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The Impact of Structural Change on Income Inequality in the Special Region of Yogyakarta Province

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ABSTRACT

The Special Region of Yogyakarta (DIY) Province exhibits the highest level of income inequality in Indonesia. The government of DIY has designed an economic development strategy that prioritizes education and tourism, which encourages structural change from the agricultural sector to the service sector. Nevertheless, such conditions may lead to continued income inequality. This study aims to ascertain the condition and impact of structural changes on income inequality in the Special Region of Yogyakarta (DIY) between 2013 and 2023. This study employs two analytical methods: shift-share analysis and panel data regression with a Random Effect Model (REM). The findings indicate that structural change from agriculture to the service sector exerts a positive and statistically significant effect on income inequality. In addition, it is found that income inequality is also affected by service sector labor income and government educational expenditure.

Keywords: income inequality, structural change, DIY, panel data regression, random effect model, shift-share.
JEL Classification: D63, I24, J21, L16, R11

INTRODUCTION

Income inequality constitutes a multifaceted problem that continues to be a salient challenge in developing countries. This inequality issue is a matter of concern, given the disparity in the results of development enjoyed by the upper and lower classes in society. When inequality is high, the upper socioeconomic groups tend to get the biggest slice of the development pie, while the lower tend to get a smaller pie. This dynamic contributes to the perpetuation of wealth disparities, making it challenging for the poor to escape poverty and get stuck in the middle-income trap. Moreover, studies conducted by the IMF proved that inequality can be very damaging, as it can impact economic growth, also economic and political stability (Berg and Ostry, 2011). Thus, inequality deserves special attention, as stated in the 10th goal of the Sustainable Development Goals (SDGs), which is to reduce inequality.

The Special Region of Yogyakarta (DIY) has been identified as the Indonesian province with the worst income inequality. This condition is shown in Figure 1, which presents the inequality levels of the provinces with the highest Gini ratios in Indonesia. In line with the national Gini ratio from 2012 to 2023, the provinces show a similar decline in inequality, with the exception of DIY, DKI Jakarta, and West Java. Despite they have increased, DIY Province has the largest increase with the gap far exceeding the national average. This makes DIY Province the highest Gini ratio in Indonesia, which has been going on consistently since 2017. Specifically, the Gini ratio for the DIY has been on an upward trajectory, increasing from 0.434 in 2012 to 0.449 in 2023, with no indication of a sustained decline.

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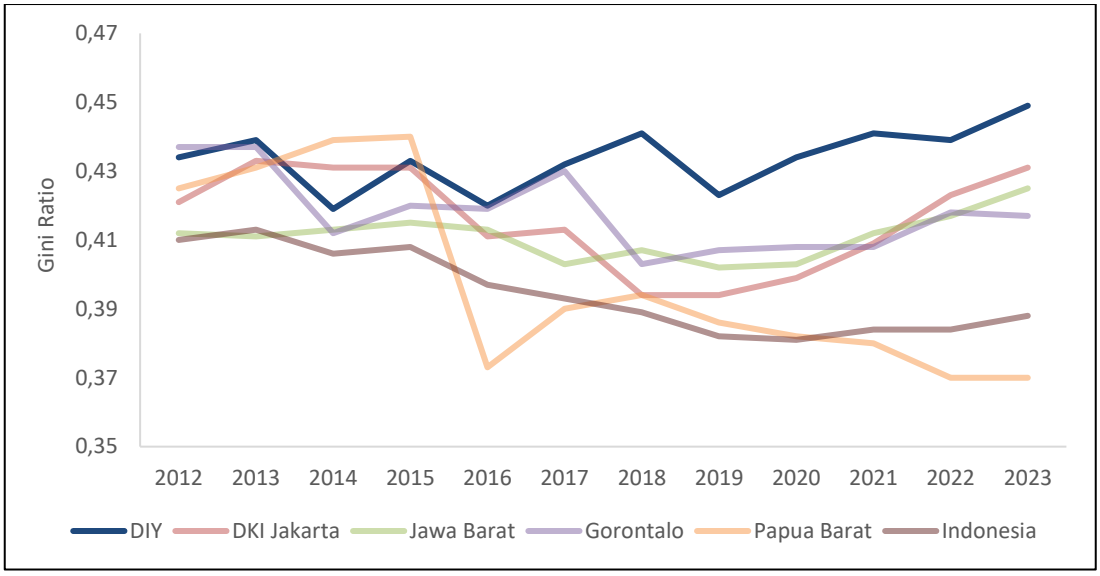

Figure 1. Gini ratio of DIY Province and Indonesia in 2009-2023 (March)

The DIY government has pledged its commitment to supporting the Sustainable Development Goals (SDGs) to reduce inequality, which is stated in the Regional Medium-Term Development Plan (RPJMD) 2017-2022, with a final target of a Gini ratio of 0.3635 in 2022. In this context, the DIY government has implemented a series of initiatives, including the development of leading sectors such as tourism and creative industries. Nevertheless, the persistently high level of inequality indicates that the DIY government has not been able to achieve equitable development results following its stated goals.

As a region with a rich heritage of local wisdom, the development process in DIY Province gives priority to culture, education, and tourism. This formulation is reflected in DIY's development goals as outlined in the Regional Long-Term Development Plan (RPJPD) 2005-2025, which aims to establish DIY as a center of education, culture, and a leading tourist destination by 2025. Thus, it is unsurprising that one of the primary sources of DIYs' regional income is derived from the education and tourism sectors (Setiawan et al., 2022). The development of these sectors also creates a multiplier effect that will help the growth of other economic sectors, including through the development of transportation, educational facilities support, and the provision of needs for students and tourists.

The accelerated expansion of tourism and educational activities serves the efficacy of the DIY government's policy design. Considering the composition of GRDP in 2023, the tourism sector provides the most dominant contribution, through trade activities (8.17%) while hotels and restaurants (10.18%). Moreover, the education sector also plays a notable part, with a share of 8.39% in forming GRDP. The substantial contributions of the tourism and education sectors to economic development reinforce the critical role of the service sector as a cornerstone of the DIY economy, with its contribution reaching over 50% of the GRDP.

