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-RESEARCH ARTICLE-

NEXUS BETWEEN BANK AGRICULTURE CREDIT AND ECONOMIC DEVELOPMENT IN ETHIOPIA: ARDL MODEL APPROACH

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─Abstract─

Agriculture financing is believed to play a catalytic role in consolidating farm businesses and increasing the productivity of scarce resources, particularly in developing nations. Agriculture has a critical part in economic growth because agriculture employs the bulk of the population in developing countries. This study examines the relationship between agricultural loans and economic development by using time series data from 1998 to 2020 and estimating an autoregressive regressive distributive lag model (ARDL). The

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study's findings indicate that agricultural credit, human capital, life expectancy, and foreign direct investment have a long-term favourable effect on economic development (HDI). However, foreign direct investment has a significant detrimental effect in the near run. However, life expectancy and currency devaluation benefit economic progress. Joint adjustment to balance occurs rapidly. Thus, a long-run equilibrium relationship among the variables contained in the mode is confirmed by the considerable error correction time (ECT). Additionally, there is a bidirectional causal relationship between bank agriculture credits and economic development (HDI).

Keywords: Finance, Agriculture Credit and Economic Development, ARDL

1. BACKGROUND OF THE STUDY

Agriculture financing is regarded as critical and crucial to the macroeconomic and microeconomic growth of any country. It is catalysing the strengthening of agriculture and increasing the productivity of scarce resources, particularly in emerging countries. Agriculture has a critical part in economic growth because agriculture employs the bulk of the population in developing countries. In developing countries, agricultural development is projected to have a multiplicative effect on the economy regarding product, factors, market, poverty alleviation through foreign exchange, and job creation. Thus, agriculture sector development contributes to food security, price stability, output growth, job creation, and poverty alleviation. This is predicted to occur if agricultural sectors obtain appropriate financing and public capital investment (Alemu, 2016).

Over the last several decades, the world has seen significant economic and agricultural expansion, particularly in developing countries. This is because commercial banks have increased their lending to commercial agriculture significantly. Although the connection between commercial banking and agricultural financing has long been acknowledged (Langwenya, 2019; Pesaran, Shin, & Smith, 2001; Romer & Romer, 1989; Solow, 1956), discrepancies continue to be a source of concern for many people. Receiving commercial agriculture loans from commercial banks or other financial institutions is typically the simplest and least expensive way to conduct business in industrialised nations throughout the medium to long term. On the other hand, commercial farmers in developing countries such as Africa confront several obstacles that limit their ability to obtain bank loans, resulting in decreased agricultural productivity (Anthony, 2012).

Access to financial services for agricultural producers and agribusinesses is critical in Ethiopia for unlocking the country's agricultural potential and funding the sector's expansion. Credit, savings, payment, and insurance services are all critical; the latter three are essential in and of themselves and may also present chances to expand agricultural credit availability (Zewdie, 2015).

According to dual-economy models and labour-surplus economic theories, agriculture can only become self-sustaining if productivity grows. Sustaining development requires

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a path of balanced growth in both traditional and modern areas. According to economists such as Jorgenson, these increases in agricultural productivity are primarily due to agricultural finance and technological progress (Rao, Francis, & Christopher, 1977). According to developing country experiences, structural change necessitates agricultural development, which requires incentive packages such as loan provisions to low-income farmers, irrigation development, research on improved seed varieties, and improved access to land for landless rural y. (Anthony, 2012). However, the neglect of the agricultural sector in general and rural employment in particular over the previous two decades in Ethiopia has resulted in decreased export volume, increased food prices, increased vulnerability to food insecurity and increased unemployment (Moti, Behnampour, & Alinezhad, 2009).

Ethiopia's agricultural sector also requires primary financial services to transition from traditional agriculture to modern commercial agriculture. Indeed, the essential increase in agricultural productivity necessitates more capital investment. Farmers need significantly more capital than they can save, and small and marginal farmers with scant savings require a more significant capital input, namely borrowing. Contrary to this, Ethiopia's 8.3 percent access to farm finance is the lowest among SSA countries (12.4 percent) (Status), 2019).Ethiopia lags considerably behind both in terms of potential and in comparison to other SSA countries. However, because agriculture is still largely traditional and subsistence-oriented, improved agricultural finance is required to develop the supporting infrastructure necessary for the adoption of new technology and modernisation of the agriculture sector, which will contribute to Ethiopia's economic development (Zewdie, 2015).

