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Article

Tax Revenue and Income Inequality in Indonesia: A Provincial Level Evidence

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Abstract

This study examines the relationship between tax revenue and income inequality at the provincial level in Indonesia from 2011 to 2019. It uses a fixed-effect approach and finds that total tax revenue has no significant effect on income inequality. The finding implies that Indonesia's current tax system and structure have been unable to contribute to reducing regional income inequality. Similarly, by the type of taxes, both income tax and value-added tax revenue have a relatively insignificant effect. On the other hand, the ratio of local taxes to gross regional domestic product (GRDP) has a considerably positive effect on income inequality, indicating that the majority of consumption taxes in the local tax component are regressive. Moreover, expenditure programs may play a more significant role in reducing regional inequality instead of the tax system.

Keywords: tax revenue; income inequality; income tax; value-added tax; local tax.

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I. Introduction

This study assesses the role of taxation on income inequality. Inequality remains an important concern in Indonesia due to its detrimental effect on development. Fiscal policy is seen to be capable of overcoming this issue, possibly through tax policy. In modern governments, the tax serves both functions. It covers state spending and encourages income redistribution (Pfahler, 1983). These purposes would be consistent with the Pigou-Dalton Transfer Sensitivity Theory, which states that transfers from rich to poor people reduce income inequality, as indicated by the gini ratio (Shorrocks & Foster, 1987).

There have not been any studies that assess the role of the tax on income distribution in the Indonesian context. This study also consolidates central tax and local tax as variables of interest to describe the overall tax collecting base, making it more reliable in estimating the effect of tax revenue on income inequality within provinces. Moreover, many existing studies have been conducted cross-country (Bird & Zolt, 2005; Martinez-Vazquez *et al.*, 2012; Martorano, 2018; Alavuotunki *et al.*, 2019; Nusiantari & Swasito, 2020), but this study uses the provincial level (cross-sub-national) as the unit of analysis. So, this study would address that research gap.

This study concludes that total tax revenue has no significant effect on income inequality. This conclusion implies that Indonesia's current tax system and structure, both national and regional, have not contributed to achieving income equality. Similarly, income tax and VAT have a minor impact on income inequality. In contrast, the ratio of local tax to Gross Regional Domestic Product (GRDP) is significant and positively related to income inequality. It indicates the regressivity of consumption taxes that compose the local tax component. However, the log of the local tax indicator is not significant. Thus, the government must consider reforming the taxation system and structure. So, it must improve the tax administration, optimize tax extensification, review tax progressivity, and optimize regional tax structure to achieve equitable income distribution.

According to the World Income Inequality Database (WIID), Indonesia's Gini ratio has been relatively stable over the last decade, averaging 0.403 compared to the rest of the world. However, it remains lower than the world average of 0.420 for income inequality. As a result, Indonesia is ranked 65th out of 132 countries. Nevertheless, compared to high-income countries, Indonesia still has a relatively high level of income inequality.

Based on Todaro and Smith (2012), the ideal Gini ratio ranges from 0.200 to 0.350. So, the Indonesian government plans to improve the Gini ratio gradually from 0.360 to 0.374 in the 2020–2024 RPJMN. However, the plan is a challenging task. But income inequality is considered a crucial issue to eradicate in order to promote social justice and economic stability as well as high-income countries,

Regarding whether income inequality positively or negatively affects the economy, academics still disagree. According to Adam Smith, income inequality benefits economic growth in a region through investment by high-income groups (Berg & Ostry, 2017). However, this occurs only in developed countries. Still, developing countries can slow economic growth because the credit market is imperfect and the quality of human resources is low, affecting the investment mechanism that should support the lower-income groups (Barro, 2003). Income inequality can be detrimental to economic growth by limiting investment in human capital, fostering social inequality, precipitating financial crises,

demeaning health quality, and even sparking social unrest and crime, all of which harm the economy (Galor & Zeira, 1993; World Bank, 2016).

Many governments are attempting to reduce income inequality through various means to avoid the negative economic impact of Inequality, one of which is tax policies (Martinez-Vazquez *et al.*, 2012; Matorano, 2018). Based on the Pigou-Dalton Transfer Sensitivity Theory, transfers from rich to poor can reduce income inequality as measured by the Gini ratio (Shorrocks & Foster, 1987). According to this study, the tax mechanism is one of the tools for transferring the income of the rich, who are subject to higher taxes, to the state as revenue. Then, the revenue will be distributed to the poorer communities, either directly or indirectly, through the realization of government expenditure. In a fiscal policy context, taxation is more effective in reducing Inequality than government spending directed at the lowest income group (Bird & Zolt, 2005). This effectiveness comes because taxes can affect people at all levels of income. The upper-income groups will face increased taxes at progressive rates. In contrast, individuals in the lowest income groups are exempt from taxation due to a minimum income threshold.

Additionally, understanding how the tax burden has been allocated, as assessed by its progressivity and impact on Inequality, is critical for considering various alternatives when selecting tax policies (Kesselman & Cheung, 2004). For example, direct taxes, which include personal income taxes, corporate income taxes, oil and gas income taxes, property taxes, and vehicle taxes, can increase progressivity and reduce Inequality. On the other hand, indirect taxes such as VAT, the luxury goods sales tax, excise, and other indirect taxes can erode progressivity and exacerbate inequality (Aemkulwat, 2015). Furthermore, Kesselman and Cheung (2004) identify the personal income tax as a critical component of any net progress of the total tax system toward inequality reduction, given the regressivity of many other types of taxes.

