

## Structural Transformation Patterns and Factors That Influenced: The Case in Indonesia

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### Abstract

The purpose of this study is to determine the pattern of structural transformation and analyze the effect of per capita income, population, and human capital structural transformation in Indonesia. The research data uses data from three economic sectors, namely the agricultural, industrial, and service sectors in Indonesia from 1990-2019. The research analysis method is descriptive qualitative to see sectoral patterns and trends, while the quantitative analysis method uses the Chenery-Syrquin regression model approach. The findings in the study that there has been a structural transformation in Indonesia during the last three decades with the S-I-A pattern (agricultural service industry). The population has a positive and significant effect on the agricultural, industrial, and service sectors, while human capital has a significant positive effect on the industrial and service sectors. In conclusion, various factors influence structural transformation in different sectors in Indonesia.

**Keywords:** Structural Transformation, GDP Per Capita, Population, Human Capital, OLS Regression.

## Pola Transformasi Struktural dan Faktor yang Mempengaruhinya: Kasus di Indonesia

### Abstrak

Tujuan penelitian untuk mengetahui pola transformasi struktural dan menganalisis pengaruh pendapatan perkapita, jumlah penduduk, dan modal manusia terhadap transformasi struktural di Indonesia. Menggunakan data sektor ekonomi utama, yaitu sektor *agriculture*, *industry*, dan *service*. Metode analisis menggunakan deskriptif kualitatif untuk melihat pola dan trend sektoral selama tahun 1980-2019. Analisis kuantitatif dengan regresi linier berganda pendekatan OLS menggunakan data selama tahun 1990-2019. Hasil temuan dalam penelitian terjadi transformasi struktural di Indonesia selama 3 dekade terakhir dengan pola S-I-A (*service-industry-agriculture*), Dari model regresi menunjukkan bahwa pendapatan perkapita berpengaruh negatif dan signifikan pada sektor industri dan berpengaruh negatif dan tidak signifikan pada pertanian dan jasa. Jumlah penduduk berpengaruh positif dan signifikan pada sektor pertanian, industri dan jasa. Sedangkan modal manusia berpengaruh positif signifikan pada sektor industri dan jasa. Kesimpulannya faktor yang mempengaruhi transformasi struktural di Indonesia berbeda-beda untuk setiap sektor.

**Kata kunci:** Transformasi Struktural, GDP Perkapita, Populasi, Human Capital, Regresi OLS

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## INTRODUCTION

Structural changes in the economy that occur in Indonesia could be viewed from the value-added indicators of Gross Domestic Product (GDP) or growth as seen through the contribution of sectoral GDP. According to Herdianti et.al (2015), the characteristics of changes in economic structure that occur in the development process of developing countries towards developed countries are starting from the agricultural sector to the modern sector. In addition, Yunisvita (2011) argues that to see the success of development is the achievement of quality economic growth, accompanied by changes in the economic structure. Romli et.al (2016) confirm that changes in the economic structure that occur have been evidenced by the reduced role of the agricultural sector and the increasing role of the secondary and tertiary sectors in GDP, as well as increased absorption of labor.

The agricultural industry might still be taken into account by the government both regionally and nationally. However, we know that the role of this sector shows a declining trend along with the increase in per capita income which illustrates the process of structural transformation. This change has resulted in a shift in the economic structure that has slowed the relative role of the primary sector, this has resulted in a smaller contribution to the added value of national GDP (Vaulina & Elida, 2014). But on the other hand, the process of structural change according to Fisher and Clark is not only seen from the declining share of the agricultural sector which switches to the industrial and service sectors in terms of GDP and GRDP but also focuses on the use of labor production factors (Karyasa, 2006).

Table 1. *Contribution of Agriculture, Industry, and Services in Indonesia, 2010-2019*

No.	Year	Share Sector		
		Primary	Secondary	Tertiary
1	2010	26,45	35,82	37,73
2	2011	26,53	35,25	38,21
3	2012	26,31	34,98	38,71
4	2013	25,71	34,45	39,84
5	2014	23,99	32,00	41,62
6	2015	21,14	32,40	43,30
7	2016	20,66	32,12	43,65
8	2017	20,74	31,80	43,61
9	2018	20,89	31,65	43,42
10	2019	19,98	31,69	44,22
<b>Rata-Rata</b>		<b>23,24</b>	<b>33,22</b>	<b>41,43</b>

Source: Asian Development Bank (ADB).

According to the lengths of time, Indonesia's economic structure moves through phases that change constantly. In the 1960-1980 period, the primary sector was still dominated by the agricultural sector at 50-60 percent, followed by the tertiary sector at 30-40 percent, and the secondary sector contributed 10-20 percent. As a result of other changes in 1985, Indonesia's economic structure evolved.. The contribution of the tertiary sector began to show an increase compared to the primary sector. The contribution of the tertiary sector is 40 percent, while the contribution of the primary sector is between 25-40 percent.

The development for the secondary sector which is dominated by the manufacturing industry shows an increasing trend with a contribution of between 20-30 percent. In 1993 Indonesia's economic structure underwent another change, where the contribution of the secondary sector increased to 30-40 percent. This has an impact on the primary sector whose contribution has decreased to around 25-30 percent. Meanwhile, during the period 2000-2018, the tertiary sector still showed its largest role among the primary and secondary sectors with a contribution of 40 percent.

