



## Agricultural Gross Domestic Product and Farmer Exchange Rate on Income Distribution Inequality on the Island of Sumatra

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### ABSTRACT

This study examines the relationship between agricultural gross domestic product (GDP) and farmer exchange rate on income distribution inequality on the island of Sumatra. This research employs descriptive research methods with a quantitative approach, utilizing secondary data in the form of time series data from 2013 to 2022 (ten years) and cross-sectional data from ten provinces on the island of Sumatra obtained from the Central Statistics Agency (BPS). Descriptive statistical analysis and panel data regression were conducted using the Eviews 13 software. The findings of the research indicate that the agricultural sector GRDP variable exerts a significant negative effect on income distribution inequality, the Farmer Exchange Rate has no effect on income distribution inequality in the provinces of Sumatra Island between 2013 and 2022.

## **INTRODUCTION**

The objective of development is to create a more favorable situation for individuals and communities by guiding them towards a more prosperous trajectory. Economic development is a multifaceted process that encompasses significant shifts in economic structures, social dynamics, and the reduction or eradication of poverty, inequality, and unemployment within the framework of economic growth (Todaro and Smith, 2003). Additionally, Todaro posits that income inequality can be defined as the disparity in the relative income of high-income and low-income citizens. The issue of income inequality is not confined to international borders; it can also manifest within a single country.

Inequality in income distribution is a significant challenge faced by developing countries. In these countries, economic growth is often concentrated in specific areas, while other regions experience a decline in economic activity (Kuncoro, 2010). This uneven economic growth is a key driver of income disparity. The existence of highly developed regions and less developed regions is a clear indication of this phenomenon. Tambunan posits that regions with a high concentration of economic activity can increase the income of their inhabitants to a greater extent than regions with a low concentration of economic activity. This is because regional income disparities are related to economic concentration.

A global measure frequently employed to assess or measure the equality of income distribution among the population is the Gini ratio (Gini coefficient), also known as the Gini index. A higher Gini ratio number signifies a higher level of inequality/gap, whereas a lower number indicates a more evenly distributed distribution of population income (Aprildahani et al., 2021). The Gini index is a coefficient that measures overall inequality and has a value that ranges from 0 to 1. The coefficient indicates the degree of equity and/or inequality of income distribution in a region. A coefficient close to 0 indicates a very equal distribution of income or perfect equity, while a coefficient of 1 indicates a very unequal distribution of income or perfect inequality (Arsyad, 2010).

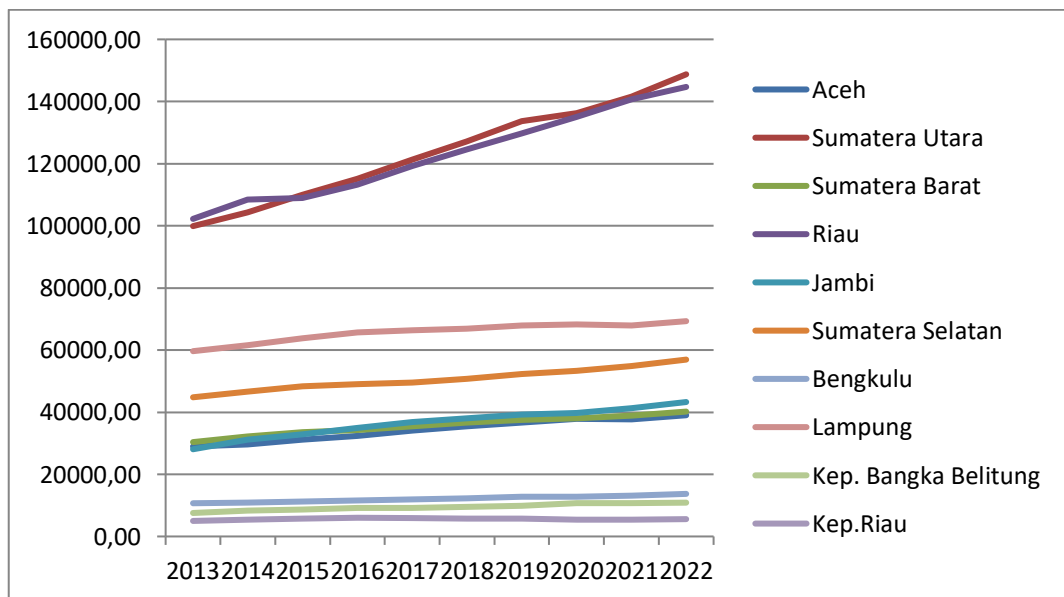
The island of Sumatra, which is part of Indonesia and consists of 10 provinces, namely Aceh, North Sumatra, Riau, West Sumatra, Riau Islands, Jambi, Bengkulu, South Sumatra, Bangka Belitung Islands, and Lampung, is inextricably linked to the problem of economic and income inequality. This is due to the existence of significant differences in the characteristics of the provinces, which have a profound impact on the formation of economic development patterns within a region. Consequently, it is to be expected that the economic development patterns between regions will vary considerably. This unevenness in growth potential subsequently results in some regions experiencing rapid growth, while other regions experience slower growth. This capacity for growth then gives rise to inequality in both development and income between regions (Sari, 2017).

