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The Transformation of Economic Structure: Unlock The Labor Interchange Theory

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Abstract

Motivation: The enormous amount of labor, particularly in agriculture and low-wage industries, continues to drive Indonesia's growth and economic transition. However, the large population, unskilled labor, and productivity concerns provide challenges for structural transformation to the service sector. Nevertheless, when the pandemic hit in 2020-2021, practically all industries plummeted and contracted to negative levels, but the agriculture sector remained resilient and had growth. Based on this condition, we investigate the possibility of structural changes by measuring sectoral performance using productivity and the elasticity of sectoral labor to each GRDP.

Aim: In this paper, we introduce a novel concept of structural change based on sectoral productivity to examine how the strength of sectoral labor affects sector development. We used sectoral labor and the Gross Regional Domestic Product (GRDP) of Indonesia's 33 provinces

from 2011 to 2022, then evaluated the model using productivity and labor elasticity to the GRDP.

Results: We discovered that the biggest impact and most positive-significant coefficient of primary and tertiary labor to the GRDP are not linearly related to their low productivity, and *vice versa*. However, very high productivity may suggest a high-efficiency business through machines and technology; similarly, low productivity but a significant effect of labor and high GRDP strongly indicate labor excess in the sector. Our hypothesis distinguishes between subsistence, secondary, and tertiary production factors based on their dominance. We discover strong productivity gains in services, even without labor interchange from the primary. We predict that the primary sector, manufacturing, and services will grow and that structural transformation will be driven by the dominance of production factors in industries rather than labor exchange.

Keywords: labor, Gross Regional Domestic Product, productivity, structural transformation
JEL: O1, O2, O4

1. Introduction

Human resources are the most challenging issue in a country with a large population, such as Indonesia, where a considerable portion of the labor force works in the subsistence sector, and labor excess must transfer to the modern economy. The large number of unskilled labor, low productivity and disparities between industries, wage rate, and skill level impede structural transformation from primary to secondary or tertiary. The COVID-19 pandemic in 2020 has caused global economic growth to collapse. Challenges have grown and disrupted the structural transformation path, with the global financial crisis recovering in between. Physical distancing, social restriction, and cutting workhours policy implied the use of automation and technology, escalating imbalances that characterized the labor market resulting in job losses and increased unemployment (International Labor Organization–Organization for Economic Cooperation and Development, 2020; International Monetary Fund, 2021; Naseer et al., 2023; United Nations Development Programme, 2024).

On the other side, agriculture proved to achieve sustainable growth when the COVID-19 pandemic impacted many sectors despite the lack of human resources and low productivity(Arif et al, 2020; Anwar, 2022; Dzulhidany and Rahman, 2022; Halimatussadiah et al., 2022; Arman et al., 2023; Ika et al., 2023; Rozaki et al, 2023;). More than a quarter of total labor works in agriculture supporting the government to maintain food security and sustainability of food stocks in the global food crisis issues. The challenges in increasing rice production, food diversification, and expanding harvested areas are priorities for Indonesia to achieve the 2030 worldwide zero hunger target in Sustainable Development Goals. Since 2022, Indonesia has planned 70,000 hectares for a new farming area as part of a food estate program to

boost food production. However, the program's implementation failed due to premature policy and is believed to have raised risks of carbon release, deforestation, biodiversity threat, and flood disaster (Maskun et al, 2021; Yeny et al., 2022; Rasman et al., 2023; Siborutorop, 2023; Wihardja et al., 2023). Despite the change in economic structure from primary to tertiary sector, the government faces multiple challenges to food security and the sustainability of food stocks, as well as to recover the failure of the food estate program. In this study, we will explore sectoral labor elasticity and productivity to examine the structural transformation theory, particularly on the necessity of sectoral labor transfer based on their impact on sectoral development.

2. Literature review

The fundamental principle of structural transformation is the transfer of human resources from subsistence to modern industries when labor excess in subsistence results in a decline of marginal productivity and impacts poor productivity in the primary sector. Thus, the labor transferred was simultaneous with the reallocation of economic activity between primary, secondary, and tertiary levels (Herrendorf et al., 2014). Conversely, investing in automation and digitization in the new sector might be more relevant to bringing about a structural transformation in manufacturing and services, particularly in high-efficiency industries with daily mass production or when technology and machines replace human labor. However, in most Asian nations, increases in GDP per capita are still driven by changes in labor productivity within sectors rather than shifts in employment between sectors. Therefore, the amount of people in industries significantly affects growth and economic transition (McGregor and Bart, 2016).

Several theoretical and empirical studies of structural transformation research focus on theories related to labor transition analysis, capital and labor mobility from agriculture and rural economics, income effects, and public policy to manufacturing or services as well as multi-sector analysis to identify the growth pattern and determinants that generate structural transformation (Herrendorf et al., 2014; McGregor and Bart, 2016; Alonso and Xavier, 2018; Alvarez et al., 2017; Awaliyyah et al., 2020; Mouelhi and Ghazali, 2020; Deininger et al., 2022; Gollin, 2023; Gollin and Kaboski, 2023; Sawada, 2023; Sartika and Sulistiawati, 2024; Alvaro et al., 2024).