Indonesia has experienced steady economic growth over the last 20 years. The transition from the primary sector to the manufacturing and service sectors, however, has been gradual. The agricultural sector remains the largest absorber of employment in Indonesia, while most of the labor transfer from the agricultural sector is absorbed into the service sector and the quality is still low. The number of workers working in the manufacturing sector has consistently increased in Indonesia, from 6 million in 1988 to 17 million in 2017. Employment in the sector, which is a proportion of the total workforce, only increased from 10% to 14%. This proves that the manufacturing sector has not become the main support for economic growth, in terms of job creation. Compared to other countries, this condition is unique, where excess workers in the agricultural sector tend to be absorbed by the manufacturing industry sector. In order to accelerate structural transformation in Indonesia, policies must be made that encourage increased productivity in all sectors and prioritize productive investments that can help develop sectors by seeing greater potential opportunities. In addition, Indonesia also needs to develop strategies to seize opportunities with the presence of industrial revolution 4.0.

In the 2019-2024 RPJMN document, one of the programs of the Advanced Indonesia Cabinet is economic transformation, defined as a continuous process McMillan et.al (2017), namely (a) moving workers and other resources from low to high productivity (transformation). structural); (b) promote growth within the existing sector using technology, and (c) encourage areas that have the potential as growth locomotives. Data from the World Bank and UNIDO shows that the economy of developed countries in 2016-2019 was dominated by the service sector 69.76%, agriculture 16.23%, and industry only 14.01%. As for the upper-middle-income countries, the contribution of services was 55.44%, followed by agriculture at 24.87%, and industry at 19.69%. The economic structure is different from Indonesia, services are still 43.72%, followed by agriculture 36.21% and industry 20.06%. Then half of Malaysia's economy is the service sector 52.90%, followed by agriculture 25.44%, and industry 21.65%.

Currently, Indonesia is experiencing the phenomenon of deindustrialization, but it moves more quickly than it should (*premature deindustrialization*). This is reflected in the proportion of the manufacturing industry sector which has fallen drastically in the last 10 years. Based on BPS data in 2008, the proportion of the manufacturing sector to the national GDP was 27.80%, and in 2018 it was only 19.80% (a decrease of 8 percent in 10 years). The impact of a slowdown in the manufacturing sector is, first, a decrease in tax revenue, because the manufacturing industry contributes 30 percent of tax revenue. Second, with this

symptom of premature deindustrialization, the potential for job creation in the manufacturing industry sector has decreased and the risk of unemployment arises.

Empirically, extensive research on structural transformation has been conducted throughout various countries, and the results of these studies have produced a wide range of results. In one study it was explained that growth causes transformation based on the neoliberal premise that export-driven development based on the principle of comparative advantage stimulates growth over time, causing structural transformation by accelerating the transition from an emphasis on agriculture to an emphasis on industry and services (Teignier, 2017). Increased income growth also affects structural transformation. When incomes increase, households spend relatively less on agricultural products and more on manufactured goods and services thereby encouraging industrial sector development (Świącki, 2017).

Empirical studies of the relationship between growth and structural transformation have yielded mixed results. For example, the structural transformation in South Korea has been linked to the role of international trade in accelerating the transition from agriculture to industry and services (Sposi, 2015). Similarly, Üngör (2017) finds that differences in sectoral productivity growth rates account for different sectoral reallocations in Latin America and East Asia. However, another study using Granger causality analysis discovered that the causal relationship is country-specific, implying that there is no universal relationship between the two variables (Elliott, 1998). Furthermore, a cross-country analysis of 53 African countries found a U-shaped relationship between income growth and the contribution of the manufacturing sector to GDP; below the threshold of US\$ 943 (current value), an increase in GDP per capita is accompanied by a decrease in the manufacturing share of GDP, but beyond this level, income is positively associated with the contribution of the manufacturing sector to GDP (Mijiyawa, 2017).

The relationship between growth and social development has also generated scholarly interest with a focus on inequality and human capital as potential drivers of structural transformation (Baek, 2017). Studies that focus on the relationship between inequality and structural transformation still do not agree on the direction of causality. Some experts, for example, Deutsch & Silber (2004) and Martorano et.al (2016) focused on the impact of structural transformation on inequality, influenced by the work of (Kuznets, 1955). Meanwhile, Piketty (1997) has emphasized the impact of inequality on growth.

Empirical findings on the relationship between social development and structural transformation suggest that outcomes depend on the nature of the transformation. For example, Dastidar (2012) finds that when structural change has been characterized by a transition from agriculture to industry, inequality does not increase in developing countries. On the other hand, inequality is found to be increasing in developing countries transforming agricultural services. In the latter case, the increase in inequality is more pronounced when the initial level of inequality is already higher than the average. Correspondingly, recently experts have highlighted the misallocation and underutilization of resources as a result of inequality which further hampers economic growth (Restuccia & Rogerson, 2017). Hypothesis Hwa (1989) states that all other factors are held constant, where faster

agricultural GDP growth leads to earlier growth in the industrial sector. Gemmell (2007) modeled the behavior of service activities of economic growth and its relationship to the industrial sector, however, several empirical studies have proven the existence of a reciprocal relationship involving activities in the service sector. Busse et.al (2018) found that although agriculture has been the dominant sector, the structural transformation has occurred and contributed significantly to African growth in the 1980-2014 period. Abdullah A & Wasil (2018) concludes that the level of economic growth and the industrial sector have a negative effect on the agricultural sector.

