

Spatial analysis on the impact of Islamic regional financial depth on income inequality in Indonesia

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Abstract

Purpose – This paper aims to analyze the effect of financial depth in Islamic banks on income inequality in 33 provinces in Indonesia.

Methodology – We use data for the period 2010-2018 from 33 provinces in Indonesia which are estimated using panel data to develop spatial panel data model. The dependent variable is income inequality, while the variable independent are Islamic regional financial depth, economic growth, human capital, and government expenditure.

Findings – This research finds that Islamic Regional Financial Depth (FDS) has a positive and statistically significant direct effect on income inequality represented by Gini index. It means that an increase in the FDS will also cause an increase in the level of Gini index. In addition, the indirect effect of FDS on income inequality is also positive and significant, indicating that the ratio of financing to GRDP has a spillover effect on connected regions.

Implications – This research recommends policymaker to expand the business of Islamic banking by financing the small medium enterprises and concern on the promotion of Islamic banking in the regional level.

Originality – This study is potentially to contribute and be the early work which employs spatial analysis in the area of Islamic economics and finance. In addition, this study examines the impact of financial depth in Islamic bank on income inequality which is rarely discussed. Hence, this study presents relatively new information for policy makers, practitioners and researchers.

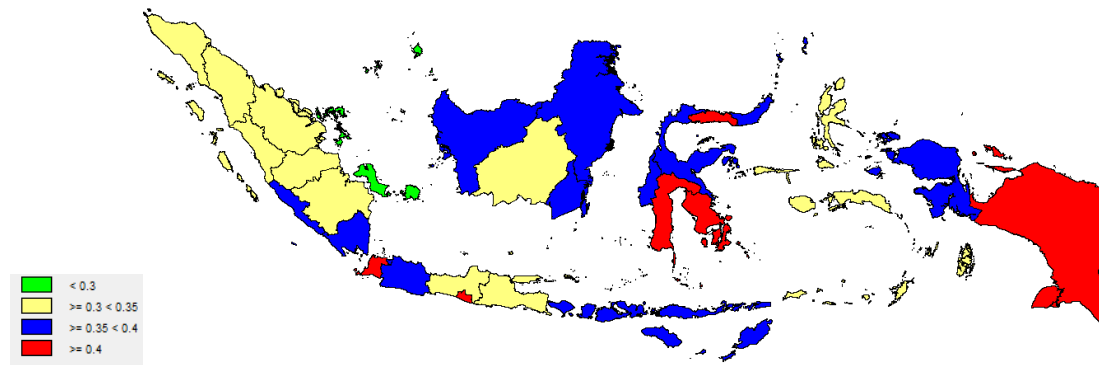
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Introduction

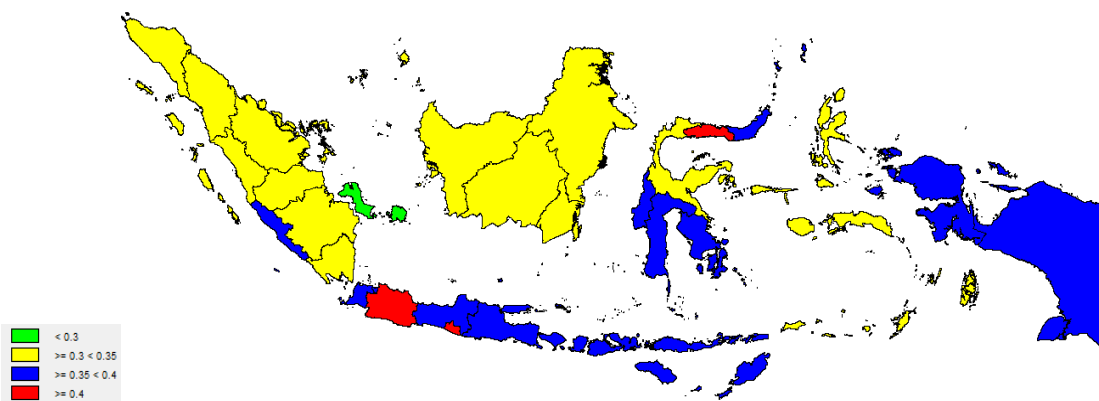
All countries around the world deal with the problem of income inequality. A report from Organization for Economic Cooperation and Development (OECD) documents that in the last 30 years the disparity between the rich and poor is at its highest level in majority of OECD countries. That is, the richest 10% of the population in the OECD region have 9.5 times higher income than the poorest 10%.

As developing country, Indonesia also experiences high income inequality. Figure (1) and (2) shows the comparison of Gini index in 2010 and 2018. It seems that some provinces experience higher income inequality represented by the change in the color from yellow into blue and blue into red. Only small part of Indonesia experience low income inequality (green color) during 2010 to 2018.



