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The impact of investment in agricultural, forestry and fisheries on economic growth in Vietnam

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Abstract

This study examines the effects of investment in the agricultural, forestry, and fisheries sectors on Vietnam's economic growth from 1998 to 2023. It aims to provide empirical evidence to support effective policy decisions, especially regarding sustainable development in the agricultural sector. The research employs the Auto-Regressive Distributed Lagged (ARDL) model to analyze both long-term and short-term relationships. Time series data were collected from reliable sources, including Vietnam's General Statistics Office and the World Bank. Key variables include gross domestic product (GDP), investment in the agricultural, forestry, and fisheries sectors, household consumption expenditure, and labor force participation. Diagnostic tests were conducted to ensure data stationarity and model validity. Results reveal a positive and statistically significant impact of investment in the agricultural, forestry, and fisheries sectors on GDP growth in both the long and short terms. Household consumption expenditure also demonstrates a positive relationship with economic growth, while the labor force significantly affects growth only in the short term. The Error Correction Term (ECT) indicates an adjustment speed of 77.49% to return to long-term equilibrium after short-term deviations. The findings highlight the critical role of investment in the agricultural sector in sustaining economic growth. Policymakers are encouraged to prioritize and increase investment in agriculture to achieve sustainable development goals, improve livelihoods, and enhance Vietnam's economic stability.

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JEL Classification: E31; O11; O47; O55; Q10.

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1. Introduction

Over the past three decades, Vietnam has changed its economy from an erstwhile centrally planned model to a socialist-oriented market economy. Following the introduction of the policy of Đổi Mới (Renovation) in 1986, the Vietnamese economy has noted phenomenal progress in terms of economic growth as well as poverty alleviation and living standards. According to data available from General Statistics Office of Vietnam [1] the growth rate of GDP (Gross

Domestic Product) in Vietnam reflects a consistent trend at an average of 6-7% annually, which places the country on the elite list of some of the fastest-growing economies worldwide.

The gross domestic product in Vietnam has three major segments: agriculture, industry, and services. Whereas the agriculture GDP share has maintained a declining trend towards decline, those of industry and services have turned out to be the main impetus of economic growth. Updated statistics reported that Vietnam's GDP as of 2023 stood at about $411.8 billion with a per capita income above $4,000. Although the contribution of the agricultural, forestry, and fisheries sectors to the GDP has been falling over the years, these activities remain very basic for the economy and society of Vietnam. By 2022, agriculture, forestry, and fishery activities contributed approximately 13.5% of the country's GDP. This is a decrease from a period of over 20% in the 2000s. However, these sectors continue to support the largest portion of income for approximately 60% of the rural population. They also provide jobs for more than 38% of the national labor force. Between 2021 and 2023, the export value of the agricultural, forestry, and fishery sectors was approximately 49.5 billion USD yearly. They are key to balancing Vietnam's trade. Vietnam is one of the leading countries in the world in terms of exports of rice, coffee, seafood, and cashew nuts [1].

Forestry and fisheries are the major forces that contribute to environmental protection and climate regulation. However, Vietnam's forest cover is not a critical natural resource. They have also been referred to as the green lungs of Vietnam because they play a significant role in the country's water regulation, anti-soil erosion, and biodiversity preservation. The fisheries sector, apart from supplying nutrient-rich food, is an important source of income for people living on the coast. However, all of these are now greatly challenged by the global phenomenon of climate change, pollution, and the depletion of fishery resources.

In the future, to further enhance the role of these sectors, Vietnam will continue with programs of agricultural restructuring, improving product quality, application of advanced technologies in production, and sustainable development with protection to the environment. Investment in agriculture forms the nucleus of all development and growth because it provides an opportunity for farmers to procure the necessary resources to embrace innovative technology, increase productivity, and meet the ever-growing demand for agricultural products on a global level. In addition, agricultural investment leads to rural development, job creation, and economic growth.

In recent years, Vietnam has attracted considerable domestic and foreign investments in the agricultural, forestry, and fisheries sectors through investment incentive policies, sectoral structural reforms, and technical support. However, the detailed influence of such investments on economic growth has not been fully studied and assessed under the conditions of today's highly volatile global economy with increasingly drastic climate change impacts.

Therefore, this study attempts to answer the question of how investment in these sectors affects GDP growth in Vietnam. The study of the impact of investment in the agricultural, forestry, and fisheries sectors on economic growth in Vietnam is not an exception and is an important topic not only for the current moment but also strategically for the guidance of sustainable and inclusive economic development in the future.

2. Conceptual Clarification and Theoretical Review

2.1. Concept of Investment

Investment is defined as an activity that applies existing personal assets to the expectation of a future good return or with a collection of wealth that is different from saving and obtaining good returns. This may have several benefits for the individual. In essence, investment is the commitment of a resource that may be financial, but not restricted to money and effort, with the aim of making more resources available in the future [2]. In economic terms, investment refers to the growth in the capital stock of an economy. These are such items, and the output produces other goods. Economic investments consist of providing new assets that become usable as and when new productive structures create built-up infrastructure, equipment, and stocks [3].