Looking at the problems and empirical studies that have been described above, it is appropriate to conduct further research to know the pattern of structural transformation and analyze the effect of per capita income, population, and human capital on structural transformation in Indonesia. Several previous studies have examined the driving factors of structural transformation (Arham, 2014; Hidayat & Herlin, 2019; Mehta, 2012; Mijiyawa, 2017), but focused on only one sector, such as the agricultural or industrial sector. This study adopts the Chenery-Syrquin model (1960) but focuses on three main sectors, namely agriculture, industry, and services which are still rarely studied. The main variables refer to the Chenery-Syrquin model, namely GRDP per capita and population, but what makes the difference in this model is that the researcher includes a social dimension variable, namely the role of human capital. Human capital which includes aspects of education, health, and adjusted per capita expenditure is one of the main determinants of economic growth (Barro, 1991; Becker, 1964; Schultz, 1961), but is neglected in the literature as a determinant of structural transformation. Some literature on growth theory is dedicated to investigating human capital accumulation and structural transformation separately, but few works have focused on their empirical and theoretical relationships (S. Li et al., 2018). Therefore, in this study, the role of human capital is proxied by the Human Development Index (HDI) which is expected to be a driving factor in the process of structural economic transformation in Indonesia.

## **METHOD**

This study aims to determine the pattern of structural transformation in GDP in Indonesia during the period 1980-2019. Data were obtained from the Central Statistics Agency (BPS) Indonesia. The method used is descriptive qualitative analysis, namely knowing and describing the pattern of structural transformation in Indonesia by comparing the relative share of the sectors of the production structure and seeing the pattern with a graph/histogram or by looking at the linear trend.

This study also uses quantitative analysis to test theory and see the causality between variables (Creswell, 2016), how the influence of GDP per capita, population, and human capital on the structural transformations that take place in Indonesia using multiple linear regression *Ordinary Least Square* (OLS) method. The observation period of 30 years is considered because the structural transformation process takes place in the long term. This study, using three models as the dependent variable which is proxied as structural transformation, where the structural transformation variable is divided into three main

sectors, namely the agriculture, industry, and service sectors as measured by value-added or sectoral GDP. The independent variables for per capita GDP data, the total population were obtained from the publications of the World Bank or the official website <http://data.worldbank.org>, while the human capital data as proxied by the Human Development Index (HDI) were obtained from the Indonesian BPS publications.

To determine the effect between variables in this study, multiple linear regression analysis was used using the Ordinary Least Square (OLS) method. The empirical model analyzed relates to the economic and social aspects of structural transformation. The general specification of the structural transformation equation was adopted from the study conducted by Chenery (1960) and Mijiyawa (2017), where several changes have been made, while the empirical model is as follows:

$$\text{Model 1 : } AGR_t = \beta_0 + \beta_1 \text{LogGDPC}_{1t} + \beta_2 \text{POP}_{2t} + \beta_3 \text{HC}_t + \varepsilon_t \dots \dots \dots (1)$$

$$\text{Model 2 : } IND_t = \beta_0 + \beta_1 \text{LogGDPC}_{1t} + \beta_2 \text{POP}_{2t} + \beta_3 \text{HC}_t + \varepsilon_t \dots \dots \dots (2)$$

$$\text{Model 3 : } SER_t = \beta_0 + \beta_1 \text{LogGDPC}_{1t} + \beta_2 \text{POP}_{2t} + \beta_3 \text{HC}_t + \varepsilon_t \dots \dots \dots (3)$$

Where, the variables of Agriculture (AGRI), Industry (IND) and Services (SER) are measured from the value added (value added) of sectoral GDP at constant prices in rupiah GDP Per capita (GDPC), Total Population in million people (POP), and Human Capital (HC) is measured by the Human Development Index (HDI), time period (t) and error term ( $\varepsilon$ ).

## **FINDING AND DISCUSSION**

### **Structural Transformation Pattern**

The development of the national economy could be known directly from the production side. Through the investigation of the production sectors, it can be seen how far the process of economic transformation is going. The pattern-following tendency appears to also be present in Indonesia. However, there is a difference in the changes compared to the normal pattern that occurs in other countries. Table 1. Shows in absolute terms the role of the primary sector on GDP tends to increase, but it is seen that the contribution of this sector has decreased in relative terms. On the other hand, in absolute and relative terms, the secondary and tertiary sectors are increasingly at the forefront of the production structure. However, when viewed from the average growth rate of the three sectors, the values fluctuate, up and down in line with the development of national and international economic conditions.

Based on the figure 1, the primary sector's contribution to GDP has decreased from year to year. This is evidenced by the magnitude of the coefficient or slope which has a negative sign. However, other sectors (secondary and tertiary) have increased their contribution, which is reflected in the positive slope of the slope.

The secondary sector is the one with an upward tendency appears to have the largest role in the national production structure, where the regression coefficient value reaches 0.3906. It means that every role of the secondary sector in the national production structure always increases by 0.39 percent. Meanwhile, the additional contribution of the tertiary sector is still far below that of the industrial sector, where the value is only 0.07 percent.

