Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146
Vol. 4 No. 4 (April) (2026)

DIALOGUE SOCIAL SCIENCE REVIEW

Agricultural Exports and Economic Growth: An Econometric Modeling Framework

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Abstract
Agricultural sector and more specifically agricultural exports are vital in providing foreign exchange, domestic production stimulation, as well as technological development. Nevertheless, the empirical correlation between agricultural exports and economic growth is controversial and incoherent in the results of different countries and at different periods of time. The analysis utilizes quantitative econometric analysis, such as time-series analysis, cointegration tests (Augmented Dickey-Fuller), Error Correction Models (ECM), and Autoregressive Distributed Lag (ARDL) models. The proposed framework confirms that agricultural exports have various effects on economic growth: foreign exchange revenues, productivity, job creation and sectoral interdependence. The paper presents a solid econometric approach to the assessment of the nexus of agricultural exports and economic growth. The framework has a practical implication to policy makers in the developing economies especially in Central Asia.

Keywords*:* Agricultural exports, economic growth, econometric modeling, ARDL, export-led growth, time-series analysis
JEL Classification: C32, F43, O13, Q17

1. INTRODUCTION

1.1 Background and Relevance

Economic growth is a key aim of both developed and developing economies because it reflects growth in income levels, employment opportunities, and general living standards. Agricultural sector is one of the key sectors of the economy in most developing economies and it has a great contribution to the gross domestic product (GDP), employment, and foreign exchange earnings, while also fostering entrepreneurial activity and income generation in rural economies (Saleem et al., 2021). The importance of agriculture is also increased by its food security contribution and maintenance of rural populations (Osabohien et al., 2019).

The exports of agriculture are especially crucial in linking domestic economies with the international markets. Exporting empowers countries to get foreign exchange and this is essential to finance imports of capital goods and advanced technologies and other inputs required to develop the economy. Moreover, greater agricultural exports lead to local production, technological advancement, and efficiency growth in the industry (Oyetade & Adeyeye, 2021).

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During the age of globalization, export-led growth has been applied to most countries, with a tendency to grow export industries in an attempt to attain economic growth. But the economies are still susceptible to such risks as price variations, unfavorable trade relations, climatic variability, and excessive reliance on scarce commodities. These issues cast crucial doubts about the sustainability and effectiveness of agricultural exports as drivers of economic growth (Mahmood & Munir, 2018).

