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Transformation of the Agricultural Sector and Trade Openness to Indonesia's Economic Growth: Macroeconomic Analysis 1991–2023

Transformasi Sektor Pertanian dan Keterbukaan Perdagangan Terhadap Pertumbuhan Ekonomi Indonesia: Analisis Makroekonomi 1991–2023

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ABSTRACT

Indonesia's economic structure, which is still dominated by the primary sector, particularly agriculture, presents its own challenges in promoting sustainable economic growth, especially amid the dynamics of global trade. This study aims to analyze the impact of the agricultural sector's contribution to Gross Domestic Product (GDP), the proportion of the workforce in the agricultural sector, and trade openness on Indonesia's economic growth. The method used is a quantitative approach with secondary data from the World Bank for the period 1991–2023. The analysis was conducted using multiple linear regression supported by classical assumption testing to ensure the validity of the estimation model. The results of the study indicate that the contribution of the agricultural sector and trade openness have a negative impact on economic growth, while the proportion of agricultural labor has a significant positive impact. These findings reflect the need to improve the quality and productivity of the agricultural labor force as a driver of growth, as well as the importance of formulating trade policies that support the strengthening of the domestic sector. This study makes an important contribution to the formulation of inclusive, sustainable economic development policies based on structural transformation of the agricultural sector.

Keywords: Agriculture, Labor, International Trade, Economic Growth, Macroeconomics

ABSTRAK

Struktur ekonomi Indonesia yang masih didominasi oleh sektor primer, khususnya pertanian, menghadirkan tantangan tersendiri dalam mendorong pertumbuhan ekonomi yang berkelanjutan, terutama di tengah dinamika perdagangan global. Penelitian ini bertujuan untuk menganalisis pengaruh kontribusi sektor pertanian terhadap Produk Domestik Bruto (PDB), proporsi tenaga kerja di sektor pertanian, dan keterbukaan perdagangan terhadap pertumbuhan ekonomi Indonesia. Metode yang digunakan adalah pendekatan kuantitatif dengan data sekunder dari World Bank selama periode 1991–2023. Analisis dilakukan menggunakan regresi linear berganda yang didukung oleh pengujian asumsi klasik untuk memastikan validitas model estimasi. Hasil penelitian menunjukkan bahwa kontribusi sektor pertanian dan keterbukaan perdagangan berpengaruh negatif terhadap pertumbuhan ekonomi, sementara proporsi tenaga kerja pertanian berpengaruh positif secara signifikan. Temuan ini mencerminkan perlunya peningkatan kualitas dan produktivitas tenaga kerja di sektor pertanian sebagai faktor pendorong pertumbuhan, serta pentingnya perumusan kebijakan perdagangan yang mendukung penguatan sektor domestik. Penelitian ini memberikan kontribusi penting dalam perumusan kebijakan pembangunan ekonomi yang inklusif, berkelanjutan, dan berbasis pada transformasi struktural sektor pertanian.

Kata Kunci: Pertanian, Tenaga Kerja, Perdagangan Internasional, Pertumbuhan Ekonomi, Makroekonomi

INTRODUCTION

Economic growth is a key indicator to assess the development performance of a country or region. In general, economic growth is defined as an increase in the production capacity of goods and services in an economy over time, which is reflected in an increase in Gross Domestic Product (GDP) or Gross Regional Domestic Product (GRDP) (Mankiw, 2016; Barro & Sala-i-Martin, 2004). The main objectives of economic growth are to improve people's welfare, expand employment opportunities, and create economic stability. Sustainable economic growth is able to

encourage increased income, reduce poverty, and improve the quality of life. However, the rate of economic growth is strongly influenced by the structure of the economic sectors in it, including the agricultural sector which is one of the important foundations in the economy, especially in developing countries (Thirtle, Lin, & Piesse, 2003).

The agricultural sector has a crucial role in sustaining the economy, especially in the early stages of development. In many developing countries, it is the backbone of rural communities and the main provider of food and industrial raw materials (World Bank, 2008). The contribution of the agricultural sector to GDP is often a measure of the extent to which this sector is able to drive economic growth. A phenomenon that has occurred in various countries shows a declining trend in the contribution of the agricultural sector to GDP as modernization and the growth of the industrial and service sectors increase (Thirtle, Lin, & Piesse, 2003). Nevertheless, this sector remains important because it provides employment, maintains food security, and plays a role in controlling inflation and socioeconomic stability.