Source: Central Bureau of Statistics

Figure 1. Indonesia Gini Index: 2010



Source: Central Bureau of Statistics)

Figure 2. Indonesia Gini Index: 2018

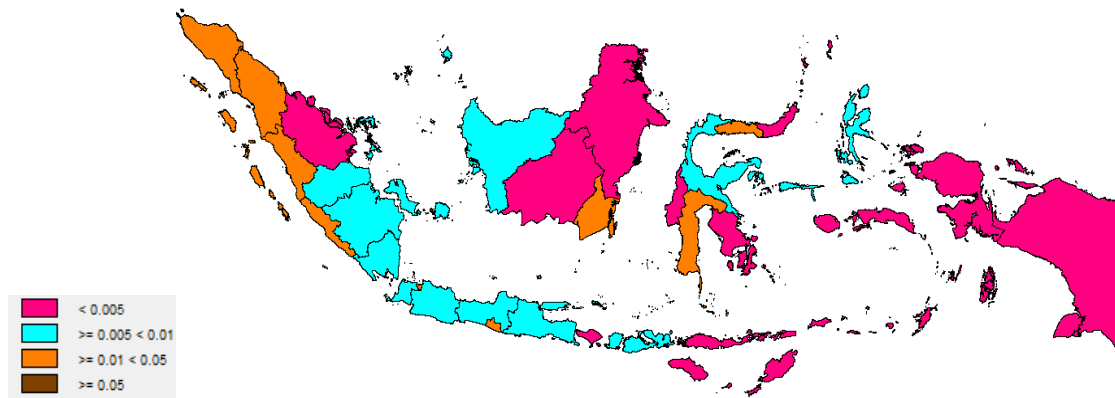
The urgency to minimize the gap of income is to stabilize the economy of a country. Previous research shows that income inequality is considered as the main determinant factor to create economic stability (Berg & Ostry, 2011; Berg et al., 2012; Kumhof & Rancière, 2010; Ostry et al., 2014). The International Monetary Fund (IMF) Managing Director, Lagarde (2015), stated that income inequality becomes the requirements to maintain economic stability as well as to have inclusive and sustainable economic growth. In other words, inequality of income is possibly to lead economic instability.

In this regards, previous empirical literatures hypothesize that financial development may reduce income distribution gap by allowing low income households to access financing from banking sector. Most of the empirical works show that bank lending may help to promote wealth distribution (Agnello & Sousa, 2012; Akimov et al., 2006; Ayyagari et al., 2013; Baligh & Pirae, 2013; Batuo et al., 2010). The positive impact occurs if banks mobilize savings from individuals and transform them into loans to be invested in prospecting business, particularly for small business enterprises. As business expands, it is expected that entrepreneurs increase their production, and hence they may offer new jobs or offer higher salaries for their workers. As a result, in the long-run, the inequality level in wealth distribution can be reduced. Therefore, finance is argued to promote wealth distribution.

Recently, Islamic banking industry develops significantly around the world, including in Indonesia. As the primary objective of Islamic bank is to create a just system through its profit and loss sharing (PLS) scheme of financing (Ahmad 1984, 1987; Chapra, 1985; Nawab & Naqvi, 1997; Rosly et al., 2003; Siddiqi, 1983), thus, it is expected that Islamic bank may promote wealth distribution amongst individuals in society (Ismail, 2010; Ismail et al., 2014).

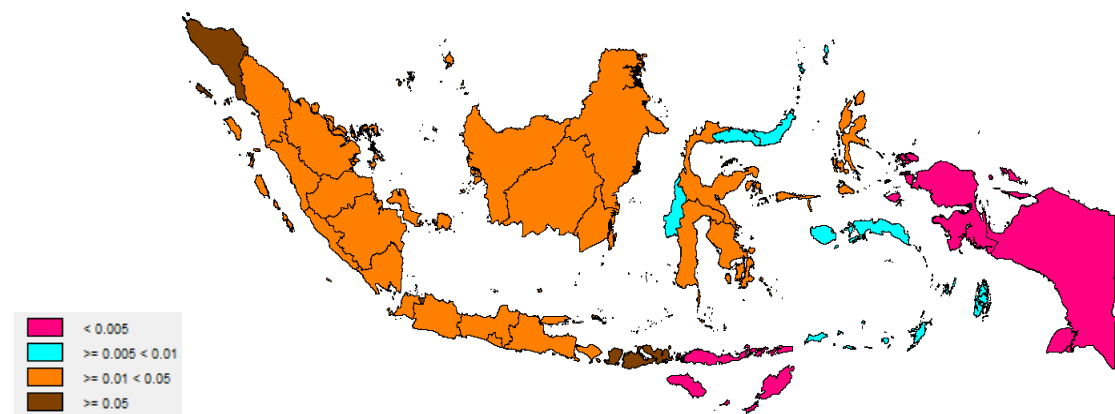
Figure (3) and (4) show ratio of regional financial depth of Islamic bank in Indonesia in 2010 and 2018, respectively. One of measure of bank development is ratio of financial depth.

