



Structural Transformation in the Indonesian Economy: Why does 'Financial Development' Matter?

Muana Nanga^{a,1}, William Widjaja^{a,2*}

^aManagement retail, Pradita University, Gading Serpong Boulevard No.1 Tower 1, Banten, 15810, Indonesia

¹muana.nanga@pradita.ac.id, ²william.widjaja@pradita.ac.id*

* corresponding author

ARTICLE INFO

Article history

Received 2-1-2024
Revised 15-8-2024
Accepted 27-8-2024

Keywords

Digital technology
Economic development
Financial development
Human capital
Structural transformation

ABSTRACT

This study offers a comprehensive examination of Indonesia's process of changing its economic structure from 2000 to 2020. Structural transformation, characterized by changes in the distribution of jobs among different sectors, is crucial for fostering economic growth. It emphasizes phenomena such as the decrease in agricultural GDP shares, rural-urban migration and shifts in economic sectors, which resemble the patterns observed in emerging countries. Nevertheless, the rate of employment transformation is comparatively slower than the fluctuations in GDP, suggesting a more gradual and protracted process of structural change. The analysis focuses on obstacles to transformation, such as insufficient personnel and digital infrastructure. The study examines the relationships between structural transformation and economic indicators in the provinces of Indonesia from 2011 to 2022, utilizing panel data regression models. The findings indicate strong correlations between economic development, human capital, financial development, digital technology, and structural transformation. The study highlights the significance of tackling these elements to accelerate transformation. The policy implications of this proposal suggest that Indonesia should prioritize economic and digital growth, improve human capital, and strengthen the financial sector. This will lead to a more rapid and comprehensive structural transformation in the country.

This is an open access article under the [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



1. Introduction

Structural transformation refers to shifts or changes in the distribution of output and economic structure, is a process that always accompanies economic development and is also considered the core of the economic development process itself (Atolia et al., 2020; Nafziger, 2012; Perkins D. H. et al., 2013). Structural transformation refers to shifting employment from the agricultural domain to the industrial and service domains. One of the six hallmarks of modern economic growth is a significant rate of structural transformation (Kuznets, 1955; Zhou et al., 2021).

A shift in the economic structure is characterized by an increasing number of people moving from rural agricultural production to urban-based employment in return for higher wages (urban-based and higher-paying employment), usually in the manufacturing or services sector (Perkins et al., 2013). In addition, the changes in the economic structure encompass an elevation in the material prosperity of individuals with low incomes, a reduction in the proportion of the agricultural sector, and an augmentation in the proportion of the industrial and service sectors in the Gross National Product (GNP). Furthermore, there is an enhancement in the education and expertise of the labor force, as well as significant domestic-originated technological advancements (Nafziger, 2012).

Structural transformation is a fundamental aspect of the development process, serving as both a catalyst and a result of economic progress. Four interconnected processes determine structural transformation: (i) the declining contribution of agriculture to the GDP and employment; (ii) The factors contributing to urbanization, including the movement of people from rural to urban areas, the rapid growth of cities, the development of modern industries and services, and the transition from high mortality and birth rates in underdeveloped rural regions to lower rates in urban areas with better healthcare (Liu & Wang, 2022; Timmer & Akkus, 2008).

Structural transformation is a regularity in the way the sectoral structure of an economy changes as income increases. Structural transformation describes how the sectoral contribution of various economic sectors (such as the primary, secondary, and tertiary sector), both in total employment and GDP, changes when GDP per capita increases or experiences an increase (Anderson & Ponnusamy, 2019; Chenery, 1981; Kuznets, 1955).

As for the structural transformation process that occurred in Indonesia, especially during the last two decades (2000 - 2020), it can be stated that the structural changes or transformations are mainly seen from changes in the structure of the domestic product (GDP), which follow a pattern like that which occurs in many developing countries. Table 1 shows that the economic development of a country typically involves a transition in the economic structure from the primary sector (agriculture, mining, etc.) to the secondary sector (manufacturing, construction, etc.) and finally to the tertiary sector (services, finance, etc.) (Ding et al., 2020; Rothbarth & Clark, 1941; Zuhroh & Harpiyansa, 2022).