Various studies indicate that fiscal policy, particularly the imposition of tax on income inequality, has shown mixed results. Tax can improve income distribution and decrease Inequality (Martinez-Vazquez, 2012; Martorano, 2018). It is because progressive taxes, particularly income taxes, are believed to promote equity (Lambert, 1993; Bird & Zolt, 2005). Moreover, changes in a country's tax structure can result in significant changes in income inequality. For example, according to Li and Sarte (2004), changes in tax progressivity associated with the 1986 Tax Reform Law significantly reduced the Gini ratio.

On the other hand, several studies indicate that taxes have a marginal redistributive effect (Bastagli *et al.*, 2012; Enami *et al.*, 2019; Nusiantari & Swasito, 2020). As Bastagli *et al.* (2012), the role of progressive taxes in reducing income inequality has diminished in various countries since the mid-1990s, as income inequality reflects the effect of reform, globalization, and technological advances. Similarly, Nusiantari and Swasito (2020) stated that the declining role of taxes in income redistribution efforts was partly due to the tax system's poor quality, the informal sector's dominance, and low tax compliance.

Meanwhile, VAT, luxury goods taxes, and taxes on the consumption of goods and services are usually regressive. Regressive tax on the consumption of goods and services will exacerbate income inequality within a community. As Tanzi and Zee (2000) and Alavuotunki *et al.* (2019) discovered, indirect taxes contribute to increasing Inequality. However, it must be recognized that indirect taxes, particularly VAT, significantly contribute to a country's financing of expenditures (Heady, 2004).

Regarding local taxes, we are still unable to discover any empirical studies that specifically define their effect on income inequality. It could be because of the wide variety of local government forms, systems, and structures (Slack, 2017). Consequently, the nature of the various taxes will have a wide range of effects.

The Indonesian government has an incentive to maximize tax revenue to support the increase in the tax ratio. It is because Indonesia has one of the lowest tax ratios in the Asia-Pacific. It is lower than the average for Organisation for Economic Cooperation and Development (OECD) countries and Latin America and Africa (OECD, 2019). This problem creates a dilemma for the government. However, social justice must be favoured through the tax function in redistributing income.

Using data from the Central Bureau of Statistics, Investment Coordinating Board, and the Ministry of Finance for 2011–2019 in 31 provinces in Indonesia, this study examines the effect of tax revenue on income inequality. It assesses both in terms of total tax revenue and the composition of income tax, VAT, and local tax. It is expected to provide input to the government on how to improve tax policies on a broad basis, most importantly to encourage income redistribution. Thus, the government can keep striving for the welfare of the Indonesian people, particularly the low-income groups, and selecting the right tax policy to increase revenue and growth. This study applied a quantitative analytical technique and a fixed-effects approach similar to those used in Martorano's (2018) and Nusiantari and Swasito's (2018) studies. Additionally, comparing the ln tax revenue and tax ratio, robustness checks were conducted using two different indicator variables.

II. Data and Methodology

2.1. Data Set

This study assessed the role of tax revenue on income inequality at the provincial level, covering 31 provinces in Indonesia from 2011 to 2019. The period was chosen to avoid the considerable effect of changes in tax policy since 2011 was the first year in which Indonesia enacted three new tax laws. This study excludes DKI Jakarta because the value and idea of income inequality are considered insufficient to reflect income inequality in the region adequately. It is a large city, a business centre, and the nation's capital. Similarly, provinces that experienced expansion were also excluded because we could not obtain data that could be validly segregated in the period before the expansion between 2011-2014. The data sources used are secondary sources from the Central Bureau of Statistics, the Ministry of Finance, and the Investment Coordinating Board, as detailed in Table 1.

2.1.1. Data on Income Inequality

Income inequality is the main dependent variable in this study, which is proxied by the Gini ratio at the provincial level. The Gini ratio in this study is the ratio of the cumulative proportion of a province's population to the cumulative proportion of income received. It ranges between 0 and 1, with 0 indicating perfect equality and 1 indicating perfect inequality. The income inequality measured in this study uses data from the National Socio-Economic Survey (Susenas) Core Module. Additionally, this statistic captures the province's overall inequality without distinguishing between rural and urban income inequality.