**Table 1. Gini Ratio Index in Sumatera Island, 2013-2022**

Tahun	Aceh	Sumatera Utara	Sumatera Barat	Riau	Jambi	Sumatera Selatan	Bengkulu	Lampung	Kepulauan Bangka Belitung	Kepulauan Riau
2013	0,341	0,354	0,363	0,374	0,348	0,383	0,386	0,356	0,313	0,362
2014	0,325	0,321	0,334	0,353	0,329	0,399	0,356	0,347	0,303	0,402
2015	0,334	0,336	0,342	0,364	0,361	0,360	0,376	0,376	0,283	0,364
2016	0,333	0,319	0,331	0,347	0,349	0,348	0,357	0,364	0,275	0,354
2017	0,329	0,315	0,318	0,325	0,335	0,361	0,351	0,334	0,282	0,334
2018	0,325	0,318	0,321	0,327	0,334	0,358	0,362	0,346	0,281	0,330
2019	0,319	0,317	0,306	0,334	0,321	0,331	0,340	0,329	0,269	0,341
2020	0,323	0,316	0,305	0,329	0,320	0,339	0,334	0,327	0,262	0,339
2021	0,324	0,314	0,306	0,326	0,321	0,341	0,326	0,323	0,256	0,343
2022	0,311	0,312	0,300	0,326	0,320	0,339	0,315	0,314	0,236	0,342
Rata-rata	0,326	0,322	0,323	0,341	0,334	0,356	0,350	0,342	0,276	0,351

Source: BPS-Statistic Indonesia (2022)

The data presented indicates that the distribution of economic activities in the provinces on the island of Sumatera remains uneven. This will indirectly affect the welfare of the people, and therefore economic development must be immediately equalized between regions. According to Todaro (2006), an increase in economic growth will increase income inequality and vice versa. Many studies have found that one of the causes of income inequality is economic growth. The optimal scenario for a country is that an increase in economic growth is accompanied by a decrease in income inequality. To ascertain the causes of income inequality, it is necessary to examine the impact of economic growth on income inequality in Indonesia. The agricultural sector is a key area of interest, given that it is the largest contributor to GRDP, as indicated by BPS data.



**Figure 1. Development of Agricultural GRDP in Sumatera Island 2013-2022**  
 Source: BPS-Statistic Indonesia (2022)

Figure 1. illustrates that the growth of the agricultural sector GRDP on the island of Sumatra persists, with the highest provinces being North Sumatra and Riau. This indicates that the majority of provinces on the island of Sumatra exhibit a consistent increase in agricultural sector GRDP. This is a positive development as it will benefit farmers and enhance their income, ultimately contributing to a reduction in income distribution inequality.

The expansion of the agricultural sector will undoubtedly impact the welfare of those engaged in agricultural activities, including farmers. One indicator of the dynamics of the level of welfare is the Agricultural Exchange Rate (NTPR), which includes the Agricultural Commodity Exchange Rate (NTKP) and the Farmer Exchange Rate (NTP). NTKP represents the exchange power/purchasing power of agricultural commodities relative to other commodities/products that are exchanged. Meanwhile, the NTP is related to the purchasing power of farmers in financing the needs of their households. The NTP is the ratio of the price index received by farmers to the price index paid by farmers. In essence, NTP assesses the interchangeability of agricultural products generated by farmers with the commodities or services utilized by farming households, as well as the items or services essential for producing agricultural goods (Riyadh, 2015).