Structural transformation theory by Arthur Lewis (as cited in Sartika and Sulistiawati, 2024) assumes that unlimited and excess labor supply in the subsistence sector has to transfer to the modern sectors. The principle of structural transformation theory not only moves labor from primary to secondary and tertiary levels, but it also considerably increases productivity in modern industries by transferring productivity from primary levels.

Based on the data cut off in February 2024, Statistics Indonesia reported more than half of the labor force (approximately 61 percent) works in agriculture, wholesale and retail trade, repair of motor vehicles and motorcycles, also in manufacturing. Low-tech industries and subsistence sector still dominate the economic structure, with 24% of workers having only completed education at the primary school level, 18% completed education at the junior high school level, 20% completed education at the high school level. Approximately 28% of total labor are employed in the agriculture sector, and 17.6% them are not yet in school and/or have only completed primary school. Labor figures in the industries are illustrated in Chart 1.

The labor composition on Chart 1 shows few university graduates employed in the industries, contributing only about 12% of the total labor force. This means that low-tech industries with unspecified skills or uneducated workers rule the economy as a key sector. But, beyond the underqualified human resources problem, the weakness and threat in the labor market are not as simple as upgrading the labor and increasing investment in education to expand the pool of educated workers, then transform the economy into the secondary or tertiary. Allen (2016) described the performance in the Indonesian labor market as weak, with slow job growth and a high level of labor underutilization. Asian Development Bank (2018) identified the coexistence of old and new development challenges in Indonesia' economy, while the labor market is held back by a large backlog of low productivity the in agriculture and informal sector. On the other side, according to the statistics, approximately 9 million students are recorded studying in academies and universities every year, which indicates the educated labor force in the labor market are rising annually. However, despite this fact, the 12% percent contribution of university graduates in the industries as shown in Figure 1 tells of an underutilization of skilled labor force, with only a small portion in the industries themselves being fit and recruiting educated workers.

When a substantial proportion of unskilled labor works in agriculture, food security and deforestation becomes a growing concern. This may be alleviated by agrobiodiversity and sustainable agriculture in order to sustain food stocks and cultivate resilience to climate change. Hailu (2025) emphasizes the importance of agrobiodiversity in sustainable agriculture regarding the diversity of living forms, which is vital for food security, ecosystem health, and climate resilience. Nsabiyeze et al. (2024) examine the current situation of carbon emissions in agriculture and accurately assess emissions across multiple farming activities. The data show that sustainable development goals promote a global strategy for highly productive, efficient, and environmentally friendly agriculture, which has been identified as a significant means of reducing carbon emissions. As a large portion of labor and low productivity occurs in agriculture, improving and reforming the sector by strategic policies, incentives, and technology could be cheaper and easier to execute than transforming the

economy to manufacture or services while the challenges of food security and climate change issues continue.

3. Methods

According to the principals of structural transformation theory, the elasticity and productivity of sectoral labor in agriculture, forestry, livestock, and fisheries (A), mining and quarrying (B), manufacturing (C), electricity, gas, and water (D), construction (E), wholesale trade, retail, restaurants, and hotels (F), transportation, warehousing, and communication (G), needs to be assessed with an exception to those have no statistical data available in financing, insurance, real estate, and business services (H), and community, social, and personal services (I).

Furthermore, this research means to examine how labor strength influences sectoral development, and then use the sector anatomy to determine whether structural transformation by shifting, adding, or reducing labor in each sector is necessary. Moreover, to predict the most effective and strategic policies, whether to transform the economic structure, or boost productivity in all sectors by balancing labor and production factors from the perspective of sector anatomy. To our current knowledge, no extensive scientific studies have been published on the combination of labor elasticity and productivity in the perspective as a sectoral architecture to assess the need for labor shifting to modify the economic structure.

The data was collected from *Badan Pusat Statistik* (BPS) from year 2011 to 2022. We use panel data analysis of labor in agriculture, forestry, livestock, and fisheries (A), mining and quarrying (B), manufacturing (C), electricity, gas, and water (D), construction (E), wholesale trade, retail, restaurants, and hotels (F), transportation, warehousing, and communication (G) and the Gross Regional Domestic Product (GRDP) of each sectors accross 33 provinces of Indonesia. The results will describe sectoral productivity and labor elasticity per each sector of 33 provinces. To estimate relationships between labor of *i* sector (x*i*) to GRDP (Y*i*) we use regression analysis formula:

$$Y_i=\alpha+\beta x_i \quad (1)$$

We transform datasets of labor and GRDP on a logarithmic scale to linearize the data that could vary between the provinces. The general form is:

$$\exp(c+ \text{iwifi } (X)) \quad (2)$$

To put into perspective the sectors anatomy in the transformation process, we combined Cobb Douglas' production function (as cite in Sandelin,

1976), and Lewis' transformation (1954) theory to construct the idea of our research, as follows.

$$Q=AL^{\alpha}K^{\beta}, \tag{3}$$

where:
Q — total output;
A — productivity-enhancing technological progress;
L — labor;
K — capital;
α,β — the share of contribution for labor and capital respectively.

When output (Y) is a production function of factors (x) with efficiency parameter that represent productivity (McKenzie, 2020), the resulting function becomes:

$$Y = \prod_{i=1}^{n} x_i^{\alpha_i} \tag{4}$$

where:
Y — total production;
x_i — i production factor;
α_i — overall efficiency of production (productivity, technology, labor, and capital).

