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Financial Inclusion, Poverty, Inequality: Empirical Evidence from Provincial in Indonesia

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Abstract

Current financial inclusion studies generally use partial indicators from access and use dimensions and are still limited in using multi-dimensional indicators. This study investigates the nexus between financial inclusion, poverty, and inequality by looking at empirical evidence from 33 provinces in Indonesia during 2009 - 2019. The Financial Inclusion Index (FII) for each province is constructed following Wang & Guan (2017) approach, which is more objective in weight assignment and avoids correlations between dimensions, namely access dimension, and usage dimension. The results show that financial inclusion has a significant effect on reducing poverty in Indonesia. There is evidence that FII supports the existence of an inverted U-curve relationship between financial inclusion and inequality. If we dispart the FII, the result shows that the only access dimension has a significant effect on reducing poverty levels in Indonesia and supports an inverted U-curve relationship with inequality. To make financial inclusion a tool for combat poverty and inequality, Indonesia needs to provide broad and greater financial access, engage unbanked people to make an account, and use financial services, especially for poor people. Alongside that, Indonesia also needs to make usage dimension has an impact on financial inclusion. Financial institutions need to design the right products so that they can provide based on people's needs.

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INTRODUCTION

Poverty and inequality are crucial fundamental issues and more prevalent in developing countries. Poverty is a lack of economic resources that are associated with negative social consequences. The poor are prone to social exclusion and stigmatization (Sen, 1983). Inequality can be interpreted as a sign of injustice, social and political instability, privileges owned by certain people, and unequal opportunities for some societies to produce, with economic growth loss. It can be considered destructive and problematic for society and also as a severe threat to economic progress.

Many works of literature consider the possible factors that have become the sources of poverty and inequality. This study considers the effect of unequal access to finance as a critical mechanism in generating slower economic growth and persistent inequality (Seven & Coskun, 2016). Financial market imperfections, such as asymmetric information and moral hazard, are one of the key determinants on inequality and poverty models (such as Banerjee & Newman, 1993 and Greenwood & Jovanovic, 1990 and) can prevent the poor to embed in education, health, human capital, and entrepreneurial activities.

Recently, policymakers have emphasized that financial inclusion is a useful tool to encounter poverty and inequality. Financial inclusion is a condition in which all economic actors have broad, affordable, and beneficial access to quality, sustainable, and safe financial services that can be used to meet their needs, whether in the form of transactions, payments, savings, credit and insurance (Cabeza-García, et al., 2019; World Bank, 2018). If the country has inclusive financial systems, all people can get more credit with a specified number of collaterals. There will be some people that previously unable to get credit and now can build entrepreneurial activities, get more income and scale up the social ladder. In the sense of being independent of inherited wealth, the remaining inequality would be justified or optimal (Jauch & Watzka, 2016).

Indonesia is one of the developing countries that has made the most progress in bringing the people into the formal financial system for East Asia and The Pacific region over the past three years. According to the latest data based on global findex 2017, the number of people with an account is raised by 13 percentage points to 49.8 percent. Besides that, Indonesia also experienced a remarkable decline in poverty, which is the percentage of poverty touched every digit in 2019, according to Central Bureau of Statistics data. However, after eight years of decline, the reduction rate has slowed to 9% in recent years and still in 9,22% in September 2019. The slow poverty reduction is due to the general nature of extreme inequality, which Indonesia's Gini index was remaining 0,389% in 2018.

Indonesian Government implemented financial inclusion as one strategy that played a significant role in poverty reduction and narrowing inequality. The Indonesian Government seeks to reform by issuing Presidential Regulation No. 82/2016 concerning the Financial Inclusion National Strategy (FINS). This strategy is the Government's effort to improve an inclusive formal financial system in Indonesia. The target is to strengthen the financial sector by increasing access for society and Micro, Small & Medium Enterprises (MSME) to formal financial system products and services. So hopefully, Indonesia can reach economic welfare through poverty reduction, inequality, and financial stability.

Despite progress in literature, theoretical studies between financial development, poverty, and inequality have not reached a uniform conclusion and provided conflicting views. Galor & Zeira (1993), with a two-sector model and Banerjee & Newman (1993) with three-sector models, imply that financial development will enhance growth and reduce inequality. Because the financial market development will provide more comfortable and broader credit access for the poor who lack collateral and credit histories, the credit constraints will be alleviated, which accelerates economic growth, reducing inequality.

Associated but different perspective with previous, Greenwood and Jovanovic (1990) construct a non-linear relationship with inverted

U-shape curve between financial development and inequality, following Kuznets (1963). They predict that financial development may widen inequality at the early stages of development because only the high-income people can get financial access and profit from better financial development. Nevertheless, when the system becomes healthier and more competitive at the higher levels, it will lower income inequality; as the financial system becomes healthier, the average income increases, and more households gain financial market access. This pattern emerges because informal finance often becomes the only source for the poor. They depend mainly on borrowings from relatives or friends, and the development of the financial sector is beneficial only to the rich.