Ethiopia's financial industry is dominated by state-owned banks (commercial banks), which account for over 91.1 percent of total financial sector assets, excluding those of the Development Bank of Ethiopia (DBE) and the National Bank of Ethiopia (NBE). Microfinance institutions (MFIs) account for 6.1 percent of overall financial sector assets, while insurance firms account for 2.8 percent (Ethiopia, 2019). However, interest in commercial banks arises from their dominant position among financial intermediaries and their unique role in the money supply process and agricultural investment. A sizable fraction of the claims issued by banks (checking accounts) circulates in the form of money. Indeed, commercial bank checking accounts account for the lion's share of transactions in the money supply (M1). Commercial banks generate new money through lending and investing in securities (Yimer, 2017).Commercial banking farm credit limitations required specific care for all of these reasons. Commercial banks' fear of farm finance risk is understandable given agriculture credit's ability to offset volatility in agriculture and overall contribution to the country's GDP, export, job creation, and economic development.

This study aims to determine the influence of bank agriculture credit on economic development in Ethiopia and the causal relationship between agriculture credit and

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2. EMPIRICAL REVIEW

Credit is critical for all types of corporate activities, including agriculture. The demand for agricultural loan finance is particularly acute when the agriculture industry transitions from traditional to modern agriculture. Ethiopia's agriculture sector is generally constrained by several restrictions, including extremely tiny landholdings, a fast pace of population increase, extremely high disguised unemployment, and susceptibility to weather shocks. Additionally, farmers' ability to save and invest is significantly reduced, and agricultural output is low due to a lack of inputs. Farmers then required agriculture financing to boost farm output and efficiency. This need has grown over the years as the usage of fertilisers, mechanisation, and the cost of all agricultural inputs have increased (Status), 2019).

Agricultural development is described as improving agricultural productivity through the cultivation of a variety of crops and livestock. Agricultural development, in this view, can be endogenous. Agrarian availability alone does not result in agriculture growth unless technical infrastructure is made accessible to increase agricultural production for a broad number of people in a sufficient amount (Status), 2019). Equal human resource development desires agricultural development, as a significant portion of the population subsists on agricultural activities. Thus, agricultural development and farm finance are top policy priorities for economic development to increase agriculture productivity and thus the social and financial standing of the people. Despite agriculture's importance in developing countries, the financial industry contributes little to agricultural funding. A strong demand marks Africa's agricultural sectors for agricultural financing, but the region's financial sectors have been unable to match that need due to high risk and expensive credit processing costs (Honohan & Beck, 2007).

Due to a lack of financial capital, smallholder farmers in underdeveloped nations cannot adopt new enhanced yields and technology. The majority of researchers show that farmers with limited access to credit utilise a restricted number of high-yielding varieties and prioritise investment in a few high-quality items (Etonihu, Rahman, & Usman, 2013). In most developing nations, farmers face significant barriers to accessing agriculture loans; even when access to agriculture credit is accessible, farmers face high-interest rates, creating credit challenges. Collateral loan requirements are another aspect that makes it difficult for farmers in many developing nations to obtain financing. Numerous studies have been conducted to address various issues associated with agricultural financing. The agricultural financing issues occurred when the demand for loans was stifled. The difficulties in obtaining credit to fund agriculture might be attributed to the credit application process's sophistication and the restricted number of creditors.

Sessiz, Sogut, Alp, and Esgici (2008) Sused 1980–2006 data to examine the factors of financial development and private sector credit in a panel of 85 developing and industrial

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countries. According to the findings, economic development and private sector loans are positively linked. Additionally, he discovered that interest rate spreads are significant and positive only for groupings of low- and lower-middle-income countries.

Kassim and A. Majid (2009)conducted a study to determine the banking sector's role in emerging countries using Malaysia as a case study. They applied Auto-Regressive Distributed Lag (ARDL) to 1989-2006 data. The study's findings indicate that the process of monetary transmission is positively related to bank deposits and loans.

Anthony (2012) evaluated the effects of bank saving and bank credit on the Nigerian economy and discovered that credit to the government, credit to the private sector, interest rate spread, and exchange rate all positively associated with Nigeria's economic growth. Even though banks in general and recognition, in particular, contribute significantly to economic growth, credit limits impede growth. In Ethiopia, obstacles such as high transaction costs, a high default rate, a lack of infrastructure, and limited credit availability all contribute to the difficulty of agricultural finance. The existence of inefficient credit providers, inflexible loan provisions, and the targeted poor population's limited access to credit exacerbated the problem (Zewdie, 2015).

