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Determinants of Sectoral Labor Migration and Their Contribution to Enhancing Labor Productivity: A Case Study from Indonesia

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Abstract

This study aims to analyze the determining factors influencing the migration of agricultural labor in Indonesia. In examining the dynamics of the agrarian labor share in Indonesia, the study uses several variables divided into three groups: demographic factors, structural factors, and economic factors. This study will also examine the contribution of agricultural labor migration to the Non-agricultural sector toward productivity growth in the economy. Using secondary data from various institutions, including the World Bank, Food and Agriculture Organization (FAO), and UNCTAD. The data collected consists of time series from the period 1980 to 2020; this study finds that agricultural labor migration in Indonesia heavily depends on developments in the Non-agricultural sectors, including both industry and services, education levels, and agricultural mechanization. However, foreign direct investment (FDI) does not appear to reduce the share of agricultural labor in Indonesia. This is because FDI tends to flow into sectors that rely on technology and automation. Agricultural workers may lack the skills required by these industries. FDI often seeks workers with high technical or managerial skills that do not align with the skill sets of Indonesian agricultural workers, most of whom have an education level below junior high school.

Keywords: Labor, Agriculture, Non-Agriculture, Industry, Services

1. Introduction

Economic development has transformed Indonesia from a relatively poor country in the 1960s into a developing country with an upper-middle-income level. Economic growth has changed Indonesia's financial structure, shifting from being dominated by the agricultural sector to becoming an industrial and service-oriented country. This is evident from the declining contribution of the agricultural sector's output, which decreased from 26.9% in 1980 to 13.3% in 2020. At the same time, the contribution of the non-agricultural sector's output, both industrial and service sectors, increased from 73.1% to 86.7% (BPS, 2020). This change in sectoral production contribution was accompanied by a shift in the labor force from agriculture to nonagriculture. The share of agricultural workforce decreased in 1980 by 64% and in 2020 dropped significantly to 30%. The market share of the labor force in the non-agricultural sector increased by 36% to 70%.

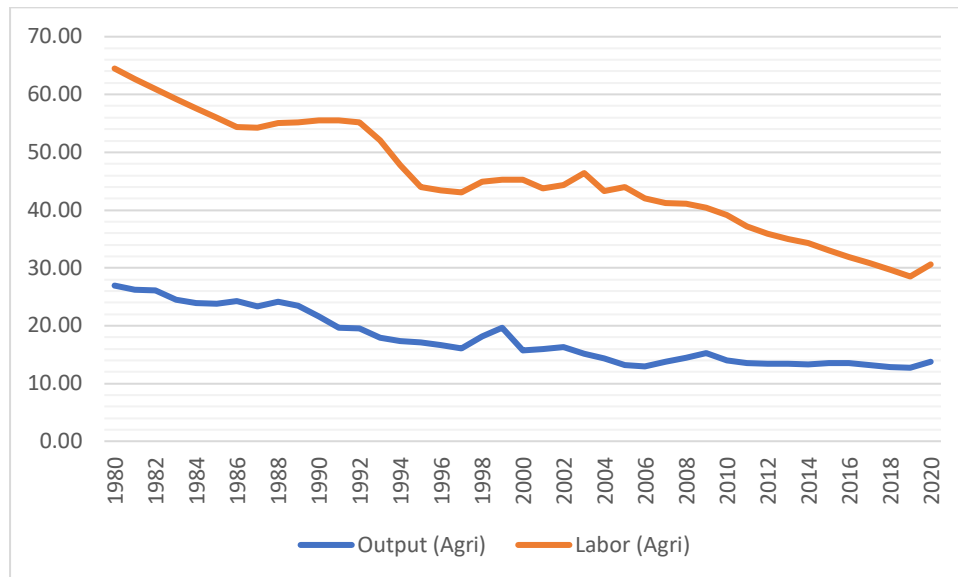


Figure 1: Comparison Of The Amount Of Output With Labor In Agriculture

The issue is that the rate of decline in the agricultural sector's output contribution has been faster than the reduction in its labor share. This has resulted in a substantial surplus of agrarian labor, leading to low productivity among farmers (Hubbansyah, Hakim, Hartoyo, & Widyastutik, 2023). The slow rate of labor transition imposes a burden on the agricultural sector by decreasing productivity and causing income inequality between agricultural and Non-agricultural sector workers (Kariyasa, 2006). This factor contributes to the relatively high level of rural poverty in Indonesia, which is even twice as high as urban poverty (Rammohan & Tohari, 2023). Consequently, rural areas have become pockets of poverty in Indonesia (Hasibuan & Hasibuan, 2022).

Therefore, the primary goal of economic development is to transfer labor from the low-productivity agricultural sector to the high-productivity non-agricultural sector (Hubbansyah, Hakim, Hartoyo, & Widyastutik, 2023). The seminal study by Lewis (1954) emphasizes the importance of the growth of the non-agricultural sector in driving the migration of agricultural labor. Additionally, individual factors such as age, education, and health, as well as non-individual factors such as socio-demographic, economic, political, and institutional factors, can influence the migration of labor from the agricultural to the non-agricultural sector (Patyka, Gryschenko, Kucher, Heldak, & Raszka, 2021). Furthermore, other studies highlight the role of foreign direct investment (FDI), credit-to-GDP ratio, per capita income, and labor productivity as determinants of the agricultural labor share (Felipe, Bayudan-Dacuycuy, & Lanzafame, 2016).

This study aims to analyze the determining factors influencing the migration of agricultural labor in Indonesia. In examining the dynamics of the agrarian labor share in Indonesia, the study uses several variables divided into three groups: demographic factors, structural factors, and economic factors. Unlike previous studies conducted in Indonesia, such as those by Raiyan & Putri (2021), Purwantoro, Rahayu, Rahman, & Hidayat (2022), and Hubbansyah, Hakim, Hartoyo, & Widyastutik (2023), this study will also examine the contribution of agricultural labor migration to the non-agricultural sector towards productivity growth in the economy. In this context, productivity growth will be decomposed into two main components: within-sector productivity and structural productivity.

Thus, the study will identify the contribution to productivity growth stemming from within the sector itself (such as increased education levels) and from labor migration between sectors (from the low-productivity agricultural sector to the more productive non-agricultural sector). In the productivity growth decomposition analysis, this study adopts the method developed by Aggarwal (2021). This study is expected to provide a more comprehensive understanding of the structural transformation process in Indonesia, focusing on two primary outcomes: the

determinants of the agricultural labor share and the contribution of labor migration to economic productivity growth in Indonesia.

