their capital constraint problem through better agricultural production and agri-business activities. The disbursement of credit in the sector not only

benefits farmers in terms of solving their liquidity problem but also catalyzes the availability of improved agricultural inputs like better seeds, fertilizers, machinery, and the adoption of better technology in the sector. This condition, in turn, improves the income stream of farmers and those who depend on agri-business through better financial literacy and entrepreneurial activity. From its inclusive point of view, agricultural credit strengthens poverty reduction and narrows income disparity at the national level.

Policymakers in Ethiopia also have to ensure economic growth, trade liberalization, and adherence to strong institutional quality to reduce poverty and income inequality at the national level. At the same time, macroeconomic components like population growth, unemployment, and inflation must be managed to curb their effect in aggravating poverty and income inequality.

Author Contributions

A.M.G., (Corresponding Author): has conceptualized and drafted the manuscript, collected, organized, formal analysis, software and analyzed the data, contributed to study design; A.-K.E., has significantly contributed to this study by conceptualization, Methodology, Supervision, Validation, Editing the Draft, contribution to conceptualization, critically reviewing the manuscript and contributed to study design; K.J., has contributed on crafting methodology, Supervision, Validation, Editing the Draft and critically reviewed literature review; A.L., has contributed to Conceptualization, methodology, supervision, editing the Draft, crafting conclusion and articles overall coherence and impact. Furthermore, All authors have read and agreed to the published version of the manuscript.

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