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Inclusive growth in rural Indonesia: exploring the interaction between technology and financial inclusion

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ARTICLE INFO	ABSTRACT
	Financial inclusion, as a form of ease in accessing financial services for the community, is key to creating inclusive growth. This research examines financial inclusion and technology in influencing inclusive growth in rural areas of Indonesia. The analytical approach is a Longitudinal Data Panel. The data is sourced from the Indonesia Family Life Survey (IFLS). The results of this study indicate that financial inclusion influences inclusive growth. On the other hand, technology plays an intermediate role between financial inclusion and inclusive growth in rural areas of Indonesia. The government also needs to provide facilities and security to develop technology. **** Inklusi keuangan sebagai bentuk kemudahan mengakses layanan keuangan bagi masyarakat menjadi kunci dalam menciptakan pertumbuhan yang inklusif. Tujuan penelitian ini untuk melihat inklusi keuangan dan teknologi dalam mempengaruhi pertumbuhan inklusif di kawasan pedesaan Indonesia. Pendekatan analisis menggunakan Longitudinal Data Panel. Data yang digunakan bersumber dari Indonesia Family Life Survey (IFLS). Hasil penelitian ini menunjukan bahwa inklusi keuangan memiliki pengaruh dalam penrtumbuhan inklusif. Di sisi lain, teknologi memiliki peran sebagai intermediate antara inklusi keuangan dengn Pertumbuhan inklusif di kawasan pedesaan Indonesia. Pemerintah juga perlu memberikan fasilitas serta pengamanan dalam perkembangan teknologi.

1. Introduciton

Economic development in developing countries has been to create inclusive growth. Inclusive growth has been understood as a condition where economic growth has benefited all layers of society (Demirguc-Kunt et al., 2017; Sanjaya & Nursechafia, 2016). Inclusive growth plays a crucial role in addressing poverty and inequality (Amar & Zghidi, 2016; Anand et al., 2014; Lee & Sissons, 2016).

Several studies have highlighted the positive impact of inclusive growth on poverty reduction (Damodaran, 2015; Lee & Sissons, 2016). The important role of inclusive growth has also been found in studies by (Amar & Zghidi, 2016) and (Neaime & Gaysset, 2018), indicating that inclusive growth can reduce inequality. This suggests that inclusive growth is a key driver of economic stability and equity in developing countries.

Government policies to encourage inclusive growth, which has benefited a country's economy, have included the development of the financial sector as a focus of the development agenda (Sanjaya & Nursechafia, 2016). It has been because removing financial barriers to financial services has driven inclusive growth (Demirguc-Kunt et al., 2017; Sanjaya & Nursechafia, 2016). Financial inclusion, defined as the accessibility of formal financial services and products for all, is considered essential for driving new economic growth, while also reducing poverty and inequality over time (Demirguc-Kunt et al., 2017; Dixit & Ghosh, 2013). The import evenly has encouraged inclusive growth. Empirically, (Kelkar, 2009; Liu, 2017) has explained that financial inclusion has driven the creation of inclusive growth. Increasing financial inclusion has influenced poverty and inequality (Fomum Tita & Jesse Aziakpono, 2017; Karpowicz, 2014; Li, 2018; Neaime & Gaysset, 2018; Park & Mercado, 2015). Thus, increasing financial inclusion has resulted in increased economic growth and reduced poverty and inequality.

At the same time, technological advancements, such as the rise of mobile phones, the Internet, and digital banking services, have revolutionized financial access. These innovations have made financial services more accessible, particularly in areas where traditional banking infrastructure is lacking. Research has shown that technology-driven financial products like mobile banking have significantly enhanced financial inclusion, contributing to inclusive growth (Abor et al., 2018; Ouma et al., 2017 and Ozili, 2018).

As a developing country, Indonesia also has the goal of achieving inclusive growth in its economic development. However, socioeconomic differences, conditions and access to facilities, and environmental characteristics and typology have divided areas in Indonesia into rural and urban areas (Central Statistics Agency, 2010). An area has been defined as an urban area if it meets the following criteria: a population density of at least 5,000 people per square kilometer, 75% of households engaged in non-agricultural sectors, and the availability of infrastructure that includes educational and health facilities. These facilities typically include at least one elementary school and one community health center or hospital in the area (Central Statistics Agency, 2010). Conversely, a rural area has been categorized as an area that still needs to meet population density requirements, the percentage of households, availability of facilities, and educational and health facilities (Central Statistics Agency, 2010). Based on this background, it has been shown that the lack of technology has influenced financial inclusion to create inclusive growth in rural areas of Indonesia.