Between 2005 and 2023, the service sector demonstrated a rapid expansion, indicating that this sector exhibits a high growth rate and is experiencing accelerated growth compared to other sectors. In contrast, the agricultural and industrial sectors have comparatively lower shares and are in decline year on year. These economic characteristics have enabled the DIY Province to undergo a structural transformation, with a greater reliance on the service sector. However, this transformation mechanism is regarded as a leap from the agricultural sector to the service sector without a preceding transition through the industrial sector first (Purwanto & Handayani, 2007). The service sector has been the dominant sector, indicating that the shift in

the economic structure of DIY has historically occurred decades ago.

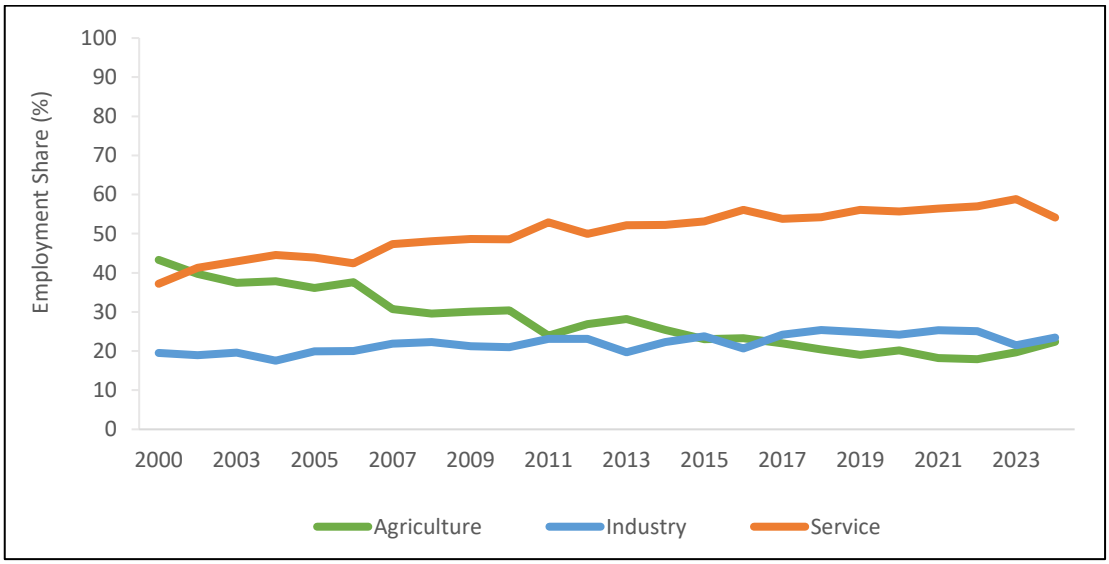

Figure 2. Sectoral employment share of DIY Province 2001-2023

Under the pattern of alterations in the GRDP structure, the structure of labor has also transformed its sectoral contribution, with a slight delay. Figure 2 illustrates the empirical evidence of structural change in DIY Province, which has entered a period of tertiarization, or a transition from the agricultural sector to the service sector. Then, as the economy developed, the proportion of agricultural labor declined while the proportion employed in services and industry increased. By 2001, the agricultural sector, which had previously absorbed most of the labor force, was no longer the primary source of employment.

However, in the context of the DIY Province, empirical studies on income inequality remain largely confined to general macroeconomic determinants such as economic growth, minimum wages, income per capita, and education (Raziq & El Hasanah, 2023; Maurilla et al., 2023; Aliyah & Rahmawati, 2024), without explicitly examining the role of economic structural change. In contrast, at the national level, economic structural transformation in Indonesia has been more extensively analyzed, particularly through shifts in sectoral contributions to GDP or employment (Dartanto et al., 2017; Alisjahbana & Akita, 2020; Yusuf & Halim, 2021).

Nevertheless, these national-level studies predominantly rely on output-based measures, which are limited in capturing the dynamics of labor reallocation across sectors and variations in labor productivity that are crucial in explaining income inequality. Consequently, although the relationship between structural change and income inequality has been explored at the national scale, it has not yet been examined using a more comprehensive analytical framework, nor has it been adequately applied to a regional context such as DIY. Therefore, this study offers novelty by simultaneously addressing the empirical gap in regional-level analysis and the methodological gap in measuring structural change.

LITERATURE REVIEW

Theoretical Framework

Income inequality is frequently linked to the phenomenon of structural change, which is identical to the movement of labor from agriculture to industry and services (Todaro & Smith,

2015). Given that each sector of the economy exhibits a distinct growth rate, shifts in the contribution of each sector to both total output and labor will inevitably impact income distribution (Krüger, 2008). The concept of structural change and income inequality was initially proposed by Kuznets (1955), who concluded that the relationship between these two phenomena is like an inverted U-shaped curve. This process is referred to as the Kuznets hypothesis, which suggests that inequality will initially increase during the early stages of development and subsequently decrease after a particular phase.

Kuznets identifies two forms of income inequality: between sectors (between urban and rural areas) and within sectors. Even though income in urban areas is higher than in rural areas, inequality is also higher as urban sectors continue to expand during the economic growth period (Alisjahbana & Akita, 2020). Conversely, inequality is relatively lower in rural areas as the largest proportion of the labor is employed in the low-productivity and undifferentiated agricultural sector (Morsy et al., 2023).

Dastidar (2012) and Baymul & Sen (2019) conclude that the impact of structural change on inequality varies depending on the specific regional characteristics and the pattern of structural change. Economic transformation from agriculture to industry will result in an equalization of income distribution, regardless of the country. In contrast, the transition from agriculture to services has no significant impact in developed countries, but will likely exacerbate income inequality in developing countries. It's clear that in developing countries, especially those with historically high inequality levels, the services sector exhibits the highest inequality compared to agriculture and industry.