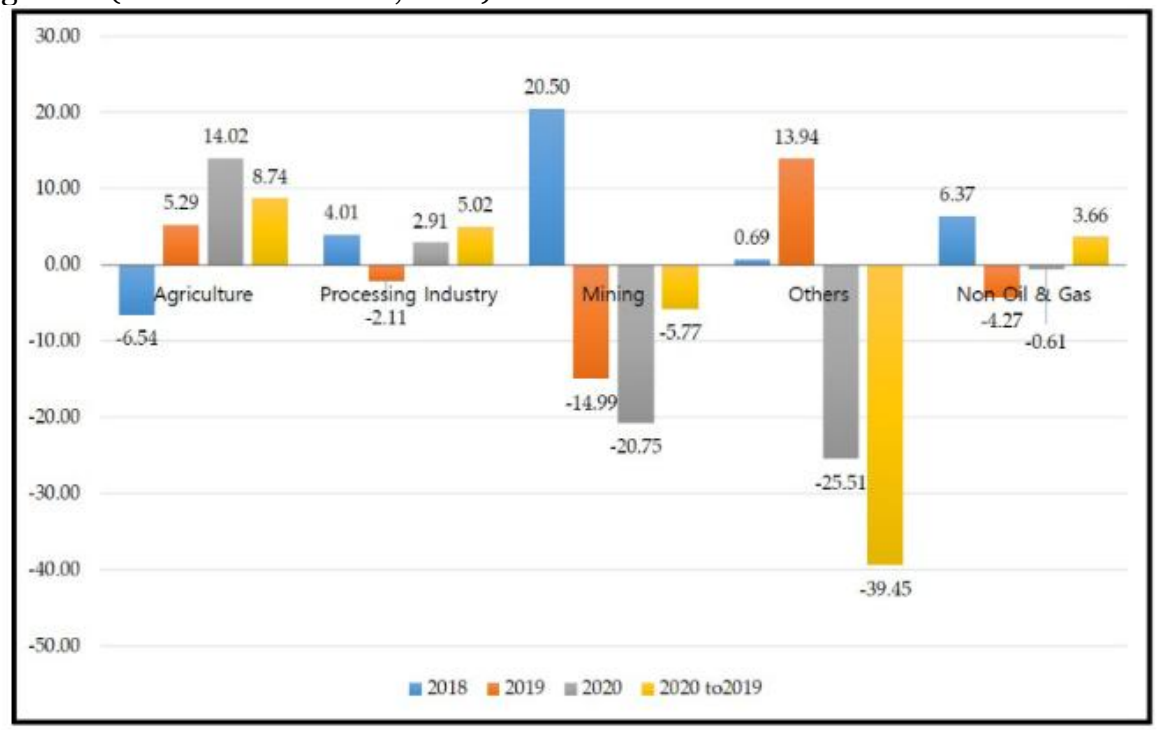

Figure 1. Export growth (percentage) in 2018–2020. Source: Author's calculation based on data from the Central Bureau of Statistics (BPS) (Arifah & Kim, 2022)

1.2 Problem Statement

Agricultural exports and their contribution to economic growth have been a controversial topic even though they are important in the majority of economies (Bakari & Mabrouki, 2017). Some researchers state that the growth of the economy based on the export of agricultural products leads to the creation of foreign exchange and stimulates the productivity of the economy, but others state that the high reliance on traditional agricultural products disposes the economies to exogenous shocks and unpredictable incomes (Bakari & Mabrouki, 2018).

In most developing nations, agricultural exports can be a significant percentage of total exports; but economic growth is not always in line with export growth (El Weriemmi & Bakari, 2024). This gap begs serious questions regarding the performance of agricultural exports as compared to sustainable economic development (Murugesan, 2019). In addition, variations in results of the relationship in different countries, and in different intervals of time, are leading to inconsistency in empirical results between countries, and thus it is necessary to have more specific econometric studies that will give certain results, specific to the context.

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1.3 Research Questions and Objectives

This study seeks to answer the following research questions:

1. What is the relationship between agricultural exports and economic growth?
2. Do agricultural exports significantly influence economic growth?
3. What are the short-run and long-run effects of agricultural exports on economic growth?

The main objective is to examine the impact of agricultural exports on economic growth using econometric modeling, with specific objectives to:

- Analyze the relationship between agricultural exports and economic growth
- Examine long-run and short-run effects of agricultural exports on economic growth
- Evaluate the contribution of agricultural exports to overall economic performance
- Provide policy recommendations based on empirical findings

1.4 Scientific Novelty and Practical Significance

This work has scientific novelty as it has a full-fledged approach to the econometric investigation of both short-term and long results, which offers insight into dynamic interactions in the economy. The methodology has combined the conventional and recent econometric approaches, such as cointegration and error correction models, to give a sound insight into the dynamic nature of the relationship between agricultural exports and the economic growth.

The practical value is in the enlightenment of policy making in terms of agriculture, trade and economic development. The findings can inform the policymakers on ways of enhancing the competitiveness of agricultural exports and making the best contribution to economic growth. The empirical evidence of the informed decision-making can also be useful to the stakeholders such as farmers, exporters, and investors.

2. THEORETICAL FRAMEWORK

2.1 Economic Growth: Concepts and Drivers

The economic growth is seen as the continuous growth of the output of goods and services in a country over a certain period of time and is usually expressed in terms of growth rate of GDP. It is a significant indicator of economic performance and an important indicator of living standards, reduction of poverty, and creation of jobs. Capital accumulation, expansion of labor force, technological improvements, quality of institutional, and openness to trade affects economic growth (Armeanu et al., 2017).

In third world economies, the development is usually strongly linked to the performance of the primary sectors such as agriculture. Economic growth is also maintained by macroeconomic stability, which is low inflation, stable exchange rates and good fiscal policies, which allow countries to attract investments and export more.