2.2. Concept of Agriculture Investment

Investment in agriculture has been highlighted as critically important for economic growth, poverty reduction, and food security and nutrition. The various formulae developed to determine this level differ in scope and orientation. To date, no source has attempted to provide an exhaustive estimate of total public and private investment in agriculture.

Investment in agriculture can be of any type: Public, private, international, or domestic. Most investments in agriculture in low- and middle-income economies are domestic, and most come from farmers themselves. They are followed by domestic public investors, with the bulk of these investments coming from the national government. Public investors also help in investment in agriculture through development partners and private foreign investors such as firms, but that is too limited. These investors, whether they are public or private, domestic or foreign, all have differential allocations of funds to the sector for different reasons. Their investments, although sometimes supplementary and sometimes reinforcing one another, are rarely substitutable. For example, government investment is channelled primarily toward agriculture, with a focus on primary production in sectors such as cereals, livestock, aquaculture, and forestry, including upstream and downstream associated activities.

2.3. Concept of Economic Growth

Economics is basically the coordination of choices, and it deals with rationing through an evaluation of fulfillment relating to economic growth, which is the major measure used to consider how well resources are allocated. People evaluate their income and the changing value of their assets, whereas businesses track profits and market shares [4].

While countries check various indicators of economic growth, such as measures of national income and labor productivity, some economists argue that analyses of national economies should not simply consider growth and productivity, but should also account for factors such as distribution, equity, and per capita income. The pursuit of economic growth has always been deeply ingrained by human culture. Even in our modern, globally connected society, economic growth remains a dominant theme in mainstream media discussions and is a central concern for individuals. Countries that achieve significantly high growth rates are often celebrated as "growth miracles" [5].

Economic growth has been dubbed "the grand narrative of our times" in that it brings material betterment and a panacea for all social ills. In fact, since decades ago, it has become an almost ternational common goal of political policy to view many parts of the world as improving economic growth quantified by the term "increase in the gross domestic product." However, a higher GDP entails more resources and environmental pressure. Most studies say that growth is not the solution to all problems yet being explored, and have discovered that growth is not automatically associated with well-being [6].

2.4. Theory of Agrarian Society

Lewis [7] put forth the first and still quite persuasive development theory for poor agricultural nations. This theory views the development of poor agricultural countries as requiring heavy capital, focused on fostering a more efficient industrial sector. The theory argues that low agricultural productivity necessitates the withdrawal of labor from agriculture, which, however, is not serious in the context of food production. From this point, the idea of taxing agriculture for the purpose of modernization emerges, given that it is the leading sector of employment and productivity in poorer countries. Protective policies should be encouraged to support domestic production. Johnston [8] counter the argument that investment in the new farming system calls for dynamic forces leading to increased production efficiency in addition to earning economic benefits. They contended that increased agricultural productivity can solve the food problem, increase exports, provide a supply source for industrial production, and create a market for industrial goods, all of which stimulate economic growth.

2.5. Solow-Swan Theory of Growth

The versions underlying the works of Solow [9] and Swan [10] represent the neoclassical residual building blocks for any growth theory to explain how an economy grows over time due to disparate factors such as K, L, and T. Neoclassical theory states that the level of output in an economy is determined by the available amount of physical capital, an increase in this amount by an economy, thus leading to economic growth. According to neoclassical theory, growth depends most importantly on technological progress, that is, progress in information, innovation, and production, termed as total factor productivity. While the model states that population growth fuels economic development, it also concedes that the benefits of such growth will taper with time. The model hypothesizes the optimum threshold of capital formation, where overinvesting leads to a declining marginal rate of return. In the Solow-Swan model, long-term economic growth is generated by the accumulation of capital and technological progress, accounting for the differences in living standards and economic performance across countries. This offers important lessons on the dynamics of economic growth.

The fundamental equation in the Solow-Swan model is the production function, which describes the transformation of capital and labor inputs into output. The simple form of the production function is written as $Y=f(K, A, L)$, where Y is the total output or GDP of the economy, K denotes the quantity of physical capital, and A denotes total factor productivity (TFP) or technological progress, sometimes also denoted by L, the labor force.

3. Empirical Review

Korgbeelo and Deekor [11] conducted a study to investigate the importance of the agricultural sector in fostering economic growth in Nigeria. This study employed the ARDL approach, error correction model, and Granger causality tests, utilizing annual time-series data from 1981 to 2020. The findings revealed that agricultural and forestry production significantly contributed to Nigeria's economic growth. However, the outputs from the livestock and fisheries sectors showed minimal contributions to the country's development. The Granger causality test confirmed a bi-directional relationship between agricultural output and economic development, while livestock output exhibited a unidirectional causality toward economic growth

Matandare and Ashraf [12] used the bounds-testing technique of the ARDL model to analyze the relationship between agricultural investment and economic growth in Zimbabwe. Their findings showed a long-term equilibrium relationship between agricultural output, livestock production, and economic growth. Notably, livestock production had a positive and significant impact on economic growth in both the short and long run. In contrast, agricultural output showed a positive and significant effect on economic growth only in the long run.