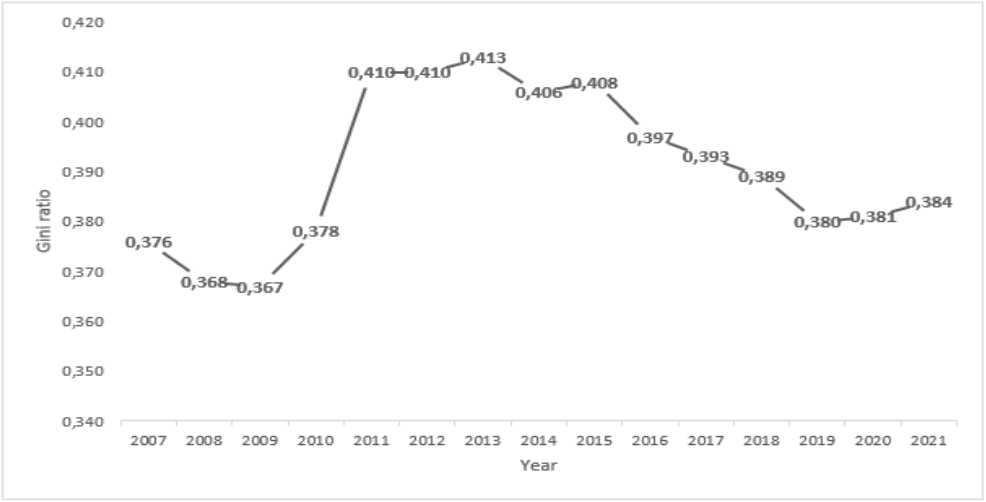

Figure 1. Trends in Indonesia's Gini ratio from 2007 to 2021
Source*:* CBS (2021), author-processed

Figure 1 shows the trend of Indonesia's overall Gini ratio. It declined from 2007 to 2009 before rising sharply in 2011. After that, it tended to fall from 2015 to 2019, before a slight increase in 2020 and 2021, when the COVID-19 pandemic hit the world, including Indonesia.

Meanwhile, the national Gini ratio average was 0.401 for the observation period (2011–2019). Eight provinces had an average Gini ratio greater than the national average, including Sulawesi Tenggara (0.406), Jawa Barat (0.409), Papua (0.410), Papua Barat (0.411), and Sulawesi Selatan (0.413), as shown in Figure 2.

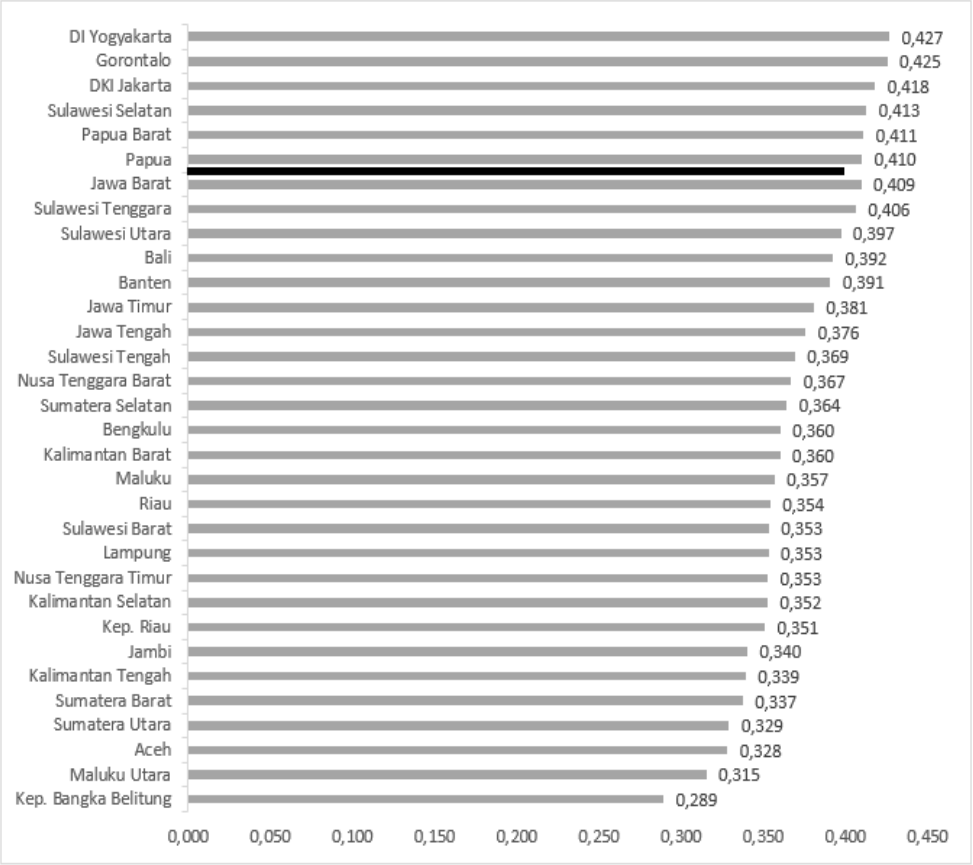

Figure 2. Gini ratio average per province from 2011 to 2019
Source: CBS (2021), author-processed

2.1.2. Data on Tax Revenue

In this study, the log of total tax revenue realization per year per province provides a proxy for the variable of interest, tax revenue. The tax revenue is further distinguished into log total tax revenue (ln total tax), log income tax revenue (ln income tax), log value-added tax revenue (ln value-added tax), and log local tax revenue (ln local tax). Total tax revenue is the total of taxes received by the central government (central tax) and local-origins revenue of provincial/district/city governments (local tax). Nevertheless, we cannot include the excise component as part of the total tax revenue due to limited resources.

Meanwhile, income tax revenue is the total realized value of non-oil and gas income taxes (personal income tax, withholding tax, and corporate income tax) and oil and gas income taxes (oil income tax and natural gas income tax). The value-added-tax revenue is the total realized value of VAT and luxury-goods sales tax.

