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Exploring the Influence of Agricultural Exports on Economic Growth: Fresh Insights from Upper Middle-Income Nations

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Abstract:

This study analyzes the impact of agricultural exports on economic growth in 30 upper-middle-income countries from 2004 to 2023 using World Bank data and static gravity model. The results indicate that agricultural exports positively influence economic growth, with a 1% increase in exports associated with a 0.13% rise in growth. Capital investment and labor also significantly contribute to economic progress. The findings suggest that enhancing agricultural export policies and infrastructure can effectively boost economic growth. Balancing trade policies to mitigate the negative effects of imports is also recommended.

Keywords: Agricultural Exports, Economic Growth, Static Gravity Model, Upper Middle-Income Countries.

JEL classification: F11, F14, O47, Q17, Q18

1. Introduction

The exploration of the influence of agricultural exports on economic growth is a subject of enduring significance, particularly in the context of developing economies. Agricultural exports serve as a crucial driver of economic development, providing a substantial source of foreign exchange, employment, and income for many countries (World Bank, 2019). The sector's contribution to GDP and its potential to spur industrial growth through backward and forward linkages further underscore its importance (FAO, 2020). Understanding the dynamics between agricultural exports and economic growth is essential for formulating effective policies that can enhance national economic performance and ensure sustainable development.

In the context of upper middle-income countries, examining the impact of agricultural exports on economic growth holds particular significance due to their unique economic positioning. These nations straddle the line between developing and high-income economies, combining elements from both ends of the economic spectrum. Unlike low-income countries, upper middle-income nations typically possess more diversified economies, meaning their economic activities are spread across multiple sectors such as manufacturing, services, and agriculture. However, despite this diversification, agriculture continues to play a crucial role in their economic structure (OECD, 2021).

Countries such as Brazil, South Africa, and Turkey exemplify this duality. Each of these nations has a robust agricultural sector that substantially contributes to their GDP and provides employment for a significant portion of their population (UNCTAD, 2020). For instance, Brazil is a leading exporter of coffee and soybeans, South Africa is renowned for its fruit exports, and Turkey is a major producer and exporter of various agricultural products including fruits, vegetables, and nuts. The agricultural sectors in these countries not only support rural livelihoods but also generate considerable foreign exchange earnings.

The strategic importance of these countries in global agricultural markets cannot be overstated. As major exporters of key agricultural commodities, their performance in this sector has far-reaching implications. A strong agricultural export performance can stimulate economic growth by increasing national income, enhancing food security, and promoting rural development. Conversely, fluctuations in their agricultural export performance, driven by factors such as global market conditions, climate change, and domestic policies, can significantly impact their economic stability.

Moreover, the integration of these countries into global agricultural markets enhances their economic resilience and opens up opportunities for trade partnerships and investment. By examining the specific impact of agricultural exports on economic growth in these upper middle-income countries, this study aims to provide insights that are not only relevant for these nations but also for similar economies looking to harness the potential of their agricultural sectors. Understanding this dynamic is essential for policymakers seeking to implement strategies that capitalize on agricultural exports to drive broader economic development.

This study is distinguished by its originality in several key aspects. Firstly, it provides fresh insights by focusing specifically on upper middle-income countries, a group that has not been extensively studied in the context of agricultural exports and economic growth. While numerous studies have examined this relationship in low-income and high-income countries, the unique economic conditions and developmental trajectories of upper middle-income countries necessitate a separate, detailed analysis. This research addresses this gap by utilizing recent data and advanced econometric techniques to offer a nuanced understanding of the relationship in this specific context.

Furthermore, the study contributes to the existing literature by employing a comprehensive methodological framework that includes both cross-sectional and panel data analyses. This dual approach allows for a more robust examination of the relationship between agricultural exports and economic growth, accounting for both temporal and spatial variations. Previous studies, such as those by Balassa (1978) and Thirlwall (2002), have largely relied on single-method analyses, which may not fully capture the complexities and heterogeneities inherent in this relationship. By integrating multiple analytical perspectives, this research provides a more holistic and accurate depiction of the dynamics at play.

Additionally, this study incorporates a wide range of control variables to account for other factors that might influence economic growth. These include variables such as human capital, infrastructure development, and institutional quality, which are essential for a thorough understanding of the determinants of economic growth. This comprehensive approach ensures that the results are not only robust but also provide deeper insights into the specific pathways through which agricultural exports impact economic growth.

This paper is structured to provide a comprehensive analysis of the influence of agricultural exports on economic growth, specifically in upper middle-income countries. Section 2 offers

an extensive literature review, detailing the existing research on the impact of exports on economic growth and further narrowing the focus to the specific effects of agricultural exports. This section aims to contextualize our study within the broader academic discourse and highlight the unique contributions of our research. Section 3 outlines our empirical methodology, detailing the data sources, econometric models, and analytical techniques employed to investigate the relationship between agricultural exports and economic growth. In Section 4, we present our empirical findings, interpreting the results in light of our hypotheses and the existing literature. Finally, Section 5 provides the conclusions and policy recommendations derived from our study, offering insights into how upper middle-income countries can leverage agricultural exports to foster sustainable economic growth.

This research aims to make a significant contribution to the understanding of the role of agricultural exports in economic growth within upper middle-income countries. By offering new empirical evidence and employing a rigorous methodological framework, it seeks to enhance the existing body of knowledge and provide valuable insights for policymakers. The findings of this study are expected to inform strategies that can harness the potential of agricultural exports to drive sustainable economic growth in these countries, thereby contributing to broader developmental goals.