2. Literature Review

The study conducted by Felipe, Bayudan-Dacuycuy, and Lanzafame (2016) aims to model and identify the factors affecting the reduction of the agricultural labor share in China. Using a long observation period from 1962 to 2013 and the Autoregressive Distributed Lag (ARDL) Model, Felipe et al. sought to identify both short-term and long-term effects of various variables, including changes in GDP per capita, Industrial Gross Value Added, the share of FDI in GDP, and the share of credit to the private sector on the agricultural labor share in China.

The results reveal that FDI has a long-term impact, indicating that open economic intensification policies will assist China in transforming its economic structure. Additionally, domestic credit, proxied by the share of credit to the private sector in GDP, also contributes to reducing the labor share in agriculture. Meanwhile, compared to the previous two variables, industry value added and income per capita has the most significant long-term impact on decreasing the agricultural labor share in China. Based on the significant variables identified, Felipe et al. conclude that the structural transformation process occurring in China follows a normal developmental trajectory.

Using the estimated determinants model, Felipe et al. projected the long-term labor conditions in China's agricultural sector. They found that it would take 80 to 87 years (from 1962) for China to achieve an agricultural labor share comparable to that of currently advanced countries, which is around 5 percent. Compared to other advanced nations, this projected timeline for China to reach such a reduction in agricultural labor is relatively swift. According to Felipe et al., this situation is attributable to China's rapid economic growth over recent decades. However, based on their findings, Felipe et al. further conclude that China has not yet surpassed the Lewis Turning Point, meaning that surplus agricultural labor has not fully transitioned to more productive sectors (manufacturing/services).

Sen (2016) describes two sets of independent factors: labor demand from high-productivity sectors and labor supply from low-productivity sectors, as determinants of the rate of labor market structural change. Government failures and market failures negatively impact labor demand in high-productivity sectors and restrict labor mobility from low-productivity sectors. Government failures, such as labor regulations and product market regulations, can adversely affect labor demand in high-productivity sectors like manufacturing. Meanwhile, land policies, such as ineffective land reforms or migration barriers, can hinder the movement of labor from low-productivity sectors (agriculture). Market failures, such as lack of coordination in investment and imperfections in credit markets, can negatively affect labor demand in high-productivity sectors (industry and services). Additionally, market failures in human capital can limit the supply of skilled labor from low-productivity sectors (agriculture) to high-productivity sectors (non-agriculture).

Raiyan and Putri (2021), who studied the shift of labor from agriculture to non-agriculture in Indonesia using a two-stage least squares (2SLS) approach, found a simultaneous relationship between economic growth and labor migration. An increase in economic growth by 1 percent in Indonesia leads to a 0.22 percent decrease in agricultural labor. This indicates that as economic growth rises, the labor force is more likely to leave the agricultural sector and seek employment in non-agricultural sectors. Furthermore, Raiyan and Putri (2021) also found that investment, proxied by domestic investment in the agricultural sector, negatively impacts agricultural labor. Specifically, a 1 percent increase in investment results in a 0.01 percent decrease in agricultural labor. According to Raiyan and Putri (2021), this suggests that investment in the agricultural sector has not been able to attract the labor force to work in agriculture, due to the perception of the sector as "dirty, dangerous, and difficult" (Wang, 2014). Susilowati (2016) also notes that most workers are disinterested in working in agriculture because the sector is perceived as unable to provide adequate rewards due to the limited availability of agricultural land.

In contrast to findings in Korea and Thailand, which indicate that structural changes positively impact income distribution (Kim, 2014; Bowothumrongchai, 2019), the structural changes in Indonesia have instead led to increased inequality (Dartanto, Yuan, and Sofiyandi, 2017). Using L Theil decomposition and econometric estimation to explore the relationship between structural transformation and inequality in Indonesia, the study by

Dartanto, Yuan, and Sofiyandi (2017) finds that: (i) the root causes of increasing inequality in Indonesia remain "mysterious," as the unexplained effect dominates the explanation for the rise in inequality; (ii) migration from agriculture to industry or services, from rural to urban areas, and from informal to formal employment are the second most significant contributors to the increase in inequality between 1996 and 2014; (iii) improvements in educational attainment contribute to reducing inequality. The econometric estimation results show that structural transformation leads to increased inequality in Indonesia. Furthermore, the rising share of the service sector in the economy creates inequality because the service sector is capital-intensive and requires high-skilled labor. As a result, fewer people benefit from growth in this sector compared to growth in agriculture or industry.

Labor migration from agriculture to non-agriculture in 31 countries implementing centrally planned economic policies from 1990 to 2019 by Herzfeld and Akhmediyeva in 2021. The study focuses on the role of land ownership and land transfer rights in transition. Using a panel data random effect model, this study analyzes factors such as land transfer liberalization, income differences, agricultural sector size and relative price changes that affect labor reallocation. The results of this study show that land transfer liberalization significantly accelerates labor migration in agriculture. In addition, a higher income ratio between non-agricultural and agricultural workers where the agricultural sector is shrinking and price shifts is positively associated with labor migration from agriculture. This study also concludes that institutional reforms, especially in land policy, play an important role in helping structural transformation in transitioning economies.

Study by Bustos, Caprettini, and Poticeli (2016) looked at how agricultural productivity growth affected structural transformation by shifting labor from agriculture to non-agriculture in Brazil. The study analyzed how the use of genetically modified soybean technology increased agricultural productivity and affected labor reallocation. Using the difference in difference (DID) method, the study exploited variations in soil suitability for new technologies across regions to identify causal effects. The study found that higher agricultural productivity led to a decline in agricultural employment and an increase in industrialization, as excess labor moved to non-agricultural sectors. Regions with greater productivity gains experienced higher investment in manufacturing and services, supporting the idea that agricultural progress can drive broader economic transformation.

Research conducted by Gollin in 2021 explores the relationship between agricultural productivity and structural transformation in African countries. The study looks at how historical evidence from industrialized countries suggests that increasing agricultural productivity is critical for labor reallocation and economic diversification. Using comparative analysis of cross-country data and empirical studies, the same pattern holds across Africa. The results show that agricultural productivity growth can stimulate industrialization and urbanization, the extent of transformation depends on factors such as market integration, infrastructure and institutional quality. The study concludes that addressing constraints is critical to ensuring that agricultural progress contributes effectively to broader economic development.