The general model of structural transformation assumes that labor supply is excessive in the subsistence sector. Excess labor in the subsistence sector lead to a reduction in total agricultural production (ΔTPA3<ΔTPA2<ΔTPA1). In this circumstance, labor transferring to the capitalist sector greatly affect overall productivity in said sector and multiplies the coefficient of labor variable changes, (assuming all other variables are constant, n1). Thus, it locks the role of the structural transformation process from agriculture to manufacturing to only on the labor variable, where TP = f(labor); (as adapted from Sartika and Sulistiawati, 2024).

With the assumption of structural transformation locked by labor variable, and every increase of labor productivity ($\partial,\boldsymbol{\delta}$Y/ $\partial,\boldsymbol{\delta}$x) in the modern industries being higher than before, with subsistence in the contrary, the function is thus structured as below:

$$Y_1,\ldots,Y_n;\ x_1,\ldots,x_n; \frac{\partial y}{\partial x} < \frac{\Delta y}{\Delta x}; \frac{\partial y}{\partial x} > \frac{\Delta y}{\Delta x} \tag{5}$$

where:

$\frac{Y}{x}$ — productivity;

$\frac{\partial,\delta Y}{\partial,\delta x}$ — changes in productivity.

4. Results

To assess the impact of labor to economic structure, we simulated labor elasticity through the coefficient values of labor toward GRDP. The estimated regression results are summarized in Table 1 using the formulas below:

$$Y_i=\alpha+\beta x_i$$

$$Y_A=0.872x_A;\ Y_B=0.569x_B;\ Y_C=0.764x_C;\ Y_D=0.518x_D;$$

$$Y_E=0.706x_E;\ Y_F=0.931x_F;\ Y_G=0.899x_G$$

Based on the authors' calculations, the estimated results indicate positive and significant impact of all sectoral labor to GRDP. The highest proportions of the variance in GRDP explained by labor variables are 86.7% in wholesale trade, retail, restaurants, and hotels (F); 80.9% in transportation, warehousing, and communication (G); and 76.1% in agriculture, forestry, livestock, and fisheries (A). This means that the labor variable in the primary and tertiary sector had the highest impact on GRDP, and obviously on the opposite with the assumption of Lewis's theory, where the labor excess in the subsistence led to the reduction in its total production, and surely to the labor coefficient. Overall, despite of all labor elasticities and positive coefficients to GRDP, particularly the high impact of labor in agriculture, we conducted a cross-check on the agriculture's labor proportion and the GDP distribution of agriculture to ensure the condition of labor excess in agriculture. In fact, from 2011 to 2023, agriculture employed an average of 31 percent or nearly one-third of the labor force, although contributing just 12% to GDP. Thus, possibly indicates low productivity and labor excess in agriculture. Due to inconsistent results between agriculture' labor proportion, sectoral share, and labor elasticity, the structural transformation process in this study is based on labor productivity and the regression formula $Yi = \alpha + \beta xi$. In this case, a positive and high proportion of labor variance in GRDP (R^2) more readily explains the proportion of labor variable as a dominant factor in production function. Maarek and Orgiazzi (2020) uncovered an empirical scenario that is substantially identical to this result. They disaggregated the data to 28 manufacturing subsectors and found that changes in labor share dur-

ing the development process do not solely correlate with changes in factor intensities. Thus, the large share of labor absolutely has an inevitable effect on industry, but does not determine said effect's intensity in the industry. To describe this concept, we used an average productivity to illustrate the industry structure as shown in Chart 2.

Based on the average of sectoral productivity, the highest productivity generated by sectoral labor was in mining and quarrying (B) at 592.58, followed by manufacturing (C) at 186.27. When compared with the proportion of the variance, labor in sector B contributed just 32.4 percent to GRDP, whereas sector C at 58.3 percent. Despite its large contribution, sectoral labor productivity in sector F only shares 48.74, and 37.41 in sector A. According to the findings, we investigated sector productivity by scaling their GRDP and comparing it with labor productivity (the results are illustrated in Chart 3, 4, 5, 6, 7, 8, 9).

The comparatives result between GRDP and productivity shown vary widely level of sectors productivity. In general, high productivity is generated by sectors C, B, and sector G. Overall, mining and quarrying (B) output has a 32.4 percent labor variance, with 1.2 percent an average labor share from the total labor force. In manufacturing (C), labor variable affected production by 58.3 percent, and share of labor at 14.04 percent. Transportation, warehousing, and communication (G) employs approximately 18.72 percent of labor force, and contributed 80.9 percent to its GRDP. Low productivity indicated by sectors A, D, E, and F (Table 2).

According to our findings, high productivity categories (sector B, C, G) with small shares and low proportion of labor variance strongly indicates other production factor dominates in the sector ($Q = AL^{\alpha}K^{\beta}$). Also, low productivity but large number of labor and high labor variance proportion indicate excess labor in the sectors (A,F). Alternatively, we can assume low productivity, low share of labor and low proportion of variance in sector D, E indicates the sector has potential to grow by production instrument injections such as by capital or technology.