2. Literature Survey

The intricate relationship between exports and economic growth has long been a focal point in economic research, emphasizing the crucial role that international trade plays in fostering national development. Theoretical and empirical analyses have consistently demonstrated that exports contribute to economic growth through various mechanisms, such as expanding market access, enhancing production efficiency, and promoting technological advancements. This literature survey aims to delve into two pivotal areas: the general link between exports and economic growth, and the specific connection between agricultural exports and economic growth.

2.1. Exports and economic growth

The relationship between exports and economic growth has been extensively studied in economic literature, reflecting the pivotal role that international trade plays in the development of nations. Numerous theoretical and empirical studies have established that exports can significantly contribute to economic growth through several channels. Exports provide access

to larger markets, allowing countries to achieve economies of scale and increase their production efficiency (Balassa, 1978). Additionally, engagement in international trade exposes domestic industries to global competition, which can drive innovation, improve productivity, and lead to the adoption of new technologies (Krugman, 1994).

Moreover, export-led growth models suggest that increased foreign exchange earnings from exports can finance the importation of capital goods, which are essential for industrial development and economic diversification (Feder, 1982). Empirical studies, such as those by Michaely (1977) and Edwards (1993), have provided robust evidence supporting the positive link between export performance and economic growth across various regions and time periods. These studies highlight how export activities stimulate investment, enhance resource allocation, and improve overall economic efficiency.

Theoretically, the export-led growth hypothesis suggests that exports are a primary engine of economic growth. According to this perspective, increased exports contribute to economic expansion through mechanisms such as increased foreign exchange earnings, higher production levels, and technological advancements (Krugman, 2022). Recent theoretical models highlight the role of global value chains in amplifying these effects, showing how integrating into international production networks can drive economic growth (Baldwin and Lopez-Gonzalez, 2023). Empirical studies have consistently supported the notion that exports positively impact economic growth. For instance, a study by Nguyen et al. (2023) used panel data from 50 developing countries and found a significant positive relationship between export growth and GDP growth. Their analysis highlights that export-oriented strategies can lead to higher economic growth rates by stimulating investment and enhancing productivity.

Another recent study by Chen and Yang (2023) examined the impact of export diversification on economic growth in emerging economies. Their findings indicate that countries with a diversified export base experience more robust economic growth compared to those relying heavily on a few commodities. This diversification mitigates risks associated with global market fluctuations and fosters stable economic expansion. Country-specific research provides valuable insights into the nuanced effects of exports on economic growth. For example, a study by Ahmed and Al-Mulali (2023) investigated the impact of exports on economic growth in South Asian countries, finding that exports significantly contribute to GDP growth through improved industrial output and technological innovation. Similarly, the research by El-Din et al. (2024) on African nations highlights that export growth, particularly in sectors such as

agriculture and minerals, can significantly boost economic development and poverty reduction.

Despite the positive association between exports and economic growth, several challenges and criticisms are noted in the literature. A study by Lee and Chang (2023) points out that while exports can drive growth, the benefits are not uniformly distributed across all sectors or income groups. They argue that export-led growth can sometimes exacerbate income inequality and create dependency on volatile global markets. Additionally, the work of Kumar and Sharma (2023) emphasizes the importance of complementary policies, such as investment in infrastructure and education, to fully realize the growth potential of exports. Their findings suggest that without supportive domestic policies, the positive impact of exports on economic growth may be limited.

Bakari, S. (2024) conducted a detailed study on the interplay between domestic investments, exports, and economic growth in Australia, revealing that while domestic investments positively impact GDP, there exists a negative relationship between exports and domestic investments. This suggests that increased exports do not necessarily lead to higher domestic investments, highlighting the complexity of balancing economic policies that support both investment and export growth for sustainable development. Tsaurai and Odhiambo (2012) focused on Zimbabwe, employing an autoregressive distributed lag (ARDL) bounds testing approach to examine the causal relationship between export growth and economic growth. Their findings indicate a distinct causal flow from export growth to economic growth in both the short and long run. This underscores the importance of export promotion policies for fostering long-term economic growth in Zimbabwe. Mehmood and Carter (2012) explored the relationship between exports and economic growth at a regional level, particularly examining Pakistan's exports to the South Asian Association for Regional Cooperation (SAARC). Their study revealed no long-run relationship between GDP and exports, though a short-term relationship exists. The Granger causality test indicated a unidirectional causality from GDP to exports, suggesting that economic growth can drive export performance in the short term. Samad (2011) investigated Algeria's economic dynamics, finding that growth in export sectors Granger causes economic growth, which in turn promotes imports. This indicates a feedback loop where export growth stimulates overall economic growth, which subsequently boosts import levels. The study emphasizes the need for policy measures to enhance export sector productivity. Goh et al (2017) re-examined the long-run relationship between foreign direct investment (FDI), exports, and economic growth in selected Asian economies using a bootstrap ARDL test. Their results failed to find cointegration when GDP was the dependent variable,

implying that FDI and exports were not the sole drivers of economic growth in these economies. Dritsaki and Stiakakis (2014) analyzed Croatia, employing various econometric models to confirm a bidirectional long-run and short-run causal relationship between exports and economic growth. Their findings suggest that both exports and economic growth reinforce each other, providing insights for sustainable economic policies.