2.2 Classical and Modern Growth Theories

The classical growth theories formulated by such economists as Adam Smith and David Ricardo were based on the factors of production namely labor, capital and land with emphasis on specialization, division of labor and comparative

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advantage (Prasetyo & Kistanti, 2020). The classical theories are divided into three theories, as shown in Figure-2:

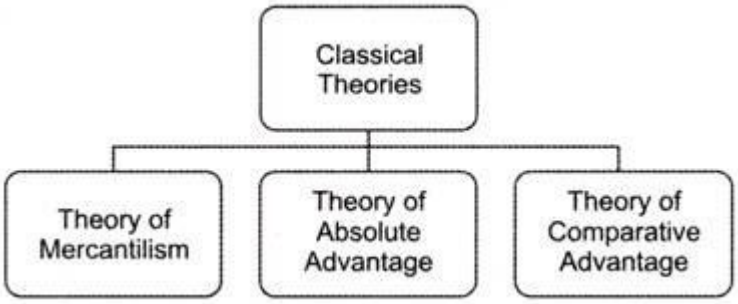

Figure # 2 classical theories
https://www.economicsdiscussion.net/international-trade/3-classical-trade-theories-discussed/4239#

The contemporary theories of growth are more elaborate. The neoclassical model of growth (named after Robert Solow) emphasizes capital formation, labor formation, and external technological progress. Endogenous growth theory focuses on domestic sources of growth such as innovation, development of human capital, and spillovers of knowledge as primary sources of the growth in the long-term (Prasetyo et al., 2022).

2.3 Export-Led Growth Hypothesis

The export-led growth hypothesis is based on the idea that export growth drives growth in economies through increased production, efficiency, and improved access to foreign markets (Sergi et al., 2019). Export earns foreign exchange which is used to finance imports of capital goods as well as modern technologies. Also, the involvement in global trade encourages competition, innovation and improvement in productivity.

2.4 Agricultural Export Channels

Agricultural exports affect economic growth through multiple channels:
Foreign exchange channel: The export earnings guarantee stable balance of payments and allow the financing of imports (Hudson, 2024)
Productivity channel: Exports promote the use of modern technologies and practices, enhancing productivity.
Knowledge transfer channel: The channel of knowledge transfer enhances the compliance to quality, safety, and environmental requirements.
Employment channel: Agricultural exports create employment in farming, processing, transportation and marketing.
Income channel: The export business will bring more income to the farmers and ruralities (Zhang & Li, 2025).

2.5 Sectoral Interlinkages

The agricultural sector has a high forward and backward integration with other sectors of the economy. Backward linkages entail the demand of inputs (fertilizers, machinery, labor), and this boosts other industries to grow. Forward linkages entail the provision of raw materials to the agro-processing industries and other industries (Lee et al., 2024). The impact of agricultural development on the general economic performance is intensified by these interlinkages.

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3. LITERATURE REVIEW

3.1 Global Empirical Evidence

Extensive empirical research has examined the relationship between agricultural exports and economic growth. A panel data analysis of 25 developing countries (1990-2020) indicated a positive and statistically significant relationship between a 1-percent increase in agricultural exports and a 0.35-percent improvement in GDP growth (Thommandru et al., 2023).

Long-run (coefficient of 0.48) analysis by ARDL revealed stronger findings in Sub-Saharan African countries which showed that export expansion has long-lasting benefits (accumulated over time). Short-run effects (coefficient of 0.21) were found to be weaker than long-run effects (Siaw et al., 2018).

The results of cross-country regression analysis of Asian economies revealed ambivalent findings: the stronger effect on the growth (0.5% increase in GDP per 1% increase in exports) was observed in countries with diversified agricultural exports and high technology adoption, whereas weak or insignificant relationships were observed in countries that relied on primary and low-value agricultural products (Kumari & Kakar, 2023).

Nevertheless, other studies have reported adverse or minimal impacts of the external shocks. The study of Latin American economies showed that the effect of fluctuations of global agricultural prices decreased the positive export contributions and volatility decreased GDP growth by up to 0.2% per year.

3.2 Evidence from Uzbekistan and Central Asia

The case-specific evidence on Uzbekistan and Central Asia offer valuable background. The time-series analysis of Uzbekistan (2000-2022) was conducted by the ARDL, which formed a significant relationship between agricultural exports and GDP in the long-run, the long-run coefficient being 0.42. The magnitude of short-run effects was smaller (coefficient 0.18), which means that there was a slow adjustment in the long-run equilibrium. Also Kadirova (2025) ascertain validity and robustness, consistent with prior econometric applications in analyzing macroeconomic dynamics.

The panel econometric analysis of the Central Asian states (Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan) showed that agricultural exports had a positive influence on the economic growth, but the strengths of the association were not the same. The effects were more pronounced in Uzbekistan and Kazakhstan (0.40-0.45 elasticity), weaker in Kyrgyzstan and Tajikistan (0.20-0.25 elasticity), mainly as they had less export diversification and infrastructure constraints (Begimkulov, 2026).