The authors collect the data from The Directorate General of Taxation (DGT), Ministry of Finance, on income tax and VAT by aggregating data from each tax office and regional tax office to the provincial level. Furthermore, revenue data from the Large Taxpayers Regional Tax Office and the Special Jakarta Regional Tax Office, whose working

area covers taxpayers throughout Indonesia, is aggregated based on the province where the taxpayer resides.

Local tax revenue is the total realized value of local taxes collected by provincial, district, and city governments and aggregated to the provincial level. It covers provincial taxes (vehicle tax, vehicle transfer fee, vehicle fuel tax, surface water tax, and cigarette tax) and district/city taxes (hotel tax, restaurant tax, entertainment tax, advertisement tax, information tax, roads, non-metal minerals, and rocks tax, parking tax, groundwater tax, Swift's nest tax, rural and urban property tax, plantation, forestry, and mining property tax, and fees for property acquisition). The realization of property tax and fees for property acquisition collected by the central government before and after the submission of rural and urban property taxes by district and city governments is added as the realization of local tax revenues from 2011 to 2019. It must be included so that analysis and estimation can be done easily and more accurately. Based on data, it is found that revenue-sharing from the property tax comprises a significant portion of local government revenues.

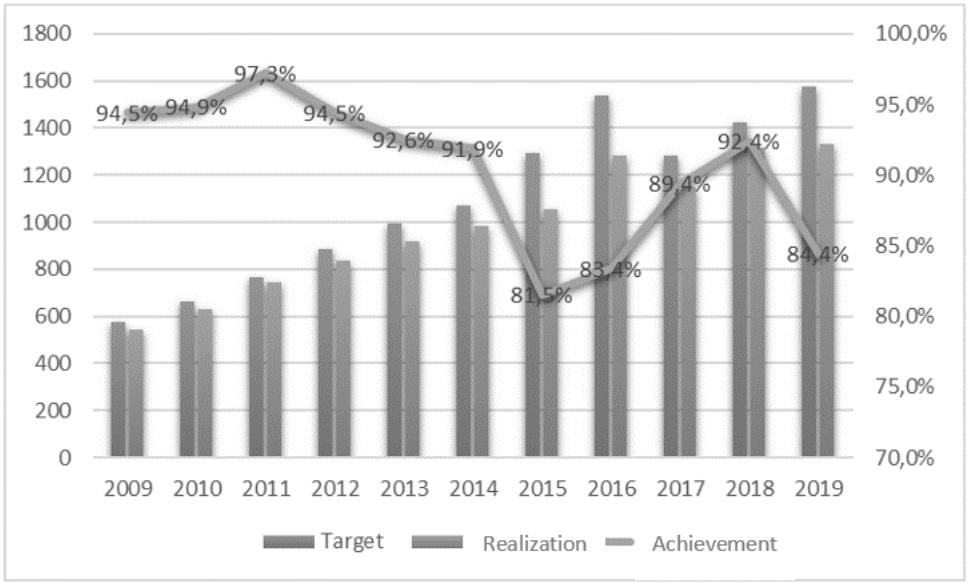

Figure 3. Central Tax Revenue from 2009 to 2019
Source*:* Ministry of Finance (2021), author-processed

According to Figure 3, the national target of overall central tax revenue from 2009 to 2019 was never achieved. On the other hand, tax revenue realization indicates an increasing tendency, despite a slight decline in 2017.

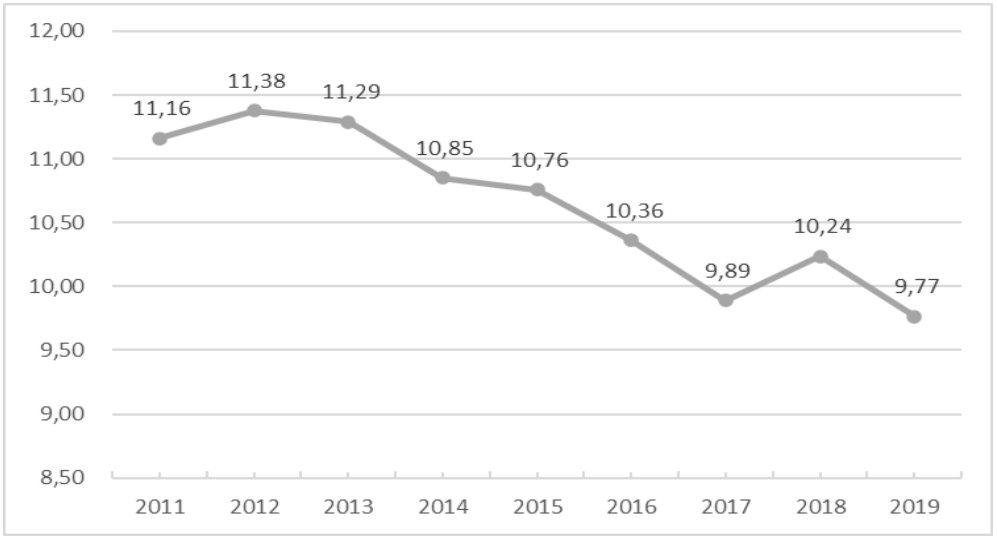

Figure 4. Indonesia's Tax Ratio from 2009 to 2019
Source*:* Ministry of Finance (2021), author-processed

While the trend for central tax revenue is upward, as in Figure 3, the tax ratio has a downward trend and increased only slightly in 2018 from 9.89 percent to 10.24 percent before falling again to 9.77 percent in 2019, as in Figure 4.