The final result of this study is that the most positive and significant coefficient of primary and tertiary labor on GRDP are not associated with low productivity, and *vice versa*. High productivity gains in services, with a skilled gap with the subsistence sector, make it impossible for the labor interchange. However, high productivity may be conducted by high efficiency industry through the use of machines and technology. Similarly, low productivity but a significant labor effect and high GRDP strongly indicate a labor excess in the sector. On that condition, we assume that the primary sector, manufacturing and services will grow and that structural transformation will be driven by the dominance of production factors in industries rather than labor exchange. These findings are in line with Ikhsan et al. (2021), for an analysis of the declining contribution of human capital, where substantial employment

shifted to unproductive service sectors while productivity of micro, small, and medium enterprises remains stagnant. Labor reallocation, on the other side, also enlarges the productivity gap between sectors, but with the right combination of production factors or the use of factor dominance, it may be possible to establish high productivity. Thus, labor productivity growth was mostly driven by within-sector improvements rather than structural change (World Bank, 2021; Sugiharti et al., 2017; Sander and Yoong, 2020).

5. Conclusion

According to Lewis' theory (1954), structural transformation is the labor reallocation from subsistence to manufacturing or services, as a result of labor excess and low productivity. In this case, it is required to move labor to the secondary or tertiary sectors, where the labor transfer itself has no effect on marginal productivity in the primary sector, but increases productivity in the secondary or tertiary sector. Lewis' thesis assumes that the process of structural change to the secondary and tertiary sector is locked by labor variable.

However, a significant number of unskilled labor in primary, slow job growth, and high level of labor underutilization in the industries are further obstacles, and the fundamental reason beyond low productivity in the subsistence. Thus, labor transfer to manufacturing or services with human resources issues may not gain sectors development, instead transferring and creating new problems. Furthermore, high productivity but small share of labor and high GRDP in manufacturing and services indicates high efficiency due to the dominance of other production factors in industries such as automation, machines, and technologies, which may significantly transform the structure of sectoral income in GDP rather than transform the economic structure by labor transition.

On the other side, despite low productivity and human resources problem, agriculture proved its resilience when the COVID-19 pandemic impacted many sectors. Also, food security and sustainability of food stocks are still priorities for Indonesia. Based on Worldometers (2024) elaboration of the latest United Nations data, the current population of Indonesia is 284 million people or equivalent to 3.47 percent of the total world population, making it the fourth most populated countries in the world. According to Statistics Indonesia, Indonesia's rice consumption in 2023 was 30.9 million tons, which equaled its rice production. However, agriculture, mining, and modern industries all contribute significantly to carbon emissions, deforestation, and land degradation. Policymakers must become more aware of how food is produced in terms of efficiency, as well as how the food system is managed. Agrobiodiversity and sustainable industries, as well as policy and farmer capacity building for business, will maximize socioeconomic benefits. Making industrial processes greener, using renewable energy and green

power, energy-saving initiatives, green building, optimizing water use, waste-to-energy, and adopting clean and environmentally-sustainable practices can reduce the negative impact of industries on climate change (Udeozor and Nzeako, 2010; Garnett, 2013; Yeny et al, 2022; Nsabiyeze et al., 2024). Thus, combining the difficult factors of moving the economic structure to manufacturing and services, as well as increasing food production in agriculture, is an emergency while conserving natural resources in the face of global climate change.

When the pandemic struck in 2020, agriculture, forestry, livestock, and fisheries all improved and increased to 1.75 percent and contributed almost 60 percent of the total GDP. Thus, it is evident that the primary sector—agriculture in particular – dominates the economic structure as a crucial sector. The major role that subsistence plays means that low industries have the most important roles in the economy, even though a large portion of labor indicates low productivity and labor exceeds in the primary sector. Deep analysis by Allen (2016) explain that it is almost impossible to transfer a large portion of unskilled and low educated labor from the primary to modern industries due to lack of skills and experience, as well as the expensive human resources upgrading cost on the other side.

On this condition – according to the results of our study, expands and strengthened the low industries could be the most strategic and relevant for the government to covering the pool of unskilled labor force in the labor market. To break out of the middle-income trap, policymakers must prioritize growing productivity in low-wage industries while also promoting modern sectors. To improve and enhancing the productivity in the primary, the government have to develop the downstreamize of the primary output to secondary or tertiary sectors. Vocational training programs and incentives for industries to hire educated workers will directly bridge the skill gaps.

This will tackle the productivity issues in the primary sector, subtantially increasing demand and solving the problem of underutilized educated workers, while also solving the mismatch of skilled jobs in the industries.

References

Allen, E.R. (2016*).* Analysis of Trends and Challenges in The Indonesian Labor Market. *ADB Papers on Indonesia No. 16*. Philippines: Asian Development Bank.

Alonso-Carrera, J. & Xavier, R. (2018). Labor Mobility, Structural Change, and Economic Growth. *Journal of Macroeconomics,* 56, 292–310. https://doi.org/10.1016/j.jmacro.2018.03.002.

Alvarez-Cuadrado. F., VanLong, N. & Poschke, M. (2017). Capital-labor sub-

stitution, structural change, and growth. *Theoretical Economics*, 12(3), 1229–1266. https://doi.org/10.3982/te2106.