Table 1. Structure of Indonesia's Gross Domestic Product (2000 – 2020)

Year	Per capita GDP (Rp million)	The sectoral composition of GDP		
		Primary sector (%)	Secondary sector (%)	Tertiary sector (%)
2000	6,145	31,16	32,26	36,58
2005	12,676	24,27	35,40	40,33
2010	27,028	26,45	35,82	37,73
2015	45,120	21,14	32,41	46,45
2020	57,290	20,13	31,80	48,07

Source: BPS, Indonesian Statistics (various editions), processed

However, different conditions occur in changes or transformations in the economic structure of employment. Conversely, there is a transition in job distribution from the primary to the tertiary sector. Labor transitions from the primary to the secondary sector, in accordance with the typical pattern observed in shifts in economic structure based on GDP. However, labor moves directly from the primary to the tertiary sector (see Table 2).

Table 2. Structure of Indonesia's Employment (2000 – 2020)

Year	Per capita GDP (Rp million)	The sectoral composition of employment		
		Primary sector (%)	Secondary sector (%)	Tertiary sector (%)
2000	6,145	45,28	16,89	37,87
2005	12,676	44,89	17,13	37,98
2010	27,028	39,51	18,16	42,33
2015	45,120	34,03	20,69	45,28
2020	57,290	29,74	21,05	49,21

Source: BPS, Indonesian Statistics (various editions), processed

Structural changes or transformations in terms of employment are slower when compared to structural changes in terms of GDP. In terms of GDP, the share of the primary sector in total GDP in 2020 is only 20.13%. Meanwhile, in terms of employment, the primary sector share is still 29.74%.

Regarding the problem of the slow structural transformation occurring in Indonesia, several factors are strongly suspected to be the cause. One of them is the low quality of human resources. The low quality of human resources impacts low labor productivity, which determines the speed of the structural transformation process. Limited digital infrastructure is another factor hindering Indonesia's rapid structural transformation (Sander & Yoong, 2020). Due to the inadequate quality of human resources, the process of structural transformation takes place from the agricultural to the service sector, rather than from agricultural to the industrial sector (Dartanto et al., 2017). In other words, the structural transformation process experienced a leap.

2. Literature Review

Structural change, also known as structural transformation, is an inherent process that occurs alongside a nation's economic progress (Kuznets, 1955; Lewis, 1954) and is the core of the economic development process (Baymul & Sen, 2020). Structural transformation is the process of labor or population moving from one economic sector or activity to another within a country or economy. This can encompass transitions from the agricultural to the industrial sector, or from the informal to the formal sector.

Structural transformation, also often referred to as economic transformation, is crucial for sustained job creation and resilience (Diwakar et al., 2019). In other words, structural transformation is a transition of an economy that involves the process of reallocating production factors, both labor and capital, that have low productivity and added value to the sector or other economic activities that are skill-intensive have higher productivity and added value (Baymul & Sen, 2020; Kanbur, 2017; Sen, 2016).

This structural transformation will encourage increased productivity, output, and workers' income, impacting poverty reduction. Apart from that, because this structural transformation increases productivity, output, and workers' income. The automatic consequence of this is an increase in demand for goods and services, leading to the creation of more jobs, both within the sector and across different sectors of the economy, so that indirectly structural transformation can also reduce poverty (Alisjahbana et al., 2019).

Structural transformation refers to the process by which an economy shifts from engaging in low-productivity, labor-intensive to high-productivity, skill-intensive activities. The primary catalyst for structural transition is the fluctuations in productivity within the contemporary sector, which is predominantly comprised of manufacturing and services. Moreover, it is characterized by a shift in workforce distribution from tasks that involve significant physical effort to tasks that demand a considerable level of specialized knowledge. The labor movement is heavily influenced by the availability of job prospects in industries that demand high-level expertise. However, labor can only transition to a different sector if it possesses adequate training to be assimilated into that sector. Hence, the current workforce will require appropriate training before transitioning into other industries.

