



Research article

Financial inclusion, economic growth, and poverty alleviation: evidence from eastern Indonesia

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ABSTRACT

The need for a good understanding of the relationship between financial inclusion and economic growth has become a significant concern in national development. Both sectors play an essential role in formulating income distribution policies and reducing poverty, evidence from Eastern Indonesia. This paper, therefore, empirically analyzes the contribution of the financial inclusion to economic growth, poverty alleviation and income inequality in Eastern Indonesia. The Toda-Yamamoto VAR bivariate causality model and the dynamic Panel Vector Autoregression (PVAR) were the two approaches used in this research. The effect and relationship of financial inclusion on economic growth, poverty, inequality and other factors were analyzed using PVAR, and Toda-Yamamoto VAR bivariate causality model, respectively. The results of the bivariate causality model indicate a high relationship level between financial inclusion, economic growth, poverty, and income distribution in Eastern Indonesia. The socio-economic growth has a positive impact on the level of financial inclusion, with a negative impact on poverty. Meanwhile, financial inclusion has a positive effect on inequality, which leads to widespread income inequality in Eastern Indonesia.

1. Introduction

The context of the relationship between financial sector development and economic growth has been debated for a long time. Robinson (1952) stated that when company profits grow properly, it encourages the development of financial conditions in the community, therefore, finance does not cause economic growth, rather it response to the demands from the real sector. This is also supported by Lucas (1988) and Miller (1988) which stated that financial markets that contribute to economic growth are propositions used to discuss the empirical evidence. The logic on the basis of good economic growth tends to encourage the development of the financial sector. Meanwhile Schumpeter (1911), Gurley and Shaw (1955), Goldsmith (1969), and McKinnon (1973) reported the importance to explore the rationality on financial sector ability to encourage economic growth, due to its accessible capital boost. Romer (1986) considered it as a form of the financial sector's role in encouraging endogenous growth through the positive impact of capital accumulation, investment and savings. Other factors such as financial technology innovation tend to encourage the development of the economic growth

in future (Romer, 1990; Grossman and Helpman, 1991; and Aghion and Howitt, 1992).

Over time, the position of the financial sector related to economic growth became one of the topics that was widely researched. Many hypotheses were formed to determine the development in accordance with domestic savings, capital accumulation, technological innovation, income growth, and financial determination (Levine et al., 2000; Honohan, 2004; DFID, 2004; Levine, 2004; and Andrianova & Demetriades, 2008). Nevertheless, the development context in the financial sector is expected to lead to "financial inclusion" conditions, which are considered by Kim et al. (2018) as: "...ease of accessibility and availability of the formal financial services, such as bank deposit, credits, insurance, etc., for all participants in an economy."

The relationship between the financial and real sectors on the basis of economic growth, develops into the concept of a "trickle down effect," which means that it encourages growth, and poverty alleviation due to an income distribution (Fan et al., 2000; Ravallion & Datt, 2002; Norton, 2002; Dollar and Kraay, 2002; Jalilian & Kirkpatrick, 2002, 2005; Beck and Levine, 2004; Honohan, 2004; Kpodar, 2006; and Beck et al., 2007).

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The following is an illustration adapted from Claessens and Faijen (2007) (see Figure 1).

The impact caused by the developing financial sector has the ability to poverty alleviation indirectly (Beck et al., 2007; Ahlin and Jiang, 2008; Odhiambo, 2010; Thanvi, 2010; and Donou-Adonsou and Sylwester, 2016). This impact is due to the correlation between the economic and financial variables (Imai and Azam, 2012; Copestake and Williams, 2011; Jeanneney and Kpodar, 2011; Buera et al., 2012; Yusupov, 2012; Donou-Adonsou and Sylwester, 2015; and Boukhatem, 2016).

Based on many interesting previous studies, Demircuc-Kunt and Klapper (2012) analyzed savings, credit, payment methods, and risk management methods using the Global Financial Index (Global Financial) in 148 countries. Their descriptive analysis showed that approximately 50 percent of adults had bank accounts in formal financial institutions spread throughout the world, while the remaining half did not own any. Similarly, 35 percent of those without an account faced high costs of living, distance, documentation/track record of transactions, and other obstacles. This is always distinguished with rational reasons and occurs between countries, due to the inefficiency that inhibits economic growth and the indirect increase in poverty due to unequal financial accessibility.

Furthermore, Uddin et al. (2012) stated that there is a development relationship in finance towards poverty. They carried out this research using data obtained from 1976-2010 in Bangladesh with the Autoregressive Distribution Lag (ARDL) approach. The result showed that the long run development in the banking sector was associated with poverty alleviation. Meanwhile, in the short run there was a two-way causality between the development of the banking sector and poverty reduction. Therefore, the findings recommend policymakers to develop the financial sector in order to gradually poverty alleviation. This research was further strengthened by Uddin et al., in 2014 using growth variables, with data obtained from 1970 - 2011 in Bangladesh through the ARDL approach. The results of the study showed that political leaders in Bangladesh have the ability to poverty alleviation by providing credit for Small and Medium Enterprises (SME), thereby, encouraging employment, and reducing poverty.

Boukhatem (2016) stated that many studies believe that the continuation of the impact of financial inclusion on economic growth is poverty reduction. However, in Boukhatem's research, the assumption of growth is omitted, therefore, the relationship of inclusive finance and poverty reducing is one-direct, with data obtained from 67 low and middle income countries from 1988-2012. The result showed that the finance development directly impacts poverty reduction. This is considered as a phenomenon for increasing money supply or bank credit which contributes to improving welfare for the poor, and increasing financial transactions that lead to opportunities for capital accumulation, income distribution, and fluent consumption.

Another research that considered the financial inclusion, economic growth and poverty alleviation is Donou-Adonsou and Sylwester (2015), using data from 71 developing countries from 2002-2011. Based on the fixed-effects and two-stage least squares in the form of panel data, the study proved that financial inclusion encourages Microfinance Institutions (MFIs). The result showed that the existence of MFIs in developing countries when compared to banks possess more forms of financial inclusion, thereby, encouraging employment and reducing poverty.

Pradhan et al. (2016) stated that the insurance market penetration is considered to be an essential part of financial inclusion and economic growth. The results of their research showed the causality relationship between insurance market penetration (broad money, stock-market capitalization) and economic growth on the member country of Association of South East Asian Nations (ASEAN) Regional Forum (ARF). The results of their research, also showed that both attributes affect each other with cointegration. Therefore, the insurance market and economic growth are considered to possess a bidirectional relationship.

Based on a review of previous literature, the research of financial inclusion and growth conditions acts as a strategy to increase the economic equality related to conditions in Eastern Indonesia (EI), which includes twelve provinces, namely: South Sulawesi, North Sulawesi, Central Sulawesi, Southeast Sulawesi, Gorontalo, West Sulawesi, Maluku, North Maluku, West Nusa Tenggara, East Nusa Tenggara, West Papua, and Papua. This is because when compared with the context of financial sector development, the real growth sector, and poverty phenomena, EI are quite bad compared to the Central and Western parts of Indonesia. However, EI has the competitiveness potential that can be developed in the fields such as agriculture, tourism (Barlow and Hardjono, 1996), energy resources (Agency for Research and Development of Agriculture, 2008) and marine wealth products (Alisjahbana, 2014; Riggs et al., 2018).

The following data showed the trends in deposits and credit (representing financial inclusiveness), and GRDP (representing real sector growth) based on the 2010 constant prices that occurred in Eastern Indonesia from 2010-2016. Figure 2 shows that the deposits, credit, and Gross Regional Domestic Product (GRDP) have a tendency to an upward trend. The aggregate deposit value of the community in Eastern Indonesia, and the credit was initially below Rp.10,000 billion, and increased to Rp.15,000 billion within 7 years (2010–2016). Similarly, the GRDP, which was originally at Rp. 200,000 billion in 2010 increased to Rp. more than 500,000 billion in 2016. This implies that deposits, credit, and GRDP have the same pattern, although the verification needs empirical evidence.