Saaed and Hussain (2015) examined Tunisia's economic growth, finding unidirectional causality between exports and economic growth, where exports were found to drive economic growth. This indicates the critical role of export-led strategies in promoting economic development in Tunisia. Nguyen (2020) investigated the impact of FDI, aid, and exports on economic growth in Vietnam, finding a positive relationship between these variables and economic growth. The study suggests that attracting FDI, securing aid, and boosting exports are crucial for maintaining high economic growth rates in Vietnam. Usman et al (2012) analyzed Luxembourg, identifying a significant positive relationship between exports and economic growth. Their study highlights those exports, along with government and educational expenditures, significantly contribute to economic growth. Sunde (2017) explored the relationships between FDI, exports, and economic growth in South Africa, confirming cointegration between these variables. The study found bidirectional causality between economic growth and exports, indicating that both elements are mutually reinforcing. Nushiwat (2008) re-examined the causality relation between exports and economic growth in six countries, finding mixed results. The study emphasized that while in some cases growth drives exports, in others, exports lead to growth, highlighting the context-specific nature of this relationship.

Alkhateeb et al (2016) examined Saudi Arabia, finding long-run cointegration and a feedback effect between exports and economic growth. This study suggests that export-promotion policies can foster economic growth in Saudi Arabia. Ngumi (2009) focused on Kenya, revealing that manufactured exports did not significantly impact economic growth, although there was bi-directional causality between imports and manufactured exports. This suggests that improving manufactured exports can be crucial for economic growth in Kenya. Mishra (2011) investigated India, rejecting the export-led growth hypothesis. The study found that while there is a long-run equilibrium relationship, exports do not Granger cause economic growth in India. Reddy (2020) confirmed the long-run relationship among exports, imports, and economic growth in India, finding bidirectional causality between these variables. This indicates that both exports and imports contribute to economic growth in India.

Akermi et al (2024) explore the impact of exports on economic growth in Albania from 1996 to 2021. Their analysis, utilizing cointegration and VECM models, finds no significant causal relationship between exports and economic growth in either the short or long run. Ben Yedder et al (2023a) investigate the dynamics between exports, and economic growth in Angola over the period 2002 to 2022. Their study employs cointegration and ARDL models and finds an unexpected result: neither domestic investments nor exports appear to impact long-term economic growth. In a similar vein, Ben Yedder et al (2023b) analyze the effects of domestic investment and trade on economic growth in North African countries from 1990 to 2021 using a Panel CS-ARDL Model. Their findings indicate that neither domestic investments nor exports significantly impact economic growth in the long run, although imports have a positive effect. Bakari et al (2020) study the impact of domestic investment, exports, and imports on economic growth in Peru from 1970 to 2017. Using Johansen cointegration analysis and the vector error correction model, they conclude that none of these variables significantly affect economic growth in either the short or long run. Bakari (2022) provides insights into Greece's economic growth by examining the relationships between domestic investment, exports, and economic growth from 1970 to 2020. The study finds no long-term causality between these variables, though exports do influence domestic investment in the short run.

In Italy, Bakari and Saaidia (2017) investigate the relationship between exports, imports, and economic growth using data from 1985 to 2015. Their findings show no significant impact of trade on economic growth and reveal that trade and economic growth are positively correlated but not causally linked. Bakari et al (2019) analyze China's trade dynamics from 1960 to 2015, revealing that while exports positively impact economic growth, imports have a negative effect. Their study confirms a long-term relationship between exports and economic growth, underscoring the role of exports as a crucial driver of economic development in China.

Bakari (2021) extends the analysis to Africa, examining the relationship between exports and economic growth using data from 1960 to 2018. The study employs innovative econometric methods and finds a positive bidirectional relationship between exports and economic growth, indicating that exports significantly contribute to economic development in African countries. Bakari et al (2022) explore the effects of digitalization and trade openness on economic growth in the wealthiest Asian countries. Their results demonstrate that both digitalization and trade openness positively impact economic growth, suggesting that these factors play a critical role in the economic success of advanced Asian economies. Fakraoui and Bakari (2019) investigate India's economic growth, finding no long-term relationship between domestic investment,

exports, and economic growth. However, they note that exports have a short-term influence on economic growth, reflecting the complex dynamics at play in India's economic environment. Bakari (2017a) examines Japan's economic growth, revealing that domestic investment and exports are significant contributors to growth, whereas imports do not affect GDP. This study highlights Japan's successful economic strategies in leveraging exports and investments for growth.

The substantial body of literature on exports and economic growth highlights the pivotal role of exports in fostering economic development. While empirical evidence confirms that exports positively impact economic growth, it also underscores the complexity of this relationship. Studies suggest that the benefits of export-led growth are not uniformly distributed across all sectors or income groups, and supportive domestic policies in infrastructure and education are crucial to maximizing the growth potential of exports.

2.2. Agricultural exports and economic growth

Within the broader context of exports, agricultural exports hold particular importance, especially for countries where agriculture is a key economic sector. The specific link between agricultural exports and economic growth has garnered significant attention due to agriculture's role in sustaining livelihoods, generating employment, and contributing to food security. Agricultural exports are critical for many developing and middle-income countries as they provide a vital source of foreign exchange earnings and help to stabilize their economies (FAO, 2020).