2. Literature Review

The **Solow Growth Model** demonstrates that technology plays a crucial role in driving long-term economic growth. In this model, economic output is influenced by capital, labor, and technology, which are combined in a production function. Initially, increases in capital and labor can raise output, but over time, their effects diminish due to the *diminishing returns* to capital. This implies that continuously adding capital will contribute progressively less to economic growth. However, technological advancements can overcome this limitation by increasing productivity, enabling labor and capital to generate more output with the same level of input.

In the Solow Growth Model, technological progress is the only factor that can sustain long-term economic growth. Without technological advancements, the economy will reach a *steady state*, where

no further growth occurs due to the limitations of capital and labor. Thus, technology serves as the primary driver of productivity enhancement, and continuous technological innovation allows economic growth to persist even as returns to capital diminish. This makes technology a key factor in creating a dynamic and expanding economy in the long run.

3. Research Method

The data used in this study were sourced from the Indonesian Family Life Survey (IFLS). The Indonesian Family Life Survey (IFLS) was a survey conducted on the socio-economic and health conditions of households in Indonesia. The data used in this study, based on IFLS, was longitudinal data from 2007 and 2014. The IFLS data is a survey conducted every seven years. Currently, the most recent data is available up to 2014. The model specification used in this study modified the research conducted by (Abor et al., 2018; Ouma et al., 2017; Seck et al., 2017) as follows:

$$PI_{it} = \alpha_1 + \alpha_2 bank\_acc_{it} + \alpha_3 cred\_acc_{it} + \alpha_4 insur_{it} + \alpha_5 age\_HH_{it} + \alpha_6 age^2\_HH_{it} + \alpha_7 gender\_HH_{it} + \alpha_8 educ\_HH_{it} + \alpha_9 educ^2\_HH_{it} + \alpha_{10} emstat\_HH_{it} + \alpha_{11} elec_{it} + \epsilon_{it} \ (1)$$

The approach used in this study to assess inclusive growth (PI) was household expenditure based on the research conducted by (Abor et al., 2018). The level of expenditure reflected real income, which, in this case, when there was an equal distribution of real income, illustrated inclusive growth. The proxies for financial inclusion in this study used savings ownership (bank_acc), credit access (cred_acc), and insurance access (insur) based on the research conducted by (Abor et al., 2018; Ouma et al., (2017) and Seck et al., 2017). Meanwhile, the technological developments to improve financial inclusion were seen using variables such as mobile phone usage (use_phone) and mobile banking (m_mobile), according to research conducted by (Abor et al., 2018; Ouma et al., 2017). On the other hand, control variables based on the research conducted by (Abor et al., 2018) and (Gnade et al., 2017), such as household characteristics consisting of the age of the household head (age), education level of the household head (educ), gender of the household head (gender), employment status of the household head (emstat), and the level of facilities or infrastructure, namely access to electricity (elec) and internet access (inter_acc). The analytical tool used in this study was a longitudinal data panel. The longitudinal data panel aimed to see the consistency of the relationship between technology and financial inclusion on inclusive growth.

4. Result and Discussion

Every country, especially developing countries, aims to create inclusive growth. Inclusive growth addresses economic problems such as poverty and inequality (Sanjaya & Nursechafia, 2016; Singh, 2017). One strategy for achieving inclusive growth was the development of the financial sector by increasing financial inclusion. (Demirguc-Kunt et al., 2017) and (Kelkar, 2009) explained that financial inclusion created inclusive growth. On the other hand, technological developments mediated the development of financial inclusion and drove the creation of inclusive growth.