Kuznets also explained that income in the modern sector (industry and services) tends to be higher than income in the traditional sector. However, unlike the industrial sector which reduces inequality, the service sector has more complex conditions because employment in the service sector is quite heterogeneous, ranging from low-income to high-income (Nelson & Lorence, 1985). Such wage dispersion drives inequality in income distribution within the service sector itself, with the potential to have a growing impact on overall income inequality (Evans & Timberlake, 1980; Son & Park, 2024).

Education is closely related to long-term investment in human capital. Human capital theory states that the level and distribution of education contribute to determining income distribution (Becker & Chiswick, 1966 in Lee & Lee, 2018). As stated by Schultz (1963) and Zhang (1996), increasing human capital is one way to reduce income inequality, which can be achieved through public education by the government. However, government policies, including government spending on education, typically do not have an immediate impact on society at the same time. Thus, the time lag is needed to observe the effect of government expenditure on education to raise the population's education level and, consequently, reduce income inequality (Kaasa, 2005).

Conceptual Framework

Structural change is often attributed as one of the causes of income inequality, which has been evidenced by several previous studies. The shift in sectoral economics from agriculture to services in developing countries tends to be accompanied by increased income inequality (Dastidar, 2012 and Baymul & Sen, 2019). Similar conclusions are also drawn for the case studies of Indonesia (Dartanto et al., 2017) and regional in West java Province (Putri & Monika, 2022), that growth in the service sector tends to drive income inequality, while growth in the agricultural and industrial sectors does the contrary.

Labor absorption of the service sector in DIY Province continues to increase, with subsectors that accommodate a considerable number of workers from year to year tend to be informal and have a relatively low level of productivity. It is particularly evident in the trade

and repair, accommodation, also eating and drinking sectors. In contrast, some workers are absorbed into highly productive service sectors, such as education, health, and public administration. This condition, as mentioned by Sitanggang (2017), is possible that the combination of low-income and high-income labor in the service sector may result in inequality in income distribution within the service sector itself, which could subsequently lead to an increase in overall inequality.

Furthermore, educational attainment is often linked to productivity and income levels. Empirical evidence from Sylwester (2002) suggests that countries with higher educational government expenditures tend to exhibit diminished levels of income inequality over time. Income is usually conceptualized as the rate of return on the educational costs incurred. Nevertheless, it must be recognized that not all individuals are afforded equal opportunities regarding access to education. It is, therefore, evident that the government has a vital role in reducing inequality through the implementation of policies related to education (Wahyuni & Monika, 2017).

Based on the previous research above, a framework can be built for this research which is illustrated as follows:

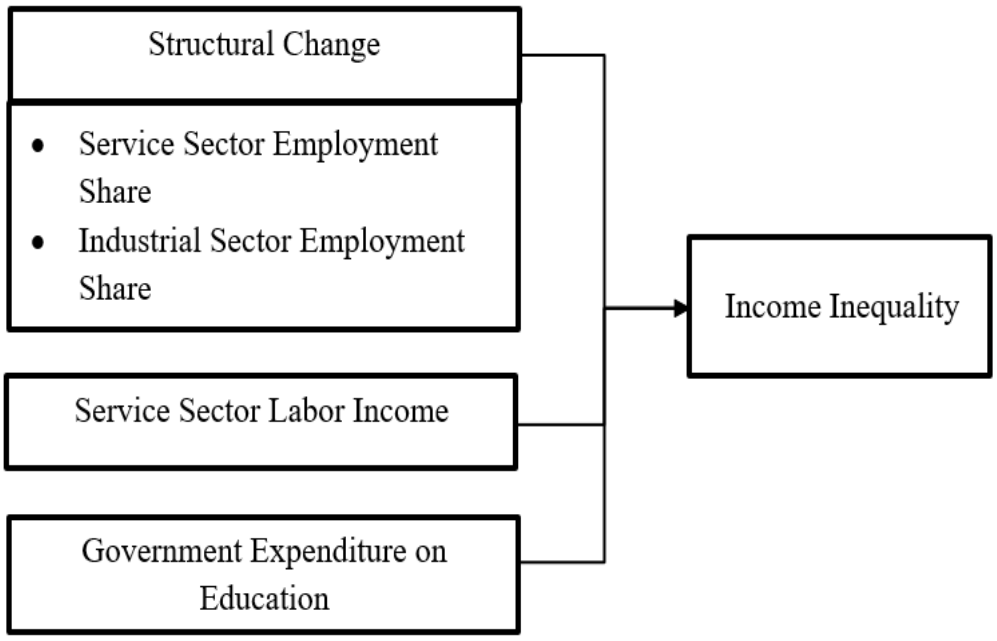

Figure 3. Research Framework

RESEARCH METHOD

This study employs a quantitative methodology, using annual data from five regencies/cities in DIY Province over the 2013-2023 period. The data used are secondary data sourced from Statistics Indonesia (BPS) and the Ministry of Finance. This research applied two analytical techniques: shift-share analysis and panel data econometric regression to ascertain the impact of structural change on income inequality.

Structural change is often interpreted as a reallocation of labor from low-productivity to high-productivity sectors (Yusuf & Halim, 2021). During the transition process, the use of labor and production factors in modern economic activities increases compared to the traditional economy, so when labor moves from agriculture to modern economic activities, overall productivity increases and thus income. Thus, changes in aggregate labor productivity

can occur within sectors or through reallocation of labor between sectors (structural change).