3.3 Identified Research Gaps

The literature review reveals several gaps:

1. Irregular empirical findings regionally and over time.
2. The absence of emphasis on dynamic behavior of agricultural exports and other macroeconomic variables (investment, inflation, exchange rates)
3. Obsolete evidence of Uzbekistan and Central Asia based on recent statistics and more sophisticated econometric techniques.
4. Lack of attention to export quality and value addition- most research is concerned with export quantity and not processing and diversification effects.

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4. METHODOLOGICAL FRAMEWORK

4.1 Research Design

This paper is a purely quantitative study which follows econometric analysis to investigate the relationship between agricultural exports and economic growth. The data analysis is carried out using secondary data of national statistical databases, international financial organizations, and published reports.

4.2 Variable Specification

Dependent variable: Economic growth (GDP or GDP growth rate)
Independent variable: Agricultural exports (value or volume)
Control variables: Investment, labor force, trade openness, inflation rate, exchange rate, government expenditure

4.3 Functional Forms

The variables relationship will be defined with the help of logarithmic transformations to stabilize the variance and be able to interpret the coefficients as elasticities. The overall shape of the model is:

$$\ln(GDPt) = \beta 0 + \beta 1 \ln(AEXPt) + \beta 2 \ln(INVt) + \beta 3 \ln(LABt) + \beta 4 \ln(OPENt) + \varepsilon t$$

Where:

- GDP = Gross Domestic Product
- AEXP = Agricultural exports
- INV = Investment
- LAB = Labor force
- OPEN = Trade openness
- ε = Error term

4.4 Econometric Methods

The study employs several econometric techniques:
Stationarity testing: Augmented Dickey-Fuller (ADF) test to test the unit roots of time-series data.
Cointegration analysis: To determine long-run equilibrium relationships among variables.
Error Correction Model (ECM): To describe the dynamics in the short run and the process of adjustment to the long-run equilibrium.
Autoregressive Distributed Lag (ARDL) model: It is used to capture both the short and long-run effects.
Diagnostic tests: Incorporating autocorrelation, heteroscedasticity and model stability tests to ascertain validity and robustness.

4.5 Model Specifications

The ARDL model specification is:

$$\Delta \ln(GDPt) = \alpha 0 + \sum i=1 \alpha 1 \Delta \ln(GDPt-i) + \sum i=0 \alpha 2 \Delta \ln(AEXPt-i) + \sum i=0 \alpha 3 \Delta \ln(INVt-i) + \lambda 1 \ln(GDPt-1) + \lambda 2 \ln(AEXPt-1) + \lambda 3 \ln(INVt-1) + \varepsilon t$$

The Error Correction Model specification is:

$$\Delta \ln(GDPt) = \beta 0 + \sum i=1 \beta 1 \Delta \ln(GDPt-i) + \sum i=0 \beta 2 \Delta \ln(AEXPt-i) + \delta ECTt-1 + \varepsilon t$$

Where ECT is the error correction term which is the speed of adjustment to long-run equilibrium.

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5. EXPECTED OUTCOMES AND DISCUSSION

5.1 Anticipated Findings

According to the theoretical framework and the existing literature, the following outcomes are expected:

1. There is a positive relationship between agricultural exports and economic growth which is statistically significant.
2. More powerful long-run effects than short-run effects.
3. Large cointegration of agricultural exports and GDP.
4. The difference in the magnitude of effects depending on the diversification of exports and the technological use.

5.2 Policy Implications

The results are likely to endorse evidence-based policy implications such as:

- Policies to increase the competitiveness of agricultural exports.
- Basket agricultural export diversification.
- Investment in technology and infrastructure in agriculture.
- Combination of agricultural export policy with overall economic development policies.
- Measures to reduce the vulnerability to external shocks (price fluctuations, climate change).

6. CONCLUSION

This paper has come up with a complete econometric modeling of how the agricultural exports affect economic growth. The model combines both the export-led growth theory, neoclassical and endogenous growth theories as well as the world and regional researches.

The suggested approach can fill the research gaps, including dynamic effects, macroeconomic variables control, and context-specific analysis. Cointegration and error correction modeling enable the individual estimation of both short-run and long-run effects that give a more nuanced view of the issues than prior studies.

The applied value of this study, is that it has the potential to inform policy making in sectors of agriculture, trade and economic development in developing economies especially in Central Asia. Further studies that need to be done in the future include this framework with measures of export quality, value addition and disaggregation by sector.

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