

## Conference Paper

# Does Financial Technology Affect Income Inequality in Indonesia?

**Birgitta Dian Saraswati, Ghozali Maski, David Kalug, and Rachmad Kresna Sakti**

Faculty of Economics and Business, Brawijaya University

## Abstract

Economic growth is insufficient to be a sole indicator of the population's welfare. Specifically, high economic growth does not necessarily imply that the population is generally prosperous. Equal income distribution is crucial to achieving sustainable economic growth. Since 2000, the Gini index as a measure of income inequality in Indonesia showed an increasing trend. On the other side, financial technology 3.0 started to develop. This paper seeks to investigate the impact of fintech 3.0 development on income inequality in Indonesia and to identify the determining factors of income inequality in Indonesia. By using the partial adjustment model (PAM) with the observation period of 1990-2017, the study empirically shows that fintech 3.0 development that started in 2000 had a significant impact on income inequality in Indonesia. Besides, the investment variable also positively affect income inequality in Indonesia. Thus, the findings indicate that the Indonesian population did not equally utilize fintech development.

**Keywords:** income inequality, financial technology, Indonesia, partial adjustment model

Corresponding Author:

Birgitta Dian Saraswati

birgitta.saraswati@staff.uksw.edu

Received: 27 December 2019

Accepted: 15 April 2020

Published: 23 April 2020

Publishing services provided by  
Knowledge E

© Birgitta Dian Saraswati

et al. This article is distributed  
under the terms of the [Creative](#)

[Commons Attribution License](#),

which permits unrestricted use  
and redistribution provided that  
the original author and source  
are credited.

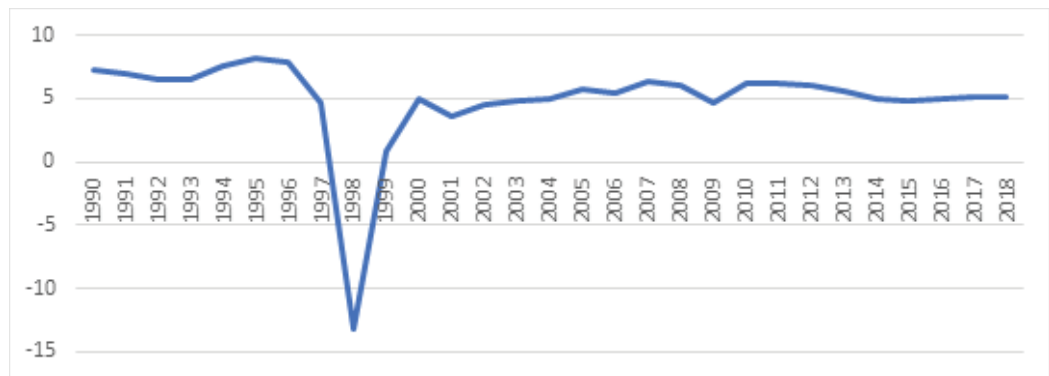
Selection and Peer-review under  
the responsibility of the 3rd  
IRCEB Conference Committee.

## 1. Introduction

Economic growth is a macroeconomic variable that becomes macroeconomic policy-makers' main objective because economic growth is an indicator of the population's welfare. As an emerging-market country, Indonesia experienced a relatively high economic growth (about 5.5 percent) in the 2004-2018 period.

However, Indonesia ever experienced negative economic growth of -13.12 percent in 1998 due to economic crisis that started in the second quarter of 1997. Thus, the 1997 crisis had a significant effect on the Indonesian economy. However, Indonesia started to undergo stable economic condition since 2004 until now. Even the 2008 economic crisis in the US and Europe did not affect significantly to Indonesia and was only a temporary shock.