Structural transformation is a shift in the economic structure, wherein there is a transition from sectors that rely heavily on labor and have low productivity to sectors that

require more capital and skills, resulting in higher productivity. A lasting transformation in the underlying institutions of an economy elucidates the trajectory of economic growth and progress. From a technological perspective, the structural restructuring of an economy is influenced by four fundamental and interconnected processes: (i) the decline in the share of agriculture in the Gross Domestic Product (GDP) and the workforce engaged in this sector; (ii) the migration of individuals from rural to urban areas, enabled by the progress in both rural; (iii) the emergence of modern industrial and service-oriented economies; and (iv) the transition in demographics from high birth and death rates (typical in isolated and rural areas) to lower rates, which is linked to improved health standards in developed and urbanized nations (Chunan-Pole et al., 2014; Timmer & Akkus, 2008). Essentially, it refers to redistributing economic activities among three primary sectors (agricultural, manufacturing, and services) that occur alongside modern economic growth (Herrendorf et al., 2013).

Structural transformation has a vital role in achieving higher productivity growth and increasing per capita income. Furthermore, it plays a crucial role in expanding economic structures, thereby strengthening a nation's capacity to tolerate poverty and external disturbances (UNIDO, 2012). Structural transformation is primarily facilitated by institutions and policies that encourage the advancement, acceptance, and utilization of technology to modify the composition of the economy and its production methods. Specialization, production, and growth initiate the processes of agglomeration, subsequent specialization, and technological advancement.

Several previous studies, including the research conducted by Buera and Kaboski (2012), and (Runtunuwu et al., 2023), have developed models that highlight the importance of increasing human resources or skill intensity in the service sector, as well as the role of expanding technological scale, as complementary factors in explaining patterns of growth in both industrial and service sectors during the development process. The impact of trade openness and variations in productivity growth rates between sectors have significant consequences for structural transformation. Researchers such as Lee and Wolpin, 2006; Matsuyama et al. (2008) have developed a two-sector model to analyze the costs of reallocating labor between sectors. They also assess the significance of changes in labor demand, which can result from shifts in sectoral productivity and relative prices, as well as labor supply factors like demographic changes, fertility rates, and educational attainment, in driving structural transformation.

The study by Nickel et al. (2008) investigates how changes in relative prices, technology, and endowment factors (capital, arable land) influence the changes in the production structure of OECD countries. The findings reveal that the manufacturing sector's contribution to GDP in the UK and the United States has declined faster than Germany and Japan. This can be primarily attributed to patterns in total factor productivity (TFP) and shifts in the relative prices of manufactured and non-manufactured goods. Furthermore, they found that lower levels of education among men were associated with a higher share of agricultural output.

Research conducted by Dabla-Norris et al. (2013) shows that human capital plays a vital role in structural transformation. In addition, the study highlights the heterogeneous impact of these human capital variables on sectoral shares across countries over time.

3. Research Method

Model Specifications

In this study, the analysis uses a panel data regression model, which is formulated as follows:

$$\text{Log}(\text{STR}) = \beta_0 + \beta_1 \log(\text{YC}) + \beta_2 \log(\text{HC}) + \beta_3 \log(\text{FD}) + \beta_4 \log(\text{DT}) + e \dots\dots\dots(1)$$

Where:

STR : level of structural transformation as measured by the share of formal employment to total employment (%)

YC : level of economic development proxied by the level of income (GRDP) per capita at constant prices (Rp million)

- HC : level of development of human capital, which is measured by the average length of time (MYS) (years)
- FD : level of financial development as measured by the ratio of banking credit to GRDP (%)
- DT : development of digital technology is measured by the share of the number of households that have computers in total households (%).
- e : disturbance error.