To measure this productivity growth, previous researchers have used shift-share decompositions. A shift-share analysis is conducted to examine structural change by decomposing labor productivity growth into productivity growth within sector and between sector. This decomposition is based on the formula proposed by McMillan & Rodrik (2011), Yilmaz (2015), Andriansyah et al. (2021), Morsy et al. (2023), with slight modifications as follows:

$$\frac{\Delta P_t}{P_0} = \sum_{i=1}^{n} \frac{S_{jt}\Delta P_{j_t}}{P_0} + \sum_{i=1}^{n} \frac{P_{j0}\Delta S_{jt}}{P_0} \quad \text{.....(1)}$$

where P is the productivity level, S_j is the employment share in sector j, t is the current period, and 0 is the base period. The base period, which serves as a reference point for comparison, is set at one year before the current period. The productivity level is calculated by dividing the constant price GRDP by the number of workers.

In the equation, the decomposition result in the first component is the *within effect*, which describes labor productivity growth within the economic sector. The second component, the *between effect*, describes productivity growth due to the reallocation of labor across economic sectors. It is also known as the structural change effect (McMillan & Rodrik, 2011). This contribution will increase productivity or be positive when labor movement occurs from low-productivity economic sectors to higher-productivity economic sectors and vice versa.

In order to identify the impact of structural change on income inequality, this study employs panel data regression analysis. The dependent variable used in the study is the Gini ratio, which serves as an indicator for measuring income inequality. The independent variable employed to capture structural change is the percentage of employment in the service and industry sectors, which in this case is the destination sector due to structural changes. Furthermore, this study incorporates control variables, specifically the mean labor income in the service sector, to reflect the heterogeneity in the sector, and the proportion of government expenditure on education relative to total expenditure, which serves as a proxy for education.

Although theoretically the relationship between education and inequality is not instantaneous, there is no empirical basis for the lag terms used (Babones et al., 2014). Considering the necessary time lag, this study assumes that the education expenditure requires more than a year or at least two-year time lag to drive income inequality. This assumption supported by the results of the maximum lag selection which shows that the education expenditure ratio variable significantly affects income inequality in DIY Province after a lag of two years. It is also consistent with the approach taken by Kambubuy & Budiasih (2020), who employed the second-lagged variable of government expenditure on education function.

The Random Effects Model (REM) emerges as the preferred panel data regression model in examining the impact of structural change on income equality within DIY Province. This model allows for the accommodation of differences in individual characteristics (regencies/cities) and time variation through the error component of the model. The consideration in employing this REM model is that there are additional factors not incorporated into the model that are believed to be associated with income inequality. These factors pertain to population migration and immigrant characteristics, which also influence the income distribution of DIY people. However, it is important to confirm using the Hausman test to ensure that the fit model is a random effect rather than a fixed effect.

The model of income inequality with a random effect can be written as follows:

$$GINI_{it} = \alpha + \beta_1 SER_{it} + \beta_2 IND_{it} + \beta_3 WAGE_{it} + \beta_4 EDU_{it-2} + (u_i + v_{it}) \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

In this model, GINI represents the Gini ratio, SER denotes the service sector employment share of total employment (%), IND denotes the industrial sector employment share of total employment (%), WAGE denotes the average service sector labor income/wage (million rupiahs), and EDU represents the percentage of education expenditure to total expenditure (%). Meanwhile, the subscript it describes the regencies/cities in DIY Province (i) during the 2013-2023 time period (t). The error component comprises individual effects (u_i) and a combined individual and time error component (v_{it}). It is assumed that the errors are normally distributed and uncorrelated with each other.

The parameters of the REM model are estimated using the GLS method, which has overcome the problems of autocorrelation and heteroscedasticity in error terms. However, it is still needed to verify the assumptions of normally distributed errors and the absence of multicollinearity between independent variables. In this study, normality was assessed using the Jarque-Bera test (JB test), and multicollinearity was evaluated by examining the Variance Inflation Factor (VIF) value.

The research data to capture economic activity uses the economic sector classification, which refers to the three-sector classification according to BPS and ISIC-Rev. 4. The agricultural sector includes Agriculture, Forestry, and Fisheries (A); the industrial sector includes Mining and Quarrying (B) to Construction (F); and the service sector includes Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles (G) to other Services (R, S, T, U).

RESULTS AND DISCUSSION

Income Inequality

A high Gini ratio indicates an unequal income distribution across income groups. Todaro and Smith (2015) propose a classification system for income inequality based on the range of Gini ratios observed. A Gini ratio between 0.5 and 0.7 is classified as "high" inequality, a ratio between 0.35 and 0.5 is classified as "moderate" inequality, and a ratio between 0.2 and 0.35 is classified as "low" inequality.

In the period between 2013 and 2023, income inequality in DIY Province was classified as "medium" and demonstrated an upward trend. This elevated GINI ratio signifies a more pronounced disparity in income inequality between the upper and lower socioeconomic strata. This also implies that the results of economic development in DIY have yet to be able to enhance the community's well-being in a fair and equitable manner, as envisioned by the sustainable development objectives of the DIY government.

