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FINANCIAL INCLUSION, ECONOMIC GROWTH AND POVERTY IN INDONESIA WITH PANEL SIMULTANEOUS MODELS APPROACH

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ABSTRACT

Financial inclusion is a condition that people have equal access to and use financial services. However, in 2021, Indonesia will have the fourth-highest proportion of unbanked citizens worldwide. Economic growth may have an indirect or direct impact on poverty, depending on financial inclusion. Several variables that encourage financial inclusion have been described by many studies. This study aims to analyze simultaneous equation models using panel data of financial inclusion, then identify its causality relationship with economic growth and poverty of 33 provinces in Indonesia from 2011-2021. As a result, only the variable mean years of school has an effect on increasing of financial inclusion index. The three variables of economic development, namely financial inclusion, economic growth, and poverty, have a one-way causality relationship. That means there has been no visible development synergy in terms of financial inclusion, economic growth, and poverty. It could be an example given to the government in evaluating Indonesia's regional development gap.

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1. INTRODUCTION

Financial inclusion is defined as the condition in which the entire community has equal access to and use of financial services [1]. Increasing access and opportunity to inclusive finance for all citizens can show the progress of economic development in a region. The number of adults in the population according to data from the World Bank, 1.38 billion people had unbanked. In 2021, Indonesia will have the fourth-highest proportion of unbanked citizens worldwide. Due to the involvement of diverse social strata in the economy, evident from access to financial services, this position is rather alarming. Economic growth cannot occur if society does not engage in economic activity. This statement is in accordance with the theory which says that a stable financial system has a positive effect on the economic growth of a region [2].

Based on data from the National Literacy Survey and Financial Inclusion in 2019, many regions still have a financial inclusion index lower than the national index, with a fairly large difference between DKI Jakarta province and other provinces. DKI Jakarta has a nearly perfect financial inclusion index. As a result, the high and low financial inclusion indexes depict the spread and utilization of financial products and services by the general public [3]. The presence of differences indicates that access to financial services remains unequal. Indonesia's financial inclusion is still unequal because most low-income individuals are unaware of how to acquire and utilize financial services and products. This problem indicates that individuals with lower middle-class incomes have low levels of financial knowledge [4].

Not only that, one of the goals of Indonesia's G20 presidency is to promote financial inclusion to lessen inequalities brought on by global unpredictability. Increasing access to finance is the main concern to support economic growth. On the other hand, Indonesia's economic growth frequently slows down. This might be because micro, small, and medium enterprises (MSME), which are the engine of economic growth and an objective of inclusion, nevertheless have trouble getting finance [5]. The fact reflects that the financial system is still exclusive; it will make slower economic growth and poverty reduction. Therefore, collaboration is required for financial inclusion, increased economic growth, and faster poverty reduction.

According to the hypothesis of the nexus between finance and poverty, economic growth may have an indirect or direct impact on poverty depending on financial inclusion [6]. Several variables that encourage financial inclusion have been described by many studies [3], [7]–[10]. However, the increase in financial inclusion has not been followed by an acceleration of the economy. Economic growth in Indonesia from 2011 to 2021 remains constant, around 5 percent. In addition, although there has not been an acceleration, Indonesia's poverty rate has declined. Therefore, this study aims to analyze simultaneous equations models of financial inclusion, then identify its causality relationship with economic growth and poverty. In this case, the positive or negative impact of increasing financial inclusion on economic growth and poverty in Indonesia can be quantified. So, it is hoped that the government can assess the impact of financial inclusion and improve the quality of economic development.

2. RESEARCH METHODS

This study considers simultaneous equations models and panel data with an analysis unit of 33 provinces in Indonesia from 2011-2021. The secondary data used in this study was obtained from various publications as well as the official websites of Badan Pusat Statistik (BPS), Otoritas Jasa Keuangan (OJK), and Bank Indonesia (BI). Additionally, the financial inclusion index calculations for the years 2011 through 2018 were based on the findings of earlier researchers, whereas those for the years 2019 through 2021 were done by the researcher on the basis of how the calculations had previously been made by the subject matter in BPS-Statistics Indonesia. Three structural equations were constructed in this study using three endogenous variables: the index of financial inclusion (IFI), which served as a variable proxy for financial inclusion variables; the natural logarithm of gross regional domestic product (lnGRDP) at constant prices, which served as a variable proxy for economic growth variables; and the natural logarithm of the number of poor people (lnPOV), which served as a variable proxy for the poverty variable. Meanwhile, the exogenous variables used are micro, small, and medium enterprises (MSME) financing, mean years of school (MYS), gini ratio (GR), gross fixed capital formation (GFCF), and open unemployment rate (UNEMP).