The financial inclusion concept goes beyond single indicators, such as number of ATMs, number of branches, percentage of bank accounts, or loans. Several studies have sought to investigated financial development with poverty reduction and inequality by that single indicator. Beck et al. (2007) use private credit as a proxy to find that financial development disproportionately affected reduces inequality and increases the lowest quintile income. They also find that financial development can significantly reduce poverty. Neaime & Gaysset (2018) using the number of banks per 100,000 adults and number of automated teller machines (ATM) per 100,000 adults as a proxy and see the impact of financial inclusion on poverty and income inequality using aggregate data in the Middle East and North Africa (MENA) countries.

However, if we talking about financial inclusion, we cannot use single indicators as a proxy, because single indicators can mean nothing and sometimes might provide miss information (Wang & Guan, 2017). Therefore, in the next episode of financial inclusion literature, try to construct a multi-dimensional index, namely the Financial Inclusion Index (FII), to measure financial inclusion with several different dimensions. Using the FII, they see the nexus between financial inclusion, poverty, or inequality.

However, most of the financial inclusion studies closely follow the methodology of Sarma (2008) in constructing FII. Sarma (2008) proposed a multi-dimensional FII by combining accessibility, availability, and usage dimension. He computed an index for each dimension, use normalized Euclidean distance achievement points between a worst and an ideal situation to aggregated each index, and then took a simple average.

Park and Mercado (2015) examine financial inclusion and poverty relationships using a panel study consisting of 176 countries, including 37 developing countries. They include five measures and closely follow the methodology of Sarma (2008) to construct FII. They find that financial inclusion significantly relates to lower poverty rates and higher economic growth for all samples. However, they did not find a significant effect of financial inclusion on inequality in developing Asia. Furthermore, Omar & Inaba (2020) construct a composite FII with Sarma's (2008) methodology under three basic dimensions of an inclusive financial system: penetration, availability, and usage of financial services in 116 developing countries. They find that financial inclusion significantly reduces poverty rates and income inequality. Other studies follow the methodology of Sarma (2008), such as Kumar (2013), Kim (2016) Ummah, et al. (2015), Sanjaya & Nursechafia (2016), and Koomson, et al. (2020).

However, the methodology of Sarma (2008) in constructing FII, has been criticized by many subsequent studies. Camara & Tuesta (2014) explain about evidence that indices are sensitive to weight assignment with subjectively since a slight change in weights can alter the results dramatically. So that subjective weight assignment needs to be questioned and does not have scientific accuracy. Hanivan & Nasrudin (2019) also stated that the assumption of homogeneity in weighting the indicators and dimensions might result in bias on FII calculations. Furthermore, according to Mialou, et al. (2017) if we give the same weighting for all dimensions so the assumption is, we will give the same effect for each dimension on the financial inclusion. In addition, Ummah, et al. (2015) also claim that using the Sarma method (2008), has not captured the financial development phenomena in each Indonesia's province. Apart

from weight assignment, there are also criticisms regarding the possibility of a correlation between the proprietary calculation method's three dimensions. According to Wang & Guan (2017) there is a potential multicollinearity problem in calculating the index because there are two dimensions that are almost the same, namely the dimensions of accessibility and availability.

This study looks to take another step in the existing literature by investigating the nexus between financial inclusion, poverty, and inequality. Using our own FII, we examine the importance of financial inclusion in reducing poverty and inequality in Indonesia. Besides that, we also use another methodology to construct the FII. We will be following Wang & Guan (2017) approach to measure financial inclusion using a more indicative approach with recapitulative dimensions and specific indicators. The advantage of the method compared to Sarma (2008) that widely used in previous studies are more objective in weight assignment. This method is based on the coefficient of variation technique and able to avoid correlations between dimensions (in Sarma (2008), 'accessibility' is similar to 'availability', which may cause multicollinearity in the calculations).

Using FE econometric models and data from thirty-three Indonesia's provinces over 2009–2019, this paper assesses the nexus of financial inclusion, inequality, and poverty empirically. This study contributes to the following existent financial inclusion-related literature. First, it constructs a multi-dimensional financial inclusion index using financial sector indicators following Wang & Guan (2017) approach, with an extensive panel data set. To the best of our knowledge, this is one of the studies using Wang & Guan methodology to construct the FII, using objective weight assignment. Second, focusing on the provincial level. The number of studies focusing on the nexus between financial inclusion, poverty, and inequality with empirical at the provincial level is relatively thin. Previous studies are conducted at a cross-country analysis. Third, this study will also conduct a more in-depth analysis by disparting FII become two forming dimensions, namely the access index and the usage index, to see each dimension's effect on poverty and inequality. So hopefully, it can provide the proper understanding and input to policymakers. In addition, this study will also try to test non-linear relationship hypotheses between financial inclusion and inequality.

Our empirical findings provide evidence that financial inclusion has a significant effect on reducing provincial poverty in Indonesia. For inequality, our findings support the existence of an inverted U-curve relationship between financial inclusion and inequality. Suppose we seek more deeply into each dimension from the FII, namely the access dimension and usage dimension. In that case, it is found that the access dimension has a significant effect on reducing poverty levels in Indonesia. On the other hand, the access dimension has a significant effect on increasing inequality. However, after adding a squared term for access dimension, it supports the existence of an inverted U-curve relationship between the access dimension and inequality in the baseline equation. After controlled other inequality determinants, the access dimension loses its significance in linear or non-linear equations. The usage dimension shows that there is no significant effect on poverty or inequality.