The model used as the basis for estimation is the Random Effect Model (REM). This is observed based on the model's feasibility test results. In the model feasibility test, the Chow test with a probability value of 0.00, which is smaller than the alpha value (α=5%), indicates that FEM is better than PLS. Meanwhile, the Hausman test, which shows a probability value of 0.000, smaller than the alpha value (α=5%), suggests that FEM is better than REM. However, the estimation results in FEM indicate collinearity issues, leading to omitted variable bias. Collinearity issues are common in FEM analysis, thus being a weakness in assessing the constant variable influence over time. Therefore, the best model selection between FEM and REM is through the

comparison concept of time series (T) with the number of observations (N). When the time series (T) is smaller than the number of observations (N), the REM is the best model. Further testing is conducted using the Langrange Multiplier (LM) test, which provides a probability value smaller than the alpha value (α=5%), indicating that the REM model is better than the PLS model.

Table 1. Longitudinal Estimation Results Panel Data

Variable	Model 1		
	Panel Least Square	Fixed Effect Model	Random Effect Model
Use_phone	-	-	-
Bank_acc	0,427*	0,199	0,397*
	(3,73)	(1,33)	(3,49)
	[0,000]	[0,185]	[0,000]
Cred_acc	0,041***	0,159	0,018***
	(2,32)	(1,53)	(2,23)
	[0,096]	[0,128]	[0,081]
Insur	0,275*	0,911*	0,367*
	(3,49)	(8,79)	(4,69)
	[0,001]	[0,000]	[0,000]
M_mobile	-	-	-
Inter_acc	-	-	-
Age_HH	0,891*	-3,987	0,088*
	(6,24)	(-1,41)	(5,81)
	[0,000]	[0,161]	[0,000]
Age^2_HH	-0,001*	0,042	-0,001*
	(-6,83)	(1,23)	(-6,37)
	[0,000]	[0,219]	[0,000]
Gender_HH	0,334*		0,364*
	(2,88)	Omitted	(2,74)
	[0,004]		[0,006]
Educ_HH	0,043***	-0,276*	0,035***
	(2,04)	(-3,05)	(2,19)
	[0,080]	[0,002]	[0,092]
$Educ^2$_HH	0,002***	0,018*	0,002**
	(2,17)	(3,19)	(2,41)
	[0,08]	[0,002]	[0,081]
Emstat_HH	0,140***	0,012	0,122***
	(2,37)	(0,07)	(2,13)
	[0,076]	[0,941]	[0,071]
Elec	1,142*	1,060*	1,152*
	(7,40)	(4,64)	(7,07)
	[0,000]	[0,000)	[0,000]
Adj R-square		0,218	
Chow test	0,000		
Hausman test			0,000
Langrange Multiplier		0,0019	

* Significant α=1%, ** significant α=5%, *** significant α=10%.

(….) = t-statistic, [….] = Probability

The estimation results show that financial inclusion plays a role in creating inclusive growth. Household characteristic variables used to assess household conditions and thinking patterns

influence creating inclusive growth. This is evident from the variable of young household head age, which has a probability of 0.000, smaller than the alpha value (α=1%). In contrast, the results differ for the age of older household heads, indicated by the squared age of the household head, which has a probability of 0.00, smaller than the alpha value (α=1%) with a negative sign. The significant negative relationship with the age of household heads indicates that older household heads influence household income increase. Studies conducted by (Gnade et al., 2017; Wang, 2017 and Wicaksono et al., 2017) explain that the age of household heads influences real household income, which can subsequently affect inclusive growth.

Gender of the household head also influences inclusive growth. This is evident from the probability value of 0.006, smaller than the alpha value (α=1%). Thus, men as household heads contribute to increasing real income compared to women as household heads. Male household heads contribute to household welfare levels (Gnade et al., 2017; Wicaksono et al., 2017). Similarly, the level of education of the household head influences inclusive growth. Specifically, this study shows that both low and high levels of education yield the same results, with probability values of 0.011 and 0.002, respectively, smaller than the alpha value (α=5%). The consistent results between low and high education levels indicate that they are not a problem in improving household welfare. One's ability to strive and increase creativity is the basis for improving quality of life, such as in entrepreneurship.

The employment status of the household head also influences inclusive growth. This is evident from the probability value of the household head's employment status being 0.071, smaller than the alpha value (α=10%). This explains that household heads with jobs can improve quality of life and household welfare (Abor et al., 2018). On the other hand, the availability of facilities such as electricity can also influence household quality of life. The probability value of ease of accessing electricity being 0.000, smaller than the alpha value (α=1%), provides evidence that electricity can improve household living conditions and welfare. The relationship between ease of accessing electricity and household welfare levels aligns with research conducted by (Gnade et al., 2017; Mensah et al., 2014).