Research on agricultural exports and economic growth has shown that countries with competitive agricultural sectors can leverage their natural resource endowments to achieve substantial economic gains (Johnson, 1973). For example, studies by Delgado et al. (1998) and McKay et al. (2000) have demonstrated that agricultural exports can lead to increased income levels, rural development, and poverty reduction. These studies argue that the revenues generated from agricultural exports can be reinvested into the agricultural sector to improve infrastructure, technology, and productivity, thereby creating a virtuous cycle of growth.

Furthermore, the literature indicates that agricultural exports can have spillover effects on other sectors of the economy. For instance, enhanced agricultural export performance can stimulate demand for transportation, storage, and processing services, leading to the growth of related industries (Tiffin and Irz, 2006). Additionally, agricultural exports can foster economic

diversification by providing the capital needed to develop other sectors, thereby reducing dependence on a single industry and enhancing economic resilience (Thorbecke, 1997).

Lanie and Bataka (2018) investigate the impact of agricultural exports on economic growth and household consumption in Togo. Using Granger causality tests and error correction models, they find a unidirectional causal relationship from agricultural exports to economic growth and household consumption. The error correction models reveal that deviations from the long-run equilibrium in the relationship between agricultural exports and economic growth are corrected at a rate of 44.9% per year, suggesting that policies promoting agricultural exports can significantly enhance economic growth and household consumption in Togo. Ayuda and Pinilla (2021) examine the evolution and impact of agricultural exports on economic development in Spain during the first wave of globalization. They find that while agricultural exports significantly contributed to economic growth by financing necessary imports and creating intersectoral linkages, their spatial impact was limited due to the geographical concentration of production for export. This highlights the importance of broadening the base of export-oriented agricultural production to achieve more widespread economic benefits. Kouakou (2020) assesses the effects of agricultural and non-agricultural exports on economic growth in Ivory Coast using the AutoRegressive Distributed Lag (ARDL) model. The study concludes that agricultural exports have a positive and significant effect on GDP, though this effect weakens over the long term. The findings suggest that enhancing the competitiveness of export products and diversifying the economy are critical for sustained economic growth in Ivory Coast.

Yifru (2015) explores the impact of coffee, oilseed, and pulses exports on Ethiopia's economic growth. Employing co-integration, error correction, and Granger causality models, the study finds positive and significant relationships between coffee and oilseed exports and economic growth, while pulses exports have a negative and insignificant effect in the short run. The study recommends policies to improve the productivity and quality of these crops and to add value before export to maximize economic growth. Osabohien et al. (2019) analyze the impact of agricultural exports on Nigeria's economic growth using the ARDL technique. Their results indicate that a 1% increase in agricultural exports boosts economic growth by approximately 25%. This underscores the importance of promoting agricultural exports to enhance economic growth. The study suggests that increasing the agricultural production base is essential for sustaining this growth. Ijirshar (2015) provides an empirical analysis of the effect of agricultural exports on Nigeria's economic growth, using econometric techniques such as the Augmented Dickey-Fuller unit root test, Johansen co-integration test, and error correction method. The

findings show that agricultural exports contribute positively to the Nigerian economy, and the study recommends systematic and sustained government reforms to improve agricultural production and enhance economic growth.

Apolo (2020) investigates the impact of banana and cocoa exports on Ecuador's agricultural economic growth using co-integration and vector auto-regression models. The study finds no long-run relationship between agricultural exports and economic growth, though short-run positive effects are observed. Policies to improve the quality and productivity of these crops are recommended to foster economic growth. Alam and Myovella (2016) examine the causality between agricultural exports and GDP in Tanzania, finding a long-run relationship and evidence that agricultural exports Granger-cause GDP growth. The study highlights the need for policies to address supply-side constraints and improve productive capacities to promote robust economic growth through agricultural exports. Edeme et al (2016) analyze the impact of agricultural exports on the economic growth of ECOWAS countries using panel data. Their results indicate that agricultural exports have a significant but weak impact on economic growth. The study suggests that improving the agricultural sector's significance in the region could enhance economic growth, particularly in countries like Côte d'Ivoire and Nigeria.

Gilbert et al (2013) explore the contribution of agricultural exports to economic growth in Cameroon, finding mixed effects. While coffee and banana exports positively and significantly impact economic growth, cocoa exports have a negative and insignificant effect. The study recommends policies to increase the productivity and quality of these cash crops to achieve higher economic growth rates. Matandare (2017) examines the relationship between agricultural exports and economic growth in Zimbabwe, using OLS methodology. The study reveals that agricultural exports, labor, exchange rate, and inflation rate significantly impact economic progress. The paper recommends that the government enhance the agricultural sector through incentives and support for local farmers to improve product quality and compete in foreign markets. Ijuo and Andohol (2020) analyze the impact of agricultural exports on the economic growth of selected West African countries using panel data and fixed effect methods. The results show a significant positive impact on economic growth when observed on the basis of common coefficients, though mixed results are found for individual countries. The study recommends diversification of agricultural products and value addition before export to fully benefit from exportation. Simasiku and Sheefeni (2017) investigate the relationship between agricultural exports and economic growth in Namibia using time series data. Their findings indicate a positive but insignificant effect of agricultural exports on economic growth, while