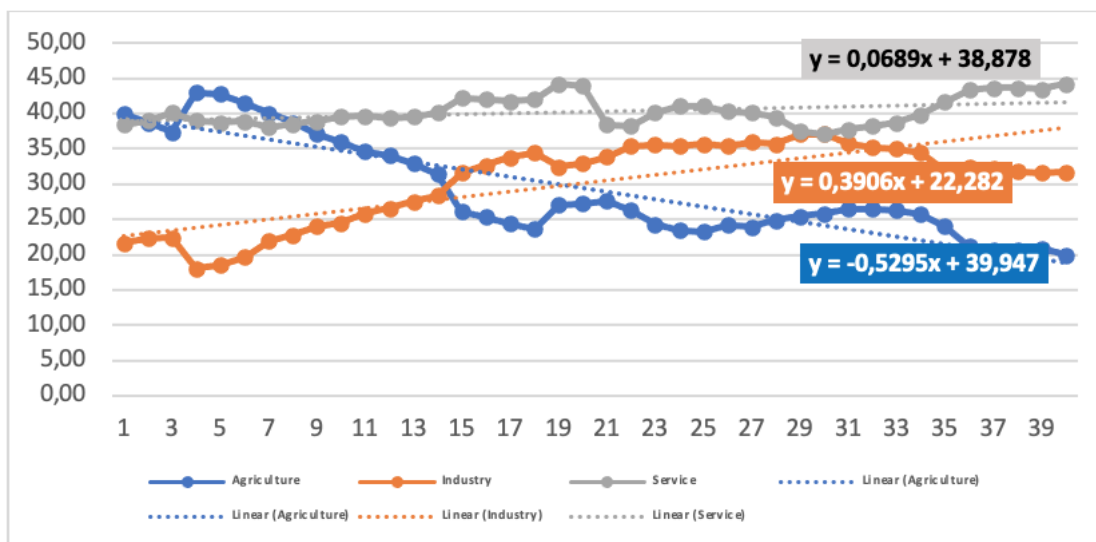


Figure 1. Structural Transformation of the Indonesian Economy

When viewed from the regression line equation, there are two trend line patterns. The primary sector trend line moves from the top right to the bottom left. This means that the longer the role of the primary sector decreases. Meanwhile, the trend line for the secondary and tertiary sectors moves from the bottom left to the top right. The rise and fall of these sectors vary widely, depending on the steepness of their respective trend lines. Additionally, the primary sector's downward trend has been crossed by the secondary sector's upward trend line. This indicates a change in the structure of the Indonesian economy, which initially rested on the primary sector moving to the secondary sector.

Furthermore, the three production sectors in Table 1 show that the highest sector contribution to GDP is the service sector at 44.22 percent (2019), which is followed by the industrial sector at 31.69 percent. It is also evident that during the period 1980-2019 the average contribution value of the service, industry, and agriculture sectors according to the pattern was 40.29 percent, 30.29 percent, and 29.09 percent. If traced back to the same period, it is visible that the role of the agricultural and industrial sectors has a relatively decreasing trend from year to year, although there is an increase in certain years not much, on the contrary, the role of the service sector has increased relatively. The impact of the decline in the contribution that occurred in the industrial sector was caused by an increase in the service sector so that these two sectors contributed greatly to the added value of GDP. The pattern of changes in the structure of GDP that occurred in Indonesia during the period 1980 - 2019 was SIA (*Service - Industry - Agriculture*), thus it can be concluded that for almost the last three decades in Indonesia there has been a change in the economic structure, where it is obvious that the role of the agricultural sector during this period its share of GDP has shifted to the lowest order.

Table 2. Estimation Results of Multiple Linear Regression

Independent Variable	Dependent Variable: <i>Structural Transformation</i>		
	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>
	Log( <i>AGRI</i> )	Log( <i>IND</i> )	Log( <i>SER</i> )
Constant	19.75192	26.45917	8.697193
LOG(GDPC)	-1.483623 (0.1377)	-2.184247 (0.0420)**	-0.702866 (0.4013)
POP	0.060949 (0.0000)***	0.066758 (0.0000)***	0.058618 (0.0000)***
HC	0.014923 (0.3688)	0.058157 (0.0023)**	0.025035 (0.0827)*
Observations	30	30	30
Adjusted R-squared	0.925471	0.931943	0.957908
Prob(F-statistic)	0.0000	0.0000	0.0000

Source: Data estimation (2021)

Note: \*statistical significance at the 10% level; \*\* statistical significance at the 5% level; \*\*\* statistical significance at the 1% level.

### Drivers of Structural Transformation in Indonesia

The results of multiple linear regression estimates, explaining the variables that affect the structural transformation of the GDP of the Agriculture, Industry, and Service sectors have an Adjusted R-squared value of 0.9254 (AGRI), 0.9319 (IND), and 0.9579 (SER). ). This indicates that the independent variables, namely GDP per capita (LogGDPC), population (POP), and human capital (IPM) in the model can explain about 92.54 percent, 93.19 percent and 95.79 percent of variations in the structural transformation variables, namely the rest of the GDP of agriculture, industry, and services comes from other sectors outside the model that is not studied. Meanwhile, the Prob test (F-statistics) shows that the variables of per capita income, population, and human capital together (simultaneously) have a significant effect on structural transformation in the agricultural, industrial, and service sectors with a p-value of 0.000.