Financial depth is defined as ratio of total financing to GDP. Referring to figure (3) and (4), it is clearly depicted that majority provinces experienced a fundamental increase in the ratio of Islamic financial depth from 2010 to 2018 represented by the change in color from pink or tosca into orange or even brown. Only few provinces which has the same or a decrease in the ratio of financial depth.



Source: Authors' own

Figure 3. Ratio of Regional Financial Depth in Indonesia Islamic Bank: 2010



Source: Authors' own

Figure 4. Ratio of Regional Financial Depth in Indonesia Islamic Bank: 2018

This study differs from previous literatures (Kenourgios & Samitas, 2007; Loayza & Ranciere, 2006; Mohieldin et al., 2012b; Ben et al., 2015; Naceur & Zhang, 2016; Onofrio & Murro, 2013; Shahbaz & Islam, 2011) in three directions. First, this study is potentially to contribute and be the early work employs spatial analysis in the area of Islamic economics and finance. Second, this study examines the impact of financial depth in Islamic bank on income inequality which is rarely discussed. Third, while prior studies observe from conventional perspective, this study investigate from Islamic perspective.

This study is divided into six parts. The first part introduces the research and includes the research gap and contribution. The second part reviews the relevant literature. The third part explains the selected research method. The fourth section examines the result and analysis, while the conclusion and policies recommendation are elaborated in the fifth section. Finally, some ideas for future research is explained in the sixth section.

Literature Review

The concept of inequality in wealth distribution differs from poverty, which focuses solely on those with living standards below a certain threshold (the poverty line). According to Pramanik (1997), an individual is considered poverty-stricken when his income is insufficient to purchase basic needs

such as food, clothing, house, education, and healthcare. The poverty line is determined either in absolute (for instance, calorie consumption) or relative terms (for instance a part of the whole average living standard)

By contrast, inequality in income distribution discusses the entire population, and hence, is a broader concept than poverty (Haughton & Khandker 2009). According to the Organization for Economic Cooperation and Development (OECD), income inequality is defined as differences in the distribution of wealth and income among individuals in the economy. Similarly, Todaro and Smith (2015) define income inequality as the imbalance in distribution of total national income among households. In other words, income inequality describes the gap in income and wealth distribution across income and wealth groups.

Islam is highly concerned with wealth distribution as its followers are asked to share their wealth to the poor. In this regards, a Muslim is given freedom to use his wealth; however, he is responsible to help others, including non-Muslims. Thus, the more wealth a person possesses, the greater his responsibility to purify his wealth (Beik & Arsyianti, 2016; Salim et al., 2016; Muhammad et al., 2013; Pramanik, 1997; Islahi, 1992). For instance, Islam commands to assist one's neighbor, the nearest relative and underprivileged. Thus, the problem of inequality in wealth distribution is embedded in Islam as a matter of religion.

As explained at the outset of this paper, many previous empirical literatures hypothesize that financial development may minimize income inequality by allowing low income households to access financing from banking sector. However, the linkage between Islamic financing and income inequality is rarely investigated (Al-Suwailem, 2008; Putriani et al., 2019). Therefore, the surveys in the role of bank financing in wealth distribution in this section observes the impact of conventional bank lending on income inequality. Financial depth measured by total customer deposit to GDP ratio has negative relationship with income inequality in case islamic banks from 13 various countries (Putriani & Prastowo, 2019).

Many studies show that financial institutions and financial markets have an influential effect on poverty alleviation, economic development as well as stability (Levine, 2005 in Philippe et al., 2005). Cihak et al. (2013) further explain that when a bank examines a borrower and finds his business has good prospects, this helps allocate resources efficiently, enlarge economic opportunity and enhance growth. Another important step in promoting economic development is the financial institutions mobilize savings from individual to invest in prospecting business. To boost efficiency of firms and minimizing waste as well as fraud by the internal worker, the financial institution can monitor the use of investment and examine managerial performance.

Several empirical works using cross-section analysis confirm that financial development may help to promote wealth distribution. By applying Generalized Method of Moments (GMM) procedures, Elmi and Ariani (2011) show that financial development has a significantly negative relationship with income inequality in the case of Middle East and the North Africa (MENA) countries for the period from 2004-2008. It suggests that financial development may improve wealth distribution. The regression shows that an increase of 1 percent in financial development causes a decline in income inequality by 0.13 percent. To accelerate the reduction of inequality, the regression also suggests increasing openness and schooling years (as a representation for human capital). A similar technique was applied to 29 urban provinces in China (Liang 2006), African countries (Batuo et al., 2010), 59 province in Vietnam (Chu & Le, 2012), 103 province in Italy (Onofrio & Murro, 2013) to produce similar results.