Then, refer to Figure 2 aggregate value of deposits above the credits with an uptrend, and at the same time the amount of GRDP increases consistently, this shows the potential for a developing economy in EI. In

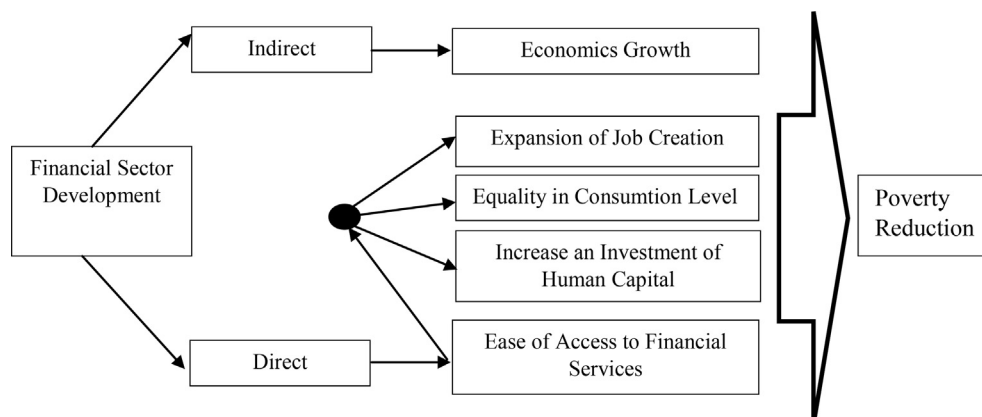


Figure 1. Financial sector development. Source: Claessens and Faijen (2007).

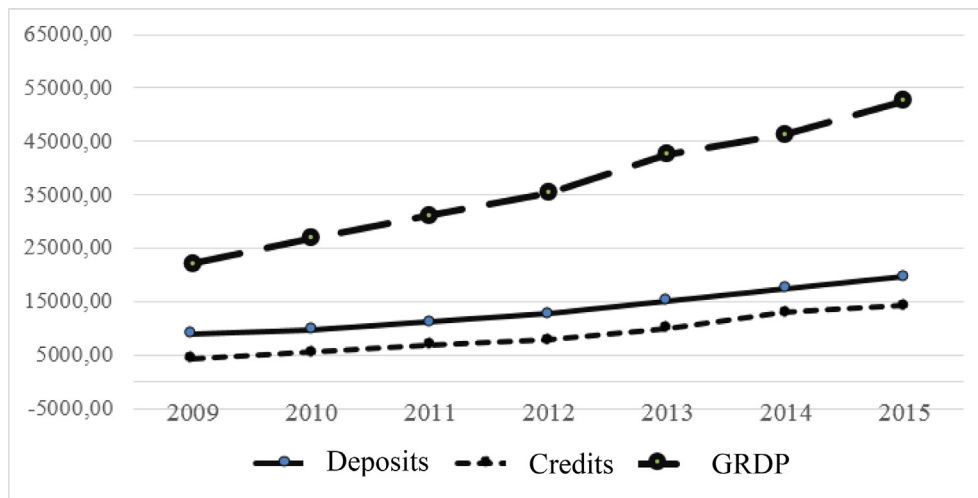


Figure 2. Comparison of deposits, credits and GRDP trends in eastern Indonesia in the period of 2010–2016 (in Billions of Rupiah). Source: Central Bureau of Statistics, 2017 (Processed Data).

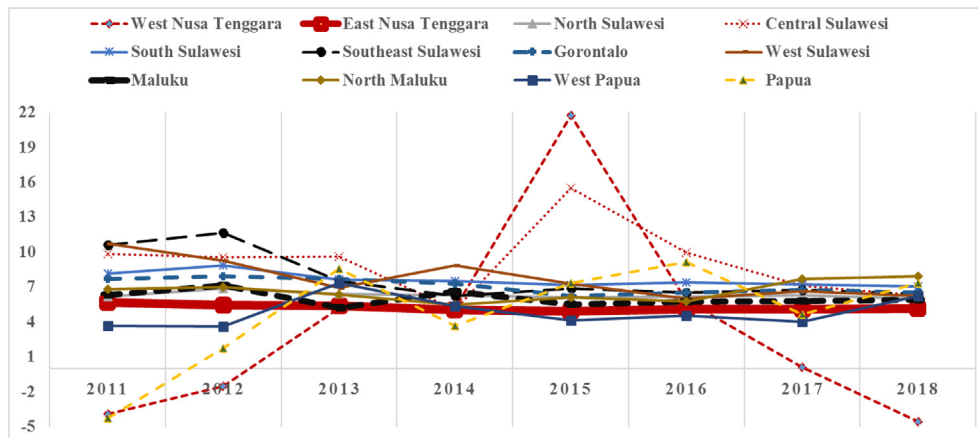


Figure 3. Comparison of Real Growth Trends in Eastern Indonesia based on Province in the period of 2011–2018. Source: Central Bureau of Statistics, 2018 (Processed Data).

Figure 3, it has been divided into several provinces on how the real growth occurred in 2011–2018.

Based on the graph, the provinces in Sulawesi region tend to maintain the growth by 2–11 percent. Meanwhile, high levels of fluctuations occur in other provinces such as West Nusa Tenggara, Centra Sulawesi, and

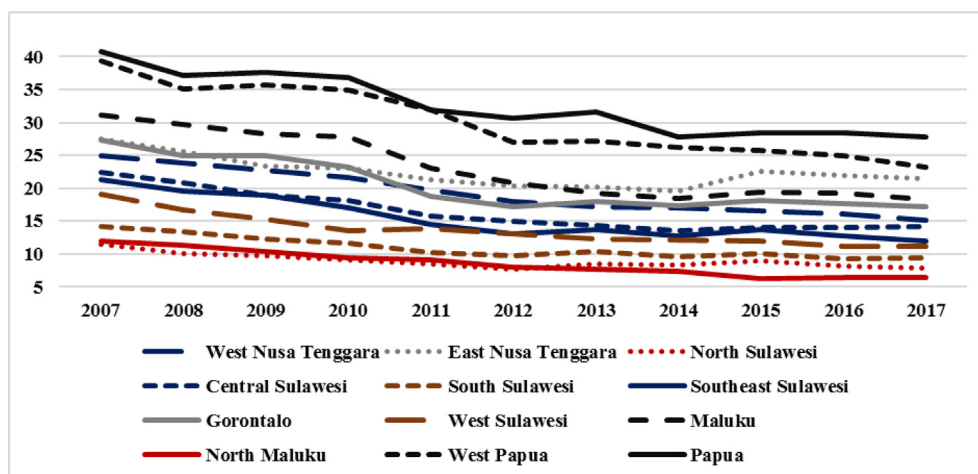


Figure 4. Comparison of Poverty Rate Trends (%) in Eastern Indonesia based on Province in the period of 2009–2015. Source: Central Bureau of Statistics, 2017 (Processed Data).

Papua. For example, in 2011, Papua had a growth of negative growth until 2012, and West Nusa Tenggara reaches growth very high in 2015 and decrease to become negative growth in 2018. This has become an exciting phenomenon to determine how these conditions occur.

Financial inclusion, followed by economic growth in the EI region, can be correlated to its relevance for reducing poverty. However, based on the following data, it looks alarming because the level of poverty is still fairly high. The following figure shows the poverty rate trends in the form of a percentage of the total population in each province (see Figure 4).

The provinces of Papua, and West Papua show that the poverty rate is still very high, with a 30 percentage from 2011–2017. This was subsequently, followed by Maluku, East Nusa Tenggara, Gorontalo, and West Nusa Tenggara which are also well-known as a province with a high poverty rate. However, although the poverty rate in Sulawesi Island is still very high, the percentage tends to be below 20. The Gini index is also used to determine the conditions of poverty in an area, as shown in Figure 5.

Figure 5 shows that all provinces in Eastern Indonesia from 2011–2017 have a Gini index value above 0.28. Based on the assumption that the Gini index needs to approach the value of 0 (null) as a form of low inequality. The fact that it occurs in Eastern Indonesia is actually still at a high inequality level. This condition also had a big impact on the Gini index at the Indonesian national level, with the value in the range of 0.35 till in 2017. Because, the Gini index value in EI, is above the national average (in the same period 0.32), according to the phenomenon shown by the data and this research gap appears with previous studies, this paper aims to determine the ability of the financial inclusion index to increase economic growth, poverty alleviation and reduce inequality in Eastern Indonesia (EI).