Overall, Table 2 explains that per capita income has a negative and insignificant effect on the structural transformation of the agriculture and service sector but has a negative and significant effect on the industrial sector in Indonesia. This condition indicates that the increase in per capita income has an impact on the reduced value added to the GDP of the agricultural and service sectors. An increase in per capita income will increase consumption in the non-agricultural sector. The rate of change in the consumption of goods and services is determined by the elasticity of income. The transformation process in the production structure is influenced mainly by the demand factor, namely the consumption pattern of income which tends to increase. An increase in per capita income tends to change the structure of the economy not only on the production side, but also on the structure of



domestic demand (consumption), international trade, employment, demographics, and distribution. From the production side, there is a downward trend in the primary sector and an increase in the secondary and tertiary sectors in the economy.

When related to the elasticity of demand for foodstuffs on changes in income (the elasticity of demand for goods), it is smaller than one ( $E_m < 1$ ), while the elasticity of demand for goods and non-food is the opposite, which is greater than one ( $E_m > 1$ ). The nature of public demand is the same as Engel's law (Ernst Engel law), that the higher the income level of the community, the less portion of income is used to buy food, while the percentage of income devoted to buying non-food ingredients is larger. In the allocation process, there are three influencing factors behind the transformation process of the production structure that accompanies economic growth, namely: (1). Changes in demand for goods and services; (2). Changes in the quantity, quality, and composition of the factors of production and technological development; (3). Improvement and specialization as well as shifts in activities between economic sectors, as well as within each business unit (Paulina, 2017). The results of this study are in line with other studies (Mijiyawa, 2017; Paulina, 2017; Romli et al., 2016; & Tarp et al., 2002), where per capita income has a negative influence on structural transformation in the agricultural sector. While the study of (Alagidede et al., 2020) others found that income per capita had a negative and significant effect.

Changes in the economic structure do not directly result in changes in the production side. Changes that occur in terms of labor are caused by changes from the traditional economic sector (agriculture) to the modern sector. This has an impact on the work side. The variable number of population or the number of people in a country has a positive and significant effect on the added value of GDP in the agricultural, industrial, and service sectors in Indonesia. This means that population growth will result in increased activity in the agricultural, industrial, and service sectors to encourage these economic sectors to increase economic output. Changes that occur in terms of workers caused by changes from the traditional economic sector (agriculture) to modern (manufacturing) will have an impact on job changes.

For countries with a fairly high concentration of the primary sector, it illustrates that the country's population has an important role in creating output in the primary sector. In some developing countries, the primary sector is still traditional (agriculture and animal husbandry), as well as the semi-modern forestry and mining sub-sectors which still depend on the use of a large amount of labor. Another impact seen from the increasing population is shown by a shift in the form of consumption of the population or society where there is a change in consumption from food products to processing industrial products and service products that have high value because of changes in human tastes in consuming non-food products. This tangible evidence is also based on Engles' law which explains that elasticity of demand is the result of an increase in population income which is inelastic for food products and elastic for manufactured products or goods and services. Associated with the population having a positive and significant effect on the GDP of the service sector, this proves that an increase in the population can also be interpreted as an increase or increase

in the number of workers in the service sector. The increasing population can have an impact on the large number of workers absorbed in various activities in various service sectors, such as an increase in transportation and warehousing services, educational services, hotel and restaurant services, as well as financial and insurance services and trade.

Population changes also affect the structure of trade. The population has a significant effect on primary exports, industrial exports, and imports, this is possible since the demand for domestic basic products continues to rise along with population growth. This is by the Chenery-Syrquin theory, namely if a country undergoes a structural transformation, there will be a change in export orientation from which usually exports more primary products, to an increase in exports of industrial products and services. In today's era, the service sector has a very important role in the economy. More and more business fields are becoming sub-sectors that are loaded by the service sector, especially supported by access to the growing digitalization of the economy. This finding is in line with previous studies (Aba et al., 2015; Dabla-Norris et al., 2013; Paulina, 2017; & Totouom et al., 2019) who concluded that the population has a positive and significant impact on the structural transformation of the economy for the GDP of the agricultural, industrial and service sectors.

The human capital variable, which is proxied by the Human Development Index (HDI), has a positive but not significant effect on the structural transformation of the agricultural sector's GDP but has a positive and significant effect on the GDP of the industrial and service sectors in Indonesia. The agricultural sector, which we know as the sector that absorbs the largest workforce in Indonesia, has quality human resources and a low level of productivity. This is due to the average worker in the agricultural sector is still traditional, with the dominant education level being junior high school and below, less supported by technological advances in producing agricultural products. The result is that Indonesia's agriculture sector has not been able to develop and compete internationally. The results of a study conducted by Arham & Dai (2019) explained that the average length of schooling had an insignificant effect, but the average length of schooling in Indonesia for the 25-year-old population tends to increase every year, in 2020 the average length of schooling in Indonesia 8.48 years with an expectation of 12.98 years of schooling.

In other cases, it proves that graduating from junior high school has a negative and significant impact on economic output. The increasing number of junior high school graduates has an impact on a decline in economic growth, this is because the portion of employment to absorb high school graduates is still limited and competes with other school graduates, especially in urban areas. This causes the quality of human resources and productivity to be below, and on average junior high school graduates and below are more dominant in working in the non-productive sector, so that the effect on economic output is still relatively small (Arham & Dai, 2019). Various earlier research have supported the same condition where the results of other studies assume that elementary school graduates, special education graduates, and junior high school graduates have a weak correlation to economic output (Ahmad & Luqman, 2012; Zhu, 2014).