## LITERATURE REVIEW

### **The Gross Regional Domestic Product (GRDP) Theory**

The Gross Regional Domestic Product (GRDP) represents the total value added by all goods and services produced within a specific region's borders, regardless of the ownership of production factors. It is a measure of economic activity over a defined period. GRDP can be calculated using three approaches: production, expenditure, and income, presented in both current and constant (real) prices. The nominal GRDP is based on current prices and is used to analyze the economic structure, while the real GRDP, adjusted for inflation using prices from a base year, is utilized to gauge economic growth. Research by Ikhsan (2019) found that agricultural income significantly contributes to income inequality in Indonesia.

H1: The Gross Regional Domestic Product (GRDP) in agriculture exhibits a noteworthy and adverse impact on income inequality within Sumatra Island.

### **Farmer Exchange Rate Theory**

The farmer exchange rate is a measure that illustrates the relationship between the price index received (It) and the price index paid by farmers (Ib), presented as a percentage. The price index received (It) mirrors the price index of farmers' production, highlighting variations in the prices of goods produced by farmers. It serves as supportive data for calculating income in the agricultural sector. Conversely, the price index paid by farmers (Ib) encompasses the prices of goods required by farmer households, including consumption and production needs. Fluctuations in Ib reveal changes in prices of goods consumed by farmers and those necessary for agricultural production processes. Additionally, variations in Ib can indicate whether inflation is occurring in rural areas.

Research by Rozali (2020) suggests that the farmer exchange rate significantly impacts income distribution inequality, with a negative correlation.

H2: The Farmer Exchange Rate demonstrates a notable and adverse impact on income distribution inequality across the Sumatra islands.

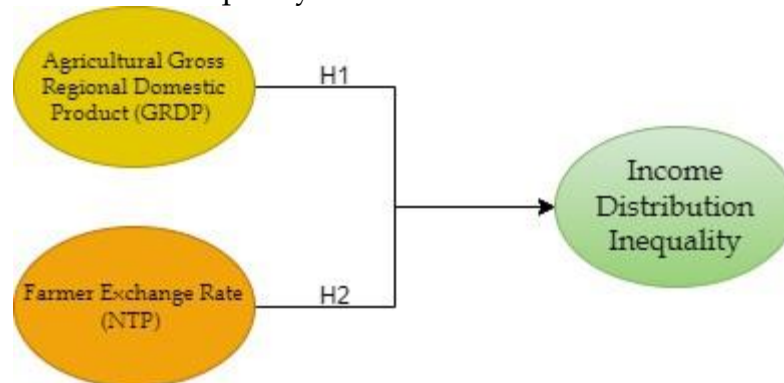


Figure 2. Conceptual Framework

## METHODOLOGY

This research employs descriptive research methods with a quantitative approach, utilizing secondary data in the form of time series data from 2013 to 2022 (ten years) and cross-sectional data from ten provinces on the island of Sumatra (Aceh, North Sumatra, Riau, West Sumatra, Riau Islands, Jambi, Bengkulu, South Sumatra, Bangka Belitung Islands, and Lampung) obtained from the BPS-Statistic Indonesia. Descriptive statistical analysis and panel data regression were conducted using the Eviews 13 software. The regression model for panel data is outlined as follows:

$$GN_{it} = \beta_0 + \beta_1 PDRBP_{it} + \beta_2 NTP_{it} + \varepsilon_{it}$$

Description:

GN = Income Distribution

PDRB = The Gross Regional Domestic Product of The Agricultural Sector

NTP = Farmer Exchange Rate

$\beta_1, \beta_2$  = The Regression Coefficient

i = The Province.

t = The Year.

$\varepsilon$  = The Term of Error.

The gross regional domestic product (GRDP) of the agricultural sector (X1) is the GRDP value of the agricultural sector on the basis of constant prices, calculated by the BPS-Statistic Indonesia of the provinces on the island of Sumatra in units of billion rupiah.

The Farmer Exchange Rate (X2) is defined as the ratio of the price index received by farmers to the price index paid by farmers in the provinces located on Sumatra Island, expressed as a percentage. The Income Distribution (Y) is the Gini ratio value of community income equality in the provinces on the island of Sumatra, measured using the Index unit.

## RESEARCH RESULT

### Chow Test

The Chow Test is typically used to test for structural breaks in a time series regression model, rather than determining whether a fixed effect or common effect model is more appropriate for panel data estimation.