The remaining sections of this paper are structured as follows. Section 2 reveals the empirical methodology, data measurement, and construction of the financial inclusion index for testing impacts through regression analysis. Section 3 presents the empirical results and discussions, and Section 5 concludes with a summary of our findings and policy implications.

RESEARCH METHODS

Our empirical analysis uses 11 years of balanced annual panel data from 2009 through 2019. The term of financial inclusion has become a global trend after the financial crisis in 2008, mainly based on the impact of the crisis on groups at the bottom of the pyramid in a developing country, such as people from low and irregular incomes, living in remote areas, people with disabilities, workers who do not have legal identity documents, and marginalized communities, which are generally unbanked.

Before examining the financial inclusion-poverty-inequality nexus, first, we construct our

own FII as the dependent variable. We closely follow the methodology of Wang & Guan (2017). Specifically, we include several indicators to construct the FII and categorized them into two dimensions: access dimension and usage dimension.

First, the access dimension indicators are the number of accounts in commercial banks per 100,000 adults, the number of commercial bank branches per 100,000 adults, and the number of automated teller machines (ATM) per 100,000 adults. Second, the indicators in the usage dimension are the amount of savings at commercial banks in the past year (% of GDP), outstanding deposits and current account in commercial banks (% of GDP), and also the number of outstanding loans with commercial banks (% of GDP). All indicator data are obtained from the Bank Indonesia (BI) and the Financial Services Authority (OJK).

We transform each indicator using the formula:

$$x_{ij} = \frac{A_{ij} - m_{ij}}{M_{ij} - m_{ij}} \quad \text{..... (1)}$$

where x_{ij} is the transformed value of indicator j in dimension i; M_ij and m_ij are the maximum and minimum of each indicator; and A_ij is the actual value. After transformation, each indicator's value is between 0 and 1, where 1 corresponds to the highest FII and 0 is the lowest FII.

Next, we compute the transformation in dimension *i* as follows:

$$IIK_i = 1 - \sqrt{\frac{w_{i1}^2\,(1-x_{i1})^2 + w_{i2}^2(1-x_{i2})^2 + \cdots + w_{in}^2(1-x_{in})^2}{\sqrt{w_{i1}^2 + w_{i2}^2 + \cdots + w_{in}^2)}}} \quad \text{..... (2)}$$

where w_{ij} is the weight of indicator *j* in dimension *i* and x_{ij} is the transformed value ($0 \leq x_{ij} \leq 1$). The difference between Wang & Guan (2017) method and Sarma (2008) is in this weight assignment, which is Wang & Guan (2017) use an objective weighting method called the coefficient of variation (CV). Each indicator and dimension's weight are defined as the proportion of its CV to the sum of all indicators' CV numerically. That is:

$$w_{ij} = \frac{v_{ij}}{\sum v_{ij}} \quad \text{.....(3)}$$

where w_{ij} is the weight of indicator *j* in dimension *i*, and v_{ij} is the CV. Then, we will get the FII using the formula:

$$IIK = 1 - \sqrt{\frac{w_1^2(1-IIK_1)^2 + w_2^2(1-IIK_2)^2}{\sqrt{(w_1^2+w_2^2)}}} \quad \text{..... (4)}$$

where w_1, w_2 are the weight of access dimension and usage dimension, while the weight assignment follows the variation method's coefficient. Table 1 presents our results for the FII computed using Wang & Guan (2017) method.

We also use measures of inequality and poverty, which have been typically used in the literature. We use the Gini coefficient (gini) to indicate inequality and headcount poverty ratio (pov) as a poverty indicator. The data is obtained from the Central Bureau of Statistics (BPS).

To estimate the relationship between financial inclusion and poverty or inequality, we also use various control variables widely used in the literature (See Beck et al., 2007; Omar & Inaba, 2020, Jauch & Watzka, 2016; Seven & Coskun, 2016). It to account for other important factors that might affect poverty and inequality. First, we control trade openness (open) as the ratio of total imports and exports to GDP. This variable uses to measure globalization's effect, and international trade affects the level of poverty and inequality in a province. Second, we add GDP per capita (gdpc) to control the economic growth, reducing inequality and poverty, and whether financial inclusion affects those in the low-income bracket because of its effects on GDP per capita. Third, we control the inflation rate (inflation) as a proxy for macroeconomic instability, following Easterly & Fischer (2001), Jalilian & Kirkpatrick (2002), and Dollar & Kray (2002). They show evidence that the inflation rate is playing a significant determinant in poverty and inequality. Some argue that the rich who have better financial access might hedge better against inflation. If unexpectedly high inflation occurs, borrowers will also benefit because it will lower the burden from real debt when almost all

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contracts are written in nominal terms. So, the impacts on inequality are unclear.

Further, we add regional government expenditure (govexp) because there is an assumption that large amounts of government spending are one way that government redistributes revenue, in this case, it should have an impact on reducing poverty and inequality.