2. Theoretical background

Financial development and economic growth have received considerable attention in the recent decade since the emergence of the endogenous growth theory (Le et al., 2019). At the G20 Summit held in Seoul, South Korea, in 2010, financial inclusion was recognized as one of the nine key pillars of the global development agenda (GPFI, 2011). Financial inclusion, i.e. the use of formal financial services, is a feature of financial development which received a great deal of public attention and research interest in the early 2000s, originating from a research findings that attributed poverty reduction to financial exclusion (Babajide et al., 2015; Sharma, 2016; Kim et al., 2018; Makina and Walle, 2019).

Financial inclusion implies that individuals and businesses are granted access to a range of proper financial services and affordable financial products that meet their needs such as transactions, payments, savings, credit and insurance, and with other financial services. Formal financial inclusion starts with having a deposit, at a bank or other financial service providers to making and receiving payments as well as storing or saving money. Moreover, financial inclusion also entangles access to convenient credit from formal financial institutions, in addition to the use of insurance products that allow people to relieve financial risks such as wildfire, earthquake, flood or crop damage, and other force majeure (Kunreuther, 1996; Kuzak et al., 2004; Demircuc-Kunt et al., 2017; Babajide et al., 2015; Seko, 2019). Financial inclusion recognized as a process that marks an advancement in quantity, quality, effectivity and efficiency of intermediary financial services, which helps improve lives, foster opportunities and strengthen economies. Local savings are promoted through financial inclusion, leading to increased productive investments in local businesses (Mlambo and Ncube, 2011; Arun and Kamath, 2015; Babajide et al., 2015).

Review of the background, literature comparison, and data for the research in the Eastern Indonesia region, lead to a form of proof/verification and analysis of the correlation between the development of financial inclusion, on increasing economic growth, and reducing poverty levels. The illustrations are shown in Figure 6 as follows:

Figure 6 shows that financial inclusion is assumed to encourage economic growth, thereby reducing poverty and inequality. The aspect of financial inclusion is reflected in the phenomenon of financial penetration among the public, easy access to credit, and the utilization of financial services carried out by the community in supporting their business or work. Subsequently, the growth aspects are adjusted with various indicators that reflect the economic structure, such as GRDP, unemployment, inflation, investment, infrastructure, population and labor. Meanwhile, poverty and inequality is determined using the percentage of the poor population compared to the total population, and the Gini index to determine the inequality of income distribution. Based on the conception of the three variables, financial inclusion has a more adaptable measurement method when compared to other variables or indicators. It represents the suitability of data in the field and pays attention to the ease of accessing financial services.

The literature on measuring financial inclusion is relatively new but growing rapidly (Honohan, 2008; Sarma, 2012, 2015; Demircuc-Kunt and Klapper, 2012; Sharma, 2016; Kim et al., 2018; Makina and Walle, 2019). Honohan (2008) measured financial inclusion by econometrically estimating the proportion of adult population/households that have a bank account. The study provides a one-time measure of financial

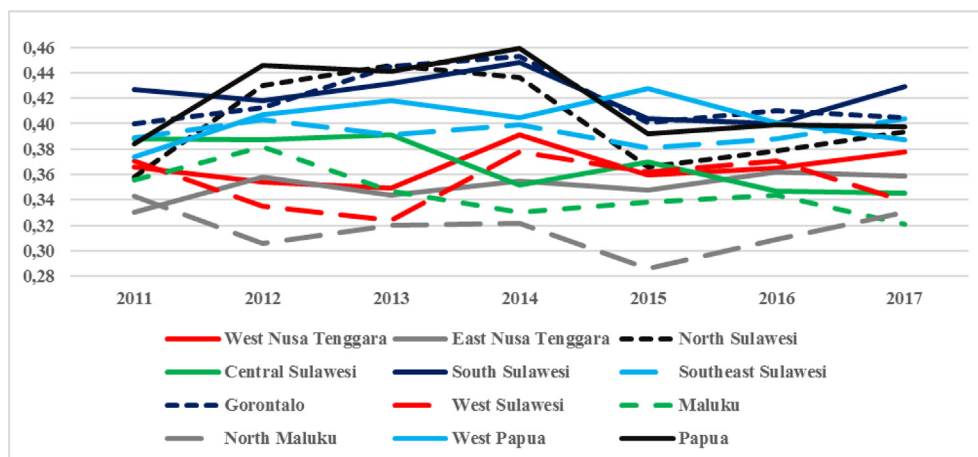


Figure 5. Comparison of Gini Index Trends in Eastern Indonesia based on Province in the period of 2009–2015. Source: Central Bureau of Statistics, 2017 (Processed Data).

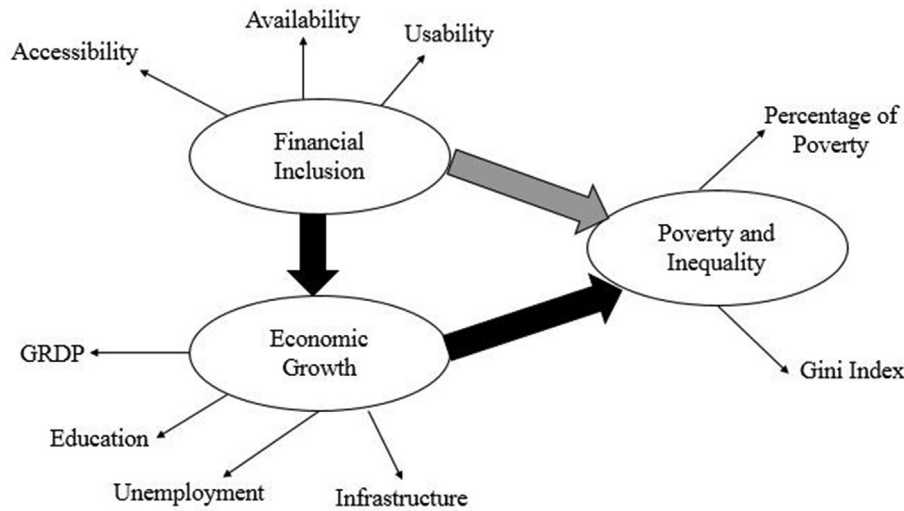


Figure 6. Research framework. Source: Processed Data, 2018.

inclusion across countries for as many as 160 countries. These estimates might effectively quantify one angle of financial inclusion, that is, financial penetration. As a measure of financial inclusion, however, it has many deficiencies since several of great importance aspects of an inclusive financial system are ignored, including affordability, availability, quality, and usage of the financial services that concurrently shape an inclusive financial system (Sarma, 2015; Umar 2017). Thereto, previous studies have shown that solely having bank accounts may not be adequate to bear meaning for financial inclusion if there are some restrictions that impede people from sufficiently using the accounts, such as remoteness of the bank, cost of the transaction, bank branches, and psychological obstacles (Kempson, 2006; Diniz et al., 2012; Karpowicz, 2016). Kempson et al. (2004) defined the notion of “underbanked” or “marginally banked” people as those who do not sufficiently utilize their bank accounts, despite having a bank account, in many countries, a significant portion of the so-called “banked population” was using informal non-bank financial services instead of the banking facilities. These households denote a portion of so-called “underbanked” or “marginally banked” households, which has been assume in the literature as equivalent to being financially excluded households (Sarma, 2012; Le et al., 2019).

Typically, the value of a financial index is determined by 3 dimensional aspects namely (1) d1 accessibility, used to determine how the poor access the formal financial sector in Indonesia, (2) d2 availability, used to measure the number of financial sector services are spread to all communities, (3) d3 usability, used to determine the ability of the poor to use formal financial services. The financial inclusion index measurement carried out by first determining the index for the dimensions with the following equation:

$$d_i = w_i \frac{A_i - m_i}{M_i - m_i}; i = 1, 2, 3 \dots \quad (1)$$

Where: d_i = the i -th dimension (d_1 = penetration, d_2 = availability, d_3 = usability), w_i = weight given to the i -th dimensions, A_i = the i -th dimension actual value, M_i = the maximum value of i -th dimension, m_i = the minimum value of i -th dimension, and Each of these variables is further explained in the following table (see Table 1):

The values for $i = 1, 2$ or 3 is between 0 and w_i . A higher value indicates the success of a region or country in achieving the i -th dimension. The achievement of a country's financial inclusion is shown by point $X = (d_1, d_2, d_3)$. In the context of dimensions, the point $O = (0, 0, 0)$ represents the worst value, while the points $W = (w_1, w_2, w_3)$ where w_1, w_2 , and w_3 are the weights given to each dimension and represents the ideal and high achievement situation. The description of the three

dimensions that form a financial inclusion index is shown in the following model (see Figure 7).