3. Methodology

In relation to the analysis of determining factors, this study uses six variables that have been empirically proven to play important roles in the agricultural labor share conditions in various countries, including India (Behera & Tiwari, 2014), China (Felipe, Bayudan-Dacuycuy, & Lanzafame, 2016), Ukraine (Patyka, Gryschenko, Kucher, Heldak, & Raszka, 2021), and several other Asian countries such as Thailand, Cambodia, and Myanmar (Bai, Zeng, Fu, & Zhang, 2024). These six variables, suspected to be determinants of the agricultural labor share, are grouped into three factors: (1) demographic factors, including rural population growth rate and the share of rural population with secondary education; (2) structural factors, including the share of industrial and service output; and (3) economic factors, including capital intensity per hectare of land and foreign direct investment. A detailed description of these six variables can be seen in the table below:

Table 1: Data Source

Variabel	Notasi	Definisi	Sumber Data	Periode
Agricultural Labor Share	agriemp	Portion of labor in the agricultural sector (%)	World Bank	1980-2020

Rural Population Growth	ruralagr	Rural Population Growth Rate (%)	World Bank	1980-2020
Secondary Education Enrollment	secondary	Gross secondary enrollment (%)	World Bank	1980-2020
Industrial Output Share	Qind	Share of industrial output to total output (%)	World Bank	1980-2020
Service Output Share	Qser	Share of service output to total output (%)	World Bank	1980-2020
Capital per Hectare of Land (Mechanization)	K/H	Agricultural capital per hectare of agricultural land	FAOSTAT	1980-2020
Foreign Direct Investment	FDI	FDI/GDP (%)	World Bank	1980-2020

The empirical model for analyzing the determining factors of the agricultural sector labor share in Indonesia is as follows:

$$agriemp_t = \alpha_0 + \alpha_1 ruralagr_t + \alpha_2 secondary_t + \alpha_3 Qind_t + \alpha_4 Qser_t + \alpha_5 K/H_t + \alpha_6 FDI_t + \varepsilon_t \quad (1)$$

Equation (1) will be estimated using time series analysis. Time series data are recorded or collected based on specific time periods (Juanda & Junaidi, 2012). Essentially, time series data capture economic behavior over time, allowing us to observe how economic agents make adjustments, improvements, and refinements to their past performance.

Since this study adopts a time series analysis approach, the estimation of equation (1), which shows a long-term relationship, is justified only if the combination of variables in equation (1) is cointegrated. Therefore, to avoid the problem of spurious regression, it is necessary to test the cointegration condition of equation (1). If the combination of variables in equation (1) is found to be stationary, it can be concluded that equation (1) has a long-term relationship. To demonstrate this, equation (1) can be rewritten in the following form:

$$\varepsilon_t = agriemp_t - \alpha_0 - \alpha_1 ruralagr_t - \alpha_2 secondary_t - \alpha_3 Qind_t - \alpha_4 Qser_t - \alpha_5 \frac{K}{H}_t - \alpha_6 FDI_t \quad (2)$$

If the linear combination is stationary, then ruralagr, secondary, Qind, Qser, K/H, and FDI are cointegrated, and the regression between the agricultural labor share and these six variables is referred to as a cointegrated regression (Juanda & Junaidi, 2012). Therefore, the estimation results of equation (1) are valid and free from the issue of spurious regression. Furthermore, this study also decomposes aggregate productivity growth into two main components: (i) within effect, which captures the contribution of productivity growth within sectors to overall economic productivity, and (ii) between effect, which reflects the impact of labor reallocation from less productive sectors to more productive sectors. The decomposition of aggregate economic productivity growth into within effect and between effect uses the following approach (Alam et al., 2008; Aggarwal, 2021):

$$P_m = \frac{Y_m}{L_m} = \sum_{j=1}^n \frac{Y_j}{L_j} * \frac{L_j}{L_m} = \sum_{j=1}^n P_j * S_j \quad (3)$$

Mathematically, aggregate labor productivity (Pm) is the total productivity level of each sector weighted by the sectoral labor share. Y is the output, L refers to the number of workers in each sector ($j=1,2,3,\dots,n$), and m denotes the total economy, while S represents the sectoral labor share.

The first term on the right-hand side of equation (3) represents the within-sector contribution to productivity growth, while the second term shows the contribution of sectoral shifts. Aggregate labor productivity will be positive if sectors with high productivity growth increase their share in employment. Conversely, productivity will be negative if growing sectors have low productivity or if the labor share of high-productivity sectors declines.

To further verify the contribution of structural changes to productivity changes in equation (3), this study also empirically tests the impact of sectoral labor transitions on labor productivity using the method developed by Dastidar (2008), Kahya (2012), and Sen (2017) as follows:

$$L_{AGR} + L_{IND} + L_{SER} = 100 \quad (4)$$

From identity equation (4) above, it is clear that the total proportion of labor in the agricultural and non-agricultural sectors (industry and services) adds up to 100 percent. By expressing productivity as a function of the sectoral labor proportions, the function can be written as follows:

$$\text{Labor Productivity} = f(L_{AGR}, L_{IND}, L_{SER}) \quad (5)$$

To model labor productivity with three sectors—agriculture (LAGR), industry (LIND), and services (LSER)—and to examine how productivity depends on sectoral labor transitions, we can modify equations (4) and (5) as follows:

$$\text{Labor Productivity} = f(L_{AGR}, L_{IND}, (100 - L_{AGR} - L_{IND})) \quad (6)$$

Given the assumption that Lind (labor in the industrial sector) is constant, any 1 percent change in Lagri (labor in the agricultural sector) corresponds to a 1 percent change in Lser (labor in the service sector), thus satisfying the identity condition in equation (4). Therefore, the empirical model to test the impact of sectoral labor transitions on labor productivity in this study is as follows:

Transition of Labor from Agriculture to Services:

$$\text{Labprod} = \alpha_0 + \alpha_1 L_A + \alpha_2 L_I + \alpha_3 \text{School} + \alpha_4 L_A * \text{School} + \varepsilon \quad (7)$$

Transition of Labor from Agriculture to Industry:

$$\text{Labprod} = \alpha_0 + \alpha_1 L_A + \alpha_2 L_S + \alpha_3 \text{School} + \alpha_4 L_A * \text{School} + \varepsilon \quad (8)$$

Given that Labprod is the output per labor unit, which measures productivity, and considering the shares of labor in agriculture (LA), industry (LI), and services (LS) as well as the gross secondary school enrollment rate (school), the interaction variable between LA and school captures the contribution of semi-skilled labor moving from agriculture to non-agriculture sectors on changes in labor productivity within the economy. Equation (7) demonstrates the impact of labor transitions from agriculture to services, while Equation (8) shows the impact of labor transitions from agriculture to industry on changes in labor productivity. Similar to Equation (1), testing Equations (7) and (8) also considers the stationarity and cointegration of variables to avoid the problem of spurious regression.