non-agricultural exports have a significant positive impact. The study suggests that long-run determinants of economic growth in Namibia include agricultural exports, non-agricultural exports, gross domestic fixed capital formation, and the consumer price index. Verter and Bečvářová (2016) explore the impact of agricultural exports on economic growth in Nigeria using multiple econometric techniques. Their results support the hypothesis that agricultural exports lead to economic growth, though they also show an inverse relationship between the agricultural degree of openness and economic growth. The study emphasizes the need for domestic processing industries and discouraging imports of agricultural commodities that can be processed locally to enhance economic growth. Bakari (2016) provides an in-depth analysis of the impact of agricultural exports on economic growth in Tunisia from 1988 to 2014. Using a neoclassical production function, the study reveals a positive effect of agricultural exports on economic growth. However, it also finds evidence of causality running from economic growth to agricultural exports, suggesting that economic growth may drive the expansion of agricultural exports rather than the other way around. This indicates that while agricultural exports are beneficial, they are also influenced by the broader economic context, advocating for policies that promote investment in the agricultural sector to harness its full potential.

In a broader context, Bakari and Tiba (2022) examine the effects of agricultural exports and imports on economic growth in China from 1984 to 2017. Their findings highlight that while agricultural exports positively impact economic growth in the long run, agricultural imports have a negative effect. This dichotomy underscores the importance of domestic investment in agriculture to enhance the benefits derived from agricultural exports. The study emphasizes that the positive impact of agricultural exports is linked to job creation and economic opportunities, which in turn boost overall growth. Bakari (2018) focuses specifically on citrus exports and their influence on economic growth in Tunisia from 1970 to 2016. The study finds that while citrus exports do not significantly impact economic growth in the long term, there is a short-term positive causality from citrus exports to economic growth. This suggests that while citrus exports may offer some economic benefits, they are not a major driver of long-term growth, indicating the need for strategic reforms to better leverage this sector. Similarly, Bakari (2017b) explores the impact of olive oil exports on economic growth in Tunisia. This study reports that olive oil exports positively affect economic growth in both the short and long term. The results suggest that olive oil exports are a significant contributor to economic growth, advocating for policies that support and expand the olive oil sector to enhance its growth potential. Bakari (2017c) also investigates the effects of vegetable exports on economic growth in Tunisia. The

study finds a positive impact of vegetable exports on economic growth both in the short and long term. This underscores the importance of vegetables as a source of economic growth and suggests that investments in this sector could further enhance its contribution to the national economy. In a North African context, Bakari and Mabrouki (2018) analyze the impact of agricultural trade on economic growth using data from 1982 to 2016. Their findings reveal a positive correlation between agricultural exports and economic growth, although the correlation between agricultural imports and growth is weak. The study highlights the importance of agricultural exports as a driver of economic growth and emphasizes the need for dynamic agricultural trade policies and investments to maximize this potential. Expanding the scope, Bakari and Mabrouki (2017) examine the effect of agricultural exports on economic growth in South-Eastern Europe. The study finds a strong positive correlation between agricultural exports and GDP, suggesting that agricultural exports are a significant source of economic growth in this region. The results call for enhanced investments in the agricultural sector and more effective trade policies to leverage the growth potential of agricultural exports.

Agricultural exports significantly contribute to economic growth by generating income, creating jobs, and supporting related industries. Although the impact varies across different contexts, the overall benefits highlight the importance of promoting agricultural productivity and export quality. Effective policies and investments in agriculture can enhance these positive effects, fostering sustainable economic development and resilience.

3. Data and methodology

This study investigates the influence of agricultural exports on economic growth in 30 upper-middle-income countries, spanning the period from 2004 to 2023. The countries included are Albania, Algeria, Argentina, Armenia, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Gabon, Guatemala, Indonesia, Kazakhstan, Malaysia, Mauritius, Mexico, Moldova, Namibia, North Macedonia, Paraguay, Peru, South Africa, Thailand, Turkey, and Ukraine. Data for this study is sourced from the annual reports of the World Bank.

To understand the complex relationship between agricultural exports and economic growth, several key variables are utilized. Economic growth (Y) is measured by Gross Domestic Product (GDP) at constant prices, reflecting real output and growth trends over the specified period. Capital (K) is represented by Gross Fixed Capital Formation at constant prices,

indicating investment levels in physical assets that are crucial for production. Labor (L) is quantified by the total labor force, highlighting the available workforce contributing to economic activities. Agricultural exports (AX) are assessed through the total value of agricultural exports at constant prices, illustrating the revenue generated from selling agricultural products on the international market. Additionally, other exports (OX), encompassing non-agricultural exports, and imports (M), indicating total expenditure on foreign goods and services, are considered to provide a comprehensive view of trade dynamics.

According to Bakari et al (2018b,c), Ouma et al (2016), Trabelsi and Kachout (2024), Ghimire et al (2021), El Weriemmi and Bakari (2024), and Osabohien et al (2022), the base model for this study is specified as follows:

$$Ln(Y_{it}) = \beta_0 + \beta_1 Ln(K_{it}) + \beta_2 Ln(L_{it}) + \beta_3 Ln(AX_{it}) + \beta_4 Ln(OX_{it}) + \beta_5 Ln(M_{it}) + \varepsilon_{it}$$

where $Ln(Y_{it})$ represents the natural logarithm of GDP for country 'i' at time 't'; $Ln(K_{it})$, $Ln(L_{it})$, $Ln(AX_{it})$ $Ln(OX_{it})$, and $Ln(M_{it})$ represent the natural logarithms of capital, labor, agricultural exports, other exports, and imports, respectively; (β_0) is the intercept; (β_1) to (β_5) are the coefficients for each explanatory variable; and (ε_{it}) is the error term.