2.1 Financial Inclusion Index

The financial inclusion index can be calculated in two stages. First, the access and usage dimensions are included in the calculation of the dimension index. There are five indicators used, namely the ratio of accounts to the adult population, the ratio of branch offices per 1000 adult residents, the ratio of ATMs per 1000 adult residents, the ratio of deposits to GRDP at constant prices, and the ratio of credit to GRDP at constant prices [11]. Each transformed indicator is used to calculate the index value for each dimension. Then, calculate the provincial financial inclusion index. The formula of transformation value and weight of each indicator j in province k is determined as follows:

$$x_j = \frac{actual_j - minimum_j}{maximum_j - minimum_j},\ w_j = \frac{(coefficient\ of\ variation)_j}{\sum_j (coefficient\ of\ variation)_j} \quad (1)$$

Then, the formula for calculating access, usage, and financial inclusion index is **[11]**:

$$IA_k = 1 - \frac{\left(\sqrt{w_1^2(1-x_1)^2 + w_2^2(1-x_2)^2 + w_3^2(1-x_3)^2}\right)}{\sqrt{w_1^2 + w_2^2 + w_3^2}} \quad (2)$$

$$IU_k = 1 - \frac{\left(\sqrt{w_4^2(1-x_4)^2 + w_5^2(1-x_5)^2}\right)}{\sqrt{w_4^2 + w_5^2}} \quad (3)$$

$$IFI = 1 - \frac{\sqrt{w_{IA}^2(1-IA_k)^2 + w_{IU}^2(1-IU_k)^2}}{\sqrt{w_{IA}^2 + w_{IU}^2}} \quad (4)$$

2.2 Simultaneous Equation Models

In estimating the relationship between financial inclusion, economic growth, and poverty, the analytical method used is simultaneous equation models with panel data. Simultaneous equation models can provide a more accurate representation than a single equation model **[12].** The following are the steps for analyzing simultaneous equation models.

1. Build a model specification based on a priori information from several related studies. Here are the specifications of the model used in this study:
   Structural equation of financial inclusion

$$IFI_{it} = \beta_{10} + \beta_{11} lnPOV_{it} + \gamma_{11} lnMSME_{it} + \gamma_{12} MYS_{it} + u_{1it} \quad (5)$$

   Structural equation of economic growth

$$lnGRDP_{it} = \beta_{20} + \beta_{21} IFI_{it} + \gamma_{21} GR_{it} + \gamma_{22} lnGFCF_{it} + \gamma_{23} UNEMP_{it} + u_{2it} \quad (6)$$

   Structural equation of poverty

$$lnPOV_{it} = \beta_{30} + \beta_{31} IFI_{it} + \beta_{32} lnGRDP_{it} + \gamma_{31} MYS_{it} + \gamma_{32} UNEMP_{it} + u_{3it} \quad (7)$$

2. Identifying models with order and rank conditions to determine whether the coefficient of the reduced form equation can be used to estimate the coefficient of the structural equation.
3. Create a reduced form equation.
4. Use the Hausman specification test to perform simultaneous and exogeneity tests at a significance level of 5 percent. Simultaneous tests are used to determine whether there is simultaneity or whether the endogenous variable, which is the regressor, correlates with an error. Meanwhile, the exogeneity test is used to determine whether a variable is endogenous or purely exogenous **[12]**.
5. Use the Chow test and the Hausman test to select the best model **[13].** The Chow test was used to choose between Pooled Two-Stage Least Squares (Pooled 2SLS) and Fixed Effect Two-Stage Least Squares (FE2LS). Meanwhile, the Hausman test was carried out to choose a model between FE2SLS and Random Error Two-Stage Least Squares (RE2SLS).
6. Perform classical assumption with normality tests at a significance level of 5 percent and non-multicollinearity detection.

7. Perform a model significance test with simultaneous tests (F-test) and partial test (t-test) at a significance level of 5 percent, then perform coefficient of determination in regression models.
8. Perform model interpretation.