Estimation Method

To estimate the regression coefficients from the regression model above, this will be done using the fixed effects method (FEM) and the random effect method (REM). Testing will be carried out using the Hausman test to determine which of these estimation methods is more appropriate.

Data and Data Sources

The type of data used in this study is panel data, namely data that is a combination of time-series data (2011 - 2022 period) and cross-section data (33 provinces). The data collected is secondary data, most of which was obtained from publications by the Central Statistics Agency (BPS) and consisted of GRDP and GRDP per capita data, data on mean years of schooling (MYS), and data on the percentage of households with computers. Meanwhile, data on the amount of banking credit is taken from Bank Indonesia publications. All data collected is for the period 2011 – 2022 and covers 33 provinces in Indonesia (excluding provinces that are new divisions).

4. Results and Discussion

The results of the models carried out using both the fixed effects method (FEM) and the random effects method (REM) show that the four independent variables used in this research are the level of economic development which is proxied by GRDP per capita, the level of human capital development which proxied by the mean years of schooling (MYS)) for junior high school (SMP), the level of financial development, which is proxied by the ratio of banking credit to GRDP, and the digital technology development, which is proxied with the percentage of households that own and control computers, it is proven that they all have a positive and significant influence on the rate of structural transformation in Indonesia (see Table 3).

Table 3. Structural Transformation Model Estimation Results (Dependent Variable: Structural Transformation, Log (STR))

Variables	Fixed Effect Model (FEM)			Random Effect Model (REM)		
	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.
C	1.692524	12.90935	0.0000	1.706939	13.19884	0.0000
Log(YC?) ¹⁾	0.261343	13.65209	0.0000	0.255323	13.54780	0.0000
Log(HC?) ²⁾	0.046361	2.083939	0.0379	0.048531	2.197643	0.0286
Log(FD?) ¹⁾	0.202041	6.649788	0.0000	0.203042	6.860374	0.0000
Log(DT?) ¹⁾	0.117321	6.754191	0.0000	0.116756	6.801051	0.0000
Adjusted R ²	0.559721			0.484221		
F Statistic	14.94885			93.70785		
N	396			396		

Source: data processed (2023)

- a. Has a significant effect on the rate of structural transformation at a significance level (α)=1%.
- b. Has a significant effect on the rate of structural transformation at a significance level (α)=5%.

Among the four independent variables used, three of them, namely the level of economic development (YC), the level of financial development (FD), and the development of digital technology (DT) have a significant impact on structural transformation (STR) at

the significance level (α) = 1%. In contrast, the human capital variable (HC) significantly affects the significance level (α) = 5%.

The Hausman test findings indicate that the estimated chi-square value of 4.775 is less than both the table chi-square value (with degrees of freedom = 4) and the significance level (α) = 5% (equivalent to 9.49). according to the Hausman test results, the computed chi-square value is smaller than the table chi-square value. Therefore, the random effects method (REM) is the better suitable estimation method for estimating the regression coefficient.

The parameter estimation results using the random effects method (REM) produced an adjusted R^2 value that was not too high, namely only 0.48422. The adjusted R^2 value of 0.48422 indicates that the four independent variables used in this study can only explain 48.42% of the variations or changes that occur in the structural transformation variable simultaneously. Other variables outside the model were used to explain the remaining 51.58%.

Many factors other than those discussed in this research are strongly suspected to influence the structural transformation process that has occurred so far. The availability of arable land, age dependency ratio, access to electricity, terms of trade, population size, urbanization, institutional quality, crop diversification, and the consumer price index are factors or variables that influence the speed of the structural transformation process that occurs (Dabla-Norris et al., 2013; López Jerez, 2022).