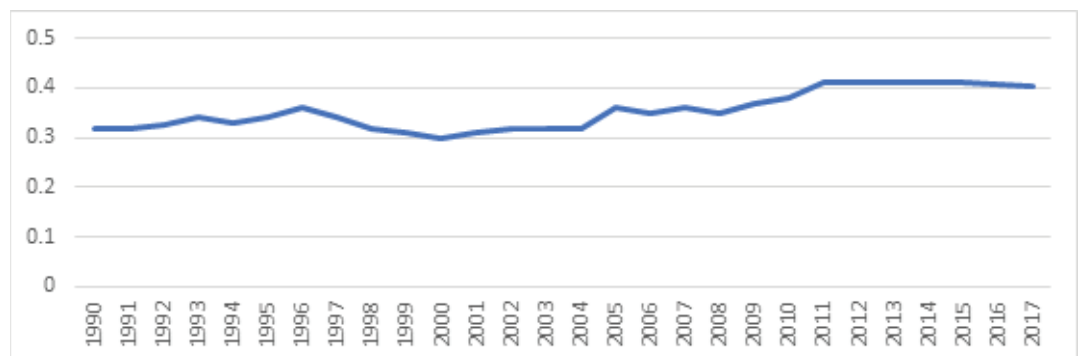
 OPEN ACCESS



**Figure 1:** The Indonesian Economic Growth 1990-2018 (Source: The World Bank [1] (processed)).

Despite its importance, economic growth is insufficient to be an indicator of the population welfare. In particular, high economic growth does not necessarily imply that society in general is wealthy. If the economic growth is mainly supported by the high-income group in the economy, then only certain groups in the population that enjoy the wealth. Thus, equal income distribution reflects better the population wealth. Equal income distribution is crucial in supporting sustainable economic growth [2]. The Gini index informs us of the equality of income distribution. Besides, the Gini index is also an indicator that is commonly used to measure income inequality.

Although the Indonesian economic growth has shown an increasing trend since 2004, such growth was not accompanied by equal income distribution. Even from 2000 to 2013, the Gini index had an increasing trend.



**Figure 2:** Indonesia's Gini Index, 1990-2017 (Source: Statistics Indonesia [3] (processed)).

The increasing trend of the Gini index of the Indonesian economy since 2000 suggests that the increased economic growth was mainly enjoyed by the 20 percent richest population. The condition was a great concern for the Indonesian government. Thus, it is necessary to identify the source of income inequality to overcome the issue.

Various factors affect income inequality in an economy, such as the quality of human resource as reflected by the education level of the population. It is expected that

more educated population will generate more income and eventually reduce income inequality [2]. Deyshaariya [4] supports the argument by demonstrating that education level significantly reduces income inequality in 33 Asian countries. However, several other studies even show that higher education level increases income inequality ([5], [6, 6]). Beside education, numerous economic and non-economic factors affect income inequality. For example, Afandi et al., [5] and Munir [7] find that besides education level, the contribution of the agricultural sector to total Gross Domestic Product (GDP) also affects income inequality. Specifically, a higher contribution of the agricultural sector to GDP will reduce income inequality. Besides, economic factors such as inflation rate, investments, government expenditures, and unemployment rate also affect income inequality ([8], [9] and [7]). Also, the noneconomic factors such as political risk [4], globalization [7], and the presence of labor union [10] affect income inequality. Besides these factors, technological progress, especially financial technology, also affects income inequality.

Indonesia undergoes relatively rapid financial technology (fintech) development. According to Bank Indonesia (BI), there were 58 fintech financing firms registered in BI. This figure was much higher than the figure at the end of 2018 (45 fintech financing firms). In a similar vein, there were 88 fintech financing firms registered in the Financial Services Authority (*OJK- Otoritas Jasa Keuangan*) in 2018. In 2019, the number of fintech financing firms registered in *OJK* increases significantly to 113. Besides, the use of fintech in financing also increases all the time. Based on the data from *OJK*, credit allocation through fintech increases continuously, and until 2019 the total fund borrowed through fintech has reached Rp 44.8 trillion [11]. More advanced financial technology produces more innovative financial products that are better able to reach previously unbankable population and eventually to enhance financial inclusion rate. Enhanced financial inclusion will then increase the population income, especially the poor and unbankable one, that reduce income inequality.

The increasing trend of the Gini Index in Indonesia since the 1997 economic crisis and rapid fintech development, added with research gaps from previous studies, motivate this study to investigate factors that affect income inequality in Indonesia and the effect of fintech 3.0 on income inequality in Indonesia. Thus, this study contributes by identifying factors that affect income inequality in Indonesia that helps policymakers increase income equality in Indonesia.