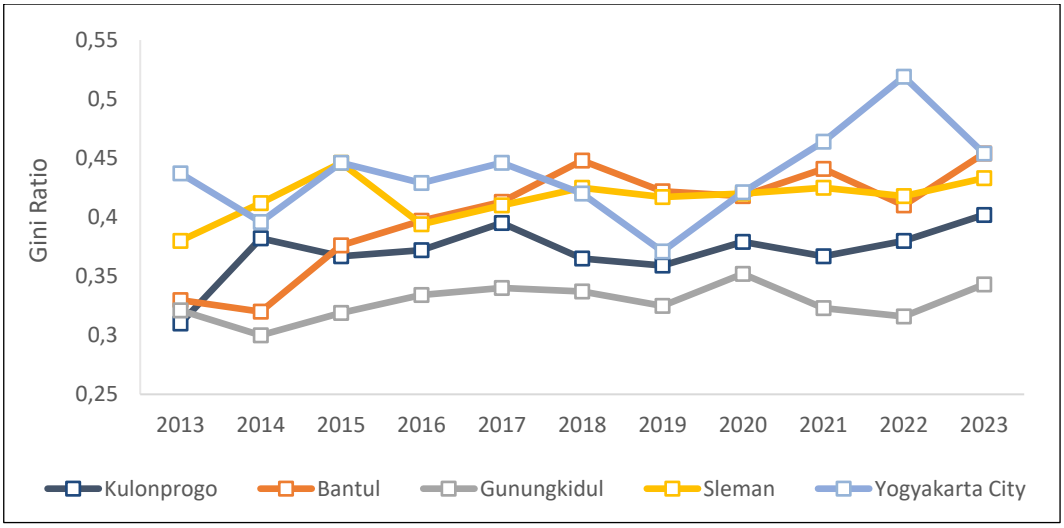

Figure 4. Gini ratio of regencies/city in DIY Province in 2013-2023

Figure 3 illustrates the income inequality at the regency/city level, in which the Gini ratio fluctuates with an increasing trend. Overall, urban areas exhibit a considerable degree of income inequality, as evidenced by the relatively high Gini ratio observed in Yogyakarta City compared to the regencies. This indicates a significant disparity between the high-income and low-income groups within the city. This phenomenon is likely associated with the heterogeneous nature of urban employment and its massive urbanization.

Yogyakarta City serves as the epicenter of economic growth for the DIY Province, which, with its various activities, offers many opportunities for creating diverse types of occupations. Furthermore, Yogyakarta is a *city of students*, boasting numerous esteemed academic institutions that attract a significant number of students from across the country. The development of Yogyakarta attracts people from outside the city to migrate, thereby increasing the diversity of the city's population (Juningsih, 2015). These newcomers come from divergent economic circumstances and backgrounds, leading to a disparity in income either between migrants or between migrants and the native population of the city. Moreover, the advent of the pandemic caused Yogyakarta's Gini ratio to experience an extreme rise throughout 2020 to 2022. This increase has resulted in the classification of Yogyakarta City as exhibiting "high" inequality in 2022, with a Gini ratio of 0.519, representing the highest recorded Gini ratio in the history of DIY Province.

Meanwhile, the Sleman Regency exhibits the highest level of inequality among the regencies, with a Gini ratio that continues to increase annually. This elevated level of inequality can be attributed to the characteristics of Sleman, which is predominantly classified as an urban area due to its geographic proximity to Yogyakarta. As a result, the characteristics of Sleman Regency are closely aligned with those of Yogyakarta in terms of activities, economy, and education. Subkhi & Mardiansjah (2019) posited that due to uninterrupted urbanization, urban areas of the regency may also grow and develop as heterogeneous areas. This is what might happen in Sleman Regency which tends to be diverse region like the city of Yogyakarta.

Conversely, the regency with the lowest level of income inequality is Gunungkidul. The Gini ratio for Gunungkidul has remained relatively constant from 2013 to 2023, with an average income inequality classified as "low." This indicates that income distribution among income groups in this region is relatively uniform. Unfortunately, the low income-inequality in this region is consistent with the low and uneven income of most Gunungkidul people due to the concentration of labor in the agricultural sector. According to data from the BPS DIY Province,

Gunungkidul's GRDP per capita is the lowest in Yogyakarta Province, at 33,257 million rupiah annually in 2023.

The remaining regencies, Kulonprogo and Bantul, overall are classified as "medium" inequality. Starting with a relatively low Gini ratio in 2013, these two regencies, along with Gunungkidul, exhibited the lowest Gini ratios among others. However, throughout the 11 years, the Gini ratios of Kulonprogo and Bantul have notably increased. The most pronounced increase was observed in Bantul, rising from 0.330 in 2013 to 0.454 in 2023. This situation represents a significant concern for the local government, which must take action to prevent the gap from widening further.

The condition of income inequality in Yogyakarta Province aligns with the Kuznets (1955), where in this case Yogyakarta City and Sleman Regency represent urban areas, while Gunungkidul Regency reflects rural areas. As posited by Kuznets, the level of income inequality is typically higher in urban areas due to the expansion of economic activities in these regions. Conversely, rural areas exhibit lower levels of income inequality due to the prevalence of relatively homogeneous levels of productivity, with most of the population engaged in the agricultural sector.

Structural Change

A structural transformation or structural change is defined as a shift in the composition of the economic structure from traditional agricultural sectors to more modern sectors such as industry and services. Aizenman et al. (2012) posited that the transformation of economic sectors affects employment, thereby necessitating the incorporation of labor migration into the process of structural change. Regarding GRDP structure, the movement of economic sector contributions in DIY province appears slow and prone to stagnation, necessitating a longer research period to discern structural changes. Consequently, the pattern of structural change in DIY province can be more readily discerned by examining changes in sectoral contributions of employment absorption.

The majority of employment in DIY Province is concentrated in the service sector, with a proportion exceeding 50% since 2013. The dominance of the service sector during this period suggests that DIY Province may have undergone a transition in its economic structure, shifting from an agricultural base to a service-oriented economy before 2013. Figure 10 presents a visual representation of the structural change in DIY Province, illustrating a notable increase in the industrial and service sectors employment share accompanied by a decline in the agricultural sector across regencies and cities.