Discussion

The Influence of Economic Development on Structural Transformation

Structural transformation is a process that accompanies the economic development of a country along with economic growth or an increase in income. The level of economic development as proxied by income or GRDP per capita in this study was found to have a positive and significant influence on the structural transformation of the regional economy in Indonesia. The regression coefficient is 0.261343, which shows that if the level of per capita income increases by 10%, the rate of structural transformation will increase by 2.61%.

Because the model used is a double log model, the regression coefficient is also an elasticity coefficient. Because the value of the regression coefficient is smaller than one, the structural transformation in Indonesia so far does not have an elastic relationship with changes in the per capita income variable. This shows that economic development has not always been accompanied by rapid structural transformation.

The findings in this research align with the findings of (George, 2020; Timmer, 1988; Timmer & Akkus, 2008), who found that GDP per capita has a negative relationship with the share of agricultural employment in total employment. In other words, increasing income or GDP per capita encourages faster structural transformation, where the share of non-agricultural sectors in GDP and employment increases. It is also in line with the opinions of (Bilan et al., 2020; Chenery, 1981; Kuznets, 1955; Lewis, 1954), who stated that economic development as measured by an increase in per capita income is a process that accompanies the structural transformation that occurs in a country.

The Influence of Human Capital on Structural Transformation

Human capital is another variable used in this research model. Human resources are believed to be a significant and determining factor for a country's economic development. The importance of human resources was firmly stated by Harbison (1973) and Indrawati & Kuncoro (2021), who stated that human resources constitute the ultimate basis for the wealth of nations. The model estimation results show that human capital, proxied by the average years of schooling, has also been proven to positively and significantly influence structural transformation in Indonesia. The regression coefficient is 0.046361, which shows that if human capital increases by 10%, then structural transformation will increase by 0.46%, and this demonstrates that the process of structural transformation in Indonesia is not directly influenced by changes in human capital. The results of this study are reinforced by the findings of Dabla-Norris et al. (2013), which demonstrate that human capital plays a

crucial role in process of structural transformation. Furthermore, the study emphasises the diverse influence of these human capital factors on the distribution of sectoral shares in different nations over a period of time.

The existence of an inelastic relationship between structural transformation and human capital shows that the structural transformation that has occurred so far has been driven more by changes in factors other than human capital itself, such as the availability of physical infrastructure, institutional factors, and government policies, which tends to place more emphasis on developing physical capital than human capital.

The study conducted by Woldemichael and Shimeles (2019) in Africa revealed that investing in human resources reduces the productivity gap, enhances labor productivity growth, expedites structural transformation, and generates high-quality employment opportunities. Human capital investments significantly influence labor productivity within sectors and the speed at which labor transitions from low-productivity to high-productivity jobs. Additional research, similarly discovered that enhancing the caliber of human resources (education) resulted in the redistribution of the workforce from agricultural to non-agricultural occupations (Porzio et al., 2022). This indicates that augmenting human capital had a favorable impact on structural transformation.

Research by Su et al. (2021), which examines the role of the digital economy in encouraging industrial structural up-grading, also found that the human capital factor, as measured by the population's education level, has a positive and significant influence at a significance level of 1 percent, in encouraging or promoting 'industrial structural up-grading.

The Influence of Financial Development on Structural Transformation

Various studies on financial development generally link financial development to economic growth, income inequality, and poverty. There are still very few studies conducted by experts that try to link financial development with structural transformation. Studies on how financial development is related to structural transformation are still relatively limited.

The model estimation findings demonstrate that the financial development variable, represented by the ratio of bank loan to GRDP, has a confirmed positive and considerable impact on the rate of structural change in Indonesia, with a regression coefficient of 0.203042, which shows that if the financial or financial development variable experiences an increase of 10%, then the structural transformation rate variable will increase by 2.03%. It shows that the structural transformation is not sensitive or inelastic to changes in financial development variables.