Alvaro, V.B., Markus. G. & Karl-Johan, L. (2024). Structural transformation, the knowledge economy, and the geography of low-income work. *Journal of Economic Geography*, Vol. 24, Issue 2, March 2024, Pages 285–308. https://doi.org/10.1093/jeg/lbad038.

Anwar, N. (2022). Indonesia' regional food security in light of the impending global food crisis. *Trikonomika*, 21(2), 101–110. https://doi.org/10.23969/trikonomika.v21i2.7113.

Arif, S., Isdijoso, W., Fatah, A.R. & Tamyis, A.R. (2020). *Tinjauan Strategis Ketahanan Pangan dan Gizi di Indonesia: Informasi Terkini 2019-2020*. The SMERU Research Institute – World Food Programme. Retrieved from http://www.smeru.or.id.

Arman, A., Asep, S., Fathia, A.P. & Sri, Y.B. (2023). Investment and Resilience of The Agricultural Sector Facing The COVID-19 Crisis. *Agrisocionomics: Jurnal Sosial Ekonomi Pertanian*, Vol. 7; 1, pp. 27–38. https://doi.org/10.14710/agrisocionomics.v7i1.15126.

Asian Development Bank. (2018). *Indonesia Enhancing Productivity Through Quality Jobs*. Asian Development Bank, Philippines. Retrieved from https://www.adb.org

Awaliyyah, E., Chen, S., Anindita, R. & Suhartini. (2020). Analysis of Structural Transformation of Labor from Agriculture to Non-Agriculture in Asia. *Agricultural Socio-Economics Journal*, 20(4), 335-341. http://dx.doi.org/10.21776/ub.agrise.2020.020.4.9.

Deininger, K., Jin, S. & Ma, M. (2022). Structural Transformation of the Agricultural Sector In Low and Middle-Income Economies. *Annual Review of Resource Economics*, 14(1), 221–241. https://doi.org/10.1146/annurev-resource-111820-033252

Dzulhidany, A.A.A. & Rahman, M.S.A. (2022). Cultivating Food Sovereignity in the Time of the Pandemic: An Analysis of Jokowi's Agricultural Policy. *KnE Social Sciences*, 7(4), 173–197. https://doi.org/10.18502/kss.v7i4.10523.

Gollin, D. (2023). Agricultural productivity and structural transformation: evidence and questions for African development. *Oxford Development Studies*, 51(4), 375–396. https://doi.org/10.1080/13600818.2023.2280638.

Gollin, D. & Kaboski, J. (2023). New Views of Structural Transformation: Insights From Recent Literature. *NBER Working Paper No. 31905.* Cambridge, MA: National Bureau of Economic Research.

Hailu, F. (2025). The role of agrobiodiversity and diverse causes of its losses and methods of conservation: A review. *Food and Humanity.* https://doi.org/10.1016/j.foohum.2025.100500

Halimatussadiah, A., Edwards, R., Moeis, F.R. & Maulia, R.F. (2022). Agriculture, Developments and Sustainability in the Covid-19 Era. *Bulletin of*

Indonesian Economic Studies, 58(1), 1–30. https://doi.org/10.1080/00074918.2022.2056935.

Herrendorf, B., Richard, R. & Akos, V. (2014). Growth and Structural Transformation. *Handbook of Economic Growth* (pp. 855-941). Elsevier 2. https://doi.org/10.1016/B978-0-444-53540-5.00006-9.

International Labor Organization–Organization for Economic Cooperation and Development. (2020). *The impact of the COVID-19 pandemic on jobs and incomes in G20 economies*. ILO-OECD paper prepared at the request of G20 Leaders Saudi Arabia's G20 Presidency 2020. Retrieved from https://www.ilo.org.

Ika, S.R., Nugroho, R.A., Santoso, B.A., Takril, N.F. & Widagdo, A.K. (2023). Does the COVID-19 epidemic impact on economic sustainability of big agricultural firms in Indonesia? *IOP Conference Series Earth and Environmental Science*, 1241(1), 012050. https://doi.org/10.1088/1755-1315/1241/1/012050.

Ikhsan, M., Indrawati, S.M., Virananda, I.G.S., Abdi, Z. & Can, C.K. (2021), The Productivity and Future Growth Potential of Indonesia. *Economics and Finance in Indonesia*, Vol. 67, No. 2, 235-256.

International Monetary Fund. (2021). *After-Effects of the COVID-19 Pandemic: Prospects for Medium-Term Economic Damage*. Retrieved from https://www.imf.org.

Lewis, A.W. (1954). Economic Development with Unlimited Supplies of Labor. *The Manchester School*, 22, 139–191. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x

Maarek, P., and Orgiazzi, E. (2020). Development and the Labor Share, *The World Bank Economic Review*, 34(1), 232–257. https://doi: 10.1093/wber/lhy001.

Maskun, N., Napang. M., Nur. SS., Bachril, S.N. & Mukarramah. N.H.A. (2021). Detrimental impact of Indonesian food estate policy: Conflict of norms, destruction of protected forest, and its implication to the climate change. *IOP Conference Series Earth and Environmental Science*, 824(1), 012097. https://doi.org/10.1088/1755-1315/824/1/012097.