## 2. Literature Review

Income inequality is defined as a condition with unequal income among the population in terms of both individual ownership and the ownership of production factors [12]. Further, Norris [2] defines income inequality as an income gap between the rich and the poor. Income inequality can also be defined as individuals' income or consumption differences from other individuals. Such inequality is closely related to individuals' different position in income distribution [6].

Several studies have investigated income inequality in previous studies. For example, Okatch et al., [6] analyze income inequality in Botswana and find that secondary education level, the number of children in a family, and the number of working family members positively affect income inequality. Meanwhile, the primary education level and the number of livestock owned by a household negatively affect income inequality. However, a study in China by [13] shows different results. Notably, the number of children in a family negatively influences income inequality. Thus, more children will reduce income inequality in China. Besides, education level and occupation type positively affect income inequality in China. Similarly, [14] observes that income inequality level in Nigeria is relatively high as indicated by the Gini coefficient of 0.46-0.60, and the population's literacy positively affects income inequality.

From the perspective of governments' policies, [8] examine the Korean data in the 1980-2010 period and show that government's policies related to government's expenditures do not affect income inequality in Korea although the ratio between investment and GDP negatively affects income inequality. However, Norris [2] and Munir [7] find different results. In particular, government's policies through the government's pro-poor expenditures reduce income inequality in emerging and developing countries (EMDCs) and Pakistan and India. Munir [7] also indicate that urbanization and globalization significantly affect income distribution.

Also, Thalassinos et al., [15] and Monnin [9] observe the relation between inflation rate and income inequality in 13 European countries for the 2000-2009 period and 10 OECD countries for the 1971-2010 period. Thalassinos et al. [15] identify that inflation will positively affect income inequality. Meanwhile, [9] reports the U-shaped relationship between income inequality and inflation rate. Initially, the inflation rate is negatively related to income inequality, i.e. income inequality will decrease as inflation rate increases. However, in the long run, where inflation rate reaches a certain point (13 percent), increased inflation rate will increase income inequality. Supporting [9], Deyshappriya [4] informs that inflation rate positively affects income inequality in 33

Asian countries for the 1990-2013 period. Besides, Deyshappriya [4] illustrates that higher political risk and unemployment rate increase income inequality. Further, higher labor participation rate reduces income inequality in these countries.

The financial sector also significantly affects income inequality. For example, Norris [2] indicates that financial inclusion (access to financial institutions) negative affects income inequality in EMDCs. Besides, Odusola et al., [16] also find that bank credit negative affects income inequality in sub-Saharan countries. Complementing Odusola et al., [16] (2017), the General Method of Moment (GMM) method used by [17] demonstrates the U-shaped relationship between bank credits allocated to households and income inequality and the inverse U-shaped relationship between bank credits allocated to businesses and income inequality. Still related to the effect of the financial sector to income inequality, [18] use the panel data of 97 countries for the 1989-2016 period and show that higher bank-based financing will reduce income inequality. However, larger market-based financing will increase income inequality.

### 3. Research Method

This study used the following quantitative (ratio) data: Gini index, inflation rate, investment, and enrollment rate. Besides, we also employed a nominal data that identified the fintech 3.0 era that started in 2000. Further, the study observed the data for the period of 1990-2017. Specifically, we used the following data:

- Income inequality with the Gini index from Statistics Indonesia as the proxy.
- Inflation is general, and continuous increases in prices. The study used the GDP deflator inflation from [www.databank.worldbank.org](http://www.databank.worldbank.org)
- Investment is the percentage of gross capital investment to total GDP. We generated the data from [www.databank.worldbank.org](http://www.databank.worldbank.org).
- Education level referred to the gross enrollment ratio for both sexes (male and female population) from [www.databank.worldbank.org](http://www.databank.worldbank.org).
- Fintech with the fintech 3.0 era that started in 2000. We identified the fintech era based on Setiawan (2016):

1. Fintech 1.0

Fintech 1.0 began in the 1950s when credit card and ATM services started.

2. Fintech 2.0

Fintech 2.0 started in the 1980s when internet and e-commerce (such as e-banking and online stock sites) began to emerge and flourish.

### 3. Fintech 3.0

Fintech 3.0 started in the 2000s when cellular phone and smartphone technologies emerged that facilitated mobile banking application.