Practical financial management training for borrowers can significantly impact credit transactions. Additionally, it may help mitigate Ethiopia's high default rate (Worku, 2010). Creditors' access has been noted as a source of concern (Ponce et al., 2005). These can be explained by a lack of infrastructure, which excludes residents in less affluent areas from the loan market. The distance between lenders and borrowers may affect their mental approach, increasing the transaction cost. Second, most bank services are concentrated in urban regions, leaving rural communities out (Ponce et al., 2005). The majority of rural residents who cannot obtain loans are evident. A general restriction on loan access is considered detrimental to growth and productivity (Wazni et al., 2010).

In their article titled "Macro-econometric Model of Ethiopia,"Sieber et al. (2018) used error correction to examine the long run and short-run dynamics of private sector credit. They looked at personal sector credit as a function of private investment, products exported and imported, and lending interest rates. They determined that international trade, rather than domestic activity and lending interest rates, better explains the credit market in the long run. According to all of the theories mentioned above and empirical studies, researchers concluded that agriculture credit affects economic development and that development itself dictates the amount of gross loan issued to agriculture sectors, as illustrated in Figure 1 below.

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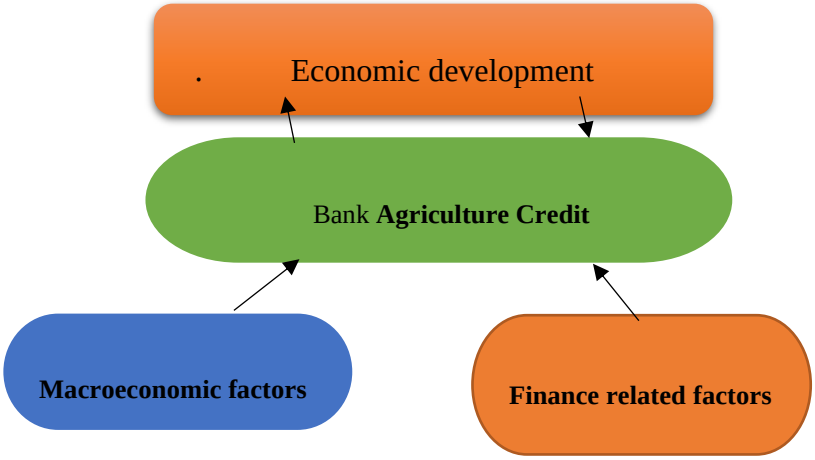
Possible Causation between Agriculture Credit and Economic Development



3. METHODOLOGY

3.1 Data Type and Source

Time series secondary data from 1998 to 2020 was collected to investigate the interlinkage between agriculture credit and economic development. The relevant institutions that will be used as a source of secondary data variable are collected from the National Bank of Ethiopia (NBE), FOASTAT, Monetary Fund (IMF), World Bank (WB), world governess indicator and comrade.

3.2 Method of Data Analysis

Econometric data estimate methods developed by ARDL are applied. Three steps comprise the methodological technique under the ARDL framework. The first step entails determining whether any variables have two or more significant integration orders. The augmented Dickey-Fuller (ADF) test will be employed to determine the order of integration among the series. Additionally, the dickey-fuller unit root test will be used, which allows for a known or exogenous structural break in the augmented Dickey-Fuller (ADF) tests.

The second phase will employ the ARDL bounds testing approach established by (Pesaran et al., 2001) for co-integration. To conduct the bound test, the ARDL model that will be used in this study can be generalised as follows, based on our equation-based ARDL model:

$$\Delta y_t = \alpha_0 + \beta_1 y_{t-1} + \sum_{k=2}^{n} \beta_k \Delta X_{t-1} + \sum_{i=1}^{p} \delta_1 \Delta y_{t-i} + \sum_{\substack{i=1 \\ k=2}}^{p} \delta_k \Delta X_{t-i} + \gamma Dum + \varepsilon_t \dots \dots \quad (1)$$

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Yt-1 and Xt-1 correlate with $\mathbf{U_t}$ by construction while taking their lag equations. This indicates that the lagged dependent variable (one of the regressors) is correlated with the error term, showing the biased and inconsistent result produced when OLS is employed for estimation defined. α_0 Is the deterministic drift parameter and Δ denotes the first difference of the respective variables.ε_t is the white noise error term. p is the maximum lag length which is determined by the user.

To test co-integration among the variables (Pesaran et al., 2001) suggests the F-test for joint significance of the coefficients of the lagged level of variables in equations the F-statistics for testing the common null hypotheses (H_0) has to be compared with the critical values (Pesaran et al., 2001).