**Table 2. Chow Test Estimation Results**

Effects Test	Statistic	d.f.	Prob.
Cross-section F	21.210360	(9,88)	0.0000
Cross-section Chi-square	115.349223	9	0.0000

Source: Processed Data Eviews 13 (2023)

Based on the information provided, it seems that the Cross-section F statistic obtained from Table 2 has a probability of 0.0000, which is smaller than the significance level ( $\alpha = 0.05$ ). Therefore, the null hypothesis ( $H_0$ ) is rejected in favor of the alternative hypothesis ( $H_a$ ), indicating that the fixed effect model is more suitable.

### Hausman Test

The Hausman test is employed to determine the preferable model between the random effect model and the fixed effect model with the following hypothesis.

**Table 3. Hausman Test Estimation Results**

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	11.188674	2	0.0037

Source: Processed Data Eviews 13 (2023)

Table 3 presents the outcomes of the Hausman Test, yielding a probability value of 0.0037, which is less than the significance level  $\alpha = 5\%$  (0.05). Thus, the null hypothesis ( $H_0$ ) is rejected in favor of the alternative hypothesis ( $H_a$ ), indicating that the Fixed Effect Model (FEM) is more suitable than the Random Effect Model (REM) and preferable model for this study.

### Hypothesis Test Analysis

Hypothesis testing in this study includes, jointly significant tests called partial tests, individual parameter significance tests or called simultaneous tests, and the coefficient of determination ( $R^2$ ).

**Table 4. Fix Regression Model**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.410459	0.016612	24.70887	0.0000
PDRBP?	-1.00E-06	2.62E-07	-3.829860	0.0002
NTP?	-0.000277	0.000177	-1.568074	0.1205
Fixed Effects (Cross)				
_ACEH--C	-0.022386			
_SUMUT--C	0.064870			
_SUMBAR--C	-0.024026			
_RIAU--C	0.083325			
_JAMBI--C	-0.010950			
_SUMSEL--C	0.023729			
_BENGKULU--C	-0.019005			
_LAMPUNG--C	0.026174			
_KEP_BABEL--C	-0.095885			
_KEP_RIAU--C	-0.025847			
R-squared	0.706839			
Adjusted R-squared	0.670194			
F-statistic	19.28880			
Prob(F-statistic)	0.000000			

Source: Processed Data Eviews 13 (2023)

The fixed effect model regression model yields the following regression equation:

$$\text{Gini ratio} = 0.410459 - 1.0025506 \text{ PDRBP} - 0.000277 \text{ NTP}$$

This equation can be interpreted as follows:

1. The constant value of 0.410459 indicates that if the agricultural sector GRDP variable and the Farmer Exchange Rate are equal to 0, the income distribution inequality is 0.410459 in percent, assuming that all other variables remain constant.
2. The agricultural sector GRDP variable has a significant negative effect on income distribution inequality, with a probability value of 0.0002, which is smaller than 0.05. The coefficient value for the agricultural GRDP variable is -1.0025506, indicating that a 1% increase in agricultural sector GRDP will result in a 1.0025506% reduction in income distribution inequality.
3. The Farmer Exchange Rate variable has no effect on income distribution inequality, with a probability value of 0.1205, which is greater than 0.05.

### Simultaneous Test

A simultaneous test is a statistical procedure that allows for the examination of the influence of multiple independent variables on a single dependent variable. The objective of this test is to ascertain whether all independent variables collectively exert an influence on the dependent variable. The hypothesis to be tested is whether all independent variables affect the dependent variable in accordance with the null hypothesis statement (H0). If the decision is H0, it will be accepted if  $> 0.05$ , and if H0 is rejected, it will be rejected if  $H0 < 0.05$ . The estimation results presented in Table 4. indicate that the Prob. (F-statistic) value of 0.000000 is less than 0.05, which implies that the null

hypothesis is rejected. This suggests that the independent variables collectively influence the dependent variable.

### **Partial Test**

A partial test is conducted to ascertain the influence of an independent variable on a dependent variable. A partial regression coefficient hypothesis test is then carried out by means of a partial test. If the probability value  $T$  is less than 0.05, it can be concluded that the independent variable has a significant effect on the dependent variable.

Table 4. provides insight into the partial relationship between the independent variables, namely agricultural sector GRDP and Farmer Exchange Rate, and the dependent variable, namely Income Distribution Inequality. When viewed from the Probability value of PDRBP of 0.0002, which indicates a probability of less than 0.05, it can be concluded that PDRBP has a significant effect on income distribution inequality. The probability of the Farmer Exchange Rate is 0.1205, which is greater than 0.05. Therefore, it can be concluded that the Farmer Exchange Rate has no significant effect on income distribution inequality.