4. Results and Discussion

Data shows that the share of agricultural labor in Indonesia has consistently declined from 65% in 1980 to 30% in 2020. In analyzing the dynamics of the agricultural labor share, this study utilizes several variables categorized as follows: (1) demographic factors, including rural population growth rate (ruralgr) and the share of population with secondary education (secondary enrollment); (2) structural factors, including the share of non-agricultural output, specifically industry and services; and (3) economic factors, including capital intensity per hectare of land (KA/HA) and foreign direct investment (FDI). The estimation results can be seen in the table below:

Table 2: Estimation Results

Variable	Model (1)	Model (2)	Model (3)	Model (4)
Demographic				
Factors:				
Ruralgr	14.11*** (1.29)	4.76*** (0.94)	-0.37 ⁿ (1.76)	-2.72 ⁿ (1.91)
Secondary		-0.38*** (0.03)	-0.26*** (0.05)	-0.12*** (0.05)
Structural				
Factors:				
Q _{IND}			-1.147*** (0.346)	-0.84** (0.42)
Q _{SER}			-1.290*** (0.395)	-1.05*** (0.48)
Economic				
Factors:				
K _A /H _A				-0.008*** (0.002)
FDI				0.26 ⁿ (0.33)
Konstanta	44.18	67.38	160.69	146.68
F-Stat	119.16	380.57	238.21	232.34
R-Square	0.753	0.952	0.963	0.976

The estimation results of model (1) show that rural population growth (ruralgr) has a positive impact on the share of agricultural labor in Indonesia. Specifically, a 1% increase in rural population growth raises the share of agricultural labor by about 14%. However, this effect diminishes when controlled for educational factors, as seen in model (2). In this case, participation in secondary education reduces the rural population working in the agricultural sector by about 4.7% for every 1% increase in rural population growth. In other words, participation in secondary education decreases the share of agricultural labor in Indonesia by 0.38%. This is because workers with higher educational qualifications have greater opportunities to work outside the agricultural sector. These findings are consistent with Drean et al. (2021), who found that education levels negatively affect agricultural labor absorption. Highly educated workers generally tend to avoid agricultural work, preferring sectors with higher wages (Gollin & Waugh, 2014; Herrendorf & Schoellman, 2018). Factually, labor data from Indonesia's agricultural sector shows that the majority of agricultural workers have an elementary school education or lower, accounting for approximately 66% of the total agricultural workforce in 2020.

Table 3: Proportion of Indonesian Agricultural Labor by Education Level

Year	Never Attended School	Didnt complete SD	SD	SLTP	SLTA	Diploma	Undergraduate
1985	8,827	12,450	12,164	1,620	453	17.6	8.8
(%)	(24.84)	(35.03)	(34.23)	(4.56)	(1.27)	(0.05)	(0.02)
1990	7,913	12,712	15,782	2,786	1,036	38.1	16.5
(%)	(19.64)	(31.56)	(39.18)	(6.92)	(2.57)	(0.09)	(0.04)
1995	5,629	9,957	15,848	3,196	1,514	48.9	43.8
(%)	(15.53)	(27.48)	(43.73)	(8.82)	(4.18)	(0.13)	(0.12)
2000	5,034	9,584	18,873	4,767	2,300	57.7	58.1
(%)	(12.38)	(23.56)	(46.40)	(11.72)	(5.65)	(0.14)	(0.14)
2005	4,276	8,176	19,592	6,908	2,693	65.1	100.8
(%)	(10.23)	(19.55)	(46.86)	(16.52)	(6.44)	(0.16)	(0.24)

2010	4,355	10,790	15,865	7,346	4,230	99.2	137.2
(%)	(10.17)	(25.20)	(37.05)	(17.15)	(9.88)	(0.23)	(0.32)
2015	3,522	10,397	14,488	6,494	4,707	168.6	282.9
(%)	(8.79)	(25.95)	(36.17)	(16.21)	(11.75)	(0.42)	(0.71)
2020	2,454	8,858	14,955	6,501	5,492	211.5	482.7
(%)	(6.30)	(22.74)	(38.39)	(16.69)	(14.10)	(0.54)	(1.24)

Regarding structural factors, this study finds that the development of non-agricultural sectors, both industry and services, contributes to the decline in the share of agricultural labor in Indonesia, as seen in model (3). Specifically, a 1% increase in industrial output can reduce the share of agricultural labor by 1.15%, while a 1% increase in service output can decrease the share by 1.29%. Interestingly, after considering the role of these structural factors in model (3), the impact of rural population growth on the share of agricultural labor becomes insignificant. This indicates that rural residents tend to seek employment in non-agricultural sectors, which are perceived to offer better wages (Wang, 2016). Most of the labor force is not interested in agricultural work due to the difficulty in earning sufficient wages caused by limited land ownership (Susilawati, 2016).

Furthermore, the estimation results of model (3) show that while still significant, the impact of education on the share of agricultural labor tends to decrease after controlling for structural factors. Previously, a 1% increase in secondary education participation reduced the share of agricultural labor by 0.38%, but now the impact is reduced to 0.26%. This suggests that although non-agricultural sectors are a priority for rural labor, limited job opportunities in these sectors make it difficult for job seekers to find employment. Additionally, there is an issue of skill mismatch between the curriculum taught in schools and the demands of businesses and industries, creating structural challenges for agricultural labor.