3. RESULTS AND DISCUSSION

Based on the identification of simultaneous equation models, it was obtained that **Equation (5)**-**Equation (7)** proposed in this study have met the order and rank condition criteria. The three structural equations are over-identified, so the OLS method is not appropriately applied because it will produce inconsistent estimates. Therefore, the two-stage least squares (2SLS) method is used to estimate all three structural equations models. In addition, based on simultaneous testing using the Hausman specification test, it is proven that there is a simultaneous problem in the structural equations of financial inclusion and poverty. Then, the results of exogeneity test showed that the variables of financial inclusion and poverty are endogenous variables.

3.1. Estimating Structural Equations Model of Regional Financial Inclusion in Indonesia 2011-2021

After carrying out tests in simultaneity and exogeneity, the next step is to the selection of the best model. The selection of this model begins by conducting a Chow test to determine the best model between Pooled 2SLS and Fixed Effect 2SLS (FE2SLS). Here are the results of the Chow test for all three structural equations. Based on **Table 1**, there is sufficient evidence to conclude that the FE2SLS model is better than the Pooled 2SLS model in estimating the structural equations at a significance level of 5 percent because all three structural equations had a p-value of less than 5 percent significance.

Table 1. Results of Chow Test

Variable	F statistic	*p value*	Conclusion
IFI	895.7909	0.0000	FE2SLS
$lnGRDP$	208.8881	0.0000	FE2SLS
$lnPOV$	1107.9943	0.0000	FE2SLS

Next, The Hausman test shown in **Table 2** was used later to determine the best model between FE2SLS and Random Error 2SLS (RE2SLS) model. There is sufficient evidence to conclude that the FE2SLS model is better than the RE2SLS model in estimating the structural equations at a significance level of 5 percent because all three structural equations had a p-value of less than 5 percent significance based on **Table 2**.

Table 2. Results of Hausman Test

Variable	Chi-Sq. statistic	*p value*	Conclusion
IFI	8.7219	0.0332	FE2SLS
$lnGRDP$	147.7099	0.0000	FE2SLS
$lnPOV$	56.4762	0.0000	FE2SLS

Because the FE2SLS model is the best obtained, variance-covariance structure testing is performed to determine whether there is heteroscedasticity and cross-sectional correlation. From **Table 3**, we can conclude that the best model is FE2SLS with a heteroscedastic covariance variant structure and cross-sectional correlation. These results indicate that the cross-section SUR should be used in the best model. However, the number of periods (T) is less than the number of individual/provinces (N) or T < N, and the weighing used is the Seemingly Unrelated Regression Panel Corrected Standard Errors (SUR PCSE) cross-section estimator **[14]**.

Table 3. Lagrange Multiplier and λLM Test

Variable	Lagrange Multiplier		λLM	
	Test Statistic	*p value*	Test Statistic	*p value*
IFI	950.4462	0.0000	3608.492	0.0000
$lnGRDP$	366.4571	0.0000	1612.952	0.0000
$lnPOV$	386.4033	0.0000	1453.754	0.0000

Classical Assumptions and Model Significance

The classical assumption test used only includes normality tests and non-multicollinearity detection [15]. Normality tests were performed using the Jarque-Bera test, and detection of multicollinearity using Variance Inflation Factors (VIF), whose results are presented in Table 4. Table 4 shows that all the p-values of the three structural equations are greater than $\alpha = 0.05$, and there are no VIF values, which greater than 10. Thus, it can be concluded that the assumptions of normalities and non multicollinearities in the three structural equations have already been satisfied at a significance level of 5 percent.

Table 4. Results of Normality Test and Multicollinearity Detection

Variable	Normality		Multicollinearity
	JB-Statistic	*p-value*	VIF > 10
IFI	2.1334	0.3441	None
$lnGRDP$	5.5764	0.0615	None
$lnPOV$	0.6507	0.7222	None

Table 5. Summary of the Structural Equation Estimation Results

Dependent Variable: IFI				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**p value**
C	0.0593	0.2544	0.2332	0.8157
$lnPOV$	-0.0250	0.0362	-0.6890	0.4913
$lnMSME$	0.0040	0.0026	1.5800	0.1151
MYS	0.0364	0.0043	8.3923	0.0000
R^2	0.9942	**F-statistic**		1697.838
$Adjusted\ R^2$	0.9936	**Prob(F-Stat)**		0.0000
Dependent Variable: lnGRDP				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**p value**
C	10.0710	0.6660	15.1206	0.0000
IFI	4.6978	0.4910	9.5686	0.0000
GR	-0.3479	0.1536	-2.2652	0.0242
$lnGFCF$	0.4383	0.0423	10.3589	0.0000
$UNEMP$	-0.0077	0.0044	-1.7340	0.0835
R^2	0.9988	**F-statistic**		19265.86
$Adjusted\ R^2$	0.9987	**Prob(F-Stat)**		0.0000