The financial inclusion index is calculated based on the distance between the worst point, and the dimension achieved O-X or X1. It is also the distance between the point of ideal achievement and the dimension (W-X or X2). This is carried out by the following formula:

$$x_1 = \frac{\sqrt{d_1^2 + d_2^2 + d_3^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2}} \quad \text{and} \quad x_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + (w_3 - d_3)^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2}} \quad (2)$$

Equation (X1) is a sign of the Euclidean distance X from the worst point O, normalized with the distance and the ideal point W. This normalization is carried out to obtain the X1 value between 0 and 1. Higher values of X1 indicate increase in financial inclusion. Equation (X2) is the inverse Euclidean distance X from the ideal point W. In this case, the Euclidean distance is shown from the formula in the right of the negative sign (-), then normalized by giving the number 1 in front of the negative sign. Normalization on the distance of the worst point and the ideal achievement point is also carried out to obtain the X2 value between 0 and 1 and the reversal is carried out to acquire an interpretation. A rise in the value of X2 leads to a higher level of financial inclusion. According to a research carried out by Sarma, all dimensions used in the formation of the financial inclusion index are equally important,

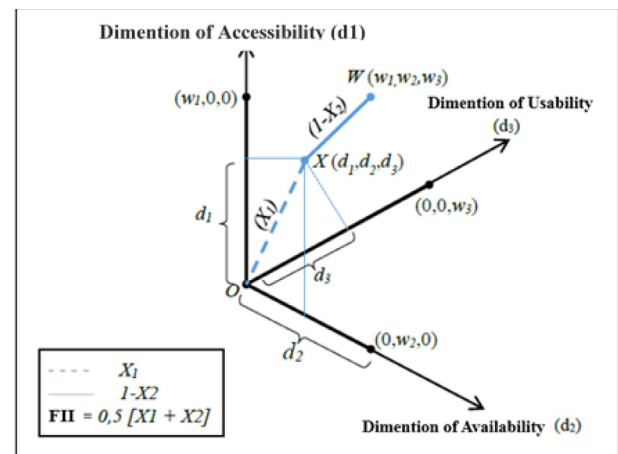


Figure 7. Illustration of the Financial Inclusion Index Calculation. Source: Sarma and Pais (2011) (with adjustments). Note: FII = Financial Inclusion Index.

Table 1. Definition of the financial inclusion index (FII) dimensions.

Dimensions	Variable
d1 accessibility	The ratio of the amount of third party funds to the number of poor adults society
d2 availability	Number of bank offices per 100,000 adult communities
d3 usability	Ratio of total deposits and bank credit toward GRDP.

Source: Modified from [Sarima and Pais \(2011\)](#).

therefore $w_i = 1$ for all i values. In this case, $W = (1, 1, 1)$ therefore, the Financial Inclusion Index (FII) equation becomes:

$$FII = -\frac{1}{2} \left[\frac{\sqrt{d_1^2 + d_2^2 + d_3^2}}{\sqrt{3}} + 1 - \left(\frac{\sqrt{(1-d_1)^2 + (2-d_2)^2 + (3-d_3)^2}}{\sqrt{3}} \right) \right] \quad (3)$$

Previous studies from [Kim et al. \(2018\)](#) finding a relationship between financial inclusion and economic growth in Organization of Islamic Cooperation (OIC) countries by the dynamic panel estimation, but also the panel VAR, IRFs, and panel Granger causality tests. Based on it, they find that financial inclusion has a positive effect on economic growth, and financial inclusion and economic growth have mutual causalities with each other based on the panel Granger causality tests. A similar study from [Makina and Walle \(2019\)](#) focuses on Africa, a continent with the lowest financial inclusion level in the world. Despite long-dated time-series data constraints, the study finds that financial inclusion – as measured by the dimension of access – has a significantly positive effect on economic growth in Africa. The finding reinforces the need for greater efforts to pursue the financial inclusion agenda as one of the most effective tools for realizing inclusive growth. Specifically empirical results from [Sharma \(2016\)](#) suggest that there is a positive association between economic growth and various dimensions of financial inclusion. Specifically, banking penetration, availability of banking services and usage of banking services in terms of deposits. The results obtained favour social banking experiments in India with a deepening of banking institutions. Most of literatures still focus on a sample in countries scale and study on a smaller scale from province perspective in a unique area such as Eastern Indonesia, become a novelty in this research.

3. Research methodology

3.1. Data

Secondary data were used to obtain the objectives of this research. The panel data consist of 12 Provinces in Eastern Indonesia, namely South Sulawesi, North Sulawesi, Central Sulawesi, Southeast Sulawesi, Gorontalo, West Sulawesi, Maluku, North Maluku, West Nusa Tenggara, East Nusa Tenggara, West Papua, and Papua for 7 years (2010–2016). The data were obtained from various sources such as the Central Bureau of Statistics (BPS), Indonesian Bank, the Financial Services Authority (OJK). The data obtained from those institutions were dominant because it was extensive and relatively consistent yearly. The variables of this research consisted of three large blocks namely, (1) a financial inclusion; (2) economic growth, and; (3) poverty and inequality (see [Table 2](#)).

3.2. Estimation technique

This research uses two estimation technique approaches. The first is the bivariate causality model estimation technique of Toda-Yamamoto and second is dynamic panel estimation techniques of Panel Vector Autoregression (PVAR).

3.2.1. Toda-Yamamoto bivariate model

This is defined as a cross-testing technique of two variables in each research. The Toda-Yamamoto causality technique could be use for sta-

tionary data at the flexible levels $I\{0, 1, 2\}$. This is different from the Engel-Granger test causality technique which requires stationary data at a certain level (should be used in level $I\{0\}$)

$$X_{it} = \beta_0 + \sum_{k=1}^K \beta_{ik} X_{it-k} + \sum_{d1=0}^{d1max} \beta_{1K+d1} X_{it-k-d1} + \beta_{1K+d1max+1} X_{jt-n} + \sum_{d2=0}^{d2max} \beta_{1K+d2max+N+d2} X_{jt-N-d2} + \varepsilon_{it} \quad (4)$$

$$X_{jt} = \beta_0 + \sum_{k=1}^K \beta_{jk} X_{jt-k} + \sum_{d1=0}^{d1max} \beta_{1K+d1} X_{it-k-d1} + \beta_{1K+d1max+1} X_{it-n} + \sum_{d2=0}^{d2max} \beta_{1K+d2max+N+d2} X_{it-N-d2} + \varepsilon_{it} \quad (5)$$

Where: k, n is the VAR model time interval, $dmax$ is order of integration/ the time series data stationarity level, X_j is research variable, where $j =$ individual, $t =$ time, β_{10} is a constant, β_{ik} is the coefficient, ε_{it} is white noise disturbance term, where $E(\varepsilon_{it}) = 0$, $(i = 1, 2)$, $E(\varepsilon_{1t}, \varepsilon_{2t}) = 0$.

3.2.2. Panel Vector Autoregression multivariate model

This paper uses the Panel Vector Autoregression (PVAR) estimation technique. However, some recent econometrics applications do not provide this estimation model, therefore, it also utilizes the programmatic applications. [Holtz-Eakin et al. \(1988\)](#) reported the concept of the PVAR estimator used to solve GMM and FGLS. [Benes \(2014\)](#) developed the current model using the Matlab process in 3 countries. [Love and Zicchino \(2006\)](#) and [Rosen and Saunders \(2010\)](#) used STATA programming to estimate PVAR. The estimation results of the two programs have several fundamental differences.