The H_0 to be tested on equation as:

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_k = 0 \qquad (\mathbf{2})$$

The alternative hypothesis (H_1) against the null is given as

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_k \neq 0 \qquad (\mathbf{3})$$

If H_0 hypothesis can be rejected, then co-integration can be confirmed (Pesaran et al., 2001) provided two sets of critical values - lower and upper bound essential - for a given significance level. If the F-statistic is higher than the upper bound critical value, the null hypothesis (H_0) of no co-integration is rejected, and we conclude in favour of a long-run relationship. In contrast, if the F-statistic falls below the lower critical bound, we cannot reject the null hypothesis of no co-integration and conclude that no long-run relationship exists. However, if the F-statistic falls between the upper-bound and lower-bound critical values, the inference would be inconclusive. To check the robustness and reliability of the ARDL model, a battery of diagnostic tests such as tests for normality of the error term, serial correlation, heteroscedasticity, and the functional form of the empirical model will be applied.

If the null hypothesis of no co-integration is rejected by following the procedure (Pesaran et al., 2001), the second step will estimate the error-correction model (ECM). The ECM is specified as follows:

$$\Delta y_t = \alpha_0 + \theta ec_{t-1} + \sum_{i=1}^{p} \delta_1 \Delta y_{t-i} + \sum_{\substack{i=1 \\ k=2}}^{p} \delta_k \Delta X_{t-i} + \gamma Dum + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4$$

where,δ_1, δ_2, δ_3, δ_4, δ_5, δ_6 ,δ_7 ,δ_9,… δ_k are the short-run dynamic coefficients vector explanatory variable of the model's convergence to equilibrium, $\theta$is the speed of adjustment from the short-run to the long-run equilibrium among the variables, andec_{t-1} is the error-correction term

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3.3 Model Specification

To examine the identified interlink-age between agriculture credit and economic development in Ethiopia, the autoregressive distributive lag (ARDL) model was specified, including other control variables.

$$\Delta HDI = \alpha_0 + \beta_1 HDI_{t-1} + \beta_2 HC_{t-1} + \beta_3 CA_{t-1} + \beta_4 TO_{t-1} + \beta_5 FDI_{t-1} + \beta_6 LEXP_{t-1} + \beta_7 IQ_{t-1} + \beta_8 COB_{t-1} + \sum_{i=1}^{p} \delta_1 \Delta HDI_{t-i} + \sum_{i=1}^{p} \delta_2 \Delta HC_{t-i} + \sum_{i=1}^{p} \delta_3 \Delta CA_{t-i} + \sum_{i=1}^{p} \delta_4 \Delta TO_{t-i} + \sum_{i=1}^{p} \delta_5 \Delta LEXP_{t-i} + \sum_{i=1}^{p} \delta_6 \Delta FDI_{t-i} + \sum_{i=1}^{p} \delta_7 \Delta COB_{t-i} + \gamma Dum + \varepsilon_t \quad (5)$$

Where HDI_t is human development indicators at year t (a proxy for economic development), CA_t is the agriculture credit TO_t trade openness (a proxy for external factors), Iq_t institutional quality (a proxy for good governance), FDI_{t-1} foreign direct investment, $LEXP_{t-1}$ life expectancy (a proxy for health factors) and COB_{t-1} currency out of the bank (a proxy for financial development). Further, β_k are coefficients of the long-run model and δ_k are coefficients of the short-run model, α_0 is the intercept term and $e_t \sim N(0, \delta^2)$ is the disturbance term of the model.

Finally, we use Granger Causality Test to identify causality between agriculture credit and economic development. Granger (1988) points out that if a cointegrating vector exists among variables, there must be at least a unidirectional causality. The ECM-based multivariate Granger-causality test will be used in this study. The following additional specifications to test the direction of causality between agriculture credit (CA) and economic development (HDI) are expressed as follows;

$$\Delta CA = \alpha_0 + \beta_1 HDI_{t-1} + \beta_2 HC_{t-1} + \beta_3 TO_{t-1} + \beta_4 FDI_{t-1} + \beta_5 LEXP_{t-1} + \beta_6 IQ_{t-1} + \beta_{87} COB_{t-1} + \sum_{i=1}^{p} \delta_1 \Delta HDI_{t-i} + \sum_{i=1}^{p} \delta_2 \Delta HC_{t-i} + \sum_{i=1}^{p} \delta_3 \Delta CA_{t-i} + \sum_{i=1}^{p} \delta_4 \Delta TO_{t-i} + \sum_{i=1}^{p} \delta_5 \Delta LEXP_{t-i} + \sum_{i=1}^{p} \delta_6 \Delta FDI_{t-i} + \sum_{i=1}^{p} \delta_7 \Delta COB_{t-i} + \gamma Dum + \varepsilon_t \quad (6)$$

Where the variables and notations are as defined earlier, v_{1t}, and v_{2t} are mutually uncorrelated white noise residuals.