Financial inclusion shows that it has an influence in driving inclusive growth. This result can be seen in bank account ownership with a probability value of 0.000, smaller than the alpha value (α=1%). Bank account ownership benefits society by providing ease of access to credit, understanding savings management, and enabling low-income individuals to receive social assistance through non-cash transfers like the Program Keluarga Harapan (PKH). Bank account ownership, which is a proxy for financial inclusion, can impact community welfare, leading to inclusive growth (Abor et al., 2018; Ouma et al., 2017).

Another variable that serves as a proxy in financial inclusion is ease of access to credit. Ease of access to credit with a probability value of 0.0081, smaller than the alpha value (α=10%), indicates that individuals who can access credit will increase real income or welfare. However, it's investment credit that affects real income or welfare. Credit used as capital in business development becomes long-term investment in increasing real income, thus fostering welfare and inclusive growth. The relationship between ease of access to credit and inclusive growth aligns with research conducted by (Iqbal et al., 2012; Ouma et al., 2017).

Insurance ownership can also have an impact on inclusive growth. This is evident from the probability value of the relationship between insurance and inclusive growth being 0.000, smaller than the alpha value (α=1%). Individuals with insurance can improve their quality of life and welfare. Insurance can serve as a driver for increasing human capital, thereby fostering the creation of inclusive growth. The relationship between insurance and economic growth aligns with research conducted by (Cristea et al., 2014) and (Ul Din et al., 2017).

Policies that needed improvement to enhance financial inclusion in driving inclusive growth included the implementation of programs that enhanced community capabilities through financial education, financial service facilities, and the improvement of financial service and product offerings tailored to the characteristics of rural communities (Kim et al., 2017; Shankar, 2013). Therefore, a program was conducted to promote financial inclusion in rural areas of Indonesia as follows:

1. Strengthening non-cash social assistance programs
   The creation of non-cash social assistance programs was facilitated through the implementation of mandatory bank account ownership for communities in banking institutions, such as the Program Keluarga Harapan. Additionally, the use of subsidy distribution programs for fertilizers with farmer cards that have savings facilities was employed. Other programs included student savings (Kartu Indonesia Pintar), Non-Cash Food Assistance (BPNT), and Family Economic Empowerment (Makaar).
2. Distribution of People's Business Credit (KUR)
   The distribution of People's Business Credit (KUR) was utilized as a program to increase financial inclusion by eliminating unbanked or underbanked individuals through the necessity of account creation.
3. Accelerating the expansion of access to rural farmers/fishermen/entrepreneurs through a food e-commerce application platform.
   The use of a food e-commerce application platform enabled farmers/fishermen/entrepreneurs to access financial products, especially in financing and insurance, thus enhancing competitiveness.
4. Increasing financial literacy in rural areas expanded access to financial services.
   A more comprehensive understanding of financial services enables rural communities to gain easier access to credit, savings, and insurance, thereby creating new economic opportunities and reducing disparities in access to financial services.

Improving financial inclusion in rural areas had an influence on the creation of inclusive growth in rural areas, reducing disparities between urban and rural areas. Research conducted by (Li, 2018) and (Park & Mercado, 2015) explained that financial inclusion played a role in reducing inequality and poverty. The important role of financial inclusion provided impetus for the creation of inclusive growth.

5. Conclusions

The results of this research showed that financial inclusion could drive inclusive growth in rural areas of Indonesia. Additionally, technology played a role as an intermediary in the relationship between financial inclusion and inclusive growth. Strategies for enhancing financial inclusion in Indonesia, especially in rural areas, included innovating financial services to reach rural communities, expanding financial services through synergy with telecommunications companies and non-banking institutions, strengthening the role of cooperatives, especially in savings and credit unions, improving infrastructure to support financial inclusion, enhancing financial literacy, and accelerating the issuance of land ownership certificates for communities. Financial Inclusion Enhancement Programs included social assistance programs, People's Business Credit (KUR) programs, food e-commerce, and systematic land registration.

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