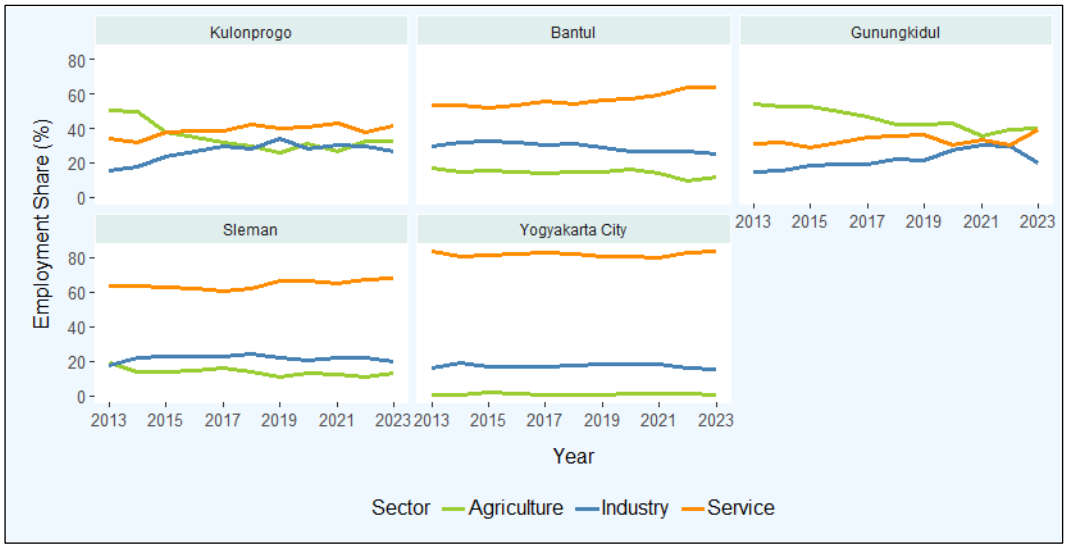

Figure 5. Sectoral employment share of regencies/city in DIY Province in 2013-2023

Service sector labor absorption has dominated almost all regencies/cities in Yogyakarta Province, particularly in Bantul Regency, Sleman Regency, and Yogyakarta City, where the contribution of labor in the service sector has reached over 50%. In these areas, the industrial sector represents the second mainstay of labor absorption, with contributions ranging from 20% to 30%. The agricultural sector, on the other hand, absorbs a relatively small portion of the workforce, particularly in Yogyakarta City, where the vast majority of the population resides in urban areas, resulting in a negligible contribution from labor in agriculture, which accounts for less than 1%.

The region that is still dominated by agricultural employment is Gunungkidul Regency. This suggests that, concerning the employment structure, this regency has yet to undergo significant structural change and still rely on the agricultural sector as the primary source of employment. Moreover, despite the continued prevalence of employment in the agricultural sector, the GRDP structure of Gunungkidul Regency has been predominantly characterized by the service sector for an extended period. This phenomenon illustrates the existence of *unbalanced transformation*, whereby changes in the GRDP structure are not accompanied by corresponding changes in the employment structure, which can impact income distribution (Romli et al., 2018).

The most notable transformation in the regional economic structure during the study period is evident in Kulonprogo Regency. In 2013, this regency still excelled in absorbing agricultural labor with a contribution of 50.17%. Along with economic development in the region, agricultural labor absorption decreased and shifted to other sectors. By 2015, the labor structure of Kulonprogo Regency had begun to be dominated by the service sector, followed by the agricultural and industrial sectors. The expansion of the service sector employment in Kulonprogo Regency was concurrent with the construction of the Yogyakarta International Airport in 2017. The continuation of airport development has a direct and indirect impact on the regional economy, and it represents one of the local government's strategies to stimulate economic growth, reduce inequality, and reduce unemployment (Fatimah & Rahayu, 2023).

Meanwhile, it is assumed that structural changes occurred in the Bantul and Sleman regencies long before 2013. Figure 4 illustrates that the expansion of the service sector in these two regencies is sharper than in other regencies. It is conceivable that the expansion of the service sector in these two regions is occurring at a more rapid pace, thereby enabling an earlier

transformation from the agricultural to the service sector.

The assessment of structural change typically employs the contribution of GDP or employment as indicators. However, these measures solely reflect the quantitative aspect of structural change. To account for both the quantity and quality of structural change, it can employ the shift-share method or decomposition of aggregate growth in labor productivity (Andriansyah et al., 2021).

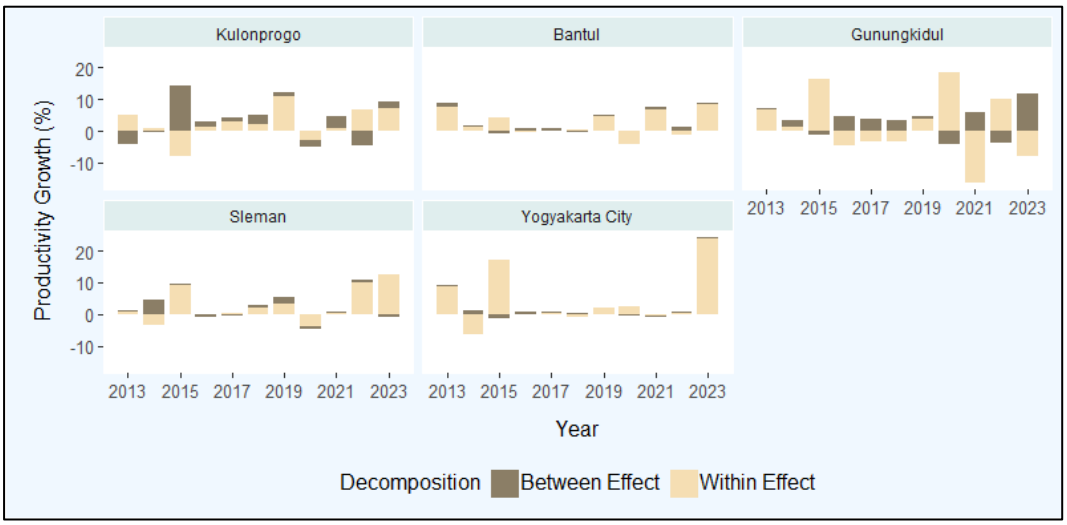

Figure 6. Decomposition of labor productivity growth in regencies/cities in the DIY Province in 2013-2023

The decomposition results in Figure 5 demonstrate that the high and low rates of productivity growth observed in each regencies/city are primarily determined by the growth in productivity within a particular sector (*within effect*). On the other hand, structural changes (b*etween effect*) have been found to contribute only a limited share of aggregate productivity growth. This phenomenon can be attributed to the observation that during the 2013-2023 period, only a few regencies were identified as experiencing labor transitions between sectors, namely Kulonprogo and Gunungkidul. Therefore, it is unsurprising that this labor movement has a negligible impact on aggregate productivity.