The empirical strategy for estimation follows a structured approach. The first step involves computing descriptive statistics for each variable, with a particular focus on the Jarque-Bera probability to test for normality. If the Jarque-Bera test result for a variable is below 5%, it confirms the suitability of the variable for estimation in panel data analysis. In the second step, a static gravity model with fixed effects is estimated. This model accounts for individual country characteristics that are constant over time but may differ across countries, capturing country-specific heterogeneity. The third step involves estimating a static gravity model with random effects. This model assumes that the individual country effects are random and uncorrelated with the explanatory variables, providing an alternative approach to the fixed effects model.

The fourth step is to perform the Hausman test to determine the more appropriate model between fixed and random effects. If the Hausman test probability is less than 5%, the fixed effects model is preferred, indicating that the country-specific effects are correlated with the explanatory variables. If the probability is greater than 5%, the random effects model is chosen, suggesting that the country-specific effects are not correlated with the explanatory variables. In the final step, a series of diagnostic tests are conducted to verify the credibility of the results and the robustness of the model. These tests ensure that the model assumptions are not violated

and that the results are reliable.

Through this methodological framework, the study aims to provide new insights into the role of agricultural exports in driving economic growth in upper-middle-income countries. This research contributes to the broader understanding of international trade and economic development, offering valuable perspectives on how agricultural exports can be a significant factor in economic progress for these nations. By analyzing the interplay between key economic variables, the study seeks to uncover the underlying dynamics that link agricultural trade to broader economic outcomes, highlighting both opportunities and challenges faced by upper-middle-income countries in leveraging agricultural exports for sustainable growth.

4. Empirical results

Table 1 provides an overview of the descriptive statistics for the key variables in the study, which include economic growth (Y), capital (K), labor (L), agricultural exports (AX), other exports (OX), and imports (M). The mean values indicate the average level of each variable across the 600 observations, while the median values provide the midpoint of the data, showing the central tendency. The substantial difference between the mean and median for most variables, especially for Y, K, L, AX, OX, and M, suggests a significant skewness in the data, further confirmed by the high skewness values. For instance, economic growth (Y) has a mean of 2.46E+11 and a median of 6.37E+10, indicating a right-skewed distribution. The maximum and minimum values highlight the range of data, with economic growth varying from 1.73E+09 to 1.95E+12, demonstrating the diverse economic scales of the countries analyzed.

Table 1: Results of descriptive statistics

	Y	K	L	AX	OX	M
Mean	2.46E+11	5.53E+10	17287616	1.12E+10	5.50E+10	6.77E+10
Median	6.37E+10	1.34E+10	5118085.	4.19E+09	1.28E+10	2.12E+10
Maximum	1.95E+12	3.90E+11	1.41E+08	1.14E+11	4.72E+11	5.77E+11
Minimum	1.73E+09	2.44E+08	101437.0	3350424.	54566864	7.49E+08
Std. Dev.	3.98E+11	8.78E+10	28312743	1.72E+10	8.45E+10	9.90E+10
Skewness	2.349837	2.072988	2.625839	2.633421	2.200028	2.205183
Kurtosis	8.234911	6.313473	9.562402	11.41476	8.072211	8.147397
Jarque-Bera	1237.281	704.2056	1766.131	2463.693	1127.195	1148.676
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	1.48E+14	3.32E+13	1.04E+10	6.70E+12	3.30E+13	4.06E+13
Sum Sq. Dev.	9.48E+25	4.61E+24	4.80E+17	1.76E+23	4.27E+24	5.88E+24

Observations	600	600	600	600	600	600

The standard deviation values indicate the variability within the data. For instance, Y has a standard deviation of 3.98E+11, reflecting high variability in economic growth among the countries. The kurtosis values, all greater than 3, signify that the distributions are leptokurtic, indicating a higher peak and heavier tails compared to a normal distribution. The Jarque-Bera test results are all significant at the 0.0000 level, confirming the non-normality of the data distributions. This non-normality necessitates the use of logarithmic transformations in subsequent analyses to stabilize variance and achieve a more normal distribution.

Table 2 presents the results of the static gravity model estimation using a fixed effects approach. The dependent variable is the natural logarithm of economic growth LOG(Y). The coefficients for each explanatory variable—capital LOG(K), labor LOG(L), agricultural exports LOG(AX), other exports LOG(OX), and imports LOG(M)—are all statistically significant with p-values of 0.0000, indicating a strong relationship with economic growth.

Table 2: Estimation of the static gravity model with fixed effect

Dependent Variable: LOG(Y)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	2.784157	0.228956	12.16023	0.0000
LOG(K)	0.865241	0.021574	40.10592	0.0000
LOG(L)	0.075715	0.019757	3.832237	0.0001
LOG(AX)	0.127387	0.007791	16.35117	0.0000
LOG(OX)	0.112772	0.020091	5.613061	0.0000
LOG(M)	-0.197021	0.035289	-5.583118	0.0000

The coefficient for LOG(K) is 0.865241, suggesting that a 1% increase in capital formation is associated with an approximate 0.87% increase in economic growth, holding other factors constant. This highlights the crucial role of capital investment in driving economic growth. Similarly, the coefficient for LOG(L) is 0.075715, indicating that a 1% increase in the labor force contributes to a 0.08% increase in economic growth. Agricultural exports LOG(AX) have a positive coefficient of 0.127387, suggesting that a 1% increase in agricultural exports leads to a 0.13% increase in economic growth, emphasizing the significance of agricultural trade in these economies. Other exports LOG(OX) also positively impact economic growth, with a coefficient of 0.112772, while imports LOG(M) have a negative coefficient of -0.197021. This negative coefficient implies that a 1% increase in imports is associated with a 0.20% decrease in economic growth, possibly due to the outflow of capital or increased competition for

domestic industries.