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3.4 Description of the Variables, Source of Data and Measurements

Based on received wisdom from previous studies, economic theory and data availability, this study uses the variables described briefly below in the empirical econometric model to access the determinants of domestic saving.

4. RESULT AND DISCUSSION

4.1 Effect of Agriculture Credit on Economic Development in Ethiopia

Agricultural financing can be defined as a situation in which farmers engage more actively in credit markets for inputs, output, or both. A basic premise of agricultural lending is that it gives income to farmers, who optimise the value of their property. Over the last half-century, the world, particularly developing nations, has seen unprecedented economic and agricultural expansion (Eicher & Staaz, 1998). This was prompted by considerable growth in commercial bank farm loans. Agriculture fosters economic growth in various industries, increases food security, eventually reduces poverty and advances economic development.

This section will use more sophisticated econometric estimate techniques to examine the relationship between economic progress and agricultural lending. The models are estimated using the ARDL method. Before using the ARDL model, we must perform a pre-test, a unit root test, and a co-integration test.

The test for unit root is checked above. Table 2 show that all variable are non-stationary at level but stationary at first difference except institutional quality, which is stationary at level. So directly, we will check the existence of a long-run relationship among variables by using ARDL bound test bellows.

The critical values for the upper and lower limits are listed in Table 3. (Narayan, 2004). The F-statistics were compared to the essential values for the upper and lower bounds.

The dependent variable is the log of the human development index (a proxy for economic development), while farm credit is one of the independent variables. Additional explanatory factors in the models include trade openness, institutional quality, foreign direct investment, life expectancy, currency out of the bank, and the Gross Enrollment Ratio. Despite controlling variables, our model's variables of interest are economic development and cointegrated agriculture credit.

Table 1: Measurement, Descriptions and Source of Data

Variables	Measurement and descriptions	Source data
Human development index (HDI)	It is a holistic measure of living levels and capabilities measuring national socio-economic development based on three goals or development products. The index attempts to rank all countries on a scale of **0 to 1**, indicating the lowest and highest human development, respectively.	WDI
foreign direct investment (FDI):	It is measured by the total money that follows Ethiopia from abroad for investment purposes.	WDI
Institutional Quality (IQ):	The average of six indicators- voice and accountability, political stability and absence of violence, control of corruption, government effectiveness, regulatory quality, and the rule of law. The original scale that ranges from -2.5 (the lowest) to 2.5 (the highest) is rescaled to an index between 0 and 1.	WGI
Trade Openness (TO):	It is used as a proxy for foreign trade and measured by the sum of exports and imports as a percentage of GDP. It's a measure of economic policies that restrict or invite trade between countries.	WDI
Currency out banks (COB):	This is another proxy that will be used to measure financial sector development. It is calculated as total cash out bank vault or currency at hand to the people.	FOASTAT
Human capital (HC):	Is human capital proxy's secondary school enrollment (% of gross)? Gross enrollment ratio is the ratio of total enrollment, regardless of age,	WDI
Life Expectation (LEX);	life expectancy at birth indicates the number of years an infant is expected to live if the current mortality rates were to persist	WDI
Agriculture credit (CA)	Percentage of credit that disbursed for agriculture sectors for all economic sectors	FOASTAT

*Where WDI is the world development indicator and WGI is the world governance indicator

Table 2. Augmented Dickey-Fuller Unit Root Test for All Variables Included in This Study

Variables In The Model	Augmented Ducky Fuller Test		
	At Level	At First Difference	Decision
Agriculture Credit	-0.76	-3.13	Station at first Difference
Gross Enrollment Ration	-0.96	-12,04	Station at first Difference
Human Development Index	-1.5	-4.04	Station at first Difference
Trade Openness	-1.45	-4.93	Stationatsecond Difference
Institutional Quality Index	-3.38		Station at level
Life Expectation	-1.97	-4.51	Station at the second difference
Cash Out Of The Bank	-1.86	-3.5	Station at first Difference
foreign direct investment	-1.81	-3.53	Station at the second difference

Source: Author's computation using STATA 14.

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Table 3: **ARDL Bounds Test for Banks Agriculture Credit and Economic Development in Ethiopia**

ARDL Bounds Test		
Sample: 1997 2020		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	10.876	7
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
1 percent	2.96	4.26
2.5 percent	2.60	3.84
5 percent	2.32	3.50
10 percent	2.03	3.13

Note: The F-statistic tests the null hypothesis of no co-integration.