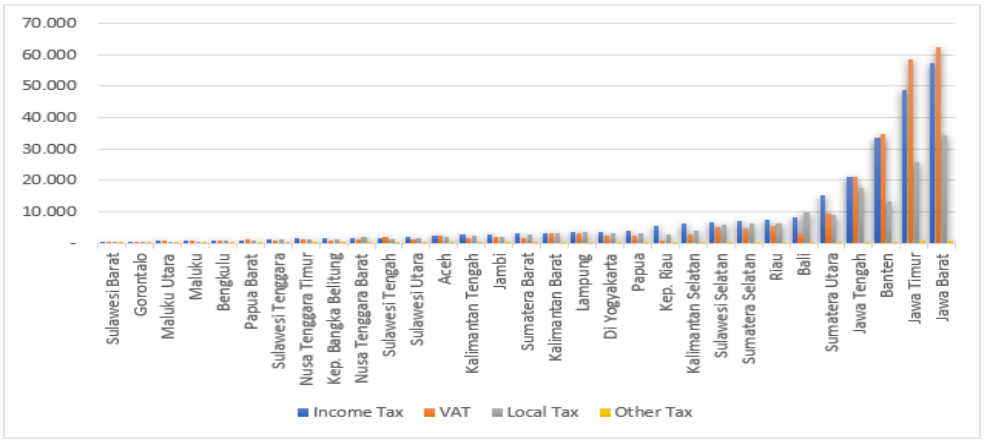

Figure 5. Tax Revenue Realization by Province in 2019 (in Billion Rupiah)
Source*:* Ministry of Finance (2021), author-processed

Additionally, Figure 5 illustrates the revenue distribution and the amount of each type of tax in each province. It illustrates a clear difference in tax revenue as a contribution from Java's provinces (Jawa Barat, Jawa Timur, Banten, and Jawa Tengah). Furthermore, income tax dominates tax revenue in most of Indonesia's areas, followed by VAT and local taxes.

2.1.3. Control Variables

Regarding supporting the tax systems to achieve income equality, some factors must be considered during the analysis. As a result, they are categorized into three categories: government spending, socioeconomic support, and external support.

Firstly it is stated that increasing the government's proportion of gross domestic product (GDP) spent on housing and public facilities, education, and health has a favourable effect on income distribution and can help reduce inequality (Martinez-Vazquez *et al.*, 2012).

Additionally, control variables include socioeconomic support such as the percentage of the population receiving social assistance, GRDP per capita, the share of agricultural to GRDP, educational attainment, unemployment rate, labour force participation rate, population, and the dependency ratio.

Social assistance spending also has a redistributive effect, particularly in nations with a sizable informal economy (Cornia *et al.*, 2011). Economic growth in developing countries tends to stimulate employment and raise wages (Cornia & Martorano, 2012).

Furthermore, in developing countries, the agriculture sector's decreased contribution to GDP is predicted to decrease inequality. However, if a country is at a particular stage of development, the bigger the share of agriculture, the lower the economic inequality (Asteriou *et al.*, 2014). Moreover, an educated labour supply can lower income inequality by allowing market forces to operate more effectively (Cornia & Martorano, 2012). Similarly, increasing the number of workers in an area reduces income inequality and the effect of a decrease in unemployment (Martinez-Vazquez, 2012).

In terms of population, the greater the population density of an area, the greater the region's income inequality (Bourlier, 1975). Likewise, the population's age structure affects income inequality. A greater dependence ratio can result in a higher average number of dependents per household and a lower household income per capita. Thus, it can increase income inequality (Martinez-Vazquez *et al.*, 2012).

Finally, the amount of investment reflects the external support factor. It is one of the factors that can help create jobs or increase labour demand, hence reducing inequality (Cornia and Martorano, 2012). However, in the case of European Union countries, the more investment a country makes, the higher the Gini ratio (Asteriou *et al.*, 2014).

2.2. Methodology

This study analyzes two panel data regression models to determine the relationship between income inequality, tax revenue, and other factors influencing inequality. The following are the specifications of the research model:

The relationship between total tax revenue and the Gini ratio (Model 1)

$$gini_{it} = \beta_0 + \beta_1 TOT\_TAX_{it} + \boldsymbol{\Sigma}\, \beta_i X_i + \delta_i + \varepsilon_{it} \quad (1)$$

The relationship between income tax, VAT, and local tax revenue and the Gini Ratio (Model 2)

$$gini_{it} = \beta_0 + \beta_1 INC\_TAX_{it} + \beta_2 VA\_TAX_{it} + \beta_3 LOC\_TAX_{it} + \boldsymbol{\Sigma}\, \beta_i X_i + \delta_i + \varepsilon_{it} \quad (2)$$

where $gini_{it}$ is the Gini ratio for province i year t, TOT_TAX_{it} is total tax revenue for province i year t, INC_TAX_{it} is income tax revenue for province i year t, VA_TAX_{it} is value-added tax revenue for province i year t, LOC_TAX_{it} is local tax revenue for province i year t, X_i is independent control variables for province i year t, ™$_i$ is year fixed effect, and ε_{it} is an error component.