Using time-series data from 1960 to 2011, Odetola and Etumnu [13] examined the connection between agricultural investment and economic growth in Nigeria. Their study highlighted the consistent and positive contribution of the agricultural sector to Nigeria's economic growth, emphasizing its critical role in the economy. Furthermore, a Granger causality test confirmed that agricultural expansion drives GDP growth, affirming agriculture as a promoter of overall economic growth. However, the reverse was not true, as GDP growth did not foster agricultural expansion. This resilience of the agricultural sector was evident in its ability to recover from adverse shocks, such as the civil war (1967–1970) and the structural adjustment period (1981–1985), much faster than other sectors.

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Nasir, et al. [14] analyzed investment demand in the agricultural sector for economic growth increase in Aceh Province, Indonesia, with the choice of identifying the agricultural types responsible for driving economic growth in Aceh. Evidence from the study concerning investment in the subsectors of crop production, livestock, forestry, and fisheries by 2.926%, 0.000%, 0.108%, and 0.298%, respectively, accompanies economic growth of their commodities by 1%. It reveals that for a 4% economic growth, according to the investment over five years needed to develop agricultural types affecting the economic welfare of Aceh (58.1% of GDP), recommendations that could be made from these research results to the government should be that it should promote investment in the agricultural sector to drive economic growth in Aceh Province.

Jatoi [15] analyzed the contribution of agriculture and its subsectors to economic growth in Pakistan. This study uses data over 21 years for agriculture and its sub-sectors in Pakistan and classifies agriculture into crops, livestock, forestry, and fisheries. The results indicate that agriculture and its sub-sectors have significantly impacted the economic growth of the country, except forestry, which does not have a significant impact.

Studies have been conducted on the contribution of agricultural subsectors to economic growth. The most recent was by Jobarteh and Selemani [16] conducting a study to assess the contribution of agricultural subsectors to economic growth in Gambia. Time series analysis is a technique that relies on the conversion of annual data to quarterly data using the disaggregation method from 2004 to 2016. ARDL is employed to investigate the effects of the variables on economic growth. The results showed that the crop and fishery subsectors positively affected economic growth in the long term, whereas crops and livestock had positive effects in the short term. From this, it was concluded that the agricultural subsectors have a significant impact on economic growth in Gambia, therefore recommending more investment in the agricultural sector to make gallants more economically viable.

Abdelhafidh and Bakari [17] investigated the factors influencing agricultural investment in Tunisia using annual time-series data from 1965 to 2016. The study employed cointegration and vector error-correction methodologies. The results indicated that, in the long run, there was a unidirectional positive causality from agricultural investment to economic growth, while other investments showed a negative causality toward economic growth. In the short run, Granger causality tests revealed a bidirectional relationship between other investments and economic growth. These findings highlight the significant role of agricultural investment in driving economic growth in Tunisia, underscoring the need for appropriate policies to strengthen the sector.

These studies reflect the major contributions of the agricultural, forestry, and fisheries sectors to economic growth in various countries. The results indicate that agricultural investment has a positive impact on economic growth. However, in Vietnam, this relationship has not been proven in recent years. Thus, one needs to obtain evidence from Vietnam for the works on this issue to be considered experimental research and to lay down the government's policies on the matter in Vietnam.

4. Methodology

It uses an ex post facto study design suitable for the quantitative research approach. The variables in the research model and regression methods are applied from the research models of Abdelhafidh and Bakari [17] and Handriyani, et al. [18]. The independent variables used in this study, namely investment capital in the agricultural, forestry, and fisheries sectors and labor force participation, are adopted from Abdelhafidh and Bakari [17] while the variable on household consumption expenditure is adopted from Handriyani, et al. [18]. The study then assesses the exogenous influence of investment capital in the agricultural, forestry, and fisheries sectors on economic growth in Vietnam with two controls, labor force participation and household consumption expenditure, added to the research model.

The study adopts as independent variables investment Capital in Agriculture, Forestry and Fishing (AFF), Labor Force Participation (LAB), and Households and Non-Profit Institutions Serving Households (NPISHs) final Consumption Expenditure (HCE), which is tested against the dependent variable (GDP). This research was conducted in Vietnam, and the data to be analyzed ranged from 1998 to 2023. The details of these variables are presented in Table 1.

Table 1.
Description of variables.

Acronyms	Description	Sources
GDP	Gross domestic product (% of Growth)	https://aric.adb.org/macroindicators
AFF	Investment capital in agriculture, forestry and fishing (% of GDP)	Statistical yearbook of Vietnam (2000-2023)
LAB	Labor force participation (% of population)	https://databank.worldbank.org
HCE	Households and NPISHs final consumption expenditure (% of GDP)	https://databank.worldbank.org

The model for this study is GDPt = $\beta_0 + \beta_1 AFF_t + \beta_2 LAB_t + \beta_3 HCE_{t} + \varepsilon_t$ *(1)*

In this study, the author uses the ARDL cointegration technique, first suggested by Pesaran, et al. [19] and later elaborated on by Pesaran, et al. [20] and Im, et al. [21]. The ARDL model is an unrestricted dynamic model in which the dependent variable is given in terms of the functions of its own lagged values and other independent variables. Thus, this methodology has been widely applied by many researchers when studying macroeconomic variables at the GDP level.