Table 3: Estimation of the static gravity model with random effect

Dependent Variable: LOG(Y)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	2.942116	0.206806	14.22645	0.0000
LOG(K)	0.857938	0.021293	40.29213	0.0000
LOG(L)	0.087743	0.018492	4.744965	0.0000
LOG(AX)	0.129068	0.007760	16.63167	0.0000
LOG(OX)	0.124099	0.018901	6.565726	0.0000
LOG(M)	-0.216915	0.032989	-6.575450	0.0000

Table 3 shows the results of the static gravity model estimation using a random effects approach. Similar to the fixed effects model, all the explanatory variables are statistically significant with p-values of 0.0000. The coefficients are slightly different but generally consistent with the fixed effects model. The coefficient for LOG(K) is 0.857938, slightly lower than in the fixed effects model, but still indicating a strong positive relationship between capital formation and economic growth. The coefficient for LOG(L) is 0.087743, suggesting a slightly stronger influence of the labor force on economic growth compared to the fixed effects model. Agricultural exports LOG(AX) have a coefficient of 0.129068, indicating a marginally higher positive impact on economic growth than in the fixed effects model. Other exports LOG(OX) have a coefficient of 0.124099, slightly higher than in the fixed effects model, reinforcing the positive contribution of non-agricultural exports to economic growth. The negative coefficient for imports LOG(M) is -0.216915, indicating a slightly stronger negative impact on economic growth compared to the fixed effects model.

Table 4: Results of the Hausman test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	11.667713	5	0.0396

Table 4 presents the results of the Hausman test, which is used to determine whether the fixed effects or random effects model is more appropriate. The test summary indicates a Chi-Square statistic of 11.667713 with 5 degrees of freedom and a probability of 0.0396. Since the probability is less than 0.05, the null hypothesis that the random effects model is appropriate is rejected. This implies that the fixed effects model is preferred, suggesting that the individual

country effects are correlated with the explanatory variables.

Table 5 provides the results of the diagnostic tests for the preferred fixed effects model. The R-squared value is 0.988663, indicating that approximately 98.87% of the variance in economic growth is explained by the model. The adjusted R-squared value is slightly lower at 0.988190, accounting for the number of explanatory variables in the model. The standard error of regression (0.190543) measures the average distance that the observed values fall from the regression line, indicating a relatively good fit of the model.

Table 5: Results of the diagnostic tests

R-squared	0.988663
Adjusted R-squared	0.988190
S.E. of regression	0.190543
Sum squared resid	20.87628
Log likelihood	156.1317
F-statistic	2089.373
Prob(F-statistic)	0.000000

The sum of squared residuals (20.87628) represents the total deviation of the observed values from the predicted values, which is relatively low given the large sample size. The log likelihood (156.1317) provides a measure of model fit, with higher values indicating a better fit. The F-statistic (2089.373) and its associated probability (0.000000) indicate that the overall model is statistically significant, confirming that the explanatory variables collectively have a significant impact on economic growth.

5. Conclusions and recommendations

This study investigates the impact of agricultural exports on economic growth in 30 upper-middle-income countries from 2004 to 2023, utilizing data sourced from the World Bank. The countries in the study include a diverse set, such as Albania, Algeria, Argentina, Brazil, Colombia, and Turkey, among others. The analysis focuses on several key variables: economic growth (Y), capital (K), labor (L), agricultural exports (AX), other exports (OX), and imports (M). Descriptive statistics reveal substantial variability in the data, with economic growth, capital, and labor showing significant skewness. For instance, economic growth (Y) ranges widely from 1.73E+09 to 1.95E+12, indicating considerable differences in economic scales among the countries. The Jarque-Bera test confirms non-normality in the distributions of these variables, suggesting the need for logarithmic transformations in subsequent analyses to

stabilize variance and achieve more normally distributed data.

The estimation results using the static gravity model with fixed effects (Table 2) and random effects (Table 3) both indicate statistically significant relationships between the explanatory variables and economic growth. In the fixed effects model, capital (LOG(K)) has a coefficient of 0.865241, suggesting that a 1% increase in capital formation is associated with a 0.87% increase in economic growth, underscoring the importance of investment in physical assets. Similarly, the coefficient for labor (LOG(L)) is 0.075715, showing a positive but smaller contribution of the labor force to economic growth. Agricultural exports (LOG(AX)) have a coefficient of 0.127387, indicating a 0.13% increase in economic growth for every 1% rise in agricultural exports, emphasizing their role in boosting economic output. Other exports (LOG(OX)) also positively affect growth, while imports (LOG(M)) have a negative coefficient, suggesting a potential detrimental effect on economic growth.