The role of human capital in accelerating the process of structural transformation has been considered very important because structural changes could not only stimulate

economic growth but can also lead to a sustainable growth path (Martins, 2019). Therefore, to strengthen the role of human resources to accelerate structural transformation, it is necessary to involve the government in fiscal decentralization policies related to government spending in supporting the improvement of human development by allocating the budget in the APBN/APBD in the education sector. The results of the study conducted (Arham & Dai, 2019) explained that the allocation of government spending for the education sector turned out to have a positive and significant relationship to the economic growth of each province in Indonesia, where the increase in economic growth will lead to a faster structural transformation process. Thus, the amount of allocation for education at 20 percent should be sought to encourage the improvement of the quality of education equally in Indonesia. So that with the government's role through fiscal decentralization policies through budget allocations for education to economic output, later it could be allocated for increasing the production structure that leads to the development of productive sectors, especially sectors that could become the key or engine of growth for the provinces in Indonesia. This evidence is also strengthened by (H. Li & Liang, 2010; Zoran, 2015), 2015), who argue that investment funds for education have a strong relationship with increasing value-added GDP.

Ciccone & Papaioannou (2009) find evidence of a positive correlation between human capital and structural change because GDP and employment growth in the industry are significantly faster in higher-school economies. Likewise Li et.al (2018), there is a positive and statistically significant relationship between the stock of human capital and the speed of structural change. One reason is that the role of human capital accumulation could expand research and development (R&D) in economic activity (Bodman & Le, 2013) and have an impact on the country's technological progress (Caselli & Coleman, 2006; Romer, 1990). Therefore, when the stock of human capital in countries increases, the productivity, and skills of workers increases, which leads to an accelerated structural transformation of the country. These findings are in line with (Anderson & Ponnusamy, 2019; Armah & Baek, 2019; Ayed Mouelhi & Ghazali, 2021; Pinto et al., 2020; Ssozi & Bbaale, 2019; Totouom et al., 2019) where they concluded that human capital influences positive and significant impact on structural transformation and also proved to be a potential accelerator of changes in economic structure.

## **CONCLUSION**

Analyzing the development of the proportion of the agricultural, industrial, and service sectors to GDP shown in the time series analysis of sectoral contributions, it can be said that the structural transformation process of the Indonesian economy has followed the normal pattern. This is evidenced again through the pattern of changes in the structure of the Indonesian economy from the production structure were during the period 1980-2019 the trend towards the S-I-A (service-industry-agriculture) pattern. This indicates that the structural change in the Indonesian state during the past 40 years has been expected

The driving factors for structural transformation in Indonesia include per capita income, population, and human capital. Where per capita income has a significant effect

on the structural transformation of the industrial sector GDP even though the direction is negative. The population has a positive and significant effect on the GDP of the agricultural, industrial, and service sectors. Meanwhile, human capital as proxied by the Human Development Index (HDI) has a positive and significant effect on the structural transformation of the GDP of the industrial and service sectors and has no significant effect on the GDP of the agricultural sector.

To accelerate the structural transformation that is taking place in Indonesia, the role of the accumulation of human capital needs to be increased by the central and local governments, namely by prioritizing the development of economic sectors that become engines of growth. Strategies that need to be implemented include industrial and sectoral policies that promote decent work and increase productivity, investment in infrastructure, and strategic sectors to address the drivers of transformative change in the world of work, strengthening fiscal decentralization to increase and distribute welfare across regions in Indonesia, as well as pursuing sectors that are drivers of inclusive economic growth and sustainable development.

## REFERENCES

- Aba, F. X. L., Yussof, O. M., & Mohd, S. B. (2015). Analysis of Economic Structure in Poverty Eradication in The Province of East Nusa Tenggara Indonesia. *Procedia - Social and Behavioral Sciences*, 211, 81–88. <https://doi.org/10.1016/j.sbspro.2015.11.013>
- Abdullah A, A. T., & Wasil, M. (2018). Pengaruh Transformasi Ekonomi Dari Sektor Pertanian Ke Sektor Industri Terhadap Pertumbuhan Ekonomi Di Indonesia. *Jurnal Dinamika Ekonomi Pembangunan (JDEP)*, 1(1), 6–11.
- Ahmad, N., & Luqman, M. (2012). Secondary Education and Economic Growth in Developing Countries: a Case Study of Pakistan. *Interdisciplinary Journal of Contemporary Research in Business*, 4(3), 306–314.
- Alagidede, I. P., Ibrahim, M., & Sare, Y. A. (2020). Structural Transformation in The Presence of Trade and Financial Integration in Sub-Saharan Africa. *Central Bank Review*, 20(1), 21–31. <https://doi.org/10.1016/j.cbrev.2020.02.001>
- Anderson, K., & Ponnusamy, S. (2019). Structural transformation to manufacturing and services: What role for trade? *Asian Development Review*, 36(2), 32–71. [https://doi.org/10.1162/adev\\_a\\_00131](https://doi.org/10.1162/adev_a_00131)
- Arham, M. A. (2014). Kebijakan Desentralisasi Fiskal, Pergeseran Sektoral, dan Ketimpangan Antarkabupaten/Kota di Sulawesi Tengah. *Jurnal Ekonomi Dan Pembangunan Indonesia*, 14(2), 145–167. <https://doi.org/10.21002/jepi.v14i2.437>
- Arham, M. A., & Dai, S. I. S. (2019). Analysis of Funding, Education Performance, and Economic Growth in Indonesia. *Jurnal Economia*, 15(2), 292–305. <https://doi.org/10.21831/economia.v15i2.26351>
- Armah, B., & Baek, S. J. (2019). Prioritising interventions for sustainable structural transformation in Africa: a structural equation modelling approach. *Review of Social Economy*, 77(3), 297–325. <https://doi.org/10.1080/00346764.2019.1602277>
- Ayed Mouelhi, R. Ben, & Ghazali, M. (2021). Structural transformation in Egypt, Morocco and Tunisia: Patterns, drivers and constraints. *Economics of Transition and Institutional*