The ARDL approach provided a good balance between these approaches. This was a general-to-specific methodology. Several of the advantages of the ARDL approach are that it does not circumvent the issue of the order of integration; it can be applied to small and large samples, it does not require the same lag order for the variables, and finally, but by no means least, it is efficient with unbiased estimates even for some endogenous explanatory variables [22]. Further, bounds testing in the ARDL analysis dynamically estimates the long-term equilibrium relationship using an error correction model. Therefore, the ARDL adjusted parameters harbor more accurate estimations of the short- and long-term coefficients, as well as the speed of adjustment.

In the quantile ARDL estimation, the following procedure is followed: first, the lag order of the variables in the ARDL model is determined through the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hannan-Quinn (HQ); second, the stationarity of the variables is checked through the Correlogram Analysis method under the consideration that the variables are not of the same order of integration and no variable should be stationary at I(2); and third, cointegration between the variables is tested using the bound test. The existence of a long-term relationship was evaluated using F-Bounds Test statistics. If it crosses the critical bounds of I(1) and I(0), a long-term relationship is established. The ECM was then estimated based on the model:

$$DGDP_t = \beta_0 + \sum_{i=>1} \beta_1 DGDP_{t-i} + \sum_i \beta_2 DAFF_{t-i} + \sum_i \beta_3 DLAB_{t-i} + \sum_i \beta_4 DHCE_{t-i} + \psi ECM_{t-i} + \varepsilon_{2t} \quad (2)$$

The Error Correction Model (ECM) is a mechanism that adjusts short-term deviations back to long-run equilibrium. The value of ψ represents the speed of adjustment, and if ψ is negative and statistically significant, it indicates that GDP, as the dependent variable, has a self-correcting mechanism to return to its equilibrium value when it deviates from the long-term equilibrium.

Step four involves estimating the ARDL model based on the selected lag orders to determine the long- and short-run relationships among the model variables. Finally, the short-term effects of the variables are evaluated using the ECM within the ARDL framework, following the Engle and Granger [23] method with cointegration to validate the model:
From Equation 1, the ARDL regression model for this study is:

$$DGDP_t = \beta_0 + \sum_{i=>1} \beta_1 DGDP_{t-i} + \sum_i \beta_2 DAFF_{t-i} + \sum_i \beta_3 DLAB_{t-i} + \sum_i \beta_4 DHCE_{t-i} + \lambda_1 GDP_{t-1} + \lambda_2 AFF_{t-1} + \lambda_3 LAB_{t-1} + \lambda_4 HCE_{t-1} + \varepsilon_{it} \quad (3)$$

Where: The model for evaluating the long-term impact is:

$$GDP_t = \beta_0 + \lambda_1 GDP_{t-1} + \lambda_2 AFF_{t-1} + \lambda_3 LAB_{t-1} + \lambda_4 HCE_{t-1} + \varepsilon_{1t} \quad (4)$$

And the model for the short-term is:

$$DGDP_t = \beta_0 + \sum_{i=>1} \beta_1 DGDP_{t-i} + \sum_i \beta_2 DAFF_{t-i} + \sum_i \beta_3 DLAB_{t-i} + \sum_i \beta_4 DHCE_{t-i} + \varepsilon_{2t} \quad (5)$$

Finally, in order to obtain reliable results from the regression, the research conducts diagnostic tests such as VIF, normality test, Breusch-Godfrey Serial correlation LM test, heteroskedasticity test, Ramsey RESET test, and CUSUM were used.

5. Empirical Analysis

This section presents the data and regression results as well as the interpretation and analysis of the findings.

5.1. Descriptive Statistics of Variables

Table 2 Descriptive statistics for the study variables Table 2 presents the descriptive statistics, defining the attributes and characteristics of the study variables. It reports the mean, median, minimum and maximum values of each variable, the standard deviation as well as the P-value of the JarqueBera statistic testing for normality of the variables.

Table 2.
Descriptive statistics.

Variables	GDP	AFF	HCE	LAB
Mean	6.457	2.220	61.559	74.445
Median	6.786	1.998	59.035	74.025
Maximum	8.464	4.740	70.889	77.200
Minimum	2.552	0.908	54.440	71.410
Std. Dev.	1.497	0.946	5.547	1.819
Jarque-Bera	5.491	1.549	2.690	2.306
Probability	0.064	0.460	0.260	0.315
Observations	26	26	26	26

Both the mean and median are measures of central tendency. The GDP has a maximum value of 8.4% and a minimum value of 2.5%. The p-value of the Jarque-Bera statistic for all variables is greater than 0.05; that is, all variables are normally distributed.

5.2. Correlation Analysis

As shown in Table 3, the variables have AFF and HCE, which have positive relationships with GDP at the 0.462 and 0.255 levels. Only LAB attains a negative relationship level, with a value of -0.044, which is less than zero. Dependent on this value, this would mean that the impact of the independent variable on the dependent variable is on an equal magnitude of positive and negative effects for and a unit change in the predictor variable. Again, Table 3 reveals that the independent variables have very weak correlations with each other. According to Mukaka [24] regarding the thumb rule of the relationship strength of variable pairs, the model's independent variables correlate moderately with a score of less than 0.70; hence, there is no range for multicollinearity in this case, and this circumstance is suitable for running the estimation model. This study also tested for Variance Inflation Factors (VIF) after running the regression model.