The problem is further complicated by changes in the economic environment, both external and internal, which have led to a decline in industrial performance in Indonesia, entering a phase known as premature deindustrialization. Priyarsono (2011) concluded that the deindustrialization process occurring in Indonesia is not a natural phenomenon, as seen in developed countries, but is premature. This situation arises due to shocks to the national economy, such as declining investment levels, foreign trade performance, raw material imports, and the influx of imported consumer goods. Hubbansyah (2018) similarly noted that industrial growth in Indonesia slowed from 10.3% in the pre-1998 crisis period to only 3% in the post-crisis period.

The impact of the slowdown in the non-agricultural sector's performance is that those who previously transitioned from agriculture find it more challenging to secure jobs in the industrial and service sectors. This is reflected in the number of agricultural workers in 2020, which still reached 38 million people, about 3 million higher than in 1995, a period when Indonesia was approaching its turning point. In other words, the transition of labor to higher productivity sectors (non-agricultural sectors) faced significant obstacles during the post-Asian financial crisis period. This situation contrasts with the rapid decline in agricultural output's contribution to the economy, from around 17% to 13% during the same period. Although not an outlier, Indonesia is also not among the few East Asian countries that managed to quickly transition agricultural workers in the past two decades (Briones and Felipe, 2013).

The estimation results of model (4) found that agricultural mechanization, indicated by the capital per hectare of agricultural land (KA/HA), negatively impacts the share of agricultural labor. In this context, the more intensive the adoption of technology in agriculture, the lower the share of agricultural labor. This finding aligns with Hubbansyah et al. (2023), who showed a trend of labor-saving in agriculture alongside technological advancements. Farmers choose technology due to greater economic incentives, such as lower production costs, increased productivity, and reduced losses. Macroeconomically, agricultural mechanization has significantly contributed to the national economy in Indonesia (Sulaiman et al. 2018). These contributions mainly come from achieving efficiency, increasing production, and raising farm income through the use of agricultural machinery.

On the other hand, education continues to play an important role in reducing the share of agricultural labor in Indonesia. Even when controlled for both structural and economic factors, participation in secondary education

significantly reduces the share of agricultural labor. However, the resulting decline in impact is diminishing. This indicates that while agricultural mechanization negatively affects agricultural labor absorption, it also requires skilled labor to enable the agricultural sector to implement technology to support its performance (Ananto & Alihamsyah, 2010; Silaban & Sugiharto, 2016).

The estimation results show that foreign direct investment (FDI) does not significantly reduce the share of agricultural labor in Indonesia. This occurs because FDI tends to flow into sectors that rely on technology and automation. Agricultural workers may not have the skills that these industries require. FDI often seeks workers with specific technical or managerial skills, which do not align with the skills of workers in Indonesia's agricultural sector, most of whom have only a middle school education or lower. Therefore, the job opportunities created by FDI in Indonesia tend to be biased towards high-skilled labor (Ningrum, 2008).

Table 4: Productivity Growth Decomposition

Tahun	Productivity Growth (%)	Contributed From	
		<i>Within (%)</i>	<i>Structural (%)</i>
1980 – 1990	3.7	2.0	1.7
1991 – 2000	2.3	0.9	1.4
2001 – 2010	3.8	2.9	0.9
2011 – 2020	3.3	2.4	0.9

The decomposition results highlight the significant contribution of structural changes to labor productivity growth in Indonesia, ranging from 0.9% to 1.7% during the period 1980–2020. Therefore, the shift of labor from agriculture to non-agriculture sectors has led to a substantial increase in aggregate productivity growth. This finding is reinforced by the empirical tests of equations (8) and (9), which show a significant impact of sectoral labor transition on productivity growth. However, the increase in productivity varies between the transition from agriculture to industry and from agriculture to services.

Table 5: Structural Transition and Productivity Changes

Variable	Coeff	Std Error	P > t	Robust Std Error	P > t
L _{AGR}	-109.08	17.25	0.000	13.19	0.000
L _{SER}	-78.31	23.45	0.002	16.42	-
L _{IND}	-	-	-	-	-
School	425.04	53.93	0.000	50.27	0.000
L _{AGR} *School	-5.80	1.75	0.002	1.47	0.000
Konstanta	11781.35	1684.64	0.000	1255.8	0.000
F-stat	538.89				
	(0.000)				
Variable	Coeff	Std Error	P > t	Robust Std Error	P > t
L _{AGR}	-30.75	16.82	0.076	12.31	0.017
L _{SER}	-	-	-	-	-
L _{IND}	78.34	23.46	0.002	16.43	0.000
School	425.07	53.93	0.000	50.28	0.000
L _{AGR} *School	-5.80	1.75	0.002	1.47	0.000
Konstanta	3948.56	1137.89	0.001	801.33	0.000
F-stat	538.87				
	(0.000)				

The productivity increase resulting from the transition of labor from agriculture to industry is significantly higher than the transition from agriculture to services. Specifically, for every 1% shift of agricultural labor to industry, productivity increases by USD 109. This figure can rise even higher to USD 114 if the agricultural labor moving to the industry has at least a high school education or is semi-skilled. Meanwhile, the transition of agricultural labor to services increases productivity by USD 30–35. This is because the industrial sector is seen as more capable

of creating a larger number of formal jobs, thus having a greater leverage effect on productivity improvement compared to the services sector (Rodrik, 2016).

However, this study also found that the contribution of structural changes to productivity growth began to slow down since the 1990s, and this trend continued into the mid-2000s. This can be observed from the declining contribution of structural changes from 1.7% in 1980–1990 to 0.9% in 2011–2020. This slowdown is due to several factors, including the decline in industrial performance, particularly in the manufacturing sector, and the development of capital-intensive service sectors such as financial services and telecommunications, which resulted in fewer job opportunities in non-agricultural sectors and the emergence of structural unemployment issues (Tarsidin, 2009).