In addition to sectoral contributions, attention also needs to be paid to the labor force employed in the agricultural sector. In many developing countries, this sector absorbs a large proportion of the labor force, especially in rural areas (World Bank, 2012). However, labor in the agricultural sector is generally dominated by informal workers with low education levels and relatively low productivity compared to other sectors. The phenomenon of urbanization and the structural transformation of the economy have led to the movement of labor from the agricultural sector to the industrial and service sectors, which in turn affects the dynamics of economic growth (De Janvry & Sadoulet, 2010). Another challenge is the low investment in agricultural training and modernization, which has not significantly improved the quality of the workforce (World Bank, 2012).

Trade is an important factor that determines the direction and speed of a country's economic growth. Trade, both domestic and international, opens up wider market opportunities, improves the efficiency of resource allocation, and encourages the diffusion of technology and innovation (Anderson & Valenzuela, 2008). In the context of developing countries, integration into the global trading system can be a catalyst for growth, especially if supported by superior products such as agricultural products and processed industries. However, the phenomenon that often occurs is dependence on primary commodity exports that are vulnerable to global price fluctuations, as well as challenges in improving product competitiveness in the international market (Goh & Wong, 2015).

Economic openness constitutes a fundamental pillar in the contemporary era of globalization, serving as a critical driver of national economic growth. By engaging actively in international trade and facilitating inflows of foreign direct investment (FDI), a country can expand its market reach, enhance production efficiency, and gain access to advanced technologies and innovations. Empirical evidence demonstrates that economic openness and FDI exert a positive and statistically significant influence on Indonesia’s economic growth over the observed period, indicating that deeper integration into the global economy can act as a catalyst for development. Nevertheless, inflation remains a persistent challenge, as rising prices can erode household purchasing power, increase production costs, and create investment uncertainty, thereby constraining growth. This underscores the necessity for economic policies that strike a balance between fostering trade and investment liberalization and maintaining price stability to ensure sustainable long-term economic development (Hartini, Aulia, & Nasution, 2024).

The following data is presented on the *Contribution of the Agricultural Sector to GDP, the Proportion of Labor Employed in the Agricultural Sector* and *the Open Trade Rate* in Indonesia for the period 2013 to 2023:

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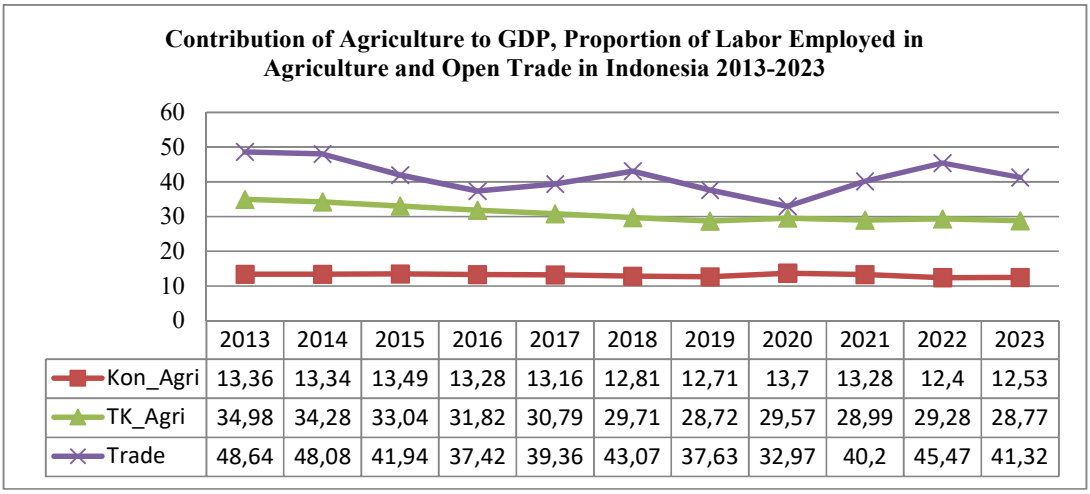