In the Kulonprogo and Gunungkidul regencies, the *between effect* component shows positive structural changes in specific years, indicating that in those years, labor was reallocated from non-productive or low-productivity sectors (agriculture) to more productive sectors (industry and services), as illustrated in Figure 4. The most notable shift in economic structure occurred in Kulonprogo Regency in 2015. This structural change was characterized by a notable decline in labor absorption in the agricultural sector, from 50.04% to 37.81%, due to migration to the industrial and service sectors, which increased by 5.98% and 6.25%, respectively.

The Effect of Structural Change, Service Sector Labor Income, and Government Spending on Education on Income Inequality in DIY Province 2013-2023

The Gini ratio in DIY Province during 2013-2023 showed similar values between regencies/city. However, the value of the Gini ratio tends to fluctuate over time, which raises the suspicion that heterogeneity in the Gini ratio occurs because the effect of temporal variation that is more dominant than the effect of variation between regencies/cities. Therefore, the initial hypothesis regarding the fit model in this study is the Random Effects Model (REM).

Table 1. Hausman test result

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	10.6221	4	0.0312

As shown in Table 1, the confirmation results for determining the fit model using the Hausman test indicate that, at the 3% significance level, the Random Effect Model (REM) is the appropriate model for analyzing the influence of structural change, service sector labor income, and education expenditure on income inequality in the regencies/city of DIY Province between 2013 and 2023.

Table 2. Parameter estimation results

Dependent Variable: Rasio Gini				
Independent Variable	**Coefficient**	**Std. Error**	**t-statistic**	**p-value**
C	0.2815	0.0384	7.3311	0,0000*
SERV	0.0014	0.0003	5.1823	0,0000*
IND	-0.0000	0.0007	-0.0147	0,4942
WAGE	0.0370	0.0119	3.0977	0,0016*
$EDU_{(-2)}$	-0.0011	0.0004	-2.4389	0,0092*
F-statistic	**p-value**	**Adjusted R^2**	**Jarque-Bera**	**p-value**
36.1661	0.0000*	0.7226	1.4724	0.4789

Notes: *) Significant at α=5%

Table 2 presents the panel data regression results based on the random effects model. The F-test results with a p-value of 0.0000 indicate that, at the 5% significance level, all independent variables simultaneously exert a significant impact on income inequality. The t-test revealed that the variables significantly affecting income inequality are the service sector employment share, the average income/wage of service sector labor, and the percentage of government expenditure on education. Furthermore, the Jarque-Bera test for normality yielded a p-value of 0.4789, indicating that the errors in the model are normally distributed at the 5% significance level.

Table 3. The Value of Variance Inflation Factor (VIF)

Variable	SER	MAN	INC	$EDU_{(-2)}$
VIF	2.1768	1.3798	1.8838	1.6928

The results of the multicollinearity checking indicate that the Variance Inflation Factors (VIFs) for all independent variables are less than 10, which suggests that there is no linear correlation between all independent variables in the model. Consequently, all variables can be

employed to model regencies/city income inequality in DIY Province.

Structural Change

Structural changes in the model of income inequality in DIY Province are explained by the service and industrial sector employment share. The estimation results indicate that the service sector employment share exerts a positive and statistically significant effect on income inequality in DIY Province. This relationship is consistent with the findings of Baymul & Sen (2019), who concluded that an increase in the share of service sector labor would be accompanied by an increase in income inequality, regardless of the stage of economic structure transformation. The results of Dastidar (2012) and Dartanto et al. (2017) also corroborate this conclusion, indicating that the transition of economic structure from agriculture to services is associated with increased inequality in Indonesia and other developing countries.

The economic development of DIY Province which concentrates on the service sector, especially tourism and education, has made the service sector being able to employ the majority of the labor force in regencies/city within the province. However, this condition appears to have contributed to a worsening of income inequality, thus failing to achieve one of the development goals set out for DIY, namely the improvement of the welfare of the people. As labor shifts away from the agricultural sector towards the service sector, the overall income in the service sector will increase, thereby further widening the income gap between the service sector and other sectors.

Furthermore, the service sector is typically associated with urban areas, which often exhibit higher levels of inequality compared to rural regions. Consequently, as the urban sector continues to expand with economic growth, this process will tend to exacerbate disparity of income (Alisjahbana et al., 2020). The higher inequality in the service sector occurs because the service sector is a mix of low-skilled and high-skilled services, thus increasing income inequality (Sitanggang, 2017).

As Kuznets postulated, the relocation of labor from low-income to high-income sectors contributes to income inequality between sectors. Moreover, if the sector which left behind has low income and inequality, while the destination sector has higher income and inequality, the process will further worsen the overall income inequality condition.

In the context of economic structural transition, the labor force from the agricultural sector is not only absorbed into the service sector, but also into the industrial sector. In contrast to the service sector, which exerts a positive and considerable influence on income inequality, labor in the industrial sector does not significantly impact income inequality in regencies/city of DIY Province.

This may be attributed to the relatively minor contribution of the industrial sector to both the GRDP and employment structure, which has never reached 40%, as illustrated in Figure 4. The economy of DIY Province continues to rely on the service sector, including tourism, trade, and education. As a result, the industrial sector has yet to become the primary driver of economic growth. This consequently makes the regression coefficient generated by the model is notably small, approaching zero, which causes an increase in the labor contribution of the industrial sector to be unable to mitigate income inequality in DIY Province. The weak relationship between the industrial sector and income inequality is also possible because the labor contribution of the industrial sector does not demonstrate a consistent direction of movement over time, unlike the service sector and agricultural sector, which have a clear direction (Baymul & Sen, 2019).