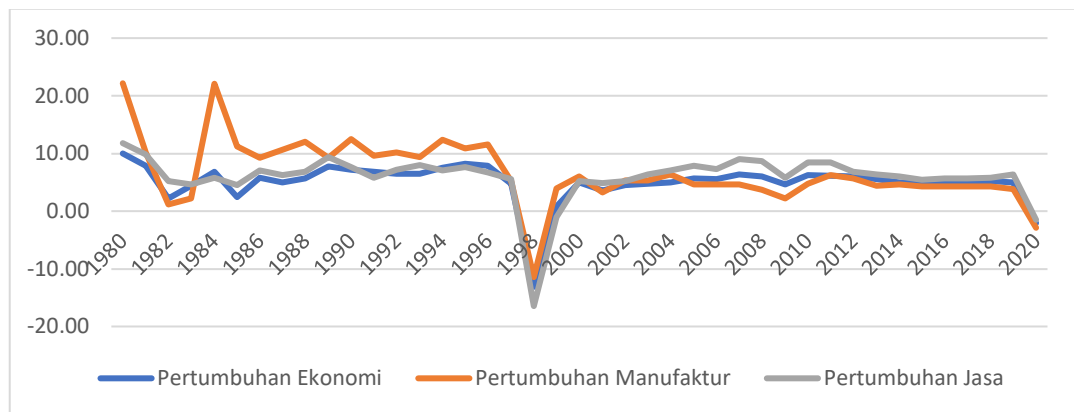


Figure 2: Comparison of Economic Growth with Manufacturing Growth and Service Sector Growth

However, the decline in the contribution of structural changes to productivity growth since the 2000s is attributed to the slowdown in manufacturing performance. Before the 1998 Asian financial crisis, the manufacturing sector's growth rate was generally higher than overall economic growth. Thus, it was the growth in manufacturing, particularly in labor-intensive sectors such as electronics and textiles, that drove economic growth. Because the skill requirements for these sectors were not too high, barriers to transitioning labor from agriculture to industry, especially manufacturing, were relatively low (Yustika, 2010).

However, following the 1998 Asian financial crisis, the manufacturing sector began to experience a premature slowdown. The crisis severely impacted most manufacturing sectors, except for transportation and equipment. The most affected subsectors were export-oriented ones such as textiles, apparel, footwear, and furniture products. These subsectors experienced a growth recession, and their contribution to GDP growth dropped drastically. Low domestic demand and worsening business conditions in the years following the Asian financial crisis were major factors in this slowdown. At the same time, rising commodity prices led to a shift in Indonesia's exports from manufacturing to resource-based commodities. This shift resulted in a different economic transformation after the Asian financial crisis, with resource-based sectors growing and labor-intensive sectors such as textiles, leather and footwear, and wood products declining.

The manufacturing sector became increasingly uncompetitive from 2001 onward, marked by a continuous decrease in the manufacturing share of total exports. Additionally, the share of manufacturing in output and labor absorption also slowed down. In developed countries, the contribution of the manufacturing sector to employment is roughly proportional to its contribution to total output. In contrast, in Indonesia, even at the peak of industrialization, the contribution of manufacturing to employment (around 13.5%) was much lower than its contribution to output (29%). In other words, Indonesia's deindustrialization process tends to be more premature and negative. Indonesia follows the pattern of premature deindustrialization observed in developing countries that reached the peak of industrialization at income levels far lower than those experienced by developed countries. Premature deindustrialization has become a characteristic of the deindustrialization process in low- and middle-income countries over the past 2-3 decades (Rodrik, 2016).

The slowdown in the manufacturing sector's growth is detrimental to Indonesia for several reasons. First, the manufacturing sector provides significant opportunities for capital accumulation. Second, it creates a substantial number of formal job opportunities. Third, it offers specific chances to achieve economies of scale. Fourth, technological advancements typically occur in the manufacturing sector, making it a primary source of technology-based productivity growth. Fifth, the linkages and spillover effects are stronger in the manufacturing sector compared to other economic sectors. Sixth, as a producer of physical and durable goods, manufacturing has a higher marketability than agriculture and services. Indeed, one of the key aspects of manufacturing compared to services and agriculture is the marketability of its output, as manufactured products remain more freely tradable than products from other sectors.

After the Asian financial crisis, the weakened growth of the manufacturing sector was unable to absorb the surplus labor from the agricultural sector as it had in the previous period. The elasticity of labor absorption to output (the percentage change in labor absorption due to a one percent change in output) in the manufacturing sector decreased from 0.67 during the period 1988-1996 to just 0.2 during 2000-2008. The manufacturing sector became increasingly unable to absorb labor.

As a result, after the 1998 Asian financial crisis, the service sector began to replace manufacturing as the engine of economic growth. This can be seen from the service sector's growth being higher than the overall economic growth. The average growth rate of the service sector from 2000 to 2020 was 6.24 percent, higher than the average economic growth rate of only 4.91 percent. Although its growth is impressive, the service sector has not been able to provide as many jobs as the manufacturing sector, and job growth varies significantly among sub-sectors. Among the main industries in each sector, finance, electricity, and construction stand out in job creation, while manufacturing, transportation, and communication are the opposite. The issue is that when early deindustrialization occurs (as in Indonesia), the service activities replacing the role of manufacturing are often low-skilled and non-tradable, with lower productivity levels (Tregenna, 2015). This is evident from the increasing share of informal labor in the non-agricultural sector across all education levels. The rise in informal workers outside the agricultural sector explains the decreasing share of structural changes in productivity growth following the 1998 Asian financial crisis.

The service subsectors that developed in Indonesia between 2000 and 2020 include financial services, telecommunications, healthcare, education, and wholesale trade. These sectors are relatively capital-intensive and require educated labor. Changes in demand and supply in the labor market due to structural economic shifts have led to structural unemployment, given the mismatch between the skills of available workers and the needs of employers. As a result, many workers remain unemployed. Meanwhile, for workers, it takes time to develop the necessary skills, as seen in formal service sectors.

Table 6: Share of Informal Labor by Education Level

Education Level	Year						
	2015	2016	2017	2018	2019	2020	2021
< SD	67.69	65.99	66.69	66.35	65.61	69.18	70.26
SMP	52.95	52.89	52.64	53.68	53.49	59.25	59.82
SMA	34.15	36.09	36.99	37.68	38.26	45.15	44.76
SMK	26.85	30.38	29.10	31.17	30.45	34.70	35.24
Diploma	14.82	18.34	17.67	18.83	19.26	23.71	23.71
University	8.19	9.99	10.48	11.48	11.63	16.16	14.57

The growth of the informal sector in non-agricultural areas is a response to the limitations of the formal sector in absorbing labor. This occurs because the formal labor market is unable to create a sufficient number of job opportunities. The formal sector tends to employ educated workers with specific skill requirements, yet not all available workers meet these requirements. As a result, labor that is not absorbed by the formal sector will seek alternative, easier opportunities, such as those in the informal sector.