For instance, STATA programming uses a stacked data structure, while [Benes's \(2014\)](#) is unstacked. Besides, the parameter estimator in STATA is GMM, while in Matlab it is FGLS. The results of the PVAR program provide more information, such as the value of the impulse response function (IRF) and the value of Variance Decomposition. In order to understand the general differences in PVAR compared to VAR, this paper explains the data matrix building with the ability to help researchers analyze the impulse response function (IRF) and the value of Variance Decomposition. The fundamental difference between PVAR and VAR lies in the data structure that adopts behavior between individuals as well as dynamic behavior between variables using the estimator concept proposed by [Holtz-Eakin \(1988\)](#). In the case of the VAR panel, a data consists of $i = 1, 2, \dots, N$ individuals where every individual has $t = 1, 2, 3, \dots, T$ period. Furthermore, forming the PVAR equation an econometrics function with a dynamic model of the Generalized Method of Moment (GMM) is as follows:

$$POV_{it} = \alpha_0 + \alpha_1 \ln GRDP_{it} + \alpha_2 IGini_{it} + \alpha_3 \ln Educ_{it} + \alpha_4 \ln Infrac_{it} + \alpha_5 Unemp_{it} + \alpha_6 FindexD1_{it} + \alpha_7 FindexD2_{it} + \alpha_8 FindexD3_{it} + v_i + \varepsilon_i \quad (6)$$

Where: POV: poverty level (percent), $\ln GRDP$: Economic growth, $\ln Educ$: Education budget natural logarithm, $\ln Infrac$: Infrastructure budget changed to natural logarithm, Unemp: Unemployment, $FindexD1$:

number of banking offices divided by the adult population, FindexD2: number of deposit accounts in the bank divided by the adult population, FindexD3: proportion of credit and deposits towards GRDP, α is coefficient, i is the number of provinces in Eastern Indonesia (12 provinces), t is the research period in 2010–2016, v_t is the panel level effect, ε_{it} is white noise disturbance term, and $E(\varepsilon_{it}) = 0$, ($i = 1, 2$), $E(\varepsilon_{1t}, \varepsilon_{2t}) = 0$.

The dynamic panel estimation presents the effects of the financial inclusion key factors for economic growth, the examination for dynamic causality, the direction of influence, and the period which shows adequate information on the relationship of variables. The best-known method for exploring dynamic variable relationships is the autoregressive vector (VAR), and this is only applicable to time series data. Autoregressive vector methodology uses a modified VAR methodology for panel data. According to Love and Zicchino (2006), the autoregressive vector method combines VAR to treat all variables as endogenous and control the panel heterogeneity. Therefore, based on the GMM panel equation model (5) the variables with statistical significance in each Arellano-Bond estimation model are obtained. In this research, the GMM model was transformed (Kim et al., 2018) as follows:

$$Y_{it} = C + \sum_{s=1}^m A_s Y_{i,t-s} + \eta_i + d_{c,t} + e_t \quad (7)$$

Where Y_{it} consists of four vector models, for model 1 (POV, LnGRDP, LnEduc, LnInfrasc, Unemp, FindexD1, FindexD2, FindexD3), for model 2 (IGini, LnGRDP, LnEduc, LnInfrasc, Unemp, FindexD1, FindexD2, FindexD3), for model 3 (Unemp, LnGRDP, LnEduc, LnInfrasc, FindexD1, FindexD2, FindexD3), and for model 4 (LnGRDP, LnEduc, LnInfrasc, Unemp, FindexD1, FindexD2, FindexD3). Where: i is the number of provinces on the Eastern Indonesia region, t is the research period from 2010–2016, with s determined based on the Arellano-Bond test for serial

correlations in all 12 provinces. v_t is the panel level effect and ε_{it} is the white noise disturbance term, where $E(\varepsilon_{it}) = 0$, ($i = 1, 2$), $E(\varepsilon_{1t}, \varepsilon_{2t}) = 0$.

4. Results and discussions

Figure 8 shows the financial inclusion index of Eastern Indonesia from 2010–2016. In general, it has increased over the years, therefore, more people acquired services in the financial sector. However, this research aims to determine the ability of the financial inclusion index to increase economic growth, poverty alleviation and inequality.

Figure 8 shows the progress of financial inclusion index in the EI from 2010–2016. In general, this information indicates if people in the EI easier to access financial services. Based on these conditions, this research will be going deep to prove the correlation between financial inclusion, economic growth, poverty alleviation, and inequality.

4.1. Unit root testing

The results of the panel unit root test are adjusted to the PVAR model used. The variables involved are POV, IGini, LnGRDP, Unemp with exogenous variables of FindexD1, FindexD2, FindexD3, LnEduc, LnInfrasc. These variable apply to all research groups in models 1, 2, 3, and 4. In the inclusive financial variables, IGini, LnEduc, and Unemp show all stationary data at the rejected H_0 , which is the stationary condition. Meanwhile the POV, LnGRDP, LnInfrasc variables show that the stationary data is at the first derivative level (1st Difference). According to Ekananda (2014), unit root testing shows that there is interconnected stationarity in the data in certain groups (see Table 3).

Panel data stationarity test results showed that there is a portion of data in this group that shows the existence of long-term mutual

Table 2. Variables.

Block	Dimension	Variable indicator	Symbol	Source
Financial Inclusion	Dimensions (1) Accessibility	Number of banking offices divided by the adult population	FindexD1	OJK and BPS
	Dimension (2) Availability	Number of deposit accounts in the bank divided by the adult population	FindexD2	OJK and BPS
	Dimensions (3) Usability	Proportion of credit and deposits towards GRDP	FindexD3	OJK and BPS
Macroeconomy		Economic growth (percent)	LnGRDP	BPS
		Education budget (billion rupiahs) transform to logarithm natural	LnEduc	
		Infrastructure budget (billion rupiahs) transform to logarithm natural	LnInfrasc	
		Unemployment (percent)	Unemp	
Poverty & Inequality		Poverty level (percent)	POV	
		Gini Index (index)	IGini	

Source: Processed Data, 2018

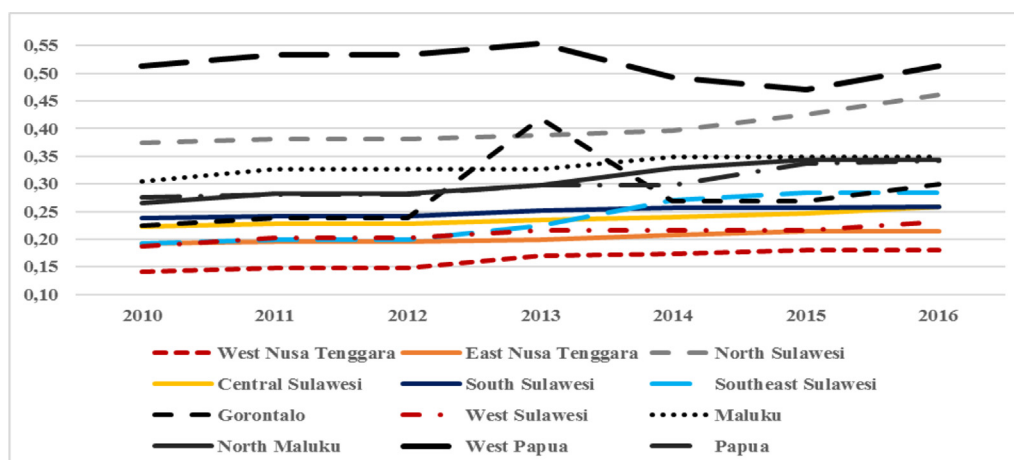


Figure 8. Comparison of Financial Inclusion Index Trends in Eastern Indonesia Based on the Province in the period of 2010–2016. Source: Processed Data, 2018.

relationships (co-movement) and the presence of a linear dependency relationship (co-integration).

4.2. The results of optimum lag and Toda-Yamamoto bivariate estimation

The causality test carried out in this research is the Toda-Yamamoto method which is preceded by the formation of a VAR with a new optimum time lag obtained from Eqs. (4) and (5) denoted by k . This time lag has a maximum data series integration order in the model denoted with $dmax$. Therefore, the optimum time interval for this new VAR model is $p = k + dmax$. Assuming the result shows that the stationary time series data in the first derivative ($dmax = 1$) and the optimum time interval of the VAR (k) model is 1, then the time interval for Toda-Yamamoto is 2 ($p = k + dmax = 1 + 1 = 2$). The VAR at this stage is carried out in the bivariate and multivariate models. After a stationarity test is performed that showed the order of the time series data is integrated, a VAR system is formed to obtain the optimum lag (k) and then it will be used in the Toda Yamamoto causality test method. Furthermore, forming the optimum lag length of the VAR system, various information criteria are used, such as AIC, SIC and HQC. The results of the optimum VAR bivariate and multivariate models based on the optimum lag length criteria is in accordance with the AIC, SIC and HQC information are shown in Table 4.