Some studies investigate single countries using time series and shows that financial development contributes to reducing income inequality. For examples, Shahbaz and Islam (2011) employ a long-run relationship using Auto Regressive Distributed Lag (ARDL) and short-run relationship using the Error Correction Model (ECM) for Pakistan. Similarly, Baligh and Pirae (2013) use the Unrestricted Error Correction Model (UECM) to investigate finance income inequality nexus for the period from 1973 to 2010 in the Iranian economy. Zhang and Chen (2015) apply SVAR analysis and observed the case of China for the period from 1978 to 2013.

In addition, other empirical works argue that income inequality exists due to the low-income families has a limited access to basic financial services. This means that the financial sector

plays an important role to reduce income inequality. Basic financial services include credit, savings mobilization, risk management, and insurance (Mohieldin et al., 2012). These services are expected to promote growth in the long-term as well as reduce income inequality (Akimov et al., 2006; Kenourgios & Samitas, 2007; Levine, 2003). Agnello and Sousa (2012) and Ayyagari et al., (2013) support that the higher access for the poor to credit enables them to expand their small business and invest in India education and healthcare for their children. This would help the poor exit poverty and hence reduce the income gap. In short, the negative relationship financial sector and income inequality should be remedied by promoting inclusive growth to reduce income inequality.

Reversely, Seven and Coskun (2016) found a positive relationship between financial development and Gini index. This implies that greater levels of bank development mean greater levels of income inequality. In addition, bank development does not benefit those in the lowest groups, which is reflected by the negative relationship. Thus, higher levels of bank development will experience higher levels of poverty. This study also finds that higher levels of inflation cause levels of income inequality and hence higher levels of poverty.

Similarly, Jauch and Watzka (2016) empirically investigate the relationship between financial development and income inequality across 138 developed and developing countries from 1960 to 2008. By employing fixed effect panel data and the GMM approach, they find that financial development raises income inequality within countries. This occurs perhaps due to excessive finance that promote rent extraction, which triggers income inequality. More specifically, the result shows that an increase of credit by 10 percent triggers an increase by about 0.22 in the Gini coefficient. By employing ARDL, Law and Tan (2009) conclude the same result in the case of Malaysia.

Hypotheses

H₁: Regional Islamic Regional financial depth has a negative effect on Income inequality

H₂: Economic growth has a negative effect on Income inequality

H₃: Human capital has a negative effect on Income inequality

H₄: Government expenditure has a negative effect on Income inequality

Research Methods

Data

This study covers cross section data between 2010 and 2018 from 33 provinces in Indonesia. The secondary data was retrieved from the Financial Services Authority (*Otoritas Jasa Keuangan*, OJK), Directorate General of Fiscal Balance (Direktorat Jenderal Perimbangan Keuangan, DJPK) Ministry of Finance, and Bureau of Statistics (*Badan Pusat Statistik*, BPS). Table (1) shows detail of employed variable and source of its data.

Table 1. Variable Measure

Type of Variable	Name	Variable Definition	Hypothesis	Source of Data
Dependent	Income inequality	GINI index	GINI	BPS
Independent	Islamic Regional Financial Depth	Ratio total financing to Regional GDP	FDS (-)	OJK, BPS
	Economic Growth	Per capita Regional GDP	RGDPC (-)	BPS
	Human capital	Mean years of schooling	EDUC (-)	BPS
	Government expenditure	Rasio Government expenditure to regional GDP	GOV (-)	DPJK

Model Development

The econometric model (1) of this study is built to model financial depth and income inequality, as follows:

$$\text{GINI}_{i,t} = \alpha + \beta_1 \text{FDS}_{i,t} + \beta_2 \text{RGDPC}_{i,t} + \beta_3 \text{EDUC}_{i,t} + \beta_4 \text{GOV}_{i,t} + \varepsilon_{i,t} \quad (1)$$

The Gini index is an aggregate measure of wealth distribution among individuals within an economy that deviates from a perfectly equal distribution. The range value of the Gini index starts from 0 to 1. Zero indicates perfect equality, meanwhile 1 signifies perfect inequality. It implies that the greater value of the Gini index means the greater wealth inequality, and vice versa. The typical value of the Gini index for countries ranges from 0.3 to 0.6.