Table 3.
Correlation coefficients of variables.

Variables	GDP	AFF	HCE	LAB
GDP	1.000	0.462	0.254	-0.044
AFF	0.462	1.000	0.610	-0.423
HCE	0.254	0.610	1.000	-0.383
LAB	-0.044	-0.423	-0.383	1.000

5.3. Optimal Lag Selection and Stationarity Tests of Variables

The AIC, SC, and HQ criteria were used to determine the lag order of the variables in the model prior to conducting the stationarity tests. Considering the comparison of these criteria, the best lag for the variables in this model was 1. The results of lag selection are presented in Table 4.

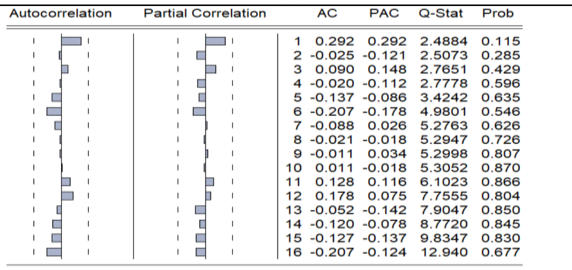
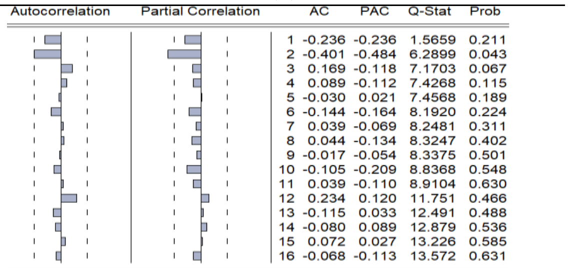
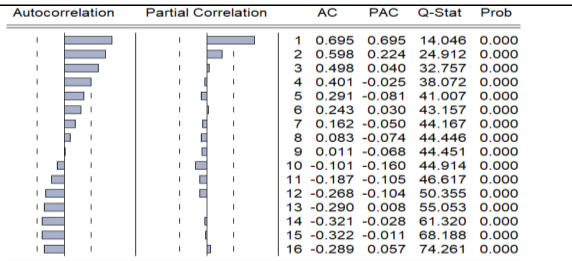
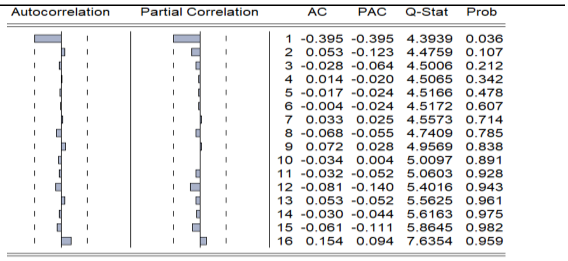
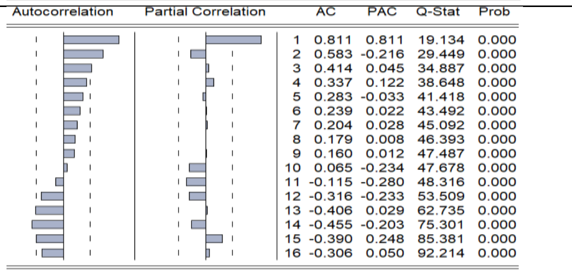
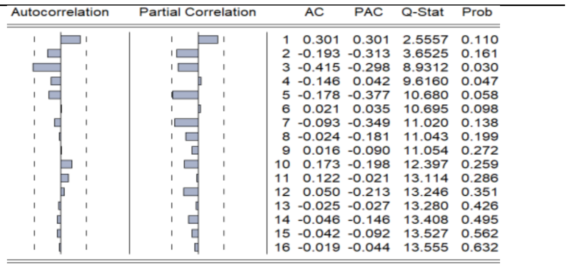
Table 4.
Optimal lag selection.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-178.6058	NA	47.74317	15.21715	15.41349	15.26924
1	-126.3838	82.68478*	2.391466*	12.19865*	13.18037*	12.45910*
2	-113.0925	16.61415	3.409953	12.42438	14.19146	12.89318

Note: The optimal lag length is determined by the lowest values of FPE, AIC, SC, and HQ, marked with an asterisk (*). In this case, lag 1 is selected as the optimal lag length, as it minimizes FPE, AIC, SC, and HQ. The LR test statistic at lag 1 also indicates statistical significance, further supporting the choice of lag 1 for the model.

When analyzing the ARDL bounds testing model, it is necessary to consider the stationarity tests of the variables as a precursor to check the level of integration of the observed data series. A correlogram Analysis method was used to determine the stationarity of the variables. As specified in Table 5, the GDP variable is stationary at level I(0), while the others are stationary at level I(1) and not at level I(0). These characteristics of the variables make the regression model using the ARDL technique suitable.

Table 5.
Stationarity test results of variables.