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Table 4. Effect Of Agriculture Credit on Economic Development

Dependent variable: human development index Method: ARDL (1,1,1,1,0,0,0,0) Sample: 1997-2020			Observation: 24 R Square: 0.92 Root MSE : 0.0189	
Long Run Model	Coefficient	Std.Err	t-statistics	P-value
(log foreign direct investment)	-0.23	0.174	-1.32	0.210
(log life expectance)	2.74 ***	0.55	4.91	0.000
(log of agriculture credit)	0 .099***	0.012	7.69	0.000
(log gross enrollment ratio)	0.079 ***	0.022	3.45	0.005
(log institutional quality)	-0.166	0.0194	-1.77	0.102
(log trade openness)	-0.034	0 .062	-0.55	0.521
(log of currency out of bank)	-0.147 *	0.092	-1.80	0.096
Error-correction Term	-1.31 ***	0.206	-6.36	0.000
Short Run Model with all other variables in the lag order				
(human development index)(-1)	-0.317	0.206	-1.53	0.15
(log foreign direct investment) (-1)	-1.07**	0.27	-3.95	0.04
(log life expectance) (-1)	8.9**	3.8	2.34	0.037
(log gross enrollment ratio)(-1)	0.064***	0.019	3.29	0.006
(log of agriculture credit)	0.130***	0.029	4.42	0.001
(log of currency out of bank)	-0.19	0.12	-1.5	0.160
(log of institutional quality)	-0.21	0.13	-1.61	0.123
(log of trade openness)	-.045	0.081	-0.58	0.56
Constant	-13.8***	4.15	3.32	0.005
Pesaran/Shin/Smith (2001) ARDL bounds test: Null hypothesis: No levels relationship F-statistics: 10.876 White test: Chi-square =24, prob(>chi-square): 0.4038 Durbin Watson: 2.24				

Source: Author's computation using STATA 14 Note: ***, ** and * indicates 1 percent, 5 percent and 10 percent level of significance, respectively

As shown in Table 4, agricultural credit has a positive and statistically significant effect on the human development index, which serves as a proxy for economic development at the 1% significance level. Keeping other variables unchanged, a 1% increase in agricultural bank lending improves economic development by.099 percent in the long run. The findings corroborate the finance–growth theoretical literature (Patrick, 1966). According to his Supply-leading approach, the establishment of financial institutions and the provision of their financial assets, liabilities, and related financial services are ahead of anticipated demand, mainly demand from entrepreneurs in modern, growth-inducing sectors. Economic progress is facilitated because supply leadership serves the dual purpose of shifting resources from traditional to modern industries and stimulating entrepreneurial activity in these current areas. Additionally, (Field, Goldsmith, & Habing, 1969) argues that expanded access to finance promotes economic growth by transforming traditional industries into contemporary ones through investment facilitation. Similarly, in Ethiopia, increased agricultural lending by banks encourages the commercialisation of agriculture farming activities, raising the standard of living for a large number of individuals employed in agriculture.

According to the test statistics in Table 4, a 1% rise in currency out of banks, a proxy for the level of financial development, reduces economic development by (-0.147) percent and is statistically significant at 10% in the long term. This means that currency in circulation outside of banks or a limited money supply has a detrimental effect on economic development. This adverse effect is described in two ways for undeveloped countries such as Ethiopia.

A well-developed financial system (as measured by currency out of the bank) may impede growth depending on whether financial development reduces or increases capital flight (Geda & Yimer, 2017). However, the study discovered a significant negative effect of capital flight on economic growth, implying that the improvement in the financial sector as measured by currency out of bank has a negative or positive impact on economic growth depending on the level of capital flight.

Second, the increase in currency out of banks contributes to rising inflation, which impairs economic growth. When Ethiopia increases its currency out of banks, its inflation rate reaches its maximum level, impairing the country's life standard or human development index performance. The negative impact is explained by the fact that the money supply had a detrimental effect on economic development during the studied period.

The gross enrollment ratio, a proxy for human capital, is positive and statistically significant at 1% in both long run and short run regression, consistent with predictions. Keeping other variables fixed, a 1% rise in gross enrolment ratio results in a 0.079 percent increase in the human development index over time. These findings reaffirm the

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augmented Solow model's validity in understanding Ethiopia's economic success. Thus, investment in human capital is critical for Ethiopia's rapid economic development.

On the other hand, the outcome is comparable to economist Theodore Schultz, who coined the word in the 1960s to convey the importance of our human capacities. He felt that human capital, like other forms of capital, could be invested in through health, education, training, and better benefits, increasing the quality and level of productivity. As a result, it benefits economic development.