Afterwards, the estimated results of the Toda-Yamamoto bivariate causality model are shown in Table 5. In model 1 there is a causal relationship between poverty levels and infrastructure. This shows that the two variables affect each other, while in models 2, 3 and 4 only a relationship occurs (one way) (see Tables 6 and 7).

The results of the bivariate model showed that poverty rates are closely related to economic growth, education, infrastructure and financial inclusion. This means that the poverty level of an area is highly dependent on macroeconomic variables and the financial sector. Then, there is a close relationship with poverty alleviation in the financial sector. The level of inequality has a close relationship with economic growth, infrastructure, and financial inclusion concerning to the dimensions of service availability, and penetration. Meanwhile, economic growth has a close relationship with education, infrastructure and financial inclusion. The results of the bivariate causality test showed that the variables in the block sector of finance, economic growth, poverty and inequality correlated with one another.

4.3. PVAR multivariate estimation results

Subsequent estimates analyze the model simultaneously into multivariate PVAR analysis. This analysis is shown in models 1, 2, 3, and 4 in order to determine the impact of each variable simultaneously.

In estimating model 1, the financial inclusion index variables have a significant effect on poverty levels. The coefficient of the financial

inclusion index variables are negative, which means an increase in its index leads to an impact on reducing the level of poverty. This is in line with the research conducted by Beck et al. (2007), Ahlin and Jiang (2008), Odhiambo (2010), and Thanvi (2010), which considered the impact caused by the developing financial sector in reducing poverty. Furthermore, in model 1, the impact of economic variables, such as growth, and education is negative and significant, which means that an increase in economic growth and education tends to poverty alleviation. This finding is in line with Boukhatem (2016) research which stated that financial inclusion on economic growth leads to poverty reduction. However, in Boukhatem's research, the assumption of growth is omitted, therefore, the relationship of inclusive finance and poverty is one-direct. The results of this study indicate that both the financial inclusion index and economic growth are mutually supportive in poverty alleviation. In this case, economic growth could be the most powerful instrument for reducing poverty and improving the quality of life in developing countries, including EI. In the other hand, a growth can generate virtuous circles of opportunity, prosperity, and happiness. Strong growth can spur employment opportunities to improve incentives for parents to do investment in their children's education by dispatching them to school. This may lead to the emergence of a strong and growing group of entrepreneurs. Meanwhile, to support the existence and development of entrepreneurs, an inclusive financial condition must be present as one of the success determinants of sustainable and inclusive growth.

Model 2 estimates that the financial index variables have a significant negative effect on inequality. This means that an increase in financial inclusion reduces inequality. In addition, the relationship of the financial and real sector developed into the concept of "trickle down effect," which means that its development encourages economic growth and poverty alleviation. Model 2 and FindexD3 has a positive effect. This means that the usability dimension in the financial index increases, and it tends to have an impact on increasing inequality. This is slightly different from the existing research hypotheses in determining the previous financial inclusion dimension. This finding is unique because an increase in financial inclusion encourages more widespread inequality. The financial inclusion index on the usability dimension comes from the indicator of the proportion of deposits and credits towards GRDP. An increase in the proportion of deposits and credit towards the GRDP leads to a rise in community inequality, the funds (deposits) are mostly from high-income communities, which are used by people with high incomes too. Therefore, the circulation of funds in the financial sector is only for people with strong capital capabilities. Also, these findings provide a signal that the flow of credit funds is not used in community economic development, and in increasing Micro, Small & Medium Enterprises (MSME). A continuous increase in this activity leads to a widespread inequality. From a different perspective, it is seen that the influence of the extensive collateral and the difficult procedures make people reluctant to take

Table 3. Unit root test.

Variables	ADF	P-value	Information
In Level			
FindexD1	-3.3589	0.0153*	Stationary
FindexD2	-3.3932	0.0142*	Stationary
FindexD3	-3.2918	0.0184*	Stationary
IGini	-3.2918	0.0184*	Stationary
LnEduc	-3.1640	0.0261*	Stationary
Unemp	-3.7319	0.0052**	Stationary
In 1st Difference			
LnInfrasc	-13.8231	0.0001**	Stationary
LnGRDP	-9.2915	0.0000**	Stationary
POV	-3.7319	0.0052**	Stationary

Note: ***) significance level 1%; **) significance level 5%; *) significance level 10%.

Source: Processed Data, 2018

Table 4. Resume of lag optimum VAR test.

Variables	Optimum Lag (k)	Order Maximum Integration (dmax)	Lag Toda-Yamamoto (p = k + dmax)
POV	1	1	2
Igini	1	0	1
LnGRDP	1	1	2
LnEduc	1	0	1
Unemp	1	0	1
LnInfrac	1	1	2
FindexD1	1	0	1
FindexD2	1	0	1
FindexD2	1	0	1

Source: Processed Data, 2018

credit in banks. Therefore, it is necessary to understand some of these cases, in the banking sector, with many product innovations based on information technology systems and internet at all levels of society. However, it is essential to note the number of banking product innovations that are accepted and useful to all levels of society, to prevent it from being available to the upper classes with strong capital and easy access.

The estimation results of model 3 on the financial inclusion index variables on the first and second dimensions have a significant positive impact on economic growth. This means that an increase in the financial inclusion index leads to an upward trend. This finding reinforces the research results of Pradhan et al. (2016) using insurance market penetration which was considered an essential part of financial inclusion and economic growth. The results showed that an increase in the penetration of the financial sector significantly reduce economic growth. However, it is slightly different from the results of the financial inclusion index on the third dimension, which is significantly negative. This means that the increase in credit and deposits is less productive in increasing economic growth due to the amount of credit circulation used for expenditure in the real sector. Therefore, the flow of funds affects the monetary sector, such as capital markets, bonds, Islamic bonds (*Sukuk*), etc. This is similar to the findings in model 2, which stated that the flow of funds in the financial sector is dominated by people with high income.

The estimation results in model 4 show the impact of financial inclusion is not significant on unemployment. However, it is significant in the first dimension. This means that a rise in the amount of financial accessibility actually leads to an increase in the unemployment rate. This finding is a bit contradictory to previous theories and research that has a negative impact (Acemoglu, 2001), Belke and Fehn, (2000), Belke et al. (2005); Garrido et al. (2012) These results indicate in eastern Indonesia that the increase in the number of bank offices was not accompanied by a decrease in unemployment. In the EI there are relatively many companies that are labor-intensive than capital intensive companies. However, it shows that this phenomenon is interesting to be investigated more deeply, to determine if unemployment is highly contributed from the financial and banking sectors.

4.4. Analysis of Impulse Response Function (IRF) in PVAR

Impulse Response Function (IRF) is a VAR tool used to predict the simultaneous movement of data. Furthermore, IRF is used to track the current and future responses of each variable due to the shock of an impulse. The following are visualization results (graphs) of dynamic responses from several endogenous variables of poverty (POV), inequality (IGini), economic growth (LnGRDP), and unemployment (Unemp) due to impulse (shock) from several macroeconomic variables, such as economic growth (LnGRDP) and education (LnEduc), infrastructure

(LnInfrac), unemployment (Unemp) and financial sector variables, such as financial inclusion index (dimension of accessibility (FindexD1), availability (FindexD2), usability (FindexD3).

When the POV impulse response function (IRF) moves towards the impulse of other variables, the increase in economic growth at the beginning of the period tends to respond positively to the poverty level. Furthermore, it slowly decreases towards the negative in the second period, therefore, the economic growth triggered poverty at the beginning, which drastically decreased in the 5th period and started stabilizing. In the education variable (LnEduc), the effect in the initial period responded negatively to poverty levels, therefore, education has the ability to reduce poverty by -4.5%.