While the informal sector has advantages like ease of entry and often acts as a buffer for absorbing labor, the increasing share of informal employment also indicates a deteriorating labor market climate in Indonesia. This is related to the characteristics of the informal sector, which include not paying taxes, being persistent (Gibson & Flaherty, 2016), having low education and skills (Ramdan, 2012; Armansyah & Taufik, 2018), and being impoverished (Chen & Vanek, 2013). The informal sector becomes a popular survival strategy for job seekers who cannot adapt to globalization, fail to enter the formal job market, face competition, or are laid off (Canclini, 2019). According to the ILO (2020), informal workers have limited access to social and employment security.

5. Conclusion

This study aims to analyze the determinants affecting the migration of agricultural labor to the non-agricultural sector and its impact on productivity within the economy. Using Indonesia as a case study, the research finds that demographic, structural, and economic factors significantly influence changes in the share of agricultural labor.

Agricultural labor migration in Indonesia heavily depends on developments in the non-agricultural sectors, including both industry and services, education levels, and agricultural mechanization. However, foreign direct investment (FDI) does not appear to reduce the share of agricultural labor in Indonesia. This is because FDI tends to flow into sectors that rely on technology and automation. Agricultural workers may lack the skills required by these industries. FDI often seeks workers with high technical or managerial skills that do not align with the skill sets of Indonesian agricultural workers, most of whom have an education level below junior high school.

Estimation results show that rural population growth positively impacts the increase in the share of agricultural labor in Indonesia. However, this effect diminishes when controlled for education factors. In this regard, higher participation in secondary education can reduce the rural population working in agriculture. This is because workers with higher educational qualifications have greater opportunities to work outside the agricultural sector. These findings are consistent with research by Drean et al. (2021), which found that education levels negatively affect the absorption of agricultural labor. Highly educated workers generally tend to avoid agricultural work, opting instead for sectors with higher wages (Gollin & Waugh, 2014; Herrendorf & Schoellman, 2018).

Regarding structural factors, this study finds that developments in the non-agricultural sector, including both industry and services, contribute to reducing the share of agricultural labor in Indonesia, as observed in model (3). Specifically, a 1% increase in industrial output can reduce the share of agricultural labor by 1.15%. Meanwhile, a 1% increase in service output can reduce the share of agricultural labor by 1.29%. Estimation results from model (4) indicate that agricultural mechanization, as measured by capital per hectare of agricultural land (KA/HA), negatively impacts the share of agricultural labor. In this context, greater adoption of technology in agriculture leads to a further decrease in the share of agricultural labor. This is consistent with findings from Hubbansyah et al. (2023), which show a tendency for input savings in agricultural labor with technological advancements. Farmers choose technology because of greater economic incentives, such as lower production costs and increased productivity.

Estimation results show that foreign direct investment (FDI) does not appear to reduce the share of agricultural labor in Indonesia. This occurs because FDI tends to flow into sectors that rely on technology and automation. Agricultural workers may lack the skills required by these industries. FDI often seeks workers with specific technical or managerial skills. Therefore, job opportunities created by FDI in Indonesia tend to be biased towards high-skilled labor (Ningrum, 2008).

Decomposition results highlight the importance of structural change in contributing to labor productivity growth in Indonesia, ranging from 0.9% to 1.7% during the period 1980-2020. Thus, the shift of labor from agriculture to non-agriculture has significantly increased overall productivity. The productivity increase resulting from the transition of labor from agriculture to industry is much greater than from agriculture to services. Specifically, for every 1% shift of agricultural labor to industry, productivity increases by USD 109. This figure can rise further to USD 114 if the agricultural labor moving to industry has at least a high school education or is semi-skilled. In contrast, the transition of agricultural labor to services increases productivity by USD 30-35. This is because the

industrial sector is seen as more capable of creating a larger number of formal job opportunities, thus having a higher leverage effect on productivity growth compared to the service sector (Rodrik, 2016).

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References

- Aggarwal, R. (2021). Comparative Analysis of Structural Transformation Process of Selected Asian Developing Economies. *Journal of Asian Economic Integration*, 3(1), 7- 24.
- Anderson, K., & Ponnusamy, S. (2023). Structural transformation away from agriculture in growing open economies. *Agricultural Economics*, 54(1), 62-76.
- Bairagi, S., Kamal, M. (2019). Is Bangladesh's Economy Approaching the Lewis Turning Point?. *South Asia Economic Journal*, 20(1), 19– 45. <https://doi.org/10.1177/1391561418822208>
- Basu, Kaushik (2000). Analytical Development Economics: The Less Developed Economy Revisited. *Cambridge and London: MIT Press*.
- Bowonthumrongchai, T. (2019). Lewis Turning Point and Agricultural Development in the Mekong: A Case of Thailand. *社会科学論集= Shakaikagaku-Ronshu (The Social Science Review)*, 156, 31-49.
- Bustos P., Capretini B., Ponticelli, J. (2016). Agricultural Productivity and Structural Transformation : Evidence From Brazil. *American Economic Review*. 106(6):1320-1365.
- Cheng, S., Heng, D., Ngim, R., Ban, K. (2015). Has Cambodia reached the Lewis Turning point?: final draft.
- Corsman, E. (2015). Has China passed its Lewis Turning Point?-A study of regional variation.
- Dartanto, T., Yuan, E. Z. W., Sofiyandi, Y. (2017). Structural Transformation and the Dynamics of Income Equality in Indonesia: 1996-2014. *Kuznets Beyond Kuznets*.
- Das, M. M., N'Diaye, M. P. M. (2013). Chronicle of a decline foretold: Has China reached the Lewis turning point?. *International Monetary Fund*.
- Dastidar, A. (2012). Income distribution and structural transformation: Empirical evidence from developed and developing countries. *Seoul Journal of Economics*, 25(1), 25-56.
- Fei, J. C., & Ranis, G. (1964). Development of the labor surplus economy; theory and policy.
- Felipe, J., Dacuycuy, C. B., Lanzafame, M. The declining share of agricultural employment in China: how fast?. *Structural Change and Economic Dynamics*, 37 (2016) 127-137.
- Firmansyah, F., Sumarno. (2013). The development of 9-year compulsory education in Indonesia in the period 1994-2008. *AVATARA, e-Journal Pendidikan Sejarah*, 1(2), hlm. 198-203.
- Fuglie, K. O., Wang, S. L., Ball, V. E. (Eds.). (2012). Productivity growth in agriculture: an international perspective. *CABI*.
- Gollin, D. (2014). The Lewis model: A 60-year retrospective. *Journal of Economic Perspectives*, 28(3), 71-88.
- Gollin, D. (2021). Agricultural Productivity and Structural Transformation : Evidence and Questions for African Development. *Oxford University*.
- Hadiana, M. H., Daud, A. R., Utami, A. W. (2019). Analysis of the efficiency of the use of production factors in dairy farming (Survey of dairy farmers, Pangalengan District, West Java). *Jurnal Sosial Bisnis Peternakan*, 1(1), 11-18.
- Herzfeld, T., Akhmediyeva, Z. (2021). Agricultural Labour in Transition :An Update. *Journal of New Economy. Ural State University of Economics. Vol.22, Iss 3, pp 144-160*.
- Hubbansyah, A. K., Husodo, Z. A. (2018). The Interdependence Between the Financial Sector and Business Sector in ASEAN 4 Countries. *Journal of Indonesian Economy and Business: JIEB.*, 33(1), 77-94.
- Hill, H. (2000). The Indonesian Economy Since 1996. *New York: Cambridge*.
- Islam, R. (2014). The employment challenge faced by Bangladesh: How far is the Lewis turning point. *The Indian Journal of Labour Economics*, 57(2), 201-225.