Life expectancy refers to the number of years an infant is projected to live at birth, assuming current mortality rates continue. At a 1% level of significance, the result indicates that life expectancy has a positive and statistically significant effect on the human development index in both the long and short run. Keeping all variables unchanged, a 1% increase in life expectancy results in a 2.74 % increase in the human development index. This is because sustenance of life: the maintenance of life is concerned with meeting necessities. No country can be considered fully developed if it cannot meet its citizens' basic needs for shelter, clothing, food, health, and education. Thus, life expectancy is an essential condition for indicators of improved quality of life due to meeting these basic demands and bringing about development. Therefore, more outstanding quality of living implies a higher level of human or economic progress. This result corroborates (Smith, 2010) the new human development index, a comprehensive measure of living standards and capacities based on three development goals or end products. The index attempts to rank all countries on a scale of one to zero, with one indicating the lowest level of human development and zero indicating the highest level of human development. It encompasses three facets of human well-being. The average life expectancy at birth quantifies health (Longevity). Knowledge, as assessed by adult literacy rates and gross school enrollment ratios, and Standard of Living, as measured by adjusted real income per capita, improve the human development index as one of its components.

Surprisingly, trade openness, which is statistically negligible with a regression coefficient of (-0.034), has a detrimental effect on Ethiopia's economic progress. The reality justifies this conclusion that most developing countries, including Ethiopia, are subjected to unfair trade practices by industrialised countries. Additionally, as Ethiopia liberalises its commerce, it allows wealthy countries to dump manufactured commodities, indirectly destroying the indigenous infant industry and creating an adverse internal economic environment because the coefficient of trade openness is a drag on economic development.

Additionally, the error correction model gives partial adjustment information and enables the calculation of short-run elasticity. The EC coefficient in the Error correction model indicates the speed with which the system adjusts to long-run equilibrium following a shock to the system. The ECT coefficient should have a statistically

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significant negative sign. The ECT is negative -1.31, indicating that the adjustment is in the appropriate direction to restore the long-run balance. The ECT coefficient is statistically significant at 1%; this suggests that the following year, the departure of the human development index from equilibrium values is corrected by -1.31 percent. The adjustment to equilibrium occurs rapidly. Thus, the presence of a large ECT shows a long-run equilibrium relationship between the model's variables.

4.2 Causality between Agriculture Credit and Economic Development

Then, using the indicator human development index, we examine the pair-wise granger causality between agriculture credit and economic development. The unit root test demonstrates that the human development index (HDI) and farm credit are not level stationary series. Due to the Granger causality test requiring variables to be stationary, the initial difference between the human development index and agricultural credit is employed. The table contains the calculated F-statistics for the causality test. As shown in Table 5, we reject the null hypothesis that agriculture credit does not affect the human development index, a proxy for economic development. This indicates that agriculture credit Granger causes economic growth, which means that current and historical information on agriculture credit progress aids in improving economic development forecasting.

Similarly, the null hypothesis that the coefficients of the lagged values of the human development index are equal to zero is compared to the alternative that at least one of them is not. Again, the F test rejects the null hypothesis of no causality, indicating that economic progress does not affect agricultural financing. In other words, present and historical data on economic development improve agricultural credit forecasting. As a result of the study's causality test, it is concluded that agriculture credit and economic development (HDI) are bidirectional in their causality, with agriculture credit influencing development and development influencing agriculture credit.

Table 5. Granger Causality Test Result Between Agriculture Credit and Economic Development

Granger Causality Tests	Sample: 2000 2020	Lags: 3
Null Hypothesis:	F-Statistic	Prob.
Δ(LNHDI) does not Granger Cause Δ(LNACR)	5.4881	0.029
Δ(LnACR) does not Granger Cause Δ(LNHDI)	13.737	0.0014

The result demonstrates that farm credit is critical for Ethiopia's economic development. The findings are consistent with those of (Ewert & Schenk, 1998),who examined the causal relationship between credit and economic growth using data from 80 nations from

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1960 to 1989. They discovered that credit boosts economic development by examining various financial development indicators. According to the findings above, there is a unidirectional causal relationship between agricultural credit expansion and economic development in Ethiopia from 1998 to 2020.

5. CONCLUSION

The estimation result indicates that agricultural loan has a strong positive effect on economic development (HDI).

Additionally, control variables like human capital, life expectancy, and real GDP per capita have a long-run effect on economic development. Additionally, we find a statistically significant negative effect when we assess the short run effect of GDP per capita. Economic growth is aided by increased life expectancy and currency circulation. The common short-run error correction demonstrates that the deviation of economic development from equilibrium values is corrected the following year. The adjustment to equilibrium occurs rapidly. Thus, a long-run equilibrium relationship among the variables contained in the mode is confirmed by the presence of a significant ECT.