Figure 9 shows an increase in the financial inclusion index variables, which responded positively to poverty levels in the initial period. This means an increase in the financial inclusion index, decreases the poverty levels. Expands poor people's access to financial services, increasing their economic opportunities and improving their lives. However, financial inclusion only helps to poverty alleviation when overall economic conditions empower people to use access to finance for productive purposes such as investing in children's education or expanding a business Micro, Small & Medium Enterprises (MSME).

Figure 10 shows the impulse response function of inequality (IGini) to the shocks of other variables. Changes in the initial period in the financial inclusion index responded negatively by the inequality variable. Although the response was very sharp at the beginning of the observation period, it declined and stabilized in the next period. The financial inclusion index has been reflected by the first and second dimensions, while the third, experienced different responses towards the positive direction. This means that changes in the usability dimensions at the beginning of the period responded positively by inequality. Therefore, the greater on outgoing funds towards the proportion of regional income, will push wider inequality. The case in the IRF results justifies the findings of the previous PVAR estimation regression results in model 2.

Figure 11 shows an impulse response function of economic growth to the impulse of other variables. Changes in the first and third dimensions positively responded to the economic growth in the early periods due to an increase in the financial inclusion index. The response starts to decline and stabilize in the next several periods with the results of IRF economic growth in line with the IRF's response which is always positive. This is different as shown by the response to economic growth caused by the shock of the second dimension of financial inclusion which moves negatively. Therefore, an increase in deposit accounts in the financial sector leads to a decrease in economic growth. However, in a long period, the response tends to move positively due to the large number of penetration by the banking sector, which actually creates economic costs and unfair financial market competition.

Furthermore, the results of the impulse response function on the unemployment variable are shown in Figure 12. Unemployment is the variable with the most stable response to changes in the financial inclusion index compared to the previous three Figure/graph models. At the beginning of the period, the observation of the unemployment

response moves positively and decreases. This means that the shock or changes in the financial inclusion index are less responded by the unemployment rate. This is most likely because the financial sector is not a real sector (labor intensive), so the impact will be slower.

Table 5. Causality Toda-Yamamoto estimation result.

Model	Variabel	Total of Obs	F-Statistic	Prob.
Model 1	IGINI does not Causality Wald POV	84	0.0027	0.9586
	POV does not Causality Wald IGINI	0.5273	0.4698	
	LNGRDP does not Causality Wald POV	84	0.7077	0.4027
	POV does not Causality Wald LNGRDP	6.2152	0.014**	
	LNINFRAS does not Causality Wald POV	84	13.5110	0.0004***
	POV does not Causality Wald LNINFRAS	24.9693	3.E-06***	
	LNEDUC does not Causality Wald POV	84	59.7045	3.E-11***
	POV does not Causality Wald LNEDUC	0.6673	0.4164	
	FINDEXD1 does not Causality Wald POV	84	2.0058	0.1606
	POV does not Causality Wald FINDEXD1	5.5970	0.0204**	
	FINDEXD2 does not Causality Wald POV	84	0.5567	0.4578
	POV does not Causality Wald FINDEXD2	97.4591	2.E-15***	
	FINDEXD3 does not Causality Wald POV	84	0.0458	0.8310
	POV does not Causality Wald FINDEXD3	4.3642	0.0399**	
	UNEMPLOY does not Causality Wald POV	84	0.2705	0.6044
	POV does not Causality Wald UNEMPLOY	4.4404	0.0382**	
Model 2	LNGRDP does not Causality Wald IGINI	84	2.9511	0.0897*
	IGINI does not Causality Wald LNGRDP	1.2829	0.2607	
	LNINFRAS does not Causality Wald IGINI	84	0.4334	0.5122
	IGINI does not Causality Wald LNINFRAS	0.6252	0.4314	
	LNEDUC does not Causality Wald IGINI	84	0.6603	0.4188
	IGINI does not Causality Wald LNEDUC	1.2574	0.2655	
	FINDEXD1 does not Causality Wald IGINI	84	2.0440	0.1567
	IGINI does not Causality Wald FINDEXD1	0.1613	0.6890	
	FINDEXD2 does not Causality Wald IGINI	84	0.0175	0.8948
	IGINI does not Causality Wald FINDEXD2	7.8871	0.0063***	
	FINDEXD3 does not Causality Wald IGINI	84	0.1818	0.6710
	IGINI does not Causality Wald FINDEXD3	0.0245	0.8760	
	UNEMPLOY does not Causality Wald IGINI	84	3.0985	0.0822*
	IGINI does not Causality Wald UNEMPLOY	2.0135	0.1598	
Model 3	LNINFRAS does not Causality Wald LNGRDP	84	4.3322	0.0406**
	LNGRDP does not Causality Wald LNINFRAS	1.3588	0.2472	
	LNEDUC does not Causality Wald LNGRDP	84	12.9308	0.0006***
	LNGRDP does not Causality Wald LNEDUC	0.7476	0.3898	
	FINDEXD1 does not Causality Wald LNGRDP	84	0.0388	0.8442
	LNGRDP does not Causality Wald FINDEXD1	0.0033	0.9541	
	FINDEXD2 does not Causality Wald LNGRDP	84	0.4900	0.4859
	LNGRDP does not Causality Wald FINDEXD2	8.0546	0.0057***	
	FINDEXD3 does not Causality Wald LNGRDP	84	0.3276	0.5686
	LNGRDP does not Causality Wald FINDEXD3	1.0147	0.3168	
Model 4	UNEMPLOY does not Causality Wald LNGRDP	84	0.1478	0.7016
	LNGRDP does not Causality Wald UNEMPLOY	0.1870	0.6665	
	UNEMPLOY does not Causality Wald LNINFRAS	84	0.2122	0.6463
	LNINFRAS does not Causality Wald UNEMPLOY	13.1643	0.0005***	
	UNEMPLOY does not Causality Wald LNEDUC	83	0.0008	0.9766
	LNEDUC does not Causality Wald UNEMPLOY	15.689	0.0002***	
	UNEMPLOY does not Causality Wald FINDEXD1	84	0.2006	0.6554
	FINDEXD1 does not Causality Wald UNEMPLOY	0.0571	0.8116	
	UNEMPLOY does not Causality Wald FINDEXD2	84	3.6193	0.0607*
	FINDEXD2 does not Causality Wald UNEMPLOY	0.0441	0.8342	
	UNEMPLOY does not Causality Wald FINDEXD3	84	0.0353	0.8513
	FINDEXD3 does not Causality Wald UNEMPLOY	0.0378	0.8462	

Note: ***) significance level 1%; **) significance level 5%; *) significance level 10%.

Source: Processed Data, 2018

Table 6. Correlation bivariate model.

Correlation Probability	POV	IGINI	LN GRDP	UNEMP	LN EDUC	LN INFRAS	FINDEXD1	FINDEXD2	FINDEXD3
POV	1.0000								
IGINI	0.4085 0.0022***	1.0000							
LN GRDP	0.3666 0.0064***	0.5994 0.0000***	1.0000						
UNEMP	-0.01984 0.8867	0.1022 0.4619	0.0167 0.9041	1.0000					
LN EDUC	-0.2560 0.0617*	0.0936 0.5007	0.3043 0.0253**	-0.1053 0.4484	1.0000				
LN INFRAS	0.5051 0.0001***	0.3941 0.0032***	0.6311 0.0000***	-0.1014 0.4656	0.2521 0.0659	1.0000			
FINDEXD1	0.4000 0.0027***	0.3626 0.0070***	0.6373 0.0000***	0.4431 0.0008***	0.0778 0.5759	0.2278 0.0975*	1.0000		
FINDEXD2	0.5500 0.0000***	0.4896 0.0002***	0.7562 0.0000***	0.2465 0.0723*	0.2526 0.0653*	0.6402 0.0000***	0.7466 0.0000***	1.0000	
FINDEXD3	-0.1189 0.0918*	-0.0910 0.5124	-0.2961 0.0297**	-0.0568 0.6833	0.3774 0.0049***	0.1791 0.1949	-0.3919 0.0034***	-0.0681 0.6245	1.0000

Note: ***) significance level 1%; **) significance level 5%; *) significance level 10%.