Table 5. Summary of the Structural Equation Estimation Results (continued)

Dependent Variable: lnPOV				
Variable	**Coefficient**	***Std. Error***	**t-Statistic**	***p value***
C	6.9341	0.9861	7.0318	0.0000
IFI	-3.2544	1.5492	-2.1007	0.0364
$lnGRDP$	-0.0622	0.0703	-0.8850	0.3768
MYS	0.1295	0.0920	1.4072	0.1603
$UNEMP$	0.0126	0.0054	2.3115	0.0214
R^2	0.9960	**F-statistic**		3744.686
$Adjusted\ R^2$	0.9955	**Prob(F-Stat)**		0.0000

The final goal of this study is to analyze simultaneous equations models of financial inclusion that have been formed and tested previously. **Table 5** above is a summary result of the estimation of structural equations of financial inclusion, economic growth, and poverty in Indonesian provinces from 2011-2021.

Table 5 shows that the variation in financial inclusion, economic growth, and poverty variables each can be explained by endogenous and predetermined explanatory variables in the model is 99 percent, while the remaining is explained by other variables not covered by the regression models or called error. At a significance level of 5 percent, the simultaneous test results provide sufficient evidence to conclude that at least one variable influence financial inclusion, economic growth, and poverty. The model of the structural equation can be written as follows.

Estimation of the structural equation of financial inclusion

$$\widehat{IFI}_{it} = 0.0593 - 0.0250lnPOV_{it} + 0.0040lnMSME_{it} + 0.0364MYS_{it}^{**} \quad (8)$$

Table 5 shows that only the variable mean years of school has a significant effect on financial inclusion at the 5 percent significance levels. Meanwhile, neither poverty nor MSME financing had a significant impact on financial inclusion.

Estimation of the structural equation of economic growth

$$\widehat{lnGRDP}_{it} = 10.0710 + 4.6978IFI_{it}^{**} - 0.3479GR_{it}^{**} + 0.4383lnGFCF_{it}^{**} - 0.0077UNEMP_{it}^{*} \quad (9)$$

The partial test results in **Table 5** show that the variables of gross fixed capital formation (GFCF) and financial inclusion have a positive and significant effect on economic growth at a 5 percent significance level. Meanwhile, the gini ratio and open unemployment rate variables have a significant negative effect on economic growth at 5 percent and 10 percent significance levels, respectively.

Estimation of the structural equation of poverty

$$\widehat{lnPOV}_{it} = 6.9341 - 3.2544IFI_{it}^{**} - 0.0622lnGRDP_{it} + 0.1295MYS_{it} + 0.0126UNEMP_{it}^{**} \quad (10)$$

Table 5 shows that the open unemployment rate has a positive and significant effect, while the financial inclusion variable has a negative and significant effect on poverty at a significance level of 5 percent. Meanwhile, the variable mean years of school had no significant effect on poverty at a significance level of 5 percent.

Causality Relationship Between Financial Inclusion, Economic Growth and Poverty

It is clear from the estimations in **Equation (9)** that financial inclusion significantly and positively affects economic growth. These results are in line with Sanjaya (2014) and Huang et al. (2021)'s research, which found that financial inclusion has a large and positive impact on economic growth. A good financial system that makes it simple for people to acquire finance from financial institutions has high financial inclusion. Financial inclusion also contributes significantly to the growth and prosperity of the economy. The

Supply-Leading phenomenon demonstrates how creating financial institutions and offering financial services can promote economic growth [16]. Financial inclusion can help to provide access to previously inaccessible communities, such as those living in rural areas or poverty. These community groups can develop small businesses or household businesses with access to finance, increasing family income. The relationship between financial inclusion and poverty is then demonstrated by **Equation (10)** which demonstrates that poverty is negatively and significantly impacted by financial inclusion. According to a study by Kusuma and Indrajaya (2018), financial inclusion has the ability to break the cycle of poverty for the poor [17]. Financial inclusion not only promotes growth but also accelerates the decline of poverty rates.

Based on the discussion above, it is possible to conclude that the three endogenous variables have a one-way causality relationship. Financial inclusion impacts on economic growth and poverty, but not the other way around. According to theory and the results of simultaneous testing, there is a two-way relationship between financial inclusion and poverty. However, empirical studies based on the panel's simultaneous equation estimation results show insufficient evidence to show a reciprocal relationship between financial inclusion and poverty in Indonesia.