McKenzie, T. (2020). *Cobb Douglas Production Function*. Inomics. Retrieved from https://inomics.com.

McGregor, N.F. & Bart, V. (2016). The Role of Structural Change in the Economic Development of Asian Economies. *Asian Development Review*, 33(2), 74–93. https://doi.org/10.1162/ADEV_a_00073.

Mouelhi, R.B.A. & Ghazali, M. (2020). 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.

Naseer, S., Khalid, S., Parveen, S., Abbass, K., Song, H. & Achim, M.V. (2023). COVID-19 outbreak: Impact on global economy. *Frontiers in public health*, 10, 1009393. https://doi.org/10.3389/fpubh.2022.1009393.

Nsabiyeze, A., Ma, R., Li, J., Luo, H., Zhao, Q., Tomka, J. & Zhang, M. (2024). Tackling climate change in agriculture: A global evaluation of the effectiveness of carbon emission reduction policies. *Journal of Cleaner Production*, 468, 142973. https://doi.org/10.1016/j.jclepro.2024.142973.

Rasman, A., Theresia, E.S. & Aginda, M.F. (2023). Analisis implementasi program food estate sebagai solusi ketahanan pangan Indonesia. *Journal of Tropical Agriculture Sciences*, 1(1). https://doi.org/10.61511/hjtas.v1i1.2023.183.

Rozaki, Z., Siregar, H., Pratama, I.A. & Istiyanti, E. (2023). Food Security, diversification, and inequality: Indonesia in the Advances in Food Security, and Sustainability. *Elsevier*, 8, 43–94. https://doi.org/10.1016/bs.af2s.2023.07.007.

Sartika, N. & Sulistiawati, R. (2024). How is Economic Structure Transformed? Evidence: West Kalimantan Province of Indonesia. *Sriwijaya International Journal of Dynamic Economics and Business*, 8(1), 45–64. https://doi.org/10.29259/sijdeb.v8i1.45-64.

Sandelin, B. (1976). On the origin of the Cobb-Douglas production function. *Economy and History*, 19:2, 117–123. https://doi.org/ 10.1080/00708852.1976.10418933.

Sander, F.G. & Yoong, P.S. (2020). Structural Transformation and Labor Productivity in Indonesia: Where are All the Good Jobs? World Bank, Washington, DC. Retrieved from https://openknowledge.worldbank.org.

Sawada, Y. (2023). Structural Transformation and Development Experience from Asian Countries. In: J.P. Estudillo, Y. Kijima & T. Sonobe (Eds). *Agricultural Development in Asia and Africa* (pp. 257–269). Springer, Singapore. https://doi.org/10.1007/978-981-19-5542-6_19.

Siborutorop, J. (2023). Analysis of Indonesia's National Food Estate Programme from a Food Sovereignty-based Perspective. *Jurnal Politik Indonesia (Indonesian Journal of Politics)*, 9(2), 92–102. https://doi.org/10.20473/jpi.v9i2.44430.

Sugiharti, L., Purwono, R., Primanthi, M.R. & Padilla, M.A.E. (2017). Indonesian Productivity Growth: Evidence from the Manufacturing Sector in Indonesia. *Pertanika J. Soc.Sci & Hum*, 25(8): 29–44.

United Nations Development Programme. (2024). *Structural Transformation and Labor Markets In Asia and The Pacific Towards a More Inclusive and Sustainable Future*. United Nations Development Programme Bangkok Regional Hub. Bangkok. Thailand. Retrieved from https://www.undp.org

Wihardja, M., Arifin, B. & Amir, M. (2023). Towards More Sustainable Agrofood Systems in Indonesia. *Center for Indonesian Policy Studies*. Retrieved from https://repository.cips-indonesia.org.

World Bank. (2021). *Global Productivity: Trends, Drivers, and Policies*. World Bank Publications. Retrieved from https://openknowledge.worldbank.org.

Yeny, I., Garsetiasih, R., Suharti, S., Gunawan, H., Sawitri, R., Karlina, E. & Narendra, B.H. (2022). Examining the Socio-Economic and Natural Resource Risks of Food Estate Development on Peatlands: A Strategy for Economic Recovery and Natural Resource Sustainability. *Sustainability*, 14(7), 3961. https://doi.org/10.3390/su14073961.

Appendix

Table 1. Estimated Regression Results

Explanatory variables	Coefficients	T value	R^2
L_A	0.872	35.38	0.761
L_B	0.569	13.72	0.324
L_C	0.764	23.48	0.583
L_D	0.518	12	0.268
L_E	0.706	19.76	0.498
L_F	0.931	50.76	0.867
L_G	0.899	40.83	0.809