These findings indicate that the progress of financial development is crucial in expediting the process of industrialization. The model is calibrated using South African data from the period of 1960 to 2010, and it offers empirical evidence that supports these claims. Empirical investigation across different countries demonstrates a robust association between the level of financial development and the transition from the agricultural sector to the manufacturing sector. This finding confirms the significant impact of financial development in promoting industrialization and facilitating structural transformation. Ultimately, this research offers significant understanding of the intricate elements that propel structural transformation, emphasizing the crucial significance of adopting technology and fostering financial prosperity (Avoumatodo, 2023).

Nwani et al. (2023), who researched structural transformation in the economies of Sub-Saharan Africa (SSA) countries using panel data for the period (1995 – 2019), found that financial development had a negative influence on output values. Extractive industries and vice versa positively impact the output value of manufacturing and services industries. This means that the financial sector's development has positively impacted the structural transformation that is taking place in Sub-Saharan African countries.

The Influence of Digital Technology Developments on Structural Transformation

Digitalization, broadly defined as the use of digital technology and data, is considered necessary for the structural transformation of developing countries. Successful digitalization

will enable countries to achieve structural transformation led or driven by a service sector with high productivity growth (Melo & Solleder, 2022).

According to Ndulu et al. (2023) and Dwi Amalia & Citra Melati (2021), digital technology can bring change to the economy in 3 ways; namely, digital technology can change the economy through automation; digital technology can also change the nature of how the market works, or functions, and digital technology can also change the organization of the economy as a whole. In short, digital technology can lower the exchange costs in markets, making exchanging goods, services, information, capital, or labor cheaper and more effective. Digital technology's ability to change the economy also means that advances in digital technology can be used as an essential instrument in accelerating a country's or economy's structural transformation process.

The results of the model estimation indicate that the variable representing the development of digital technology, measured by the percentage of households that possess and have expertise in using computers, has a substantial and statistically significant effect on the rate of structural transformation in Indonesia. The regression coefficient of 0.116756 suggests that a 10% increase in digital technology development leads to a 1.17% increase in the rate of structural transformation. This structural transformation is not sensitive or inelastic to changes in digital technology development variables.

The findings in this research are strengthened by Freire's (2021) opinion that technological changes, including digital technology, will encourage structural transformation, which will result in economic diversification in a better direction. Technological change is considered one of the specific factors driving structural change, where structural change occurs in different ways between and within regions (Matthess & Kunkel, 2020). Another research was conducted by Su et al. (2021), where technological factors, in this case, technological innovation, were used as a mediating variable between the digital economy and industrial structural grading', apparently has a positive and significant 'mediating effect' at the 1 percent significance level.

5. Conclusion

The results have shown that the variables of economic growth, human capital, financial development, and progress in digital technology all have a positive and significant impact on the level or speed of structural transformation in Indonesia. Per capita income and the ratio of bank loans to GRDP are two significant variables that greatly influence structural change in Indonesia. These variables serve as indicators of economic development and financial development, respectively.

These findings imply that to accelerate the process or level of structural transformation in Indonesia, efforts to increase economic and financial development, especially in the regions, are significant to receive attention in the various development policies implemented.

Finally, efforts to enhance economic development and financial development must be accompanied by the augmentation of human capital and the advancement of digital technology. These two elements have a direct influence on economic development, including progress in the financial sector.

In line with the research findings, the policy implication is to encourage and accelerate structural transformation in Indonesia. It is necessary to (a) continue to encourage regional economic development, (b) develop human resources to increase population access to various employment opportunities outside the agricultural sector and/or the informal sector, (c) encourage the development of the financial sector to increase population access to various sources of financing or capital, (d) continuing to encourage and improve digital technology in various sectors and fields to support the acceleration of the structural transformation process in the future.