*Change*, 29(1), 35–61. <https://doi.org/10.1111/ecot.12258>

- Baek, S. J. (2017). Is rising income inequality far from inevitable during structural transformation? A proposal for an augmented inequality dynamics. *Journal of Economics and Political Economy*, 4(3), 224–237. <https://doi.org/10.31857/s020736760001432-4>
- Barro, R. J. (1991). Economic Growth in a Cross Section of Countries. In *The Quarterly Journal of Economics* (Vol. 106, Issue 2).
- Becker, G. . (1964). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. University of Chicago Press.
- Bodman, P., & Le, T. (2013). Assessing the roles that absorptive capacity and economic distance play in the foreign direct investment-productivity growth nexus. *Applied Economics*, 45(8), 1027–1039. <https://doi.org/10.1080/00036846.2011.613789>
- Busse, M., Erdogan, C., & Mühlen, H. (2018). Structural transformation and its relevance for economic growth in Sub-Saharan Africa. *Review of Development Economics*, 23(1), 1–21. <https://doi.org/10.1111/rode.12543>
- Caselli, F., & Coleman, W. J. (2006). The world technology frontier. *American Economic Review*, 96(3), 499–522. <https://doi.org/10.1257/aer.96.3.499>
- Cicccone, A., & Papaioannou, E. (2009). Human capital, the structure of production, and growth. *Review of Economics and Statistics*, 91(1), 66–82. <https://doi.org/10.1162/rest.91.1.66>
- Creswell, J. W. (2016). *Research Design Pendekatan Metode Kualitatif, Kuantitatif, dan Campuran* (Edisi Keem). Pustaka Pelajar.
- Dabla-Norris, E., Thomas, A. H., Garcia-Verdu, R., & Chen, Y. (2013). Benchmarking Structural Transformation Across the World. In *IMF Working Papers* (Vol. 13, Issue 176). <https://doi.org/10.5089/9781484359662.001>
- Dastidar, A. G. (2012). Income Distribution and Structural Transformation: Empirical Evidence from Developed and Developing Countries. *Seoul Journal of Economics*, 25(1).
- Deutsch, J., & Silber, J. (2004). Measuring the Impact of Various Income Sources on the Link between Inequality and Development: Implications for the Kuznets Curve. *Review of Development Economics*, 8(1), 110–127. <https://doi.org/10.1111/j.1467-9361.2004.00223.x>
- Elliott, D. R. (1998). Does Growth Cause Structural Transformation? Evidence from Latin America and the Caribbean. *The Journal of Developing Areas*, 32(2), 187–198.
- Gemmell, N. (2007). Economic Development and Structural Change: The Role of the Service Sector. *The Journal of Development Studies*, 19(1), 37–66. <https://doi.org/10.1080/00220388208421849>
- Herdianti, Y. M., Burhan, M. U., & Pratomo, D. S. (2015). Analisis Transformasi Struktur Ekonomi dan Perubahan Proporsi Tenaga Kerja Provinsi Jawa Timur 1998-2012. *International Journal of Social and Local Economic Governance*, 1(1), 68–74.
- Hidayat, M. S., & Herlin, F. (2019). Fiscal decentralization and its impact on industrial development in Jambi Province. *Jurnal Perspektif Pembiayaan Dan Pembangunan Daerah*, 7(3), 297–304. <https://doi.org/10.22437/ppd.v7i3.8493>
- Hwa, E.-C. (1989). The Contribution of Agriculture to Economic Growth: Some Empirical Evidence. In *The Balance between Industry and Agriculture in Economic Development* (pp.