Table 1. Financial Inclusion Index from Thirty-Three Province in Indonesia

Province	*Access Index*		*Usage Index*		*FII Province*		*Rank*	
	2010	**2019**	**2010**	**2019**	**2010**	**2019**	**2010**	**2019**
Aceh	0,17	0,22	0,18	0,24	0,18	0,23	19	19
North Sumatera	0,18	0,23	0,31	0,28	0,24	0,26	6	9
West Sumatera	0,23	0,28	0,21	0,20	0,22	0,22	8	22
Riau	0,20	0,23	0,09	0,10	0,14	0,14	27	33
Jambi	0,14	0,22	0,15	0,17	0,14	0,19	26	28
South Sumatera	0,15	0,21	0,19	0,19	0,17	0,20	20	27
Bengkulu	0,14	0,21	0,19	0,22	0,16	0,22	21	24
Lampung	0,10	0,15	0,13	0,15	0,12	0,15	33	32
Bangka Belitung Islands	0,20	0,30	0,34	0,23	0,27	0,25	4	10
Riau Islands	0,40	0,41	0,11	0,17	0,24	0,24	7	14
DKI Jakarta	0,92	0,83	1,00	1,00	0,94	0,90	1	1
West Java	0,20	0,24	0,19	0,23	0,19	0,23	15	20
Central Java	0,19	0,25	0,18	0,24	0,19	0,24	17	16
Special Region of Yogyakarta	0,34	0,38	0,30	0,39	0,32	0,39	3	2
East Java	0,20	0,26	0,20	0,23	0,20	0,24	14	17
Banten	0,24	0,28	0,19	0,26	0,22	0,27	9	7
Bali	0,40	0,41	0,36	0,36	0,38	0,38	2	3
West Nusa Tenggara	0,13	0,18	0,14	0,27	0,13	0,24	30	18
East Nusa Tenggara	0,10	0,35	0,22	0,39	0,15	0,37	23	4
West Kalimantan	0,14	0,22	0,24	0,27	0,19	0,25	16	12
Central Kalimantan	0,13	0,23	0,16	0,19	0,15	0,20	25	26
South Kalimantan	0,19	0,27	0,24	0,29	0,21	0,28	11	5
East Kalimantan	0,33	0,44	0,11	0,14	0,21	0,23	10	21
North Sulawesi	0,28	0,32	0,25	0,25	0,26	0,28	5	6
Central Sulawesi	0,13	0,18	0,17	0,16	0,15	0,16	24	30
South Sulawesi	0,17	0,24	0,24	0,21	0,20	0,22	13	23
Southeast Sulawesi	0,12	0,20	0,13	0,18	0,12	0,18	32	29
Gorontalo	0,14	0,27	0,13	0,24	0,13	0,25	29	13
West Sulawesi	0,08	0,19	0,17	0,14	0,12	0,16	31	31
Maluku	0,14	0,24	0,28	0,29	0,21	0,27	12	8
North Maluku	0,10	0,25	0,17	0,24	0,14	0,24	28	15
West Papua	0,25	0,38	0,11	0,19	0,18	0,25	18	11
Papua	0,19	0,23	0,13	0,21	0,16	0,21	22	25

Source: Authors' calculations

Finally, we control the average years of schooling (school) as a trade for the human capital accumulation effect. Better human capital supply reduces wage differential between skill and unskilled; therefore, inequality. All the control variables are obtained from the Central Bureau of Statistics (BPS).

This empirical study uses a fixed effect estimation method with a panel regression framework for controlling provincial-specific characteristics that do not change over time but are potentially influential to poverty and inequality. These can be cultural factors, religion, and others. The Hausman test also supports the fixed effect model over the random effect model. Policy dummies are included to control the policy effect and to reduce omitted variable bias. This dummy will be used to determine the FNSI policy's effectiveness on the level of financial inclusion in Indonesia. With this policy implementation, we consider that there will be changes in the FII because it is driven by various government initiatives to improve access and usage of financial services.

In order to investigate the nexus between financial inclusion and poverty, the following equation is employed:

$$lnPov_{i,t} = \alpha_0 + \beta_1 fii_{i,t} + \beta_2 dummypolicy_{i,t} + \beta_3 gdpc_{i,t} + \beta_4 govexp_{i,t} + \beta_5 lninf_{i,t} + \beta_6 open_{i,t} + \beta_7 school_{i,t} + \beta_8 dummypolicy_{i,t} * IIK + \alpha_i + \mu_{i,t} \quad (5)$$

where *fii* is a financial inclusion index, *dummypolicy* is a policy dummy to determine the effectiveness of FNSI policies on financial inclusion in Indonesia, *gdpc* is GDP per capita, *govexp* is regional government share of total expenditure, *lninf* is inflation rate in logarithmic form, *open* is trade openness, *school* is the average length of schooling for population aged 15+ years and $dummypolicy_{i,t}$ *IIK as an interaction variable between IIK and dummypolicy. From equation (1), it is expected that financial inclusion is negatively related to poverty levels because higher access to financial services by low-income people generally helps reduce poverty by facilitating the consumption and engaging in productive activities for economic growth.