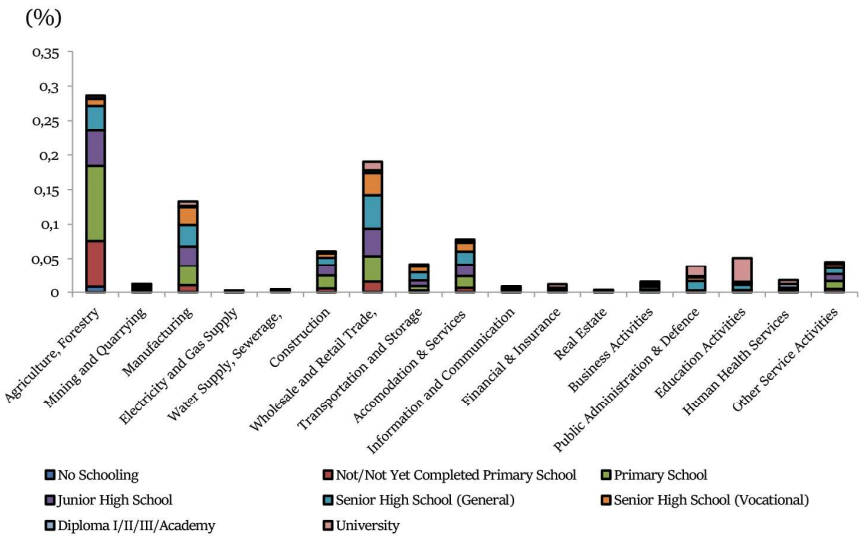
Source: Own preparation based on Author (2024, p. 6).

Table 2. Comparative Results

Sector	Categories	Productivity (Σ,%)	Share of labor (Σ,%)	R^2
A	Low productivity	37.41	31	0.761
B	High productivity	592.58	1.2	0.324
C	High productivity	186.27	14.04	0.583
D	Low productivity	20.05	0.21	0.268
E	Low productivity	95.28	0.29	0.498
F	Low productivity	48.74	6.42	0.867
G	High productivity	225.11	18.72	0.809

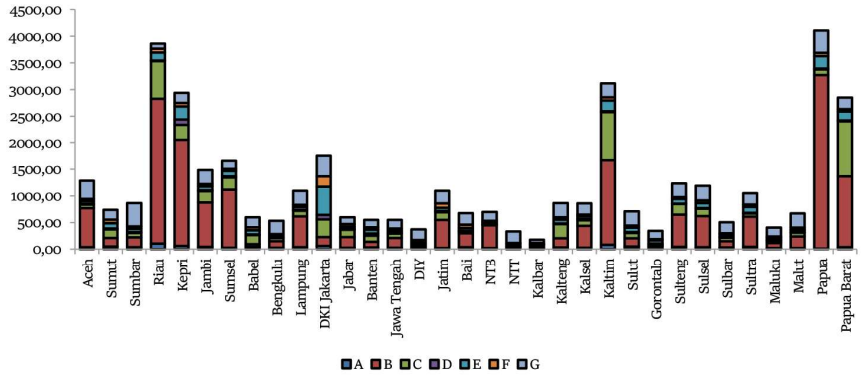
Source: Own preparation based on Author (2024, p. 7).

Chart 1. Labor by Main Industries and Educational Attainment, data cut-off period on February 2024 (%)



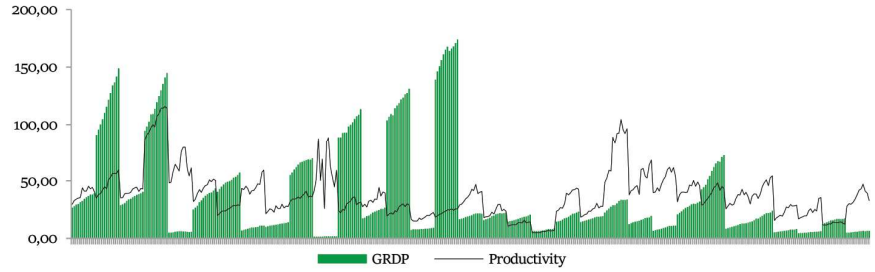
Source: Own preparation based on Statistics Indonesia dataset (2024, p. 3).

Chart 2. The Average of Sectoral Productivity from year 2011 to 2022



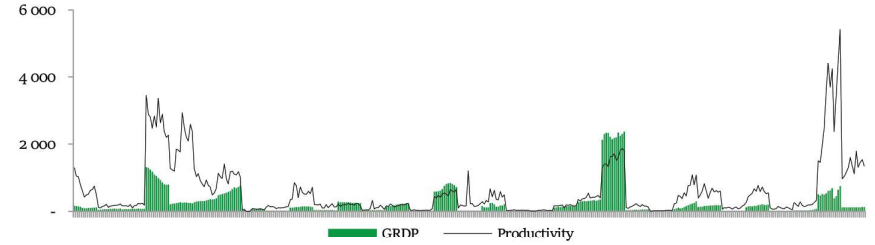
Source: Own preparation based on Statistics Indonesia dataset (2024, p. 7).

Chart 3. Productivity in Agriculture, Forestry, Livestock, and Fisheries Across 33 Provinces of Indonesia from 2011 to 2022



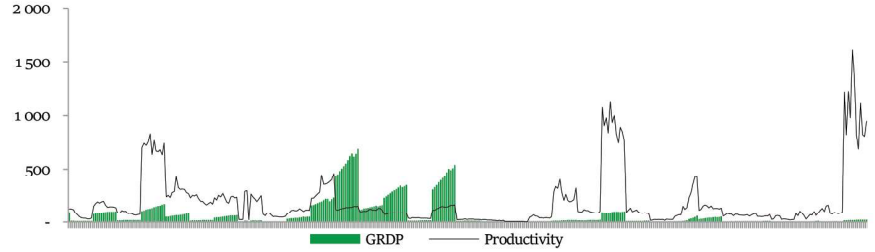
Source: Own preparation based on Author, and Statistics Indonesia dataset (2024, p. 7).