The model in this study follows the work of Clarke et al. (2006) and Jauch and Watzka (2016) who analyzed the relationship between financial development and income inequality. Specifically, Clarke et al. (2006) developed an integrated model of financial development as measured by private credit and bank assets, while Beck et al. (2007) and Jauch and Watzka (2016) used the ratio of credit to GDP. The FDS variable as a proxy for financial depth to measure the ratio of total financing to regional GDP. In addition, we include control variables which affects Gini index, such as economic growth (RGDPC) as a proxy for Per capita Regional GDP, human capital (EDUC) measuring mean years of schooling, and government expenditure (GOV).

Method

This study applies spatial econometrics. Studies in spatial statistics usually distinguish between two types of spatial effects - spatial interactions (spatial autocorrelation) and spatial structures (spatial heterogeneity). This section discusses Moran's I global and three types of spatial econometric models. Moran's I statistics is used to test the extent of spatial autocorrelation of the dependent variable (Anselin, 1995).

$$I = \frac{\sum_{i=1}^n \sum_{j=1, j \neq i}^n w_{ij} (X_i - \bar{X})(X_j - \bar{X})}{S^2 \sum_{i=1}^n \sum_{j=1, j \neq i}^n w_{ij}}$$

$i, j = 1, 2, 3, \dots, n$, $\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$, $S^2 = \frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2$, X_i and X_j is the observed value of the location i and location j . \bar{X} is the average value of the overall location and w_{ij} is the element value in the spatial weight matrix which describes the spatial relationship of location i and location j . This study uses spatial weight matrices based on distance. Moran's I global values range from -1 to 1. If the value is > 0 , it means positive spatial autocorrelation; if the value < 0 means negative spatial autocorrelation; if the value is close to 0, there is no spatial autocorrelation (Anselin et al., 2006). According to Ord (1975) data containing spatial relationships were estimated using the Maximum Likelihood (ML) technique.

To do spatial panel data model, first we employ panel data analysis (2) without spatial effect (Yang, et al, 2017):

$$y_{i,t} = \beta x'_{i,t} + u_i + \varepsilon_{i,t}, \quad (2)$$

y is the dependent variable, I is the region ($N = 33$). T is the time series dimension, from 2010-2018. $x'_{i,t}$ is the $1 \times k$ observation vector of the explanatory variable and β is the $k \times 1$ vector of the unspecified coefficient. u_i is an individual effect that cannot be observed and measured directly and $\varepsilon_{i,t}$ is a disorder term that varies with the individual and time. If u_i is associated with $\varepsilon_{i,t}$, fixed effect panel model can be used. However, if it is not associated, then the random effect panel model can be employed (Fotheringham & Rogerson, 2008).

The spatial panel data model of this research includes the spatial autoregression model (SAR), the spatial error model (SEM), and the *Spatial Durbin model* (SDM). Models that consider spatial effects are estimated using Maximum Likelihood Estimation, the application of the "xsmle" module (Belotti, 2017). The SAR model considers the spatial spillover effect of the dependent variable.

$$y_{it} = \rho W y_t + x'_{it} \beta + u_i + \varepsilon_{it}, \quad (3)$$

$\rho W y_t$ is the spatial lag of the dependent variable and $W y_t = \sum_{j=1}^n w_{ij} y_{ij}$ is spatial weight based on distance. ρ is the spatial autoregression coefficient. If ρ is statistically significant, this indicates

a significant spatial dependence between the dependent variables. The value of ρ reflects the level of spatial dependence (Gelfand et al., 2010). The SEM model is formulated as follows:

$$y_{i,t} = \beta x'_{i,t} + u_i + \varepsilon_{i,t}, \quad (4)$$

$$\varepsilon_{it} = \lambda W\varepsilon_t + v_{it}, \quad (5)$$

$\lambda W\varepsilon_t$ is *spatial error term*, λ is autoregressive factor, and v_{it} is random error term which is assumed to be independent and have identical distributions (i.i.d). If λ statistically significant, resulting in a visible trend of spatial autocorrelation in the residuals. SDM includes the spatial lag of the dependent variable and the independent variable. SDM uses the marginal effect of independent variables from nearby regions based on the SAR model. The general SDM model is as follows:

$$y_{it} = \rho W y_t + x'_{it} \beta + W X_t \delta + u_i + \varepsilon_{it}, \quad (6)$$

$W X_t \delta$ is the independent variable spatial lag, X_t is $n \times (k-1)$ independent variable matrix constant, and δ is $(k-1) \times 1$ a parameter vector that determines the marginal effect of the independent variable from the closest observations y_{it} , dependent variable.