To investigate the nexus between financial inclusion and inequality, the following equation is employed:

$$lnGini_{i,t} = \alpha_0 + \beta_1 IIK_{i,t} + \beta_2 dummypolicy_{i,t} + \beta_3 gdpc_{i,t} + \beta_4 govexp_{i,t} + \beta_5 lninf_{i,t} + \beta_6 open_{i,t} + \beta_7 school_{i,t} + \beta_8 dummypolicy_{i,t} * IIK + \alpha_i + \mu_{i,t} \quad (6)$$

Equation (6) is used to test linear relationships. If $\beta_1 > 0$ and is significant; then financial inclusion will widen the inequality level. However, if $\beta_1 < 0$ and is significant, financial inclusion will reduce inequality.

The nexus between financial inclusion and inequality can appear non-linear at a certain level of financial development according to the Greenwood and Jovanovic (1990) hypothesis, which is a claim that the inverted U-shaped finance-inequality relationship. In other words, inequality may first rise as long as the financial sector develops, but it will decline when more people gain financial access. Hence, the square term is entered separately into the regression, and the following regression equation is employed:

$$lnGini_{i,t} = \alpha_0 + \beta_1 IIK_{i,t} + \beta_2 dummypolicy_{i,t} + \beta_3 gdpc_{i,t} + \beta_4 govexp_{i,t} + \beta_5 lninf_{i,t} + \beta_6 open_{i,t} + \beta_7 school_{i,t} + \beta_8 dummypolicy_{i,t} * IIK + \beta_9 IIK^2{}_{i,t} + \beta_{10} gdpc^2{}_{i,t} \alpha_i + \mu_{i,t} \quad \text{......................................} (7)$$

From the equation (7), the inverted U-shaped hypothesis predicts $\beta_1 > 0$ dan $\beta_{12} < 0$. In addition, in testing this non-linear relationship, we also add GDP per capita squared for the control variable as a proxy for economic growth.

RESULTS AND DISCUSSION

This research employed the basic specification from the growth literature and used Stata 16 as the econometrics tools. Our specifications include the convergence effect (log of the lagged level of the dependent variable), real per capita GDP, the government consumption, the inflation rate in the log form, the trade to GDP ratio (trade openness), and the average years of schooling rate. This study also uses a policy dummies in looking at the relationship between financial inclusion and poverty and inequality, which is 0 for the research period

before 2016 and 1 for the study period 2016 - 2019. To test the non-linear hypothesis between finance and inequality, we add FII square and real per capita GDP square on the specification.

Table 2 Financial inclusion and poverty

Variabel	(1) lpov	(2) lpov	(3) lpov	(4) lpov
	OLS	**OLS**	**FE**	**FE**
IIK	-1.853***	-1.178***	**-1.584****	**-1.593****
	(0.188)	(0.279)	(0.695)	(0.611)
dummypolicy	-0.120**	-0.171	-0.126***	-0.162***
	(0.052)	(0.105)	(0.011)	(0.022)
gdpc		-0.170*		-0.272**
		(0.094)		(0.110)
govexp		0.705*		-0.362
		(0.396)		(0.319)
linflasi		-0.061		-0.022***
		(0.046)		(0.008)
open		-0.000***		0.000
		(0.000)		(0.000)
school		-0.138***		-0.054
		(0.032)		(0.034)
dummypolicy IIK*		0.170		**0.515*****
		(0.387)		(0.143)
Constant	2.835***	3.986***	2.775***	3.337***
	(0.052)	(0.241)	(0.158)	(0.228)
Observasi	363.000	363.000	363.000	363.000
Rsquared	0.223	0.342	0.491	0.634

The dependent variable is the poverty headcount ratio.

All standard errors are robust and reported in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

Variabel *dummypolicy* takes a value of 1 for the study period of 2016 - 2019 and a value of zero for the study period before 2016. The interaction variables of *dummypolicy* and IIK are presented for the value of *dummypolicy* = 1.

For comprehensiveness, our models estimate using both the OLS and fixed effect methods. According to the empirical literature, the OLS methods may give biased and inconsistent results, so the fixed effect results are our discussion's primary source. In all models, the left-hand-side variable is the poverty or inequality measures, which are defined in the log of (i) headcount poverty ratio, (ii) Gini coefficient. We assume that FII is endogenous, and all control variables are exogenous.

To answer the objectives of this study, first, we will estimate whether financial inclusion can reduce poverty and inequality. We estimate four specifications with two OLS estimates and two fixed effect estimates by testing all control variables' impacts in a forward step. In column (1) and column (3) represent the baseline equation in this study, both for the OLS and fixed effect method, using only the FII and policy dummies. In column (2) and column (4) the control variables are added to see whether the FII still has a significant effect on poverty or inequality if it is affected by other poverty or inequality determinants.

Furthermore, this study will attempt to test the inverted U-shaped finance inclusion - inequality relationship and do the FII dispart become two forming dimensions: the access index and the usage index to see each dimension's effect on poverty and inequality.

Table 2 presents the empirical findings for the financial inclusion and poverty nexus in Indonesia provinces. By using the headcount

poverty ratio in each province as the dependent variable, this study shows that financial inclusion has a highly significant negative effect on poverty on all models. This implies that a province with a higher level of financial inclusion has strongly reduced poverty rates. This result is highly significant with expected negative signs, even after controlling for other poverty determinants as a control variable.