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Kon_Agri	13,36	13,34	13,49	13,28	13,16	12,81	12,71	13,7	13,28	12,4	12,53
TK_Agri	34,98	34,28	33,04	31,82	30,79	29,71	28,72	29,57	28,99	29,28	28,77
Trade	48,64	48,08	41,94	37,42	39,36	43,07	37,63	32,97	40,2	45,47	41,32

Data Source: World Bank, 2024

Based on the figure above, in general, the three variables show great potential in supporting Indonesia's economic growth. The contribution of the agricultural sector to GDP shows good resilience amidst the transformation of the national economy. Although it had declined in recent years, from 13.36% in 2013 to 12.40% in 2022, the sector showed positive signals with an increase back to 12.53% in 2023. This reflects improvements in productivity and efficiency in the agricultural sector.

The proportion of the workforce in the agricultural sector also declined significantly from 34.98% in 2013 to 28.77% in 2023, which can be explained by increasing urbanization, structural transformation of the economy, as well as the declining interest of the younger generation to work in this sector because it is considered less economically profitable and less technological. Meanwhile, open trade showed fluctuating dynamics, with the highest figure in 2013 (48.64%) and the lowest point in 2020 (32.97%), which was influenced by external conditions such as global commodity price instability, changes in international trade policies, as well as the impact of the COVID-19 pandemic which significantly disrupted global trade flows. The post-2020 trade recovery is reflected in the increase in the value of open trade in the following years. Overall, this trend reflects structural economic transformation, labor dynamics, and economic vulnerability to external conditions.

Various studies in the economic literature show that the contribution of the agricultural sector, agricultural labor, and trade to economic growth is contextual and not universal. In terms of the contribution of the agricultural sector to economic growth, a number of studies show a significant positive relationship, especially in developing countries whose economic structure is still based on agriculture (Christiaensen & Martin, 2018; Tiffin & Irz, 2006; Irz et al., 2001).

The agricultural sector is considered capable of driving income generation, food security, and rural development. However, on the other hand, several studies have found that the contribution of agriculture tends to be insignificant in the context of countries that have undergone economic transformation towards the industrial and service sectors, especially if agricultural productivity is stagnant due to limited infrastructure, market access, and technology (Rajan & Subramanian, 2008; Dreher & Langlotz, 2020; Tian, 2023). Therefore, the role of the agricultural sector is highly dependent on the structural context of the economy, policy support, and the stage of development of a country.

The discussion on labor in the agricultural sector shows its own complexity. The high proportion of labor in this sector is often considered to reflect a traditional and less efficient economic structure, potentially hampering economic growth (Khan et al., 2021; Otsuka & Yamano, 2006). This view is beginning to change as several studies show the positive potential of the agricultural sector for economic growth if managed in a modern way. Such management includes improving labor skills, utilizing technology, and integrating with processing industries (Kumar & Singh, 2020; Adebayo et al., 2022). Thus, the contribution of the agricultural workforce is not only determined by its number, but depends more on its quality, productivity, and ability to create added value through

agriculture-based economic activities.

International trade also plays an important role in promoting economic growth. Various studies confirm that increasing the volume of exports and imports can boost production efficiency, expand market access, and accelerate technology transfer (Baldwin & Taglioni, 2011; Melitz, 2003). Increased trade activity is generally correlated with higher national income and increased competitiveness of domestic products. However, not all countries benefit equally. Undiversified trade structures or the absence of strong industrial policies may pose risks, such as premature deindustrialization and dependence on primary commodities (Rodrik, 2018; Faber & Ferdous, 2020). Therefore, the success of trade in promoting economic growth is highly dependent on the quality of institutions, the direction of policies implemented, and the readiness of the domestic economic structure.

Many studies show that the relationship between the agricultural sector, its labor force, and open trade to economic growth is complex and varies across countries and time. However, there are still few studies that examine the three variables as a whole in one analysis that is suitable for Indonesia's current economic conditions. This study offers a more integrative approach to examine how the contribution of the agricultural sector to gross domestic product, the proportion of agricultural labor, and open trade simultaneously affect national economic growth.