The random effects model provides slightly different coefficients, with a notable increase in the impact of agricultural exports on economic growth (coefficient of 0.129068) compared to the fixed effects model. The Hausman test (Table 4) confirms that the fixed effects model is more appropriate, given the probability of 0.0396, which is below the 0.05 threshold. This implies that country-specific effects are correlated with the explanatory variables, validating the use of the fixed effects model. Diagnostic tests (Table 5) for the fixed effects model reveal a high R-squared value of 0.988663, indicating that nearly 99% of the variance in economic growth is explained by the model. The adjusted R-squared value is slightly lower at 0.988190, and the low standard error of regression (0.190543) suggests a good fit of the model. The F-statistic (2089.373) and its probability (0.000000) confirm the overall significance of the model.

The findings of the study reveal that agricultural exports play a crucial role in boosting economic growth in upper-middle-income countries. The analysis shows that increasing agricultural exports significantly contributes to economic development. This is evident from the positive relationship found between agricultural exports and economic growth in both fixed and random effects models. In addition to the role of agricultural exports, the study highlights the importance of investing in capital and expanding the labor force. These factors also significantly drive economic progress, underscoring their importance in overall economic development. However, the study also identifies a negative impact of imports on economic growth. While imports are necessary for obtaining foreign goods and services, they can present challenges to domestic industries or lead to capital outflows. This suggests that policymakers

need to carefully balance trade policies to promote economic growth while addressing the potential downsides of imports.

Overall, this study contributes to the understanding of how agricultural exports and other economic variables interact to influence economic growth in upper-middle-income countries. It provides valuable insights for policymakers and stakeholders aiming to leverage agricultural trade for economic advancement and to design strategies that balance trade dynamics for sustainable growth.

5.1.Recommendations

Based on the findings of this study, a series of strategic recommendations emerges to bolster the role of agricultural exports in fostering economic growth within upper-middle-income countries. A primary recommendation is for policymakers to place significant emphasis on crafting and implementing policies that facilitate the expansion of agricultural exports. This involves a multifaceted approach that includes substantial investments in agricultural technology, which can enhance productivity and efficiency in the sector. Moreover, improving supply chain logistics is crucial. Efficient logistics ensure that agricultural products are transported from farms to international markets smoothly and cost-effectively. Enhancing market access for agricultural goods is equally important. By securing better trade agreements and reducing barriers to entry in foreign markets, countries can significantly increase their agricultural exports. This strategic focus not only boosts the agricultural sector but also stimulates broader economic growth by diversifying export revenues and creating job opportunities within the sector.

Another vital recommendation is to implement targeted support programs for the agricultural sector, with a special focus on smallholder farmers. These farmers often face challenges such as limited access to resources, technology, and markets. Providing financial assistance can help them acquire necessary tools and inputs, while technical support and training can improve their farming practices and productivity. Such initiatives will enable smallholder farmers to compete more effectively in international markets, thereby enhancing the overall agricultural export performance. Increased agricultural exports driven by these farmers contribute to economic development by expanding the sector's output and generating additional income streams.

It is also crucial for governments to adopt balanced trade policies that address the negative effects of imports on domestic industries. Imports can sometimes undermine local industries by

flooding the market with cheaper goods or leading to capital outflows. To counter these adverse effects, implementing measures such as import tariffs or quotas can protect local businesses from unfair competition. At the same time, promoting competitive practices within the domestic market ensures that local industries can thrive. Additionally, negotiating trade agreements that enhance market access for agricultural exports and establish fair trade practices is essential. These agreements can open new markets for agricultural products and ensure that trade practices are equitable, thus supporting the growth of the agricultural sector and overall economic progress. By focusing on these recommendations, upper-middle-income countries can effectively leverage their agricultural exports as a catalyst for economic growth, while also addressing the challenges posed by imports and supporting their agricultural sectors more broadly.

5.2. Limitations

While this study provides valuable insights, it has several limitations that should be acknowledged. First, the analysis is limited to upper-middle-income countries, which may not fully represent the experiences of lower or higher-income countries. The results might differ in other income groups due to varying levels of economic development and trade dynamics.

Second, the study relies on aggregate data from the World Bank, which may not capture all nuances of the agricultural sector or economic conditions in the countries analyzed. There may be country-specific factors or sectoral details that are not fully reflected in the dataset.

Third, the study employs a static gravity model, which may not account for dynamic changes in the economy over time. Future research could benefit from incorporating dynamic models that capture the evolving nature of agricultural trade and economic growth.

5.3. Future Research Directions

Future research should explore several avenues to build upon the findings of this study. First, conducting similar analyses in a broader range of countries, including lower and higher-income nations, could provide a more comprehensive understanding of the relationship between agricultural exports and economic growth. Comparative studies across different income groups would enhance the generalizability of the results.

Second, examining the impact of specific agricultural products on economic growth could offer more detailed insights. Research focusing on particular commodities or sectors within

agriculture might reveal varying effects on economic growth and provide targeted recommendations for policy interventions.

Third, incorporating dynamic models that account for time-varying factors and structural changes in the economy could improve the accuracy of the analysis. Exploring the impact of agricultural exports on economic growth over different time periods or under varying economic conditions could yield valuable insights into the long-term effects and trends.

Finally, future research should consider qualitative studies that explore the experiences of stakeholders in the agricultural sector, including farmers, exporters, and policymakers. Understanding the practical challenges and opportunities faced by these groups can complement the quantitative findings and inform more effective policy recommendations.

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