This empirical finding is similar to the findings documented by (Burgess & Pande, 2005; Beck et al., 2007; Omar & Inaba, 2020; Asuming et al., 2019) that financial inclusion highly significant negative effect on poverty. However, this result is different from the research conducted by (Neaime & Gaysset, 2018) and (Seven & Coskun, 2016), which shows that financial inclusion does not significantly impact poverty reduction. This difference in results is due to differences in indicators as a proxy for financial inclusion.

Amongst the variable controls, gdpc and inflation are significantly related to poverty. GDP per capita has a negatively significant effect on provincial poverty, meaning that a higher GDP per capita will reduce poverty rates by 27.2%. Reverse to expectations, inflation rate has a negatively significant effect on poverty, imply that a higher inflation rate will reduce poverty in each Indonesian provincial. According to Omar & Inaba (2020), the possible reason is when inflation occurs, it will depreciate the value of cash holdings by rich people, so it drives them to invest their idle cash become real capital expenditures. This will encourage business opportunities and employ more unemployed and low-income people, thereby reducing poverty levels. Other control variables, such as government expenditure and average years of schooling rate, show insignificant negative signs, while trade openness shows insignificant positive effects on poverty rates.

Table 3 presents the empirical finding for financial inclusion and inequality nexus in Indonesia provinces. To test the inequality-widening and the inequality-narrowing hypotheses, we estimate the natural log form of the Gini coefficient on linear terms to measure financial inclusion. The fixed effect estimates show that there is a significant positive relationship between financial inclusion and inequality. Our results reject theories that are predicting an inequality-narrowing hypothesis of financial development. Contrary, our result supports the inequality-widening hypothesis, which implies that inequality will be relatively higher in provinces with higher financial inclusion. This result is significant with positive signs, even after controlling other inequality determinants as a control variable. This empirical finding is similar to the findings documented by (Bittencourt et al., 2019; Jauch & Watzka, 2016; Seven & Coskun, 2016; dan Stiglitz J., 2013).

Beck et al. (2004) suggest that in the early stages of financial development, the financial sector can charge high regulatory fees for financial services to benefit from screening and pooling risks beyond the poor's affordability. As a result, the poor are unable to get out of the cycle of inequality. Furthermore, shortcomings in the financial market related to asymmetric information, intermediates fees, and transaction fees can limit the poor to get credit access from financial institutions. They do not have collateral, histories, or personal relationships with high-ranking officials in the financial sector to obtain loans at reasonable interest rates. Therefore, even if there are enough funds to be distributed at a reasonable interest rate among the poor, they cannot take advantage of the service.

Delis, et al. (2014) and Law, et al. (2014) states that if a country has low institutional quality, then development in the financial sector will not impact inequality. Rajan & Zingales (2003) also argued the same thing: under weak political institutions, representation would be dominated by political influence that prioritized certain groups' interests, which would affect the financial access, in turns that groups would benefit more from financial development than the poor. As a result, inequality can actually increase. In addition, Stiglitz (2013) underlines the existence of financial companies that pursue their own profits through several rent-seeking, inefficient regulation, supervision and enforcement, also play a role in widening inequality.

Table 3 Financial inclusion and inequality

Variabel	(1) lgini	(2) lgini	(3) lgini	(4) lgini	(5) lgini	(6) lgini	(7) lgini	(8) lgini
	OLS	**OLS**	**OLS**	**OLS**	**FE**	**FE**	**FE**	**FE**
IIK	0.195***	0.309***	0.456***	0.717***	**0.517****	**0.886*****	**1.476*****	**0.973*****
	(0.040)	(0.063)	(0.166)	(0.177)	**(0.211)**	**(0.183)**	**(0.295)**	**(0.307)**
dummypolicy=1	-0.025**	0.008	-0.028**	0.053*	-0.031***	0.018	-0.036***	-0.043**
	(0.011)	(0.023)	(0.011)	(0.029)	(0.007)	(0.015)	(0.007)	(0.020)
gdpc		0.037*		0.194***		0.186***		0.408***
		(0.021)		(0.052)		(0.058)		(0.083)
govexp		0.112		0.226***		0.143		0.264***
		(0.088)		(0.086)		(0.181)		(0.095)
linflasi		0.017*		0.016		0.018***		0.013**
		(0.010)		(0.010)		(0.005)		(0.005)
open		-0.000***		-0.000***		-0.000		-0.000
		(0.000)		(0.000)		(0.000)		(0.000)
school		-0.036***		-0.039***		-0.078***		-0.086***
		(0.007)		(0.007)		(0.021)		(0.023)
*dummypolicy=1**		-0.084		0.069		**-0.195*****		0.014
IIK		(0.085)		(0.084)		(0.061)		(0.061)
IIKsq			-0.263	-0.462***			**-1.892*****	**-0.930***
			(0.163)	(0.175)			**(0.391)**	**(0.494)**
gdpcsq				-0.082***				-0.121***
				(0.028)				(0.022)
Constant	-1.054***	-0.819***	-1.094***	-0.904***	-1.129***	-0.695***	-1.214***	-0.642***
	(0.011)	(0.052)	(0.027)	(0.054)	(0.048)	(0.155)	(0.048)	(0.165)
Observations	363.000	363.000	363.000	363.000	363.000	363.000	363.000	363.000
RSquared	0.064	0.175	0.069	0.221	0.054	0.257	0.080	0.320