This study used a panel data regression model employed by Martorano (2018) and Nusiantari and Swasito (2020) to determine the relationship between tax revenue and income inequality. We chose the fixed effect method (FEM) to estimate these two models because it is suitable for controlling unobserved regional characteristics, particularly those related to tax revenue and income inequality within every province, which stands as the unit of analysis in this study. Moreover, FEM is more appropriate for research where the unit of analysis is not randomly selected (Gujarati, 2009).

III. Methodology

This part analyses the regression results, focusing on the effects of the main independent variables on income inequality, including total and specific taxes such as income tax, VAT, and local tax revenues.

3.1. Total Tax Revenue's Effect on Income Inequality

Table 1 shows the regression results in Model 1, which examines the effect of total tax revenue on income inequality. Table 1 Column (1) contains the baseline model specifications, specifically those that relate the change in total tax revenue (ln total tax) to the Gini ratio with a province-fixed effect. Column (2) specifies the model by including a year-fixed effect, which accounts for shocks during the observation year. Furthermore, Column (3) is a specification that controls fiscal policy variables regarding government spending based on Martinez-Vazquez *et al.* (2012). Column (4) is the final estimation result that includes all control variables, as described in Chu *et al.* (2000), Borge and Rattso (2004), Martinez-Vazquez *et al.* (2012), Martorano (2018), Alavuotunki *et al.* (2019), and Nusiantari and Swasito (2020).

The regression results in Table 1 show that the correlation and significance of the total tax revenue (ln Total tax) coefficient remain robust after Year FE, as in Columns (2), (3), and (4). Therefore, as shown in Table 1 Column (4), the final results of the regression indicate that total tax revenue has a positive association with the Gini ratio, but the association is not statistically significant.

Suppose the proxy for total tax revenue in Table 1 is intended to estimate the effect of increasing or decreasing total tax revenue on the Gini ratio using the natural logarithm value of total tax revenue. Furthermore, this variable is compared to the tax ratio in Table 2 as a robustness check. The robustness check is conducted to determine whether the amount of tax collected compared to its potential affects income inequality.

Table 1. Total Tax Revenue's Effect on Income Inequality

Variables	(1)	(2)	(3)	(4)
ln (Total tax)	-0.0242***	0.0183	0.0198	0.0251
	(0.006)	(0.0154)	(0.016)	(0.0149)
Housing expenditure			**-0.006****	**-0.0045***
			(0.0026)	(0.0024)
Education expenditure			0.0002	-0.0006
			(0.0034)	(0.0034)
Health expenditure			0.0042	0.0055
			(0.0047)	(0.0044)
Social assistance				-0.0089
				(0.0256)
ln (GDP per capita)				0.0496
				(0.0354)
Agriculture share of GDP				**0.0036****
				(0.0014)
Investments				0.0003
				(0.0003)
Educational attainment				-0.0004
				(0.0013)
Unemployment				0.0006
				(0.0016)
LFPR				-0.0001
				(0.0011)
Population				0.0046
				(0.0030)
Dependency ratio (young)				0.127
				(0.0892)

Dependency ratio (old)				-0.669
				(0.535)
Constant	1.082***	-0.155	-0.194	-1.298
	(0.176)	(0.446)	(0.465)	(0.803)
Year FE	No	Yes	Yes	Yes
Observations	279	279	279	279
R-squared	0.171	0.296	0.320	0.376
Number of ID	31	31	31	31

Notes: Dependent variable: gini ratio; Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The final results of the regression are shown in Table 2, Columns (3) and (6). It indicates that the value and ratio effects of tax revenue show a positive association but are not statistically significant. It implies that overall tax revenue does not affect income inequality. It also suggests that Indonesia's existing tax system and structures, both national and regional, have been unable to contribute to establishing income equality.

Table 2. Robustness Check, Total Tax Ratio's Effect on Income Inequality

Variables	**ln (Total tax)**			**Total tax/GDP ratio**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
ln (Total tax)	-0.0242***	0.0183	0.0251			
	(0.0060)	(0.0154)	(0.0149)			
Total tax ratio				-0.0022	0.0037	0.0048
				(0.0031)	(0.0031)	(0.0035)
Year FE	No	Yes	Yes	No	Yes	Yes
All controls	No	No	Yes	No	No	Yes
Number of observations	279	279	279	279	279	279
Number of provinces	31	31	31	31	31	31
R-squared	0.171	0.296	0.376	0.003	0.295	0.372

Notes: Dependent variable: gini ratio; Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The regression results are consistent with Bastagli *et al.* (2012), Enami *et al.* (2019), and Nusiantari and Swasito (2020). They argue that the influence of taxes on reducing income inequality is either negligible or diminishing with time. Nevertheless, these results contradict those of Martinez-Vasquez *et al.* (2012) and Martorano (2018), who find that taxes contribute to reducing inequality.