- 106–126). [https://doi.org/10.1007/978-1-349-19746-0\\_5](https://doi.org/10.1007/978-1-349-19746-0_5)
- Karyasa, K. (2006). Perubahan Struktur Ekonomi Dan Kesempatan Kerja Serta Kualitas Sumberdaya Manusia Di Indonesia. *SOCA: Socioeconomics of Agriculture and Agribusiness*, 6(1), 1–21.
- Kuznets, S. (1955). Economic Growth and Income Inequality. *The American Economic Review*, 45(1), 1–28. <https://doi.org/10.1257/aer.99.2.i>
- Li, H., & Liang, H. (2010). Health, education, and economic growth in East Asia. *Journal of Chinese Economic and Foreign Trade Studies*, 3(2), 110–131.
- Li, S., Wang, G., & Wang, J. (2018). *Romer Meets Kongsamut-Rebelo-Xie in a Nonbalanced Growth Model* Romer Meets Kongsamut-Rebelo-Xie in a Nonbalanced Growth (Issue 87582).
- Martins, P. M. G. (2019). Structural change: Pace, patterns and determinants. *Review of Development Economics*, 23(1), 1–32. <https://doi.org/10.1111/rode.12555>
- Martorano, B., Park, D., & Sanfilippo, M. (2016). Catching-up, Structural Transformation, and Inequality: Industry-Level Evidence From Asia. *Industrial and Corporate Change*, 1–16. <https://doi.org/10.1093/icc/dtw039>
- McMillan, M., Page, J., & Velde, D. W. Te. (2017). *Supporting economic transformation*. <https://euagenda.eu/upload/publications/untitled-80158-ea.pdf>
- Mehta, S. (2012). Structural Transformation and Industrialization: A Panel Analysis of Indian Manufacturing Industries. *Journal of Comparative Asian Development*, 11(1), 152–194. <https://doi.org/10.1080/15339114.2012.680340>
- Mijiyawa, A. G. (2017). Drivers of Structural Transformation: The Case of the Manufacturing Sector in Africa. *World Development*, xx, 141–159. <https://doi.org/10.1016/j.worlddev.2017.07.007>
- Paulina. (2017). Structure Changes, the Contribution of Sectors, Income Per Capita Indonesia in 1990 – 2014. *Journal of Economics, Business & Accountancy Ventura*, 19(3), 293–304. <https://doi.org/10.14414/jebav.v19i3.758>
- Piketty, T. (1997). The Dynamics of the Wealth Distribution and the Interest Rate with Credit Rationing. *Review of Economic Studies*, 64, 173–189. <https://doi.org/10.2307/2971708>
- Pinto, M. A. N., Tebaldi, E., & ... (2020). The Role of Human Capital in the Structural Change Process. In ... *Nacional dos Centros* .... [https://digitalcommons.bryant.edu/econ\\_jou/55/](https://digitalcommons.bryant.edu/econ_jou/55/)
- Restuccia, D., & Rogerson, R. (2017). The Causes and Costs of Misallocation. *Journal of Economic Perspectives*, 31(3), 151–174. <https://doi.org/10.1257/jep.31.3.151>
- Romer, P. M. (1990). Are Nonconvexities Important for Understanding Growth? *NBER Working Paper Series*, 3271.
- Romli, M. S., Hutagaol, M. P., & Priyarsono, D. S. (2016). Transformasi Struktural: Faktor-Faktor Dan Pengaruhnya Terhadap Disparitas Pendapatan Di Madura. *Jurnal Ekonomi Dan Kebijakan Pembangunan*, 5(1), 25–44. <https://doi.org/10.29244/jekp.5.1.25-44>
- Schultz, T. W. (1961). Investment in Human Capital. *The American Economic Review*, Vol. 51, No. 1 (Mar., 1961), Pp. 1-17, 51(1), 1–17.

- Sposi, M. (2015). Evolving Comparative Advantage, Sectoral Linkages, and Structural Change. In *Federal Reserve Bank of Dallas, Globalization and Monetary Policy Institute Working Papers* (Issue 231). <https://doi.org/10.24149/gwp231>
- Ssozi, J., & Bbaale, E. (2019). The Effects of the Catch-Up Mechanism on the Structural Transformation of Sub-Saharan Africa. *Economies*, 7(111), 2–27.
- Świąćki, T. (2017). Determinants of Structural Change. *Review of Economic Dynamics*, 24, 95–131. <https://doi.org/10.1016/j.red.2017.01.007>
- Tarp, F., Arndt, C., Jensen, H. T., Robinson, S., & Heltberg, R. (2002). Facing the Development Challenge in Mozambique: An Economywide Perspective. In *Research Report of the International Food Policy Research Institute Washington, D.C* (Issue 126). <https://doi.org/10.2499/0896291316rr126>
- Teignier, M. (2017). The Role of Trade in Structural Transformation. *Journal of Development Economics*, 1–53. <https://doi.org/10.1016/j.jdeveco.2017.09.002>
- Totouom, A., Kaffo, H. F., & Sundjo, F. (2019). Structural transformation of Sub-Saharan Africa: Does the quality of institutions matter in its industrialization process? *Region et Developpement*, 50.
- Üngör, M. (2017). Productivity Growth and Labor Reallocation: Latin America versus East Asia. *Review of Economic Dynamics*, 1–33. <https://doi.org/10.1016/j.red.2016.12.004>
- Vaulina, S., & Elida, S. (2014). Analisis Transformasi Struktural Ekonomi Di Kota Pekanbaru. *Jurnal Dinamika Pertanian*, XXIX(1 April 2014), 69–78.
- Yunisvita. (2011). Transformasi Struktur Ketenagakerjaan dan Pertumbuhan Ekonomi Sumatera Selatan. *JURNAL EKONOMI PEMBANGUNAN Volume 9, No. 2 Hal: 90 - 99*, 9(2), 90–99.
- Zhu, X. (2014). The Effect of Education on Economic Growth - An Empirical Research Based on the EBA Model. *Journal of Interdisciplinary Mathematics*, 17(1), 67–79. <https://doi.org/10.1080/09720502.2014.881147>
- Zoran, T. (2015). Analysis of the Impact of Public Education Expenditure on Economic Growth of European Union and BRICS. In *Economic Analysis* (Vol. 48, Issues 1–2).