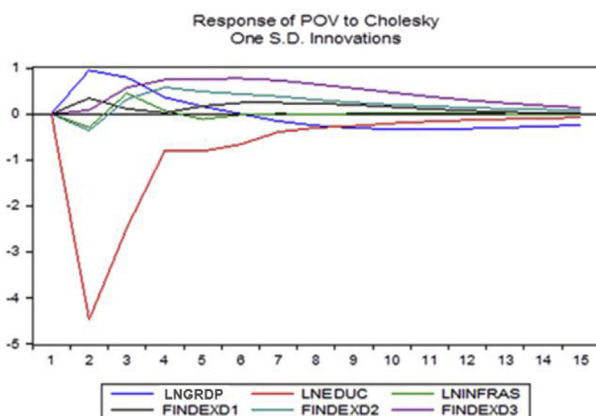
Source: Processed Data, 2018

Table 7. Multivariate PVAR estimation result.

Variabel	Model 1 Koefisien (Probabilitas)	Model 2	Model 3	Model 4
POV		0.0007 (0.3617)	-0.0142 (0.0300)**	-0.1345 (0.0095)***
Igini	4.2652 (0.0320)**		3.290 (0.0003)***	11.6062 (0.1307)
LnGRDP	-7.0509 (0.0300)**	0.0744 (0.0003)***		-2.515 (0.0312)**
LnEduc	-12.8077 (0.0013)***	-0.0430 (0.0031)***	0.2897 (0.1200)	-2.510 (0.0911)*
LnInfrasc	4.7985 (0.0091)***	-0.0042 (0.0563)*	0.3102 (0.0001)***	0.3735 (0.5856)
Unemp	-1.0431 (0.0095)***	0.0031 (0.0018)***	-0.0393 (0.0312)*	
FindexD1	-25.9488 (0.0611)*	-0.0638 (0.0436)*	1.402 (0.0230)**	15.6968 (0.0010)***
FindexD2	-5.3199 (0.0585)*	-0.0025 (0.0911)*	0.2162 (0.0883)*	0.9909 (0.3336)
FindexD3	-0.0001 (0.0962)*	0.0004 (0.0001)***	-0.0005 (0.0005)***	0.0009 (0.4250)
Intersept	64.8511 (0.2295)	0.1594 (0.4784)	-2.316 (0.3410)	37.4592 (0.0502)*
R ²	0.6324	0.7708	0.8427	0.4403
Prob (F-statistic)	(0.0000)***	(0.0000)***	(0.0000)***	(0.0005)***

Note: ***) significance level 1%; **) significance level 5%; *) significance level 10%.

Source: Processed Data, 2018

**Figure 9.** Poverty response towards other variables (Model 1).

5. Conclusions and recommendations

Over the past few decades, financial inclusion has played an important impact in the financial sector. However, only a few research have specialized in comparing it to economic growth. In that context, the purpose of this research was to analyze the impact of financial inclusion on economic growth, while analyzing the policies and economic development to reduce poverty and inequality. Therefore, this study explores the impact of financial inclusion on economic growth, poverty and inequality in 12 provinces in Eastern Indonesia (EI).

In model 1, the regression results showed that the higher the financial inclusion, the lower the poverty level. Therefore, the financial sector is able to contribute reducing poverty by providing capital. Besides, the IRF results from the VAR analysis panel showed that the initial period was positive, while the subsequent was negative and stable. In model 2, the regression results showed that financial inclusion has a negative impact on inequality. Therefore, the income distribution is more evenly distributed. However, it is different in the third dimension, with a positive response. In model 3, the panel dynamic regression results showed

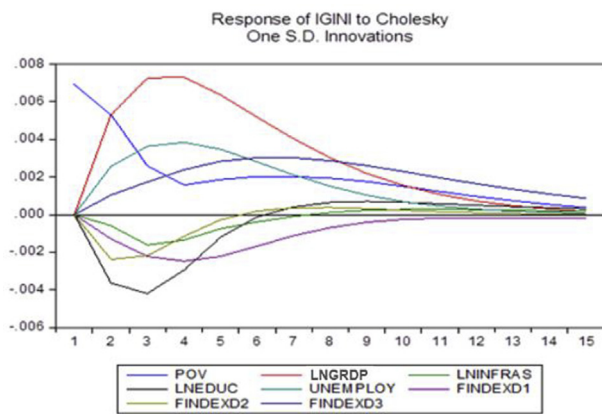


Figure 10. Inequality responses towards other variables (Model 2).

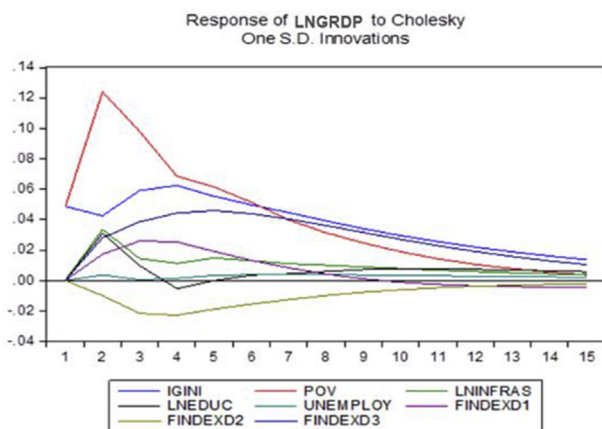


Figure 11. Economic growth responses towards other variables (Model 3).

that financial inclusion has a significant positive impact on economic growth in Eastern Indonesia, as shown from the VAR analysis. In model 4, the panel dynamic regression results showed that the financial inclusion of the second and third dimensions have no significant impact on unemployment. Meanwhile, the first dimension, which comprises financial availability has a positive impact on the unemployment variable. The more services in the financial sector or accessibility, the higher the unemployment rate. This is because unemployment may increase due to a shift in the financial industry, from labor to capital intensive.

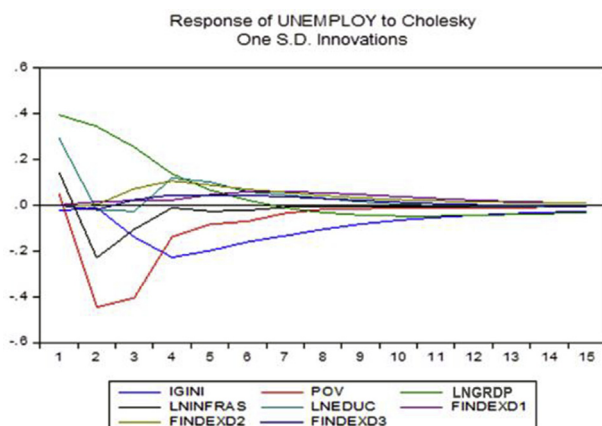


Figure 12. Unemployment responses towards other variables (Model 4).

In conclusion, this research provides empirical evidence of a positive relationship between financial inclusion and economic growth, with a negative relationship on inequality and poverty. The several suggestions for increasing research contributions in the area of financial inclusion are as follows: Firstly, although this research found a positive relationship between financial inclusion and economic growth in Eastern Indonesia, and found a negative relationship with poverty and inequality, there are still large differences in the level of financial inclusion among the regions. However, this is due to the different socio-cultural levels, illiteracy rates, regional interest, gender inequality, income, government policies, etc. Therefore, non-economic factors need to be considered in increasing financial inclusion for more inclusive economic growth.

Secondly, the financial inclusion index was calculated by using several financial inclusion measures. The dimensions of financial inclusion are interrelated and cause several problems, such as multicollinearity when using all dimensions to measure financial inclusion in one analysis model. Conversely, calculating the financial inclusion index with multifactorial finance is a more appropriate step to measure the level of pertinence. In addition, several models to test the impact of financial inclusion with various other factors involve macro, and micro variables such as household consumption levels, and savings in the banking sector. In addition, further research is also recommended to consider measurement indicators or other parameters such as affordability, timeliness and quality of banking services with new technological advances such as mobile and internet banking.

Thirdly, in measuring financial inclusion in the service availability dimension, this research only uses data on the number of commercial banks in 12 provinces in Eastern Indonesia due to the limited data obtained. In subsequent research, it is recommended to use more complete banking data which includes commercial, rural, and Islamic commercial banks, as well as and Islamic business, bonds, stocks etc.

Declarations

Author contribution statement

A. Erlando: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

F.D. Riyanto: Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

S. Masakazu: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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