This study aims to provide a deeper understanding of the synergies between these key sectors and how their roles can be optimized in strengthening the foundation of the national economy. The findings of this study are expected to provide a strong empirical foundation for the formulation of economic development policies that are more contextual, inclusive, and long-term oriented, while enriching the scientific literature on growth strategies in developing countries.

RESEARCH METHODS

This research is a quantitative study with a descriptive and verification approach, which aims to examine the effect of the contribution of the agricultural sector, the proportion of labor in the agricultural sector, and open trade on economic growth in Indonesia. The location of this research is focused on the context of the Indonesian economy, with an observation period from 1991 to 2023. The type of data used is secondary data obtained from trusted sources, namely the World Bank and techniques. Data collection is done through documentation and recording of statistical data available online from the official portals of these institutions.

Table 1. Operational Definition of Variables

No	Variable	Operational Definition	Measurement Unit	Data Source
1	Economic Growth (Y)	The annual percentage change in Gross Domestic Product (GDP) at constant prices that reflects the rate of economic growth.	Percentage (%)	World Bank
2	Agriculture Sector Contribution (X_1)	Percentage contribution of the agricultural sector to total national GDP at constant prices	Percentage (%)	World Bank
3	Agricultural Labor (X_2)	Proportion of labor force working in the agricultural sector compared to the total national labor force	Percentage (%)	World Bank
4	Open Trade (X_3)	The ratio of total export and import value to GDP as an indicator of economic openness to international trade.	Ratio (%)	World Bank

Data Analysis Technique

Data analysis in this study used the multiple linear regression method to determine the extent of the influence of the contribution of the agricultural sector (X_1), the proportion of labor in the agricultural sector (X_2), and the level of open trade (X_3) on Indonesia's economic growth (Y) during the period 1991-2023 (Gujarati, 2009). The regression equation model used in this study is formulated as follows:

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$Y=\beta0+\beta1Kon\_AGR+\beta2TK\_AGR+\beta3TRADE+\varepsilon$

Description:

Y : Economic growth (in percent)

β0 : Constant

β1,β2,β3 : Regression coefficient for each independent variable Kon_AGR : Contribution of agriculture sector (% to GDP) TK_AGR : Proportion of labor force in agriculture sector (%)
TRADE : Open trade (export + import / GDP in %)

ε : Error term

Before performing regression estimation, a classical assumption test is conducted to ensure the validity of the regression model, including, multicollinearity test by calculating the Variance Inflation Factor (VIF, ideal value <10), heteroscedasticity test using the White test, and autocorrelation test using the Breusch-Godfrey LM Test. After fulfilling the classical assumptions, hypothesis testing is carried out with the t test to test the partial effect of each independent variable, and the F test for the simultaneous effect of the variables on the dependent variable. In addition, the coefficient of determination (R^2) to determine the proportion of variance in economic growth that can be explained by the three independent variables (Gujarati 2009).

RESULTS AND DISCUSSION

Classical Assumption Test

The results of classical assumption testing show that all assumptions are met, so that the regression model can be used to analyze the relationship between variables with an adequate level of confidence. The following is a description of the results of each classical assumption test:

Heteroscedasticity Test

Table 2. Heteroscedasticity Test Results

Heteroskedasticity Test: White			
F-statistic	2.557548	Prob. F(9,23)	0.0334
Obs*R-squared	16.50643	Prob. Chi-Square(9)	0.0570
Scaled explained SS	29.97458	Prob. Chi-Square(9)	0.0004

Source: Processed data (2025)

Based on the results of the White test, the main indicator used as the basis for assessment is the Obs * R-squared value, which has a probability of 0.0570 **(>** 0.05). This value indicates that the model does not contain heteroscedasticity, so the assumption of constant residual variance (homoscedasticity) is fulfilled.