Taxes, especially income taxes, are considered to have the ability to affect people of all income levels. This is because the top income groups will face increased taxes at

progressive rates. On the other hand, people in the lowest income group are not taxed due to the imposition of a minimum income limit.

On the other hand, taxes are viewed as having a limited effect on income inequality, but social assistance is often more efficient in decreasing inequality (Enami *et al.*, 2019). In addition, social assistance programs have a greater potential to impact income distribution in the lowest income group. So, shifting income distribution from the higher-income to the lowest-income group can help reduce income inequality. Although, based on our study's results, the social assistance variable is insignificant in affecting income inequality reduction.

Nusiantari and Swasito (2020) also found that total tax revenue had no discernible effect on income distribution efforts in several countries. Progressive direct taxes make little difference in lowering income inequality due to the inadequacy of the tax system, the informal sector's dominance, and a low level of tax compliance. Martorano (2018) also argues that taxes, particularly direct taxes, contribute significantly to inequality reduction. However, this role is constrained in developing countries, particularly Latin America, due to the low average tax rate, limited taxes on high-wealth individuals and property taxes. Meanwhile, Carter and Matthews (2012) and de Freitas (2012) believe that direct taxes are ineffective in reducing income inequality because the level of administrative costs, the capacity of the informal sector, and the extent of tax avoidance vary across the country.

In Indonesia, the term "tax system" refers to both the tax administration and the tax policy. Regarding administration, Indonesia's tax system is falling behind compared to other countries. In 2019, Indonesia ranked 112th out of 190 nations in the ease of doing business. It calculates using data on company tax payments, compliance with tax requirements, tax rates, and the time required to refund tax payments.

Meanwhile, Indonesia, like other developing countries, has a large informal economy. For example, the percentage of informal workers in Indonesia's agricultural sector reached 87.59 percent in 2019. Likewise, micro, small, and medium-sized enterprises (MSMEs) dominate business units contributing to the national gross domestic product, which are inherently more difficult to reach under the current tax structure. Nonetheless, MSMEs contributed 57.8% of GDP and employed 89.2% of the labour force. At the same time, it is difficult to maximize the tax revenue contribution from MSMEs that dominate the informal sector in a country (Schneider & Enste, 2000; Ikhsan & Amir, 2016; and Chongvilaivan & Chooi, 2021). So, we should take steps to promote reform of Indonesia's taxation system and structure, including strengthening the tax administration and optimizing tax extensification at the national and regional levels. These actions are done to maximize the role of taxes in redistributing income.

Additionally, as illustrated in Table 1, other factors are affecting the Gini ratio in addition to tax revenue policy. It shows that agriculture shares positively and significantly correlates with income inequality. It is possible because, in emerging countries, the agriculture sector's lower contribution to GDP is expected to reduce income inequality (Asteriou *et al.*, 2014). Meanwhile, government spending on housing and public facilities, particularly local government spending, negatively correlates with income inequality. Therefore, it implies that income inequality decreases as the share of housing and public facilities in GRDP increases. It is consistent with Martinez-Vazquez (2012), who said government spending affects income inequality. However, it also shows that some other variables have no significant effect on income inequality in Indonesia.

3.2. Income Tax, Value Added Tax, and Local Tax Revenue's Effect on Income Inequality

This section analyzes whether the estimation results formerly obtained for the effect of total tax revenue on income inequality were also affected by changes in the composition of taxes, as specified in Model 2. Based on the theory, increasing the role of direct taxes, such as income tax and wealth tax (such as property tax and vehicle tax), with progressive characteristics can promote income redistribution and reduce inequality. It implies that people in the top decile contribute more to tax payments than those in the lowest decile, increasing disposable income distribution across taxpayers (Duncan & Sabririanova, 2016). In comparison, indirect taxes such as VAT and taxes on consumption, which account for the majority of local taxes, are more regressive and can increase income inequality between communities, as everyone from the highest to the lowest decile pays the same tax on the same goods and services (Tanzi & Zee, 2000).

The baseline variables of interest are substituted with indicators of the dominant tax composition, specifically income tax, VAT, and local tax, to assess the effects of changes in tax composition on income inequality. Some conclusions derive from the regression results in Table 3, presented in columns (2) and (4). Firstly, income tax revenue's value and ratio effects exhibit a positive correlation but are not statistically significant. It shows that revenues from income taxes do not affect income inequality. It also indicates that income tax, a kind of direct tax that is typically quite progressive, has been unable to reduce income inequality and may have a positive correlation with it or tend to increase inequality. Finally, it supports the arguments made by Engel *et al.* (1999) and Sharpe (2003) that direct taxes have a lower impact on income inequality in developing countries. The effect of direct taxes, particularly income taxes, can be explained by several circumstances, including the low average tax rate, taxes on high-wealth individuals, and property taxes (Martorano, 2018).