### **Determinant Coefficient**

The coefficient of determination is employed to assess the extent to which the model explains the dependent variable, with the value of adj. R-square serving as a correction factor for the number of variables and sample size. This is done to reduce bias in the event of an increase in variables or samples. Table 4. indicates that the adjusted coefficient of determination (adj. R-square) of 0.706839 suggests that 70.68% of income distribution inequality can be attributed to the two independent variables, namely the agricultural sector GRDP and the farmer exchange rate. The remaining 29.32% can be attributed to other variables that were not examined by the researchers.

## **DISCUSSION**

The regression results of the selected model indicate that the variables of agricultural sector GRDP and Farmer Exchange Rate simultaneously affect income distribution inequality with a probability  $F$  value  $<0.05$ . Additionally, the agricultural sector GRDP variable has a significant negative effect on income distribution inequality, while the Farmer Exchange Rate has no effect on income distribution inequality. The panel data estimation results indicate a relationship between the dependent and independent variables, with an adjusted R-squared value of 0.706839. This suggests that 70.68% of income distribution inequality can be explained by the two independent variables, namely agricultural sector GRDP and Farmer Exchange Rate. The remaining 29.32% of the variance in income distribution inequality can be attributed to other variables that were not included in the model and that were not examined by the researchers.

### **The Effect of Agricultural GRDP on Income Distribution Inequality**

The regression results indicate that the coefficient value of the agricultural sector GRDP variable is -1.0025506, with a probability value of 0.0002. This suggests that the agricultural sector GRDP variable exerts a negative effect on income distribution inequality in the provinces of Sumatra Island between 2013 and 2022. This implies that an increase of one percent in agricultural GRDP is associated with a decrease in income distribution inequality of -1.0025506 percent, assuming that other variables remain constant.

This is consistent with the hypothesis that agricultural sector GRDP has a negative effect on income inequality. This indicates that the agricultural sector GRDP variable has a negative relationship with income inequality, which means that the higher the value of agricultural sector GRDP, the lower the level of income inequality. Conversely, the low value of agricultural GRDP reflects that agricultural GRDP plays an important role in increasing income inequality among provinces in Sumatra Island. This research is in alignment with the findings of Akbar et al. (2021), which demonstrate that the agricultural sector exerts a deleterious and statistically significant impact on income inequality in Indonesia. Furthermore, it is consistent with the conclusions of Yasrizal & Hasan (2017), who found that agricultural sector income has a detrimental and statistically significant effect on income inequality in Indonesia. Raeskyesa (2020) also identified a significant and negative correlation between the agricultural sector and income inequality in his research.

### **The Effect of Farmer Exchange Rate on Income Distribution Inequality**

The regression results, as indicated by the Eviews output, indicate that the coefficient value of the Farmer Exchange Rate variable is -0.000277, with a probability value of 0.1205. This suggests that the Farmer Exchange Rate variable exerts no effect on income distribution inequality in the provinces of Sumatra Island between the years 2013 and 2022. This implies that an increase of 1% in the Farmer Exchange Rate will result in a 0.000277% increase in income distribution inequality, assuming that all other variables remain constant.

The findings of this study are inconsistent with the hypothesis that an increase in NTP should result in adverse effects on the welfare and income of farmers. Furthermore, the study indicates that an increase in NTP is also associated with an increase in income inequality. This suggests that the NTP may not be an effective policy in all provinces on the island of Sumatra. This research is not in alignment with the findings of Firmansah (2019), which demonstrate that NTP has a negative and significant impact on income inequality in Sumatra Island. Additionally, the results of this study diverge from those of Rozali (2020), which indicate that the farmer exchange rate influences income distribution inequality.

## CONCLUSIONS AND RECOMMENDATIONS

The findings of the research indicate that the variables of agricultural sector GRDP and Farmer Exchange Rate have a simultaneous effect on income distribution inequality in the provinces of Sumatra Island between 2013 and 2022. While the agricultural sector GRDP variable exerts a significant negative effect on income distribution inequality, the Farmer Exchange Rate has no effect on income distribution inequality in the provinces of Sumatra Island between 2013 and 2022. The leading role of agriculture in providing sufficient labor and food at low prices for the development of dynamic industries as an important sector in all economic development strategies.

## ADVANCED RESEARCH

It is hoped that future researchers will examine the factors that affect the income distribution inequality, apart from the variables that have been studied previously. These include variables such as agricultural sector GRDP and farmer exchange rate as a whole in Indonesia.

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