Multicollinearity Test

Table 3. Multicollinearity Test Results

Variance Inflation Factors
Date: 05/04/25 Time: 12:27
Sample: 1991 2023
Included observations: 33

	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
C	8.979278	50.50337	NA
CON_AGR	0.091675	118.0281	2.426619
TK_AGR	0.016093	141.7565	3.639954
TRADE	0.002620	42.66623	2.086057

Source: Processed data (2025)

The multicollinearity test results show that all independent variables have a Centered VIF value <10, which means that there are no multicollinearity symptoms among the independent variables. This indicates that each independent variable has a unique information contribution and does not experience high overlap, so it is appropriate to be included in the model.

Autocorrelation Test

Table 4. Autocorrelation Test Results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.509350	Prob. F(1,28)	0.4813
Obs*R-squared	0.589581	Prob. Chi-Square(1)	0.4426

Source: Processed data (2025)

The autocorrelation test using the Breusch-Godfrey method produces a Prob. F-statistic (0.4813) and Prob. Chi-Square (0.4426), both of which are greater than 0.05. Thus, it can be concluded that there is no autocorrelation in the model, and the assumption of residual independence has been met.

Multiple Linear Regression Analysis

Multiple linear regression analysis was used in this study to examine the effect of agricultural sector contribution (CON_AGR), agricultural sector labor (TK_AGR), and trade openness (TRADE) on Indonesia's economic growth during the period 1991-2023. This method allows us to determine the extent to which changes in the independent variables affect the dependent variable (economic growth).

Table 5. Multiple Linear Regression Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Probability
Constant (C)	7.918085	2.996544	2.642405	0.0131
CON_AGR	-0.787856	0.302779	-2.602080	0.0144
TK_AGR	0.654546	0.126860	5.159610	0.0000
TRADE	-0.324919	0.051184	-6.348096	0.0000

Model Statistics	Value
R-squared	0.610463
Adjusted R^2	0.570166
F-statistic	15.14914
Prob (F-stat)	0.000004
Durbin-Watson	1.706076

Source: Processed data (2025)

Based on the estimation results above, the multiple linear regression model can be written as follows:

$$Y=7.918-0.788\cdot KON\_AGR+0.655\cdot TK\_AGR-0.325+\varepsilon$$

Based on the results of the multiple linear regression equation, the following is the interpretation of the regression coefficient, namely**:**

- Constant (C) = 7.918: If all independent variables are zero, then economic growth is estimated at 7.918 percent. This value is theoretical because in reality the variables are not zero.
- KON_AGR = -0.788: Every 1 unit increase in the contribution of the agricultural sector to GDP will reduce economic growth by 0.788 percent, ceteris paribus. The coefficient is statistically significant (p = 0.0144), indicating a significant negative effect.
- TK_AGR = 0.655: Every 1 percent increase in labor in the agricultural sector will increase economic growth by 0.655 percent, assuming other variables are constant. This value is significant at the 1% level (p = 0.0000), indicating a strong positive effect.
- TRADE = -0.325: A 1 unit increase in the trade openness indicator is associated with a 0.325 percent decrease in economic growth, which is also statistically significant (p = 0.0000). This

indicates that trade openness in this context has a negative effect on economic growth.

Based on the multiple linear regression results above, the following is the Interpretation of the F Test, t Test and Coefficient of Determination, namely:

- F-test: The F-statistic value of 15.149 with a probability of 0.000004 (<0.01) indicates that simultaneously, all independent variables used in the model have a significant effect on economic growth. The model is feasible to use for prediction.
- T test: Partially, each variable (KON_AGR, TK_AGR, and TRADE) has a probability value <0.05, which means that all three have a significant effect on the dependent variable. Thus, each variable makes a real contribution in explaining variations in economic growth.
- R-squared (R^2) = 0.610 indicates that 61.0% of the variation in economic growth can be explained by the variation in the three independent variables (KON_AGR, TK_AGR, TRADE). The remaining 39% is explained by other variables outside the model.

Discussion

Effect of Agricultural Sector Contribution Variables on Economic Growth

The regression results show that the KON_AGR variable has a negative and significant coefficient on economic growth, which means that the greater the contribution of the agricultural sector to GDP, the negative impact on Indonesia's economic growth rate. This can be explained theoretically through the structural transformation approach in economic development, where economic growth tends to be spurred by a shift in contribution from primary sectors (such as agriculture) to secondary and tertiary sectors (manufacturing and services) that have higher productivity (Thirtle et al., 2003; Tiffin & Irz, 2006). In the Indonesian context, although the agricultural sector still absorbs around 28% of the workforce (BPS, 2023), its contribution to GDP is only around 12%, reflecting the low productivity of this sector.