References

- Alisjahbana, A. S., Hahm, H., & Malik, H. A. (2019). *Structural transformation and its role in reducing poverty structural transformation and its role in reducing poverty Asia-Pacific countries with special needs development report*.
- 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
- Atolia, M., Loungani, P., Marquis, M., & Papageorgiou, C. (2020). Rethinking development policy: What remains of structural transformation? In *World Development* (Vol. 128). Elsevier Ltd. <https://doi.org/10.1016/j.worlddev.2019.104834>
- Avoumatodo, K. (2023). *Financial development, globalization, and structural transformation in developing countries*. <https://doi.org/10.13140/RG.2.2.18841.39525>
- Baymul, C., & Sen, K. (2020). Was Kuznets right? New evidence on the relationship between structural transformation and inequality. *Journal of Development Studies*, 56(9), 1643–1662. <https://doi.org/10.1080/00220388.2019.1702161>
- Bilan, Y., Mishchuk, H., Samoliuk, N., & Yurchyk, H. (2020). Impact of Income Distribution on Social and Economic Well-Being of the State. *Sustainability (Switzerland)*, 12(1). <https://doi.org/10.3390/su12010429>
- Buera, F. J., & Kaboski, J. P. (2012). The Rise of the Service Economy. *American Economic Review*, 102(6), 2540–2569. <https://doi.org/10.1257/aer.102.6.2540>
- Chenery, H. (1981). Structural change and development policy. *The Journal of Asian Studies*, 40(2), 329–331. <https://doi.org/10.2307/2054868>
- Chunan-Pole, P., Ferreira, F. H. G., Christiaensen, L., Kambou, G., Angwafo, M., Pardo, C. G., Korman, V., Popova, A., & Bultano, M. (2014). *Africa's pulse: An analysis of issues shaping Africa's economic future*.
- Dabla-Norris, E., Thomas, A., Garcia-Verdu, R., Chen, Y., Bredenkamp, H., Loungani, P., & Peralta-Alva, A. (2013). *Benchmarking structural transformation across the world*.
- Dartanto, T., Yuan, Z. W., & Sofiyandi, Y. (2017). *Two decades of structural transformation and dynamics of income equality in Indonesia*. <https://www.adb.org/publications/two->
- Ding, Y. Y., Li, Z., Ge, X., & Hu, Y. (2020). Empirical analysis of the synergy of the three sectors' development and labor employment. *Technological Forecasting and Social Change*, 160. <https://doi.org/10.1016/j.techfore.2020.120223>
- Diwakar, V., Lemma, A., Shepherd, A., & Willem te Velde, D. (2019). *Economic transformation and poverty*.
- Dwi Amalia, A., & Citra Melati, F. (2021). Analysis of MSMEs Recovery using Digital Technology in the Covid-19 Pandemic Era. *Jurnal Ilmiah Bidang Ilmu Ekonomi*, 16(2), 117–128. <http://journal.umpo.ac.id/index.php/ekuilibrium>
- George, T. (2020). A new look at agricultural development and the non-agriculture economy in low-income countries. In *Global Food Security* (Vol. 26). Elsevier B.V. <https://doi.org/10.1016/j.gfs.2020.100449>
- Harbison, F. H. (1973). *Human Resources as the Wealth of Nations*. Oxford University Press.
- Herrendorf, B., Rogerson, R., Valentinyi, Á., Caselli, F., Ngai, R., Schoellman, T., Ventura, G., & Carey, W. P. (2013). *Growth and structural transformation* (18996). <http://www.nber.org/papers/w18996.ack>
- Indrawati, S. M., & Kuncoro, A. (2021). Improving Competitiveness Through Vocational and Higher Education: Indonesia's Vision For Human Capital Development In 2019–2024. *Bulletin of Indonesian Economic Studies*, 57(1), 29–59. <https://doi.org/10.1080/00074918.2021.1909692>
- Kanbur, R. (2017). *Structural transformation and income distribution: Kuznets and beyond* (266). <https://www.afdb.org/en/documents/publications/working-paper-series/>
- Kuznets, S. (1955). Economic growth and income inequality. *American Economic Association*, 45(1), 1–28.
- Lewis, W. A. (1954). *Economic development with unlimited supplies of labour*.