The research that supports this finding is Morsy et al. (2023), which also suggests that the contribution of labor in the industrial sector has a negative but insignificant effect on income inequality in Africa. These findings contrast with the research of Baymul & Sen (2019), which

indicates that structural transformation associated with an increase in the contribution of labor in the industrial sector will reduce income inequality.

Service Sector Labor Income

The service sector represents a significant potential source of employment and a substantial contributor to economic growth, as evidenced by its capacity to absorb a considerable proportion of the labor force and generate substantial income. The estimation results indicate that income inequality in DIY Province is also significantly influenced by service sector labor income/wages, with a positive coefficient direction. This is supported by Son & Park (2024) who argue that wages in the service sector experience disparities that occur due to variations in job roles, skill requirements, and institutional context, thus contributing to a wider wage gap in the economy.

An increase in average income that increases inequality indicates that the increase in income is concentrated among the high-income population in the service sector, thereby deepening the gap between the high-income and low-income population overall. This may also be attributed to the low minimum wage in DIY Province and its sluggish increase, which has been unable to enhance the income of lower-income groups.

As stated by Gottschalk (1997), an increase in the average income will reduce the proportion of individuals living below the poverty line. However, this condition may become more severe when income heterogeneity also increases concurrently with the rise in average income. This situation is similar to that which occurred in the United States several decades ago, wherein the expansion of income inequality was propelled by an increase in the mean income along with income heterogeneity, culminating in a reduction in the relative income of the poor.

The service sector in DIY Province exhibits the highest average income among other economic sectors. It is supposed that the transfer of labor from the agricultural sector to the service sector, as previously described, will result in an increase in income, subsequently leading to a reduction in inequality. However, this does not appear to consider the aspect of inequality within the service sector, which ultimately contributes to overall inequality (Evans & Timberlake, 1980). As previously stated, the service sector offers a diverse range of occupations, resulting in not only a high average income but also a wide income range. Therefore, an increase in the average income accompanied by an increase in the income range tends to worsen income inequality.

Government Expenditure on Education

Education represents an investment in human capital, which will ultimately determine the quality of the human resources available to a given society. One type of investment in education by the government is the allocation of funds to education programs. The estimation results indicate that the percentage of education spending in the previous two years had a negative and significant effect on income inequality in DIY Province. This result is consistent with the findings of Priyono et al. (2019), Kambubuy & Budiasih (2020), and Wahyudi (2023), which demonstrate that government spending on education, either in the same year or in previous years, is an effective strategy for reducing income disparities at the provincial level in Indonesia.

Duman (2008) posits that each individual is born into a distinct economic situation. In most countries, a high level of income is the result of education, so then highlights the importance of education in society. However, if educational opportunities are constrained by economic background, education may exacerbate income disparities. Thus, in this context, the government plays a pivotal role in addressing inequality through strategic education spending

and subsidies.

The education budget, allocated through a DIY government expenditure framework, is primarily designed to facilitate the fulfilment of the 12-year compulsory basic education program. The implementation of the education budget is distributed among various programs, including the School Operational Assistance (BOS) program, scholarships, the construction of educational facilities and infrastructure, and the provision of salaries and allowances for teachers. These programs, which are funded by education budgets, not only facilitate the continuity of teaching and learning activities while also expanding access to education services for underprivileged and underdeveloped communities. Consequently, all levels of society have equal opportunities in terms of education, which in the long run can contribute to income growth and, subsequently, income distribution.

CONCLUSION AND RECOMMENDATIONS

The level of income inequality in Yogyakarta Province did not differ much between regencies/city during the 2013-2023 period. However, there was a notable increase over time, with fluctuations observed in each year. Overall, Yogyakarta City exhibits the highest levels, while Gunungkidul Regency demonstrates the lowest. According to the employment, all regencies/city except Gunungkidul Regency have been predominantly engaged in service sector employment, which suggests that the service sector is experiencing a period of rapid growth in the province of DIY. It can be observed that the regencies/city in DIY Province are undergoing structural changes, with a transition from the agricultural sector to the service sector. This is evidenced by a decline in the share of agricultural sector employment along with an increase in the share of the service sector employment. Furthermore, structural changes can be explained through the decomposition of labor productivity growth through shift-share analysis, which is particularly evident in Kulonprogo Regency and Gunungkidul Regency during the period.

The results of panel data regression using a random effects model indicate that structural change from the agricultural sector to the service sector has a positive and significant effect on income inequality in DIY Province during 2013-2023. In contrast, structural change from the agricultural sector to the industrial sector has no significant impact on income inequality. Income inequality in DIY Province is also significantly influenced by the service sector labor income/wages, with a positive coefficient. Meanwhile, the government education expenditure has a significant negative effect on income inequality.

Considering these findings, several recommendations can be offered concerning DIY government policy. In general, the government's initiatives in economic development that prioritize the service sector can be regarded as successful, given the rising contribution of the service sector to both GRDP and employment. Nevertheless, the government must persist in its efforts to facilitate the creation of job opportunities in both the service and industrial sectors within Gunungkidul Regency. This may be possible with innovative economic development strategies and the development of micro, small and medium enterprises (UMKM) to accommodate excess labor in the agricultural sector. Furthermore, this must also be accompanied by modernization of the agricultural sector, considering that this sector currently absorbs the majority of employment but its productivity is still relatively low.

In pursuing the government's policy of advancing the service sector, it is essential to prioritize improving the employment quality. The employment should receive adequate training and skills development to enhance productivity so that it will be able to equalize income distribution. Moreover, local governments must force the efficacy of their expenditure on education, ensuring that it is more appropriate and well-targeted. Furthermore, the

management of education funds must consider the priority scale concerning the availability of existing funds. In this way, those in need can enjoy the benefits of education spending, thereby improving the quality of education. Additionally, the government must exercise greater caution in controlling income inequality, particularly in areas that have experienced a notable increase in the Gini ratio, such as the Kulonprogo and Bantul regencies.

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