- Islam, R. (2015). Structural transformation and alternative pathways to the Lewis Turning Point. Paper prepared for the International Seminar on Labor and Employment Issues in the Emerging Rural-Urban Continuum: *Dimensions, Processes and Policies, 12–14 March, Hyderabad, India.*
- Juanda, B., Junaidi, J. (2012). *Ekonometrika deret waktu: teori dan aplikasi.*
- Kuznets, S. (1955). Economic growth and income inequality. *The American economic review*, 45(1), 1-28.
- Lewis, W. A. (1954). Economic development with unlimited supplies of labor. *The Manchester School*, 22(2), 139–191.
- Liu, S. (2019). Research on China's "Lewis Turning Point" and Efficiency Analysis of Each Province—Based on DEA and SFA Methods. *Modern Economy*, 10(4), 1178-1189.
- Ma, X., & Minami, R. (2022). Dual Economic Structure, Surplus Labour and Rural-Urban Migration. In *Growth Mechanisms and Sustainable Development of the Chinese Economy: Comparison with Japanese Experiences* (pp. 249-277). Singapore: Springer Nature Singapore.
- Mariyono, J., Kompas, T., Grafton, R. Q. (2010). Shifting from Green Revolution to environmentally sound policies: technological change in Indonesian rice agriculture. *Journal of the Asia Pacific economy*, 15(2), 128-147.
- McCaig, B., Pavcnik, N. (2018). Export markets and labor allocation in a low-income country. *American Economic Review*, 108(7), 1899-1941.
- Minami, R., Makino, F., Kim, K. (Eds.). (2014). *Lewisian Turning Point in the Chinese Economy: Comparison with East Asian Countries.* Springer.
- Minami, Ryoshin. 1968. The turning point in the Japanese economy. *Quarterly Journal of Economics* 82, no.3: 380–402.
- Pingali, P. L. (1997). From subsistence to commercial production systems: The transformation of Asian agriculture. *American journal of Agricultural economics*, 79(2), 628-634.
- Raiyan, N., & Putri, N. D. K. (2021, November). Determinants of the Shifting Labor in Agricultural Sector to Non-agricultural Sectors Evidence in Indonesia. In *Seminar Nasional Official Statistics (Vol. 2021, No. 1, pp. 439-448).*
- Ranis, G. (2012). Labor surplus revisited (Yale University Economic Growth Center Discussion Paper No.1016). New Haven, CT: Yale University.
- Ranis, G., & Fei, J. C. (1961). A theory of economic development. *The American Economic Review*, 51(4), 533–565.
- Rostow, W. W. (1956). The take-off into self-sustained growth. *The Economic Journal*, 66(261), 25-48.
- Sen, K. (2019). What explains the job creating potential of industrialisation in the developing world?. *The Journal of Development Studies*, 55(7), 1565-1583.
- Setiyanto, A. (2015). Analysis of rural labor absorption in dry land plantations.
- Silaban, L. R., & Sugiharto, M. S. (2016). Efforts undertaken by the Government in Developing the Agricultural Sector. *JPPUMA: Jurnal Ilmu Pemerintahan dan Sosial Politik UMA (Journal of Governance and Political Social UMA)*, 4(2), 196-210.
- Supriyati, S. (2010). Dynamics of Agricultural Employment Economy: Problems and Strategic Policies for Development.
- Susilo, Y. S., & Handoko, B. S. (2002). The Impact of Economic Crisis on Industrial Sector Performance: An Applied General Equilibrium Model Approach Indorani. *Journal of Indonesian Economy and Business (JIEB)*, 17(3).
- Wie, T. K. (2006). Technology and Indonesia's industrial competitiveness (No. 72). ADBI Research Paper Series.
- Wiggins, S. (2016). *Ifad Research Series 1-Agricultural and rural development reconsidered: a guide to issues and debates.* IFAD Research Series.
- Winardi, W., Priyarsono, D. S., Siregar, H., & Kustanto, H. (2019). The role of industrial areas in overcoming the symptoms of deindustrialization. *Jurnal Ekonomi dan Pembangunan Indonesia*, 19(1), 5.
- World Bank (1996) *The Chinese Economy: Controlling Inflation, Deepening Reform,* The World Bank Publication, Washington, D.C.
- Yamada, T. (2016, September). The Turning Point in the Vietnamese Economy: Revisiting Labor Surplus Theory. In *Forum of International Development Studies (Vol. 47, No. 5, pp. 1-15).*
- Yusdja, Y., & Soeparno, H. (2011). The Impact of the Economic Crisis on Agriculture in Indonesia. Land Conversion and Fermentation Threats to Food Independence. *Food Research and Development Agency, Ministry of Agriculture.* Jakarta. <http://www.litbang.pertanian.go.id/buku/konversi-fragmentasi-lahan/BAB-II-1.pdf> [Retrieved April 21 2018].
- Zhang, X., Yang, J., & Wang, S. (2011). China has reached the Lewis turning point. *China Economic Review*, 22(4), 542-554.
- Zhu, A., Cai, W. (2012). The Lewis turning point in China and its impacts on the world economy. *AUGUR WorkingPaper*, (1).