Variables	I(0)	I(1)
GDP		
AFF		
HCE		

GDP – I(0) (Autocorrelation, Partial Correlation):

	AC	PAC	Q-Stat	Prob
1	0.292	0.292	2.4884	0.115
2	-0.025	-0.121	2.5073	0.285
3	0.090	0.148	2.7651	0.429
4	-0.020	-0.112	2.7778	0.596
5	-0.137	-0.086	3.4242	0.635
6	-0.207	-0.178	4.9801	0.546
7	-0.088	0.026	5.2763	0.626
8	-0.021	-0.018	5.2947	0.726
9	-0.011	0.034	5.2998	0.807
10	0.011	-0.018	5.3052	0.870
11	0.128	0.116	6.1023	0.866
12	0.178	0.075	7.7555	0.804
13	-0.052	-0.142	7.9047	0.850
14	-0.120	-0.078	8.7720	0.845
15	-0.127	-0.137	9.8347	0.830
16	-0.207	-0.124	12.940	0.677

GDP – I(1) (Autocorrelation, Partial Correlation):

	AC	PAC	Q-Stat	Prob
1	-0.236	-0.236	1.5659	0.211
2	-0.401	-0.484	6.2899	0.043
3	0.169	-0.118	7.1703	0.067
4	0.089	-0.112	7.4268	0.115
5	-0.030	0.021	7.4568	0.189
6	-0.144	-0.164	8.1920	0.224
7	0.039	-0.069	8.2481	0.311
8	0.044	-0.134	8.3247	0.402
9	-0.017	-0.054	8.3375	0.501
10	-0.105	-0.209	8.8368	0.548
11	0.039	-0.110	8.9104	0.630
12	0.234	0.120	11.751	0.466
13	-0.115	0.033	12.491	0.488
14	-0.080	0.089	12.879	0.536
15	0.072	0.027	13.226	0.585
16	-0.068	-0.113	13.572	0.631

AFF – I(0) (Autocorrelation, Partial Correlation):

	AC	PAC	Q-Stat	Prob
1	0.695	0.695	14.046	0.000
2	0.598	0.224	24.912	0.000
3	0.498	0.040	32.757	0.000
4	0.401	-0.025	38.072	0.000
5	0.291	-0.081	41.007	0.000
6	0.243	0.030	43.157	0.000
7	0.162	-0.050	44.167	0.000
8	0.083	-0.074	44.446	0.000
9	0.011	-0.068	44.451	0.000
10	-0.101	-0.160	44.914	0.000
11	-0.187	-0.105	46.617	0.000
12	-0.268	-0.104	50.355	0.000
13	-0.290	0.008	55.053	0.000
14	-0.321	-0.028	61.320	0.000
15	-0.322	-0.011	68.188	0.000
16	-0.289	0.057	74.261	0.000

AFF – I(1) (Autocorrelation, Partial Correlation):

	AC	PAC	Q-Stat	Prob
1	-0.395	-0.395	4.3939	0.036
2	0.053	-0.123	4.4759	0.107
3	-0.028	-0.064	4.5006	0.212
4	0.014	-0.020	4.5065	0.342
5	-0.017	-0.024	4.5166	0.478
6	-0.004	-0.024	4.5172	0.607
7	0.033	0.025	4.5573	0.714
8	-0.068	-0.055	4.7409	0.785
9	0.072	0.028	4.9569	0.838
10	-0.034	0.004	5.0097	0.891
11	-0.032	-0.052	5.0603	0.928
12	-0.081	-0.140	5.4016	0.943
13	0.053	-0.052	5.5625	0.961
14	-0.030	-0.044	5.6163	0.975
15	-0.061	-0.111	5.8645	0.982
16	0.154	0.094	7.6354	0.959

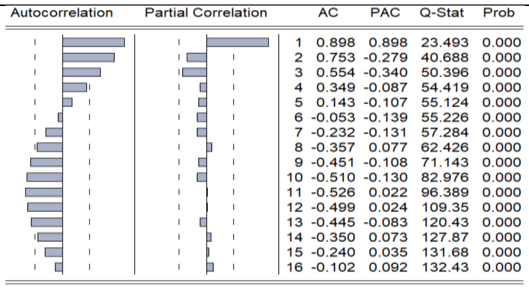
HCE – I(0) (Autocorrelation, Partial Correlation):

	AC	PAC	Q-Stat	Prob
1	0.811	0.811	19.134	0.000
2	0.583	-0.216	29.449	0.000
3	0.414	0.045	34.887	0.000
4	0.337	0.122	38.648	0.000
5	0.283	-0.033	41.418	0.000
6	0.239	0.022	43.492	0.000
7	0.204	0.028	45.092	0.000
8	0.179	0.008	46.393	0.000
9	0.160	0.012	47.487	0.000
10	0.065	-0.234	47.678	0.000
11	-0.115	-0.280	48.316	0.000
12	-0.316	-0.233	53.509	0.000
13	-0.406	0.029	62.735	0.000
14	-0.455	-0.203	75.301	0.000
15	-0.390	0.248	85.381	0.000
16	-0.306	0.050	92.214	0.000

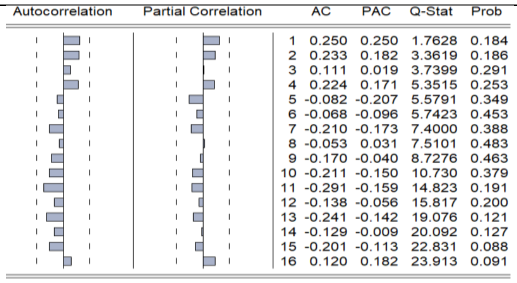
HCE – I(1) (Autocorrelation, Partial Correlation):