## 4. Model Specification

The study estimated the relationship between income inequality and inflation, investment, education level, and fintech by developing the model of [8]. Specifically, we added the inflation and fintech variables from the model as the independent variables that affect income inequality in Indonesia. The following is the estimation model:

$$Gini_t = f(P_t, Inv_t, Edu, Fintech_t) \quad (1)$$

where:

$Gini_t$  = income inequality

$P_t$  = inflation rate

$Inv_t$  = investment

$Edu_t$  = education level

Fintech = dummy of fintech 3.0 era that started in 2000

We employed the Partial Adjustment Model (PAM) regression model to identify factors that affect income inequality in Indonesia and to analyze the short-run and long-run effects of the development of fintech 3.0 to income inequality in Indonesia. The following econometric model illustrates the relationship between the expected income inequality variable with inflation, investment, education level, and fintech 3.0 development:

$$Gini_t^* = \beta_0 + \beta_1 P_t + \beta_2 Inv_t + \beta_3 Edu_t + \beta_4 Fintech_t + u_t \quad (2)$$

where:

$Gini_t^*$  = the expected income inequality rate

$Fintech_t$  = a dummy of fintech 3.0 era

Because the expected income inequality variable in equation (2) cannot be directly observed, we employed the Nirlove's postulate that is commonly known as the partial adjustment [20]

$$Gini_t - Gini_{t-1} = \delta (Gini_t^* - Gini_t) \quad (3)$$

where:

$Gini_t - Gini_{t-1}$  = actual change

$(Gini_t^* - Gini_t)$  = expected change

$\delta$  was the adjustment coefficient with the value of  $0 < \delta \leq 1$ . If  $\delta = 1$ , then the actual income inequality is equal to the expected income inequality; the actual income inequality will adjust to the expected income inequality quickly (in the same period). The adjustment mechanism can be illustrated as follows:

$$Gini_t = \delta Gini_t^* + (1 - \delta) Gini_{t-1} \quad (4)$$

Next, we substituted equation (2) into equation (4) to produce the following equation:

$$\begin{aligned} Gini_t &= \delta (\beta_0 + \beta_1 P_t + \beta_2 Inv_t + \beta_3 Edu_t + \beta_4 Fintech_t + u_t) + (1 - \delta) Gini_{t-1} \\ &= \delta \beta_0 + \delta \beta_1 P_t + \delta \beta_2 Inv_t + \delta \beta_3 Edu_t + \delta \beta_4 Fintech_t + (1 - \delta) Gini_{t-1} + \delta u_t \end{aligned} \quad (5)$$

Equation (5) is commonly known as the partial adjustment model. While equation (2) represents the long-run relationship or the equilibrium condition, equation (5) illustrates the short-run relationship.

If:

$$\pi_0 = \delta \beta_0$$

$$\pi_1 = \delta \beta_1$$

$$\pi_2 = \delta \beta_2$$

$$\pi_3 = \delta \beta_3$$

$$\pi_4 = \delta \beta_4$$

$$\pi_5 = (1 - \delta)$$

$$\epsilon_t = \delta u_t$$

then equation (5) can be simplified as follows:

$$Gini_t = \pi_0 + \pi_1 P_t + \pi_2 Inv_t + \pi_3 Edu_t + \pi_4 Fintech_t + \pi_5 Gini_{t-1} + \epsilon_t \quad (6)$$

This study estimated equation (6) to analyze the effects of inflation, investment, education level, and fintech 3.0 development on income inequality in Indonesia.

## 5. Results and Discussion

Table 1 below displays the estimation results of the effects of inflation, investment, education level, and fintech 3.0 development on income inequality in Indonesia by using the Partial Adjustment Model (PAM).

TABLE 1: The Short-Run Estimation Results of the Income Inequality Model in Indonesia.