Chart 4. Productivity in Mining and Quarrying Across 33 Provinces of Indonesia from 2011 to 2022



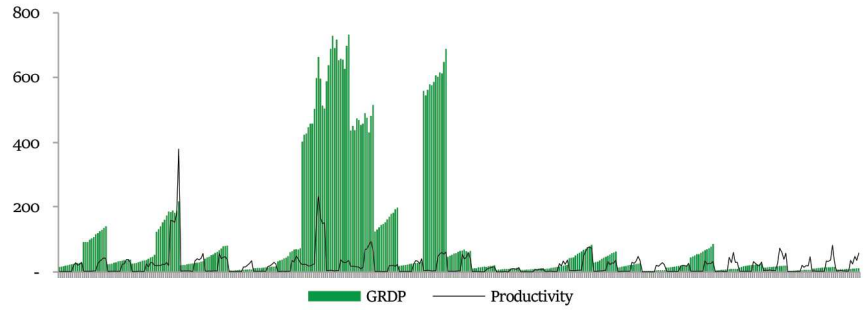
Source: Own preparation based on Author, and Statistics Indonesia dataset (2024, p. 7).

Chart 5. Productivity in Manufacturing Across 33 Provinces of Indonesia from 2011 to 2022



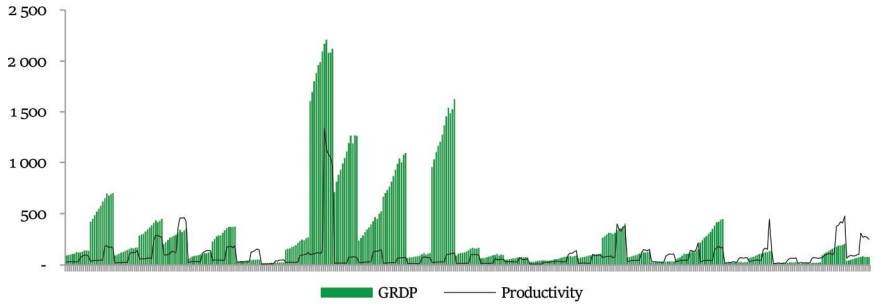
Source: Own preparation based on Author, and Statistics Indonesia dataset (2024, p. 7).

Chart 6. Productivity in Electricity, Gas, and Water Across 33 Provinces of Indonesia from 2011 to 2022



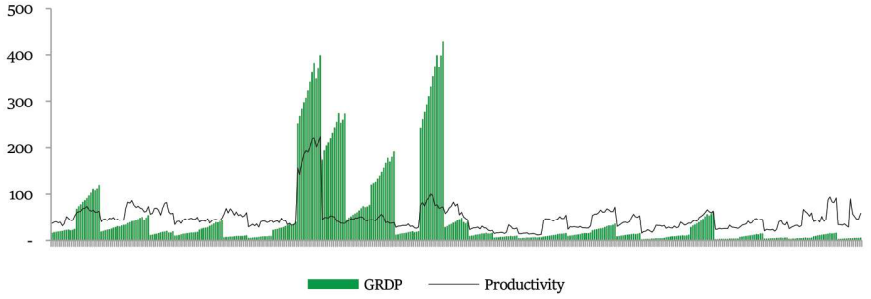
Source: Own preparation based on Author, and Statistics Indonesia dataset (2024, p. 7).

Chart 7. Productivity in Construction Across 33 Provinces of Indonesia from 2011 to 2022



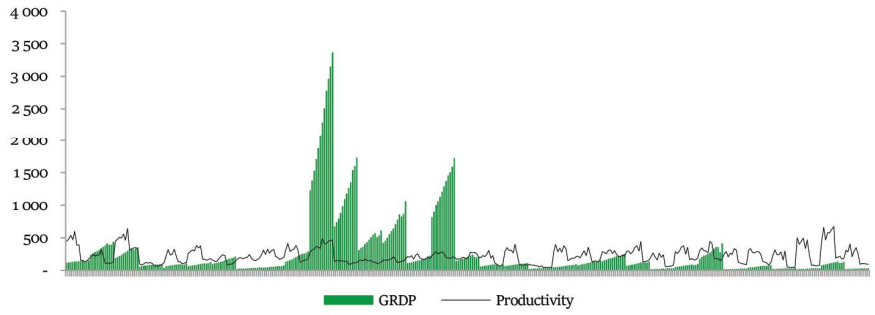
Source: Own preparation based on Author, and Statistics Indonesia dataset (2024, p. 7).

Chart 8. Productivity in Wholesale Trade, Retail, Restaurants, and Hotels Across 33 Provinces of Indonesia from 2011 to 2022



Source: Own preparation based on Author, and Statistics Indonesia dataset (2024, p. 7).

Chart 9. Productivity in Transportation, Warehousing, and Communication Across 33 Provinces of Indonesia from 2011 to 2022



Source: Own preparation based on Author, and Statistics Indonesia dataset (2024, p. 7).