	AC	PAC	Q-Stat	Prob
1	0.301	0.301	2.5557	0.110
2	-0.193	-0.313	3.6525	0.161
3	-0.415	-0.298	8.9312	0.030
4	-0.146	0.042	9.6160	0.047
5	-0.178	-0.377	10.680	0.058
6	0.021	0.035	10.695	0.098
7	-0.093	-0.349	11.020	0.138
8	-0.024	-0.181	11.043	0.199
9	0.016	-0.090	11.054	0.272
10	0.173	-0.198	12.397	0.259
11	0.122	-0.021	13.114	0.286
12	0.050	-0.213	13.246	0.351
13	-0.025	-0.027	13.280	0.426
14	-0.046	-0.146	13.408	0.495
15	-0.042	-0.092	13.527	0.562
16	-0.019	-0.044	13.555	0.632

Variables	I(0)	I(1)
LAB	(see below)	(see below)



	Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1			0.898	0.898	23.493	0.000
2			0.753	-0.279	40.688	0.000
3			0.554	-0.340	50.396	0.000
4			0.349	-0.087	54.419	0.000
5			0.143	-0.107	55.124	0.000
6			-0.053	-0.139	55.226	0.000
7			-0.232	-0.131	57.284	0.000
8			-0.357	0.077	62.426	0.000
9			-0.451	-0.108	71.143	0.000
10			-0.510	-0.130	82.976	0.000
11			-0.526	0.022	96.389	0.000
12			-0.499	0.024	109.35	0.000
13			-0.445	-0.083	120.43	0.000
14			-0.350	0.073	127.87	0.000
15			-0.240	0.035	131.68	0.000
16			-0.102	0.092	132.43	0.000



	Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1			0.250	0.250	1.7628	0.184
2			0.233	0.182	3.3619	0.186
3			0.111	0.019	3.7399	0.291
4			0.224	0.171	5.3515	0.253
5			-0.082	-0.207	5.5791	0.349
6			-0.068	-0.096	5.7423	0.453
7			-0.210	-0.173	7.4000	0.388
8			-0.053	0.031	7.5101	0.483
9			-0.170	-0.040	8.7276	0.463
10			-0.211	-0.150	10.730	0.379
11			-0.291	-0.159	14.823	0.191
12			-0.138	-0.056	15.817	0.200
13			-0.241	-0.142	19.076	0.121
14			-0.129	-0.009	20.092	0.127
15			-0.201	-0.113	22.831	0.088
16			0.120	0.182	23.913	0.091

5.4. Bound Test for Determining Cointegration

After ascertaining the optimal lag and testing for variable stationarity, the study will now undertake the bound test of the long-term relationship between GDP and its independent variables (AFF, LAB, HCE). The results of the bound test are listed in Table 6.

Table 6.
Bound test results.

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
F-statistic	6.408	10%	2.72	3.77
k	3	5%	3.23	4.35
		2.5%	3.69	4.89
		1%	4.29	5.61

Table 6 shows that the calculated F-statistic value of 6.408890 significantly exceeds the upper critical bounds at the 90%, 95%, and 99% confidence levels, which are 3.77, 4.35, and 5.61, respectively. This result confirms the existence of cointegration or a long-term relationship between the dependent variable (economic growth, GDP) and the independent variables (AFF, HCE, and LAB). The subsequent section provides an estimation of both the long-term and short-term relationships between these variables.

5.5. ARDL Model Estimation

Long-term cointegration between the dependent and independent variables was checked using the ARDL model. The coefficients in Table 7 express both short- and long-term elasticities with respect to various independent variables.

Table 7.
Estimation results.

Variables	Coefficient	Std. Error	t-Statistic	Prob.
The dependent variable: GDP. Long-term estimation results				
AFF	1.382	0.665	2.076	0.041
HCE	0.166	0.128	1.295	0.020
LAB	-0.039	0.219	-0.178	0.860
The dependent variable: D(GDP). Short-term estimation results				
C	12.829	2.369	5.415	0.000
D(AFF)	0.709	0.245	2.746	0.036
D(LAB)	0.884	0.319	2.772	0.012
CointEq(-1)	-0.774	0.142	-5.448	0.000

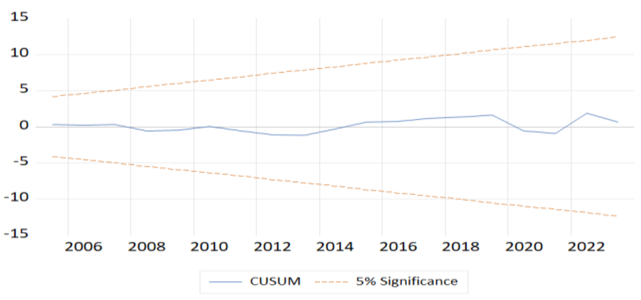
To ensure reliability of the estimation results, we conducted six diagnostic tests. The results are presented in Tables 8 and 9, respectively.