Results and Discussion

Results

Table 2 shows the average GINI index of 0.366 with a standard deviation of 0.038. The highest GINI index is 0.459 and the lowest is 0.272. The average Islamic Regional Financial Depth (FDS) is 0.016 with a standard deviation of 0.015. The highest FDS is 0.117 and the lowest is 0.001. The Regional average GDP per capita (RGDPC) 2010-2018 is 35.75 million rupiah with a standard deviation of 28.48 million rupiah. The highest regional GDP per capita is 165.86 million rupiah and the lowest is 9.31 million rupiah. The average length of schooling (EDUC) was 7.94 years with a standard deviation of 0.99 years. The highest length of schooling is 11.05 years and the lowest is 5.59 years. The average ratio of government spending to regional GDP (GOV) is 0.038 with a standard deviation of 0.025. The ratio of government expenditure to regional GDP (GOV) is the highest at 0.131 and the lowest is 0.0007.

Table 2. Statistic Descriptive

Variable	Mean	Std. Dev.	Min	Max	Obs.
GINI	0.366	0.038	0.272	0.459	297
FDS	0.016	0.015	0.001	0.117	297
RGDPC	35.755	28.486	9.316	165.863	297
EDUC	7.940	0.997	5.59	11.05	297
GOV	0.038	0.025	0.0007	0.131	297

Table 3 shows that the global value of Moran'I Income Inequality (GINI) and Islamic Regional Financial Depth (FDS) during 2010-2018 is about greater more than zero (> 0), which means that there was positive spatial autocorrelation. Since there is a clustering or concentration income inequality and FDS in certain province in Indonesia, therefore, data containing positive spatial relationships is estimated using the Maximum Likelihood (ML) Technique (Ord, (1975).

The results of the Non-Spatial panel model in table 4 use the non-spatial a pooled model, fixed effect (FE) and random effect (RE) panel model approach. To choose the best model between a pooled model and the fixed effect (FE) models, the Chow Test is conducted. The Chow Test value F is 23.25 and significant at the 0.05 significance level, thus the best model is the fixed effect panel model. To choose the best model between the fixed effect (FE) and random effect (RE) models, the Hausman Test is conducted. The Hausman test value χ^2 is 8.90 and significant at the 0.05 significance level, thus the best model is the fixed effect panel model. Before estimating the spatial panel data model, cross-sectional dependency testing was performed using Pesaran's test (2004). The table shows the results of the Pesaran's test of 3,621 and significant at the 0.05 significance level which also means that the model has a spatial dependence.

Table 3. The Global Value of Moran'I Income Inequality and Islamic Regional Financial Depth

Year	GINI		FDS	
	Moran's I	p-value	Moran's I	p-value
2010	0.061	0.026	0.022	0.122
2011	0.027	0.108	0.045	0.047
2012	0.008	0.203	0.041	0.049
2013	0.045	0.054	0.031	0.076
2014	0.051	0.042	0.041	0.049
2015	0.102	0.002	0.059	0.018
2016	0.089	0.005	0.011	0.134
2017	0.097	0.003	0.009	0.155
2018	0.086	0.006	-0.003	0.256

Table 4. Wald Test

Model 1	Model 2	Wald Test
SDM	SAR	8.63*
SDM	SEM	9.50**

***p<0.01; **p<0.05; *p<0.1.

Table 4 shows the results of the Wald test value proposed to choose spatial panel data. The choice of model between SDM and SAR based on the Wald test value which equals to 8.63 and significant at a significance level of 0.05. Thus, the chosen model is SDM. Meanwhile, the choice of model between SDM and SEM based on the Wald test score of 9.50 and significant at a significance level of 0.05, therefore the chosen model is SDM. Based on these two tests, the SDM Model is the best model in examining spatial panel data.

Table 5. Panel Non-Spatial dan Spatial

Variable	Dependent Variable GINI			
	Non-spatial	SDM FE	SAR FE	SEM RE
FDS	0.3939*** (2.79)	0.3074**(2.41)	0.3222***(2.52)	0.2330*(1.78)
RGDPC	0.0005(1.42)	0.0001(0.39)	0.0005(1.58)	0.0003*(1.85)
EDUC	-0.0440*** (-5.35)	-0.0473*** (-3.85)	-0.0346*** (-4.51)	-0.0176***(-2.96)
GOV	0.5113*** (3.40)	0.3939*** (2.71)	0.4055 *** (2.96)	0.1411(1.17)
_cons	0.6704*** (12.21)			0.4838***(11.15)
W x FDS		2.3514 ** (2.29)		
W x RGDPC		-0.0027 (-1.31)		
W x EDUC		0.0076(0.18)		
W x GOV		0.5024 (0.69)		
rho (ρ)		0.4258** (2.13)	0.6602*** (4.65)	
Lamda (λ)				0.7634*** (5.18)
Hausman	12.88*** (FE)	23.63*** (SDM FE)	13.49*** (SAR FE)	9.18 (SAR RE)
Chow test	23.25*** (FE)			
AIC		-1518.329	-1517.632	-1364.531
Log-likelihood		769.1646	764.8158	690.2654
R-sq	0.0224	0.0001	0.0027	0.0357

Pesaran's test : 4.828***

***p<0.01; **p<0.05; *p<0.1.

As shown in Table 5, the SDM log-likelihood of 769.1646 is higher than the SAR and SEM models, and has the lowest AIC value of -1518.329. Thus, the SDM model is more effective for explaining spatial dependence. In the SDM model the value of spatial dependency is 0.4258 and significant positive. Thus, this study rejects $H_0: (\rho) = 0$ or there is a positive spatial dependency on the income inequality.