Table 3. Income Tax, Value Added Tax, and Local Tax Revenue's Effect on Income Inequality with Robustness Check Using Tax/GDP Ratio

Variables	ln (Tax revenue)		Tax/GDP ratio	
	(1)	(2)	(3)	(4)
ln (Total tax)	0.0251			
	(0.0149)			
ln (Income tax)		0.0095		
		(0.0146)		
ln (Value added tax)		0.0045		
		(0.0041)		
ln (Local tax)		0.0174		
		(0.0118)		
Total tax ratio			0.0048	
			(0.0035)	
Income tax ratio				0.0026
				(0.0087)
Value-added tax ratio				0.0006
				(0.0055)
Local tax ratio				**0.0243****

				(0.0109)
Year FE	Yes	Yes	Yes	Yes
All controls	Yes	Yes	Yes	Yes
Number of observations	279	278	279	279
Number of provinces	31	31	31	31
R-squared	0.376	0.375	0.372	0.385

Notes: Dependent variable: Gini ratio; Robust standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1

Secondly, the VAT revenue variable shows a positive correlation with the Gini ratio, which is consistent with the prediction but not statistically significant. Taxes on the consumption of goods and services have been more regressive than income taxes due to the administrative difficulty of applying a broadly stratified tax rate on consumption (Tanzi & Zee, 2000). However, Gemmel and Morissey (2005) argue that taxes on goods consumed primarily by the poor (e.g., basic commodities) are much more consistently regressive. In contrast, taxes on luxury goods such as automobiles, beverages, and alcohol are more likely to be progressive. The variable's insignificance may be explained by its components, which include a somewhat regressive value-added tax and a relatively progressive sales tax on luxury products.

Finally, local tax exhibits a positive relationship with the Gini ratio. However, there is a different regression result between the value of local tax revenue and the ratio of local tax revenue to GRDP. While the Gini ratio has a negligible relationship with local tax, the local tax ratio has a positive and significant correlation at the 5% level. It means the more local tax revenue can be collected from existing capacity, the more significant the increase in income inequality. It also implies that every 1% increase in local tax income relative to GRDP would result in a 0.0243 point increase in the Gini ratio.

Regressive taxes on consumption dominate local taxes. Therefore, it will probably increase or positively correlate with a region's income inequality. It is consistent with Tanzi and Zee's (2000) and Alavuotunki *et al.* (2019) findings that indirect taxes contribute to rising income disparity. Tanzi and Zee (2000) also argue that developing countries rely heavily on indirect taxation, contributing to the widening income inequality. Local taxes are relatively regressive in this context. Local taxes on consumption, such as the Motor Vehicle Fuel Tax, the Surface Water Tax, the Cigarette Tax, the Hotel Tax, the Restaurant Tax, the Entertainment Tax, the Advertising Tax, the Street Lighting Tax, the Non-Metallic Mineral and Rock Tax, the Parking Tax, the GroundWater Tax, and the Swift's Nest Tax, can be said to be relatively regressive in various regions of Indonesia. Meanwhile, wealth taxes such as the property tax or vehicle tax, which are relatively progressive, have had little effect on inequality reduction.

Another conclusion derived from the findings is that the tax structure in Indonesia, both national and regional, does not significantly affect income distribution, particularly in terms of lowering income inequality. According to Foster and Shorrocks (1987), the concept of Pigou-Dalton Transfer Sensitivity is defined as more detailed transfers based on a composite transfer that benefits from both regressive and progressive transfers concurrently at lower income levels. Furthermore, regression for the composition of taxes shows that local taxes significantly increase income inequality. However, when assessed as a composite

(combined) in total tax revenue, the progressive effects of income tax and the regressivity of VAT and local taxes have no significant effect on income inequality.

IV. Conclusion and Recommendation

Indonesia has a relatively moderate level of income inequality compared to other countries. Nevertheless, this study signals a relatively high level of income inequality at the provincial level. Moreover, reducing national income inequality from 0,384 in 2021 to 0.360 in the next five years, as planned in RPJMN, needs to consider the index of income inequality at the provincial level.

In addition to expenditure programs, tax policies are one of the strategies the government could implement to reduce income inequality. Using the provincial level inequality index, we explore whether tax policies in total and in their composition, specifically income tax, VAT, and local taxes, affect provincial inequality.

Some conclusions were drawn from this study. Firstly, total tax revenue does not significantly impact provincial inequality in Indonesia. It indicates that Indonesia's current tax system and structure, both national and regional, have not supported the distribution of income.

Secondly, in terms of composition, income tax and VAT have no significant impact on income inequality. Meanwhile, the local tax to GRDP ratio has a positive and significant association with income inequality, showing that most consumer taxes that comprise the local tax component are regressive and increase income inequality. However, the relationship is insignificant when the local tax indicator is a value of local tax revenue. Thus, these findings suggest that the composite transfer, which combines regressive and progressive transfers, explains why the progressive effect of income tax, the regressive effect of VAT, and local taxes are insignificant in influencing income inequality.

Based on the findings, policymakers in Indonesia can be encouraged to reform the country's taxation system and structure. It includes improving tax administration and optimizing tax extensification, reviewing the progressivity of income tax and VAT, encouraging more prudent local tax structure policies, and optimizing the role of wealth taxes in redistributing income.

This study, however has several limitations due to data availability and the proxies used. The data were absent due to the existence of provinces in the expansion. The central tax component in the form of excise and the realization of social assistance the central government provides to the poor also cannot be considered. We recommend that future studies analyze the effect of tax revenue on income inequality with more complete observations and data over a longer timeframe.

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