The dependent variable is income inequality measured by Gini coefficient.
All standard errors are robust and reported in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level

In column (6), we can see some controls that have a significant effect on inequality. Inflation and GDP per capita are the control variable that positively significant in the fixed-effects model. Surprisingly, the effects of increasing GDP per capita can increase inequality. This can be caused by economic growth, which only benefits the rich. Considering inflation as macroeconomic stability indicator, the empirical findings indicate that higher uncertainty levels tighten the inequality level. The positive effect of inflation on inequality due to an increase in inflation can reduce the community purchasing power and decrease the individual real income, especially the poor. It explains the importance of macroeconomic stability for reducing inequality in developing countries like Indonesia. The trade openness variable can have a positive effect because the expansion of the traded goods sector due to greater trade openness in a country can increase wage inequality through employment (Barro, 2008).

The interaction term between the IIK and the policy dummy (dummypolicy * IIK) and the variable average length of schooling (school) resulted in a significant reduction in Indonesia's regional inequality. It implied that with the better implementation of the FNSI program, financial inclusion could reduce inequality. In addition, the longer education is taken by the Indonesian people; it will increase the knowledge, skills, and productivity of the poor. The better quality of human resources can increase access to jobs and increase wages. So, it can reduce the level of inequality.

Further, to explore whether there is an inverted U-shaped nexus between financial inclusion and inequality, as proposed by Greenwood & Jovanovic (1990), we regress the Gini coefficient's logarithm on the log of FIII and its square (See column 5 and 6). We also add real per capita GDP and its square to see the relationship between economic development and inequality, as proposed by Kuznets (1963). If this hypothesis is correct, then an increase in financial inclusion can initially increase inequality in every province in Indonesia. Inequality will decrease after the province reaches a particular stage of financial sector development.

In column (7) is the basic equation to test whether the non-linear relationship hypothesis occurs; the results show that the FII is positively significant, and the square term is negatively significant. The results indicate that in Indonesia, the existence of financial inclusion will increase inequality until the level of development of financial inclusion reaches its threshold. After reaching the threshold level, financial inclusion will reduce inequality. In column (8), when the control variable is added, it also supports non-linear relationships with an inverted-U curve between financial inclusion and inequality. It has a smaller effect if we compare it with the basic equation, both on FII and square term. The same relationship can be seen in the GDP per capita in a square term, a proxy for economic growth. The results show an inverse U-shaped non-linear relationship between inequality and GDP per capita. It can be concluded that as per capita income continues to increase, income inequality begins to decline, and this finding also supports the Kuznets Curve.

Financial inclusion index is measured by multi-dimensional, which is in this study, we use two-dimension, access, and usage. To get in-depth analysis, this study will try to see the impact of each dimension. Using the same specifications when we estimate FII, this study examines the impact of access index and usage index on poverty and inequality. We can know which dimensions are the most carry weight or which dimensions need to be improved to make financial inclusion become the right tool in reducing poverty and inequality.

Table 4 presents the empirical findings for the access index and usage index impact on Indonesia provinces' poverty/inequality. The fixed effect estimates show that access has a highly significant negative effect on poverty, even after controlling for other poverty determinants as a control variable (see columns 1 and 2). This implies that a province with higher access to financial institutions has strongly reduced poverty rates. Otherwise, access has a significant positive effect on inequality, but it loses significance when adding other control variables (see columns 3 and 4).

Table 4. Access Dimension & Usage Dimension to Poverty & Inequality.

Variabel	(1) lpov	(2) lpov	(3) lgini	(4) lgini	(5) lgini	(6) lgini
	FE	**FE**	**FE**	**FE**	**FE**	**FE**
accessindex	**-1.640*****	**-1.130****	**0.448****	-0.009	**1.088*****	0.145
	(0.387)	(0.515)	(0.186)	(0.265)	(0.253)	(0.379)
usageindex	0.163	0.349	0.001	-0.089	0.193	0.424
	(0.286)	(0.277)	(0.146)	(0.221)	(0.808)	(0.661)
dummypolicy=1	-0.088***	-0.108***	-0.040***	0.016	-0.049***	-0.042**
	(0.013)	(0.027)	(0.010)	(0.015)	(0.008)	(0.020)
gdpc		-0.146		0.181***		0.447***
		(0.099)		(0.055)		(0.097)
govexp		-0.584**		0.150		0.257***
		(0.255)		(0.187)		(0.092)
linflasi		-0.016**		0.017***		0.012**
		(0.006)		(0.006)		(0.005)
open		0.000		-0.000		0.000
		(0.000)		(0.000)		(0.000)
school		-0.056**		-0.078***		-0.090***
		(0.025)		(0.020)		(0.022)
*dummypolicy=1*IIK*		-0.161		0.753		0.505
		(0.760)		(0.452)		(0.408)
accesssq					**-1.185*****	-0.512
					(0.257)	(0.362)
usagesq					-0.187	-0.539
					(1.186)	(0.895)
gdpcsq						-0.135***
						(0.027)
Constant	2.754***	3.244***	-1.111***	-0.688***	-1.202***	-0.639***
	(0.147)	(0.180)	(0.058)	(0.161)	(0.101)	(0.161)
Observasi	363.000	363.000	363.000	363.000	363.000	363.000
Rsquared	0.596	0.692	0.069	0.254	0.110	0.320