By using coefficients to interpret impacts can lead to invalid conclusions (LeSage & Pace, 2009) because the coefficients in the SDM model do not state the effect of changes in explanatory variables on income inequality (GINI). Thus, researchers should use direct and indirect effects to assess the impact. Direct effects mean that there is a change in the explanatory variable in a province and will have an impact on the dependent variable in the same province. Indirect effects or spillover effects is a change in the explanatory variable in neighboring provinces and will have an impact on the dependent variable in the local province.

Table 6. Results of Spatial Effects

Variable	Direct effect		Indirect effect		Total effect	
	Coef.	P-value	Coef.	P-value	Coef.	P-value
FDS	0.3515***	0.008	2.2347**	0.013	2.5862***	0.005
RGDPC	0.000096	0.816	-0.0023	0.246	-0.0022	0.313
EDUC	-0.0464***	0	-0.0120	0.706	-0.0584**	0.044
GOV	0.3956***	0.003	0.5732	0.355	0.9689	0.112

***p<0.01; **p<0.05; *p<0.1.

Table 6. shows that FDS has a positive and statistically significant direct effect on income inequality (GINI). Increasing 1 unit of FDS can directly increase regional income inequality (GINI) equals to 0.515. The positive relationship on FDS means that the higher the depth of Islamic finance in banking will have a positive impact on income inequality. This result further implies that Islamic bank in Indonesia tend to choose to lend financing only for certain category of group society, e.g. those who have big business and those who have collateral. In other words, Islamic bank in Indonesia does not prioritize to give a financing for micro and small medium enterprises (MSME, or UMKM) group which is categorized as small in size and does not have collateral. Therefore, those who have big company has greater access to financial institution, i.e., Islamic bank. As its result, these big companies will have greater opportunity to expand their business and thus they also have a greater probability to earn a higher income. Higher income in certain groups makes greater gap in income level.

In the other hand, when MSME has lower opportunities or difficulties to access Islamic bank, it means they have lower opportunity to expand their business and hence their income most probably remains the same. As its consequences, the gap in income is getting greater as FDS is getting higher. Sarma (2008, 2012) asserts that if a small medium enterprise can borrow money from the bank, it could expand its business, increase production and offer new jobs which means higher income. Financial inclusion hence appears to have a positive impact on income inequality reduction. Reversely, if small medium enterprises have less access to financial sector, they will not be able to expand their business and hence less income. As its consequences, the gap of income become greater. Other empirical studies have also shown that inequality in wealth distribution is caused by limited access to the financial sector, especially for low-income households (Akimov et al., 2006; Kenourgios & Samitas, 2007; Levine, 2003; Park & Shin, 2017).

In addition, the indirect effect of FDS on income inequality (GINI) is also positive and significant, indicating that the ratio of financing to GDP has a significant spillover effect. This means that an increase of 1 unit in the ratio of financing to GDP can lead to an increase in 2.2347 income inequality (GINI) in neighboring areas.

Human capital (EDUC) has a negative and statistically significant direct effect on income inequality (GINI). Specifically, an increase in 1 unit of Human capital (EDUC) can directly reduce regional income inequality (GINI) equals to 0.0464. The negative relationship on Human capital (EDUC) and GINI means that a higher mean years of schooling reduces income inequality. Direct human capital (EDUC) to income inequality (GINI) is also negative although insignificant. In this regards, inequality of income renders the poor unable to invest in education. Nafziger (2006) explains that underprivileged people in developing countries usually earn income from their monthly wages as labor. Since the poor live with low wages, they have limited capital that limits their capacity to invest, for instance buying shares or investing in higher education. In addition, Mohieldin et al. (2012) and Dabla-norris and Kochhar (2015) further address that limited access to

the financial sector, especially for the low-income group (both individual household and small firm), will affect human and physical capital accumulation. This is because the low-income group is situated in the poverty trap whereby they are not able to save when they earn income or meet their needs sufficiently. Since they are not eligible to borrow, they cannot invest in education or healthcare for their children or expand their potential business. They depend solely on their internal financial resources to invest in healthcare, education, or business.