Dependent variable: GINI				
Sample: 1991-2017				
Variable	Coefficient	Std Error	t-Statistic	Prob
C	0.051890	0.220428	0.235408	0.8162
P	-0.000136	0.000280	-0.486187	0.6319
INV	0.003105	0.001305	2.379858	0.0269
EDU	0.0000561	0.001750	0.032024	0.9748
FINTECH	0.018592	0.007798	2.384147	0.0266
GINI(-1)	0.556943	0.189673	2.936331	0.0079
R-squared	0.913716			
Adjusted R-squared	0.893173			
Sum squared resid	0.012299			
F-statistic	44.47674			

Table 1 suggests that the inflation rate does not affect income inequality in Indonesia. The finding is consistent with [21] and Munir [7] who observe that inflation rate does not affect income inequality in Korea, India, and Pakistan. Although theoretically, inflation will increase income distribution gap, empirically inflation does not have a significant impact on income inequality in Indonesia. Besides inflation rate, education level with enrollment rate as the proxy also does not affect income inequality in Indonesia. We posit that the success of the 9-year basic education program enables most of the poor to attain the 9-year basic education. Further, we predict that tertiary enrollment rate affects income inequality. In this respect, tertiary education is arguably more accessible by the high-income population. Additional education will facilitates individuals with higher income to compete in the labor market and to receive higher income.

Meanwhile, the investment variable positively affects income inequality in Indonesia. The finding implies that increased investment will result in increased income inequality in Indonesia. The result is not consistent with Lee et al., [8] who observe that higher investment reduces income inequality in Korea. We explain the finding by arguing that investments are mainly allocated to Java Island, of which population has a higher income



than the people from non-Java Island. Thus, the increased investment that is primarily allocated to Java Island will only increase income inequality in Indonesia.

Fintech 3.0 development positively has a short-run effect on income inequality in Indonesia. The result is not consistent with Abraham [22], who demonstrates that fintech increases the equal income distribution through its impact on increased financial literacy. The finding suggests that fintech 3.0 development that started in 2000 increases income inequality in Indonesia. In the short run, the coefficient value of the fintech 3.0 era dummy is 0.018, implying that *ceteris paribus*, during the presence of fintech 3.0, income inequality (the Gini index) will be 0.018 higher. We posit that fintech development has not been equally utilized by the Indonesian population. More diverse and advanced financial product innovations as a consequence of fintech 3.0 are largely enjoyed by the population in Java Island. For example, the data from OJK shows that until February 2019, the total loans allocated by the peer-to-peer fintech was Rp 28.4 trillion. From this amount, about Rp 24.45 trillion (86.2 percent) is allocated in Java Island while the rest (Rp 3.9 trillion or 13.8 percent) is allocated outside Java. The condition implies that fintech 3.0 development increases income inequality in Indonesia.

Meanwhile, the effect of the Gini(-1) variable significantly affects income inequality. The value of the Gini(-1) coefficient is 0.557, implying that the value of the  $\delta$  adjustment coefficient in equation (3) is  $(1 - 0.557) = 0.443$ . The finding suggests that a 44.3% discrepancy between the actual income inequality and the expected income inequality will be eliminated in one year.

The use of Partial Adjustment Model enables us to investigate the long-run impact of fintech development on income inequality in Indonesia. The long-run income inequality model with Partial Adjustment Model classifies all short-run coefficients with the adjustment coefficients ( $\delta$ ) as displayed by Table 3 below.

TABLE 2: The Computation of Long-run Coefficients of the Income Inequality Model in Indonesia.

Variable	Short-run coefficient	Adjustment coefficient	Long-run coefficient
Constant	0.051890	0.443	0.117133
Inf	-0.000136	0.443	-0.00031
Inv	0.003105	0.443	0.007009
Edu	0.0000561	0.443	0.000127
Fintech	0.018592	0.443	0.041968

Table 2 above shows that the impact of fintech 3.0 development on income inequality in Indonesia is higher in the long term than in the short term in the same direction.

## 6. Conclusion

The analysis and discussion conclude that the development of fintech 3.0 that started in 2000 contribute quite significantly to income inequality in Indonesia. In particular, increasingly diverse financial product innovations as a consequence of the development of fintech 3.0 increase income inequality in Indonesia likely because of the disparity in the use of technological progress in Indonesia. In this respect, fintech development is mainly utilized by the population in Java Island that increases further income inequality. Besides, the investment variable also positively affects income inequality in Indonesia. The result indicates unequal development or the distribution of investment fund in Indonesia. All the time, the development has mainly focused on Java Island that increases the income distribution gap between the population in Java Island and outside Java Island.