To explore whether it is non-linear with inverted U-shaped curve relationship between access/usage dimension to inequality, we add access index and usage index in the square term (see columns 5 and 6). The result shows that the access dimension supports an inverted U-curve relationship with inequality. It means that access to financial services was widening the inequality

up to some threshold, and after that, it narrowed the inequality. The positive impact of more significant and broader access to financial services, that is, increasing the availability of financial services for the poor, is more relevant for developing countries like Indonesia, where relatively more people are unbanked and do not have access to financial services. Hence, financial inclusion can reduce inequality at higher financial inclusion stages through greater and broader access for society, especially for the poor.

Contrary, the empirical findings show that the usage dimension does not affect all models' poverty or inequality. This result is unique because it indicates that an increase in financial services makes poverty and inequality increase. Many factors cause the use of financial services in Indonesia cannot reduce poverty and inequality. Erlando et al. (2020) explain that most of the saving funds come from high-income groups in Indonesia, which are also used by high-income people in the form of credit. Therefore, the circulation of funds in the financial sector is only for people with solid capital capabilities.

In addition, these findings indicate that the flow of credit funds is not used in economic community development and improvement of MSME. Based on the survey, about half of the credit volume by poor households is for non-business purposes, including consumption. Essential non-business uses include paying for school fees, medical care, expanding home improvements, daily consumption, and social and vacation expenses. The findings apply to low-income households below the regional poverty line, just above the line, and well above the line. Many unbanked people in Indonesia, require loans in small amounts, and it cannot generate profits with the same interest rates, even though they are considered creditworthy by microfinance professionals (Johnston Jr. & Morduch, 2008).

Another factor originating from the supply side, such as high transaction costs, uncertainty, asymmetric information, or lack of physical access is considered an obstacle to efficient financial services (Beck, Demirgüç-Kunt, & Levine, 2007). As a result, the continuous increase in these activities has resulted in widening poverty and inequality.

CONCLUSION

This study addresses the need to understand better the finance inclusion–poverty–inequality nexus based on empirical evidence from the provincial level using Indonesia as a sample during 2009 - 2019. Moreover, this study constructs a new composite financial inclusion index using the access and usage dimension of financial inclusion by following Wang & Guan (2017) approach.

The fixed effect estimates show that financial inclusion has a significant effect in reducing provincial poverty in Indonesia, and it consistent with all models. When we examine the nexus between financial inclusion and inequality,

The result provides overwhelming evidence of a non-linear relationship with the inverted-U curve between financial inclusion and inequality. Our result supports Greenwood & Jovanovic (1990) hypothesis.

If we dispart the FII into two dimensions, namely access, and usage dimension, the result shows that the access dimension has a significant effect on reducing poverty levels in Indonesia. On the other hand, the access dimension has a significant effect on widening inequality. However, after adding the access dimension's square term, we find a non-linear relationship with the inverted-U curve between the access dimension and inequality in the baseline equation. After that, the access dimension loses its significance when we controlled for other determinants of inequality. Contrary, the result for the usage dimension shows no impact on poverty or inequality on all models.

Hence, to make financial inclusion a tool for combat poverty and inequality, Indonesia needs to provide broad and greater financial access, engage unbanked people to make an account, and use financial services, especially for poor people. Government and private sector need to coordinate to escalate the existing access by reducing barriers both in terms of cost and non-cost. With the availability of accurate population information that excluded from the financial services and the reasons not using formal financial services, the government and private sector can make appropriate policies to

escalate the existing access, especially by utilizing a new technology.

Alongside that, Indonesia also needs to make usage dimension has an impact on financial inclusion. Financial institutions need to design the right products so that they can provide based on people's needs. They need to make product innovations that are acceptable and beneficial to all social levels and are easily accessible. Not only intended for high-income and well-capitalized groups of people. To increase the benefits of financial inclusion against inequality, the government should help fulfil basic needs through social safety net programs and encourage job creation among the poor to have rest income to savings.

However, the nexus between financial inclusion, poverty, and inequality offers more research opportunities and requires more resources and efforts. The availability of data at the provincial level in Indonesia is one of the limitations in this study to obtain a complete picture of financial inclusion. Several indicators to construct FII related to payment transactions, insurance, and remittances are not available. So, this study only considers savings and credit services to construct the FII. Additionally, the potential for endogenous problems between financial inclusion and poverty and inequality may not be overcome by the fixed-effect method.

Future studies can seek to find the correct variable instrument to overcome this problem and build a financial inclusion index using all indicators to fit the growing literature. It is also preferable to construct FII at the individual level to avoid potential bias in the obtained results. This is because financial behaviour will be more appropriate when we observed at the individual or household level as decision-makers.

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