The poor in the long-term will not be able to access higher-income jobs which requires a higher level of education or advanced knowledge of technology (Dabla-norris & Kochhar, 2015). As a result, the poor will be situated in the poverty trap such that they cannot save and fulfill their basic educational needs. Nafziger (2005) further explains that education or training is leading method of redistributing human capital. Sacrificing quality of education even at primary level often affects basic elements of academic competence such as the fundamentals of mathematics, science, or even formal language. Those at the productive age should master these academic skills. Higher education is always linked with relatively higher income. Those who have rare skills in the prospective market will earn higher incomes compared with those who have basic skills. In other words, one will be paid based on their ability. To acquire that skill, one should benefit from all types of education, formal or informal. Therefore, when the poor has greater access to financial sector, it means they have greater opportunity to invest in education. As its consequences, the gap in income is getting lower as investment on human capital is getting higher.

Furthermore, the ratio of government expenditure to regional GDP (GOV) has a significant positive and has direct effect on income inequality (GINI). Specifically, an increase of 1 unit of the ratio of Government expenditure to regional GDP (GOV) can directly increase the regional income inequality (GINI) equals to 0.3956. It occurs due to there is inequality amongst provinces in Indonesia. This income inequality in regional level is due to the unequal allocation and distribution of government spending. If the variation in government spending increases, it will cause the income inequality amongst provinces also raises (Djohan et al., 2016). This result is in line with the work of Song (2013) who shows that government spending leads regional income inequality in China increases from 1978 to 2007.

Conclusion

This study aims to analyze the effect of financial depth in Islamic banking on income inequality using spatial analysis. By applying the Moran's I index to the financial depth and income inequality of provinces from 2010 to 2018 in Indonesia, this research shows positive spatial autocorrelation between provinces, confirming the existence of spillover effect between provinces. Having done some test, this research concludes that the SDM panel is chosen to explain the spatial dependence of the 2010-2018 data panel on 33 provinces in Indonesia.

The empirical results show that Islamic Regional Financial Depth (FDS) has a positive and statistically significant direct effect on income inequality (GINI). It means that the higher FDS will cause higher income inequality in Indonesia. This result further implies that Islamic banks in Indonesia do not prefer to give a financing for MSME, but prefer to give financing for those who have big business and collateral. Thus, those who have big company has greater access to financial institution (Islamic bank). Greater access to financial institutions means greater probability to earn a higher income and vice versa. In this regard, when MSME has less opportunity to access Islamic bank, it means they have lower opportunity to get higher income. As its result, the gap in income is getting greater as FDS is getting higher. In addition, the ratio of government expenditure to regional GDP (GOV) also have a positive and statistically significant direct effect on income inequality (GINI). Meanwhile, Human capital (EDUC) has a positive and statistically significant direct effect on income inequality (GINI). The indirect effect of Islamic Financial Depth (FDS) on income inequality (GINI) is also positive and significant, indicating that the ratio of financing to GRDP has a spillover effect on connected regions.

Recommendation

The findings in this research have important implications for future financial development policies. In this regards, this research recommends two main points below.

First, there is a need to increase financial inclusion in all province in Indonesia. In this regards, the regulators of Islamic banking industry need to encourage Islamic banks to expand its business by channeling its financing on small business. This is because Islamic bank currently tends to give financing for certain category of group society. Therefore, if Islamic banks channel their financing on small business, they will have greater opportunity to expand their business and hence will reduce number of unemployment as well as income inequality.

Second, Islamic banks are encouraged to apply profit and loss sharing (PLS) contracts rather than markup based financing, especially for its financing. Historically, the objective of Islamic banking when it was initially mooted was to eliminate interest in the financial system and to promote the application of the profit and loss sharing (PLS) as an alternative scheme of financing. It is expected that the application of PLS may promote wealth distribution amongst individuals in society. However, contemporary Islamic banks tend to apply markup based financing rather than PLS scheme.

Future Research

This research focuses on the examination of the impact of financial depth in Islamic banks on income inequality in 33 provinces in Indonesia by employing spatial analysis with time spans from 2010 to 2018. Considering this objectives, hence, the authors recommend three suggestions for developing the model in this research, as follows.

- a. This research is considered an initial attempt to examine the impact of regional financial depth in Islamic bank financing on income inequality using spatial analysis. Thus, this research tries to simplify the model by involving some fundamental macroeconomic variables. It is expected that future research may involve other significant macroeconomic variables in the model.
- b. The second step to develop this research is to compare the impact of conventional bank lending on income inequality. Therefore, the future research may confirm whether Islamic bank financing may have better performance than conventional bank shown by a lower level of Gini index.
- c. The third step is to employ qualitative methods by interviewing the practitioners from Islamic banks, especially with the top management. Thus, the analysis can be deepened, and the recommendation can meet the needs of the Islamic bank industry.

Author Contributions

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