The model used to establish causation demonstrates that bank agriculture credit is favourably and significantly influenced by economic development (HDI) and vice versa. The estimation results indicate that the relationship between growth and agriculture credit is bidirectional, which means bank agriculture credit has a statistically significant effect on economic development. Economic development also has a statistically significant impact on bank agriculture credit. Additionally, the findings of the causality test indicate that bidirectional causality exists between them. It is demonstrated that bank agricultural credit Granger causes the development and that development Granger causes bank agricultural credit supply. This signifies that one's growth will be slowed unless the other is carefully handled.

There are various approaches to broaden the scope of this investigation. The most straightforward would be to present an examination of agricultural finance in Africa as a whole, not only in Ethiopia. It would enable us to determine whether agriculture credit has reached a "saturation point" or, in other words, whether agriculture credit is only necessary before attaining a particular degree of development. Thus, the issue of differences in economic development variables between emerging countries might be uncovered.

6. RECOMMENDATIONS

The importance of bidirectional causality between economic development (HDI) and bank agriculture finance requires bidirectional agriculture credit-inducing economic development and economic development-inducing agriculture credit solutions. Because causality runs in both directions, farm credit must prioritise "agriculture credit-inducing"

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activities. Additionally, adequate attention must be paid to enhancing agricultural financing while working to accelerate economic development. Instead of seeing agriculture finance as a distinct strategy from economic growth, stakeholders should adopt policies that promote agriculture finance as a fundamental component of the same plan. Additionally, there is a need to adopt policies that favour economic development (as bank agriculture finance responds positively to improved economic growth in the long run). Ethiopia must therefore prioritise policies that promote development, as development improves agricultural credit.

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Appendix

Appendix Table 1. Co Integration ARDL Bound Test Result for Agriculture Credit and Economic Development

Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship F = 10.876
t = -6.365

Critical Values (0.1-0.01), **F-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_7	2.03	3.13	2.32	3.50	2.60	3.84	2.96	4.26

accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), **t-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_7	-2.57	-4.23	-2.86	-4.57	-3.13	-4.85	-3.43	-5.19

accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)

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Appendix Table 2. Short Run and Long Run Model for Agriculture Credit and Economic Development Model

```
. ardl LNHDI LNGDPPC  LNLEX LNGER  LNACR  LNIQ LNCOB LNTO, lags(1 1 1 1 0  0  0
>  0) ec btest

ARDL(1,1,1,1,0,0,0,0) regression

Sample:     1997 -     2020                 Number of obs     =         24
                                            R-squared         =     0.9186
                                            Adj R-squared     =     0.8440
Log likelihood =  69.541587                 Root MSE          =     0.0189
```

D.LNHDI	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
LNHDI						
L1.	-1.317133	.2069412	-6.36	0.000	-1.768019	-.8662472
LR						
LNGDPPC	-.2311795	.1746994	-1.32	0.210	-.6118167	.1494577
LNLEX	2.741985	.5590153	4.91	0.000	1.523996	3.959975
LNGER	.0793308	.0229815	3.45	0.005	.0292584	.1294033
LNACR	.0991325	.0128841	7.69	0.000	.0710603	.1272046
LNIQ	-.1664841	.0940894	-1.77	0.102	-.3714874	.0385191
LNCOB	-.1479809	.0820078	-1.80	0.096	-.3266607	.0306988
LNTO	-.0347254	.0628154	-0.55	0.591	-.1715885	.1021376
SR						
LNGDPPC						
D1.	1.078171	.2728239	3.95	0.002	.4837388	1.672603
LNLEX						
D1.	-8.988566	3.841177	-2.34	0.037	-17.35777	-.6193612
LNGER						
D1.	-.0649138	.0197315	-3.29	0.006	-.107905	-.0219227
_cons	-13.8227	4.158575	-3.32	0.006	-22.88346	-4.761949

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Appendix Table 3. Posttest for Agriculture Credit and Economic Development Model

```
. estat dwatson

Durbin-Watson d-statistic( 12,    24) =  2.247553

. estat bgodfrey, lags(1)

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.645	1	0.4218

H0: no serial correlation

```
. estat imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(23)     =     24.00
         Prob > chi2  =    0.4038

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	24.00	23	0.4038
Skewness	7.25	11	0.7787
Kurtosis	1.73	1	0.1878
Total	32.98	35	0.5658