Dependence on traditional agriculture that lacks modernization and technology has led to output stagnation. Therefore, the dominance of this sector's contribution in the GDP structure may be a structural bottleneck to the acceleration of national economic growth. The results of this study are in line with the findings by Otsuka and Yamano (2006) who showed that an unmodernized agricultural sector can hinder economic growth, as well as research by Fan and Zhang (2004) who emphasized the importance of shifting from the agricultural sector to the industrial sector to increase economic growth.

The Effect of Labor Variables in the Agricultural Sector on Economic Growth

The positive and significant regression coefficient of the TK_AGR variable indicates that an increase in the proportion of labor in the agricultural sector has a positive influence on economic growth. This finding indicates that labor in the agricultural sector, despite being in the primary sector, still contributes productively as long as it is supported by high value-added agricultural activities (Kumar & Singh, 2020; Adebayo et al., 2022). In the Indonesian context, the agricultural revitalization program and farmer empowerment through farmer groups, extension, and the application of precision agricultural technology in recent years have encouraged an increase in labor productivity in this sector which is able to drive economic growth through increased food production and village economic resilience.

The results of this study are in line with the findings by Diao et al. (2010) which shows that an increase in the proportion of labor in the agricultural sector can contribute positively to economic growth, as well as research by Hazell and Wood (2008) which emphasizes the important role of labor in the agricultural sector in supporting economic growth in developing countries.

Effect of Trade Openness Variable on Economic Growth

The TRADE variable shows a significant negative coefficient on economic growth, indicating that in the 1991-2023 period, increased trade openness has not been able to make a consistent positive contribution to Indonesia's economic growth. In theory, trade openness is expected to increase economic efficiency and growth through greater market access and technology transfer (Baldwin & Taglioni, 2011; Melitz, 2003). However, in Indonesia's reality, the export structure that is still dominated by raw commodities (such as coal, palm oil, and rubber) with high dependence on global demand causes macroeconomic instability. In addition, trade liberalization also poses challenges to domestic industries that are not yet fully competitive, so instead of strengthening the real sector, free trade can enlarge the current account deficit and hamper industrialization (Rodrik,

2018; Faber & Ferdous, 2020).

Data from the World Bank and BPS note that while trade volume has increased in the last two decades, export contribution to GDP has remained relatively stagnant and has not been accompanied by a significant increase in high-tech manufacturing industries. This shows the importance of export diversification and value-added strategies in Indonesia's international trade activities in order to contribute positively to economic growth in a sustainable manner. The results of this study are in line with the findings by Ocampo and Vos (2008) who emphasize that dependence on raw commodities can hinder long- term economic growth and the need for diversification to achieve sustainable growth.

CONCLUSION

Conclusion

This study shows that the contribution of the agricultural sector to GDP, the proportion of labor in the agricultural sector, and trade openness have a significant influence on Indonesia's economic growth over the period 1991-2023. Specifically, the contribution of the agricultural sector and trade openness have a negative effect on economic growth, while labor in the agricultural sector has a positive effect. These results reflect the structural dynamics of the Indonesian economy which still faces challenges in managing primary sector transformation and optimizing global trade to support sustainable growth. Thus, future development strategies need to consider the efficiency of the agricultural sector and improve the quality of the workforce, as well as reorganize the direction of trade policy to support industrialization and increase added value.

Policy Recommendations

Based on these findings, the government is advised to encourage the modernization of the agricultural sector through the application of technology, increasing access to finance, and strengthening farmer institutions to increase productivity and competitiveness. On the other hand, the development of agricultural labor skills needs to be strengthened through vocational training and agroindustry-based education. In the context of trade, policies need to focus on export diversification and the development of downstream industries to reduce dependence on raw commodities. Trade policy reforms also need to ensure proportional protection of domestic industries while still promoting integration with global markets that support inclusive and sustainable growth.

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