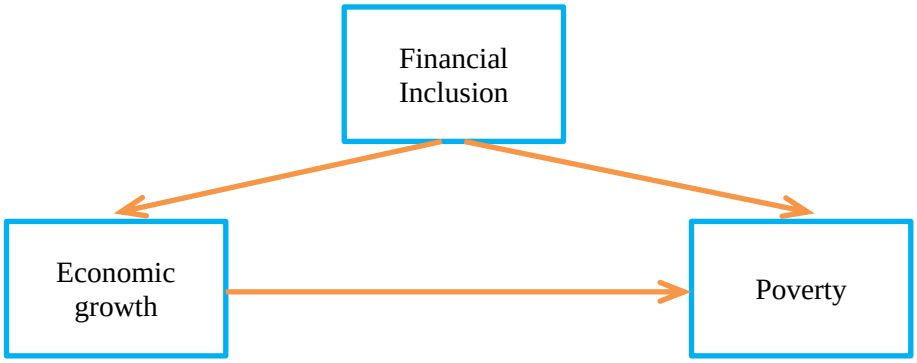

Figure 1. Relationship Between Financial Inclusion, Economic Growth, and Poverty

The relationship between the three variables can be described in **Figure 1**. This demonstrates that there has been no visible development synergy in terms of financial inclusion, economic growth, and poverty. It could be an example given to the government in evaluating Indonesia's regional development gap.

Financial Inclusion and Its Impact on Economic Growth and Poverty in Indonesia 2011-2021

According to **Table 5**, the variable of mean years of school has a coefficient value of 0.0364. The score indicates that any increase in the mean years of school over the course of a year, will increase the financial inclusion index by 0.0364 index points, assuming the other variables remain constant (ceteris paribus). This is consistent with Fauzan's (2019) research, which found that education has a significant positive effect on financial inclusion. Furthermore, the OJK survey results show that an increase in the percentage of financial literacy correlates with an increase in the level of public education. Various financial education programs have proven effective, including the preparation of financial literacy books, socialization in schools, and the launch of the Learning Management System (LMS) by the OJK, which is expected to be financial inclusivity in Indonesia. As a result, improving educational quality can help people understand financial products and services, thereby increasing financial inclusion. Meanwhile, MSME financing variables do not significantly affect financial inclusion. This indicates that MSME financing has not reached the lower middle class as the main target of financial inclusion. Furthermore, low financial literacy among MSMEs, as well as being considered unfeasible, is an impediment to obtaining financing.

Next, the financial inclusion index variable has a positive and significant impact on economic growth at a significance level of 5 percent in the structural equation of economic growth. According to **Table 5**, the coefficient value of the financial inclusion index variable is 4.6978. The value indicates that increasing financial inclusion by one index point increases economic growth (GRDP) by 4.6978 percent, assuming the other variables remain constant (ceteris paribus). According to Dhrifi's (2013) research, financial inclusion boosts economic growth in the middle- and high-income countries but has no effect on the economy in low-income countries [18]. Increased income can increase the demand for savings so that the opportunity to access formal financial services for high-income people is greater. Furthermore, it can encourage the financial sector in Indonesia to meet the needs of the community through the creation and development of various financial products and services.

Following that, at a significance level of 5 percent, the financial inclusion index variable has a negative and significant impact on poverty. The coefficient value of the financial inclusion index variable is -3.2544, according to **Table 5**. The value indicates that a one-point increase in the financial inclusion index reduces the growth of poor people by 3.2544, assuming all other variables remain constant (ceteris paribus). The role of the financial services sector in supporting public welfare, such as lending or financing by banks. People with greater access to finance can start small businesses and earn more money. This can help reduce the poverty rate in a region. Furthermore, Park and Mercado (2015) discovered a strong relationship between financial inclusion and lower poverty rates. The interaction between per capita income and financial inclusion significantly reduces poverty rates, demonstrating the importance of increasing income levels in reducing poverty rates **[19]**.

4. CONCLUSIONS

According to the simultaneous equation models analysis, financial inclusion, economic growth, and poverty in Indonesia have a one-way relationship. Financial inclusion has a positive impact on economic growth while having a negative impact on poverty, but not vice versa. This indicates that sustainable development in Indonesia has not gone well. In addition, financial inclusion is only significantly affected by the variable mean years of school at a significance level of 5 percent. As a result, the government and financial institutions must work together to increase financial inclusion and expand financial services for the entire community.

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