Table 8.
Diagnostic test results.

No.	Tests	P-Value	Results
1	Normality test	0.919	Normal distribution
2	Breusch-Godfrey serial correlation LM test	0.683	No autocorrelation
3	Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.201	No heteroscedasticity detected
4	Ramsey reset test	0.210	No need for additional variables

Table 9.
Variance inflation factor (VIF) and CUSUM test results.

Variables	Coefficient variances	Centered VIF
GDP(-1)	0.035	1.182
AFF	0.192	2.659
AFF(-1)	0.348	1.477
HCE	0.007	3.135
LAB	0.129	6.590
LAB(-1)	0.148	7.397



All entered VIF values are below 9; this states, according to Hair, et al. [25] that the long-term impact model does not have multicollinearity. Interpreting the CUSUM test results, there were no clear signs of instability or abrupt changes in the model throughout the period, as it did not cross the test boundaries. Overall, the CUSUM plot indicated that the regression model in this study was stable over time.

5.6. Discussion of Research Findings

In the long term, the following variable represented investment in agriculture, forestry, and fishery, and it had a coefficient value of 1.382220; thus, the p-value was found to be equal to 0.0416, which is less than 0.05, indicating that this variable has a positive and significant impact on GDP. In other words, investment in this sector is a leading contributor to GDP growth. The HCE variable had a coefficient of 0.166945 with a p-value of 0.0208, which was also less than 0.05, with the GDP value indicating that this variable had a positive and significant impact on GDP. However, the labor variable was not based on sufficient evidence for the evaluation.

In the short term, Investment in the Agricultural, Forestry, and Fisheries sectors has a coefficient of 0.709657 with a p-value of 0.0367, less than 0.05. This implies that the variable has a positive and significant impact. In other words, the variable had a positive and significant effect. The labor variable had '0.884754' coefficient with 0.0121 p-value (also less than 0.05) meant.

The coefficient of CointEq.(-1) is -0.774933, with a p-value of 0.0000. This means that this variable is highly statistically significant and reflects the speed of adjustment to the long-term equilibrium state. Hence, doubt over the absence of a long-term cointegrated relationship between economic growth and the model's independent variables is cast off further. This implies that when GDP is not at equilibrium in the long term, it will readjust at a rate of 77.49% in the subsequent period.

Overall, investment in the agricultural, forestry, and fisheries sectors has positive short- and long-term effects on GDP. This finding is in line with those of Abdelhafidh and Bakari [17] and Nasir, et al. [14].

6. Policy Implications

Based on research findings on the impact of investment in the agricultural, forestry, and fishery sectors on Vietnam's economic growth, the following are the specific policy implications that may be considered by the Government of Vietnam:

First, public investment in the agricultural, forestry, and fishery sectors is increasing. The Government should continue to scale up public investment programs in infrastructure, technology, and financial support in these sectors. The research results prove that investment in these sectors is influencing GDP positively and significantly; thus, more investment will be a boost to the economy, especially when Vietnam is moving towards better value addition and quality of products in these sectors.

Second, policies should be formulated to promote private investment. Enforce stimulants, such as tax exemptions, a conducive interest rate, and a business setting to pull private investment into the agricultural forestry and fishery sectors. With support from the government, private investment would be enhanced in these sectors; hence, better production efficiency with productivity increases and Vietnamese products in the world market become more competitive.

Third, it enhances investment in Research and Development (R&D). Invest agricultural R&D centers to apply advanced science and technology in production. This will help increase productivity and product quality using more science-based methods. Innovation in agricultural technology and methods would make the investment more beneficial, increase farmers' incomes, and would contribute to the economy's sustainable growth.

Moreover, the creation of value chains is also supported. Programs that should be initiated and promoted by the government include the development of viable value chains in the agriculture, forestry, and fisheries sectors from production to consumption, which consist of processing and export stages. Creating viable value chains optimizes the production process and enhances value addition. This ensures that agricultural, forestry, and fishery products can compete better in the international market.

Fifth, it encourages domestic consumption and improves the living standards. Measures to implement policies to raise incomes and living standards of the population, thereby stimulating household consumption expenditure. With research indicating that household consumption has a positive influence on GDP, domestic consumption will be encouraged as a way of propping up economic growth while simultaneously reducing the country's overreliance on export-driven growth.

Sixth, elaborating training programs to improve labor skills. Upgrading training programs and capacity building of labor for the agriculture, forestry, and fisheries sectors with special emphasis on techniques of cultivation, management, and marketing. Although the long-term influence of labor is not well articulated, it has a positive and remarkable short-term effect on GDP. Capacity building optimizes efficiency and is productive for increased labor.

Seventh, the macroeconomic policy adjustments were strengthened. The Government should keep a close check on economic fluctuations and timely adjust policies to maintain the equilibrium of macroeconomics, including policies on interest rates, exchange rates, and fissures. With a high Error Correction Term coefficient, the speed of adjustment towards long-term equilibrium GDP is quite rapid, wherein the importance of macroeconomic measures lies in the stability and sustainability of development.

It would help the Government of Vietnam strategically lead sustainable development in the agricultural, forestry, and fisheries sectors and, however, tap the full potential of these sectors in contributing to national economic growth.

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