As a policy implication, the study thus suggests that the government design a program to enhance financial literacy, including on financial product innovation, for the population, especially those who live in non-Java islands.

## References

- [1] World Bank, "World Development Indicators," 2019.
- [2] E. Dabla-Norris, K. Kochhar, N. Suphaphiphat, F. Ricka, and E. Tsounta. (2015). Causes and Consequences of Income Inequality: A Global Perspective, Staff Discuss. Notes, vol. 15, no. 13, p. 1.
- [3] Badan Pusat Statistik Indonesia. (2019). Gini Ratio Provinsi 2019.
- [4] N. P. R. Deysappriya. (2017). Impact of Macroeconomic Factors on Income Inequality and Income Distribution in Asian Countries, Adbi Work. Pap., no. 696.
- [5] A. Afandi, V. P. Rantung, and H. Marashdeh. (2017). Determinant of income inequality in Indonesia. *Econ. J. Emerg. Mark.*, vol. 9, no. 2, pp. 159–171.
- [6] A. Okatch, Zelda; Siddique, Abu; Ramohan. (2015). ECONOMICS DETERMINANTS OF INCOME INEQUALITY IN BOTSWANA. Discuss. Pap., vol. 13.
- [7] K. Munir. (2017). Macroeconomic determinants of income inequality in India and Pakistan. *Theor. Appl. Econ.*, vol. 24, no. 4, pp. 109–120.
- [8] H.-Y. Lee, J. Kim, and B. C. Cin. (2013). Empirical Analysis on the Determinants of Income Inequality in Korea. *Int. J. Adv. Sci. Technol.*, vol. 53, no. April, pp. 95–110.
- [9] P. Monnin. (2014). Inflation and Income Inequality in Developed Economies. *SSRN Electron. J.*, no. May.

- [10] P. Tridico. (2018). The determinants of income inequality in OECD countries. *Cambridge J. Econ.*, vol. 42, no. 4, pp. 1009–1042.
- [11] Otoritas Jasa Keuangan OJK. (2019). *Ikhtisar Keuangan Fintech Periode Februari 2019*.
- [12] Todaro Michael and Smith. (2014). *Economic Development*, 12th ed. Pearson.
- [13] B. SU and A. HESHMATI. (2013). Analysis of the Determinants of Income and Income Gap Between Urban and Rural China. *China Econ. Policy Rev.*, vol. 02, no. 01, p. 1350002.
- [14] A. Bakare. (2012). Measuring the Income Inequality in Nigeria: the Lorenz Curve and Gini Co-efficient Approach. *Am. J. Econ.*, vol. 2, no. 1, pp. 47–52.
- [15] E. Thalassinou, E. Ugurlu, and Y. Muratoglu. (2012). Income inequality and inflation in the EU. *Eur. Res. Stud. J.*, vol. 15, no. 1, pp. 127–140.
- [16] A. Odusola, G. A. Cornia, and H. Bhorat. (2017). *Income Inequality Trends in sub-Saharan Africa* Edited by.
- [17] C. Casti and C. Casti. (2018). Income Inequality and Financial Development: a Multidimensional Approach Income inequality and ... nancial development: a multidimensional approach. Evidence from panel data. pp. 0–17.
- [18] X. Hou, S. Li, and Q. Wang. (2018). Financial Structure and Income Inequality: Evidence from China. *Emerg. Mark. Financ. Trade*, vol. 54, no. 2, pp. 359–376.
- [19] S. R. D. Setiawan. (2016). Siapa Sangka Fintech Sudah Berkembang Sejak 1950-an. 29-Aug-2016. [Online]. Available: <https://money.kompas.com/read/2016/08/29/133000326/Siapa.Sangka.Fintech.Ternyata.Sudah.Berkembang.Sejak.1950-an>.
- [20] D. N. Gujarati. (2003) *Basic Econometrics*, Fourth. Mc Graw Hill.
- [21] H. Yue. (2011). Income Inequality, Economic Growth and Inflation: a Study on Korea. *Int. J. Econ. Res.*, vol. 02, no. 05, pp. 14–21.
- [22] T. W. Abraham. (2015). Financial Innovation and Poverty Reduction: Evidence From Rural. *Work. Pap. Ser.*, vol. 4, no. 1, pp. 1–4..