- Liu, S., & Wang, B. (2022). The decline in agricultural share and agricultural industrialization—some stylized facts and theoretical explanations. *China Agricultural Economic Review*, 14(3), 469–493. <https://doi.org/10.1108/CAER-12-2021-0254>
- López Jerez, M. (2022). Factor endowments, vent for surplus and involutory process in rural developing economies. *Economic History of Developing Regions*, 37(1), 50–74. <https://doi.org/10.1080/20780389.2021.1957825>
- Matthess, M., & Kunkel, S. (2020). Structural change and digitalization in developing countries: Conceptually linking the two transformations. *Technology in Society*, 63. <https://doi.org/10.1016/j.techsoc.2020.101428>
- Melo, J. De, & Solleder, J.-M. (2022). *Structural transformation in MENA and SSA: The role of digitalization* (1547). www.erf.org.eg
- Nafziger, E. Wayne. (2012). *Economic development* (5th ed.). Cambridge University Press.
- Ndulu, B., Stuart, E., Dercon, S., & Knaack, P. (2023). *Driving digital transformation: Lessons from seven developing countries*. Oxford University Press. <https://academic.oup.com/book/45785>
- Nwani, C., Okezie, B. N., Nwali, A. C., Nwokeiwu, J., Duruzor, G. I., & Eze, O. N. (2023). Natural resources, financial development and structural transformation in Sub-Saharan Africa. *Heliyon*, 9(9). <https://doi.org/10.1016/j.heliyon.2023.e19522>
- Perkins D. H., Radelet S. C., Lindauer D. L., & Block S. A. (2013). *Economics of development* (7th ed.). Norton.
- Porzio, T., Rossi, F., & Santangelo, G. (2022). The Human Side of Structural Transformation. *American Economic Review*, 112(8), 2774–2814. <https://doi.org/10.1257/aer.20201157>
- Rothbarth, E., & Clark, C. (1941). The Conditions of Economic Progress. *The Economic Journal*, 51(201), 120. <https://doi.org/10.2307/2225658>
- Runtuuwu, P. C. H., Mazelan, N. A., & Rajasekera, J. (2023). Analysis of Government Funding Performance on Economic Growth and Human Development Index in Indonesia. *Jurnal Ilmiah Bidang Ilmu Ekonomi*, 18(2), 136–148. <http://journal.umpo.ac.id/index.php/ekuilibrium>
- Sander, F. G., & Yoong, P. S. (2020). *Structural transformation and labor productivity in Indonesia: Where are all the good jobs?*
- Sen, K. (2016). *The determinants of structural transformation in Asia: A review of the literature* (478). www.adb.org
- Su, J., Su, K., & Wang, S. (2021). Does the digital economy promote industrial structural upgrading?—a test of mediating effects based on heterogeneous technological innovation. *Sustainability (Switzerland)*, 13(18). <https://doi.org/10.3390/su131810105>
- Timmer, C. P. (1988). The agricultural transformation. In *Handbook of Development Economics* (pp. 275–331).
- Timmer, C. P., & Akkus, S. (2008). *The structural transformation as a pathway out of poverty: Analytics, empirics and politics* (150). www.cgdev.org
- Woldemichael, A., & Shimeles, A. (2019). *Human capital, productivity, and structural transformation* (329). <https://www.afdb.org/en/documents/publications/working-paper-series/>
- Zhou, X., Cai, Z., Tan, K. H., Zhang, L., Du, J., & Song, M. (2021). Technological innovation and structural change for economic development in China as an emerging market. *Technological Forecasting and Social Change*, 167. <https://doi.org/10.1016/j.techfore.2021.120671>
- Zuhroh, I., & Harpiyansa. (2022). Global Crisis and Economic Fundamentals: Its Impact on Foreign Direct Investment in ASEAN Countries. *EkUILIBRIUM: Jurnal Ilmiah Bidang Ilmu Ekonomi*, 17(1), 91–101. <http://journal.umpo.ac.id/index.php/ekuilibrium>