Financial development, income inequality and institutional quality: A multi-dimensional analysis

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Abstract

Ambiguous impacts of financial development on income inequality in the literature imply that the impacts can be affected by other variables and may depend on different dimensions of financial development. This paper studies the effects of financial development with multi-dimensional analysis (financial depth, financial access and financial efficiency) of two main categories (financial institutions and financial markets) and institutional quality on income inequality in 30 Asian countries in the period 2000 – 2019. Results show that the financial institutions development (FI), the financial institutions access (FIA), the financial institutions efficiency (FIE), and the financial markets access (FMA) reduce income inequality; but the overall financial development (OFD), the financial markets development (FM), the financial institutions depth (FID), and the financial markets depths (FMD) increase it. Notably, better institutional quality not only lessens income inequality, but also moderates the effects of financial development on income inequality. Specifically, the improvement of institutional quality strengthens the beneficial effects of FI, FIA, FIE, and FMA on income inequality. Meanwhile, OFD, FM, FID, and FMD initially exacerbate income inequality until respective thresholds of institutional quality, and then beyond those levels of IQ, these indicators of financial development reduce income inequality. Results are robust with various estimators. These findings strongly support the importance of financial development with multi-dimensions and institutional reform in Asian countries as they have both direct and indirect impacts on income inequality through their mutual interactions.

1. Introduction

The impact of financial development on income inequality has been inconclusive in the literature. On the one hand, financial development can reduce income inequality by helping the poor reach more opportunities to invest in education for their children in the future (Galor & Moav, 2004), lowering the fixed costs of accessing financial

services for low-income individuals, improving welfare as well as stimulating demand for low-skilled workers (Demirgüç-Kunt & Levine, 2009), and giving the poor more financial access (Weychert, 2020). On the other hand, scholars argue that financial development can exacerbate income inequality because: i) the rich are much easier and more advantageous for accessing financial institutions (Rajan & Zingales, 2003), ii) the poor get little benefit when financial development leads to higher returns to capital and higher payment for professionals in financial sector (Greenwood & Jovanovic, 1990), and iii) expanded financial services raise the demand for high-skilled workers and their relative wages (Demirgüç-Kunt & Levine, 2009).

Such ambiguous effects of financial development on income inequality found in the literature imply that the effects may depend on dimensions of financial development, and can be affected by other variables. For instance, Naceur and Zhang (2019) show that rising financial access and stability decrease income inequality while financial liberalization tends to worsen it. However, when using a particular traditional variable for financial development such as domestic credit to private sector (% of GDP) authors gain contradictory results. For example, to Beck et al. (2007), domestic credit to private sector can lessen income inequality, but De Haan and Sturm (2017) find that this indicator of financial development exacerbates income distribution. Such conflicting results indicate that the impact of financial development on income inequality may depend on other factors. De Haan and Sturm (2017), as an example, find that financial development increases income inequality and the impact of financial liberalization on income inequality is conditioned by the quality of political institutions. In addition, it is found that income inequality caused by the financial factors is associated to more income redistribution than inequality caused by other factors, implying that the inequality-increasing effect of finance can be redressed by policy

makers (Van Velthoven et al., 2019). Therefore, institutional quality can play an important role in moderating the impact of financial development on income inequality. However, it is still a research gap in this field.

In this paper, we investigate the impacts of financial development with three dimensions (financial depth, financial access, and financial efficiency) of two main categories (financial institutions and financial markets) and institutional quality on income inequality in 30 Asian countries for the period 2000 – 2019. Each dimension of financial development deputizes a different aspect and may have different impacts on income inequality. Therefore, the role of institutional quality in moderating the impact of each dimension on income inequality is also dissimilar.

Asia provides a fruitful context to study for many reasons. *First*, recent rapid economic growth has reduced poverty (Perera & Lee, 2013) but widened income inequality in many Asian countries (Yang & Greaney, 2017). *Second*, accompanied with higher income inequality is low institutional quality with slow progress in this continent (Huynh & Nguyen, 2020; Huynh et al., 2020; Huynh, 2021). *Third*, policy makers need empirical evidence to support their decision making on whether they can improve institutional quality and which dimensions of financial development they should boost to lessen income inequality in Asian countries, because each dimension of financial development differently affects income inequality, and this effect depends on institutional quality.

We contribute to the existing literature by three key points. *First*, we analyse the effect of financial development on income inequality in both integrated and disintegrated ways of financial development with three dimensions (financial access, financial depth, and financial efficiency) of two main categories (financial markets and financial institutions). *Second*, we simultaneously examine the impact of various

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dimensions of financial development and institutional quality on income inequality. *Third*, we explore the role of institutional quality in moderating the impact of various dimensions of financial development on income inequality.

2. Literature review

2.1. The effect of financial development on income inequality

Evidence on the effects of financial development on income inequality has been inconclusive. Based on the results, previous studies can be categorized into three strands, including positive effect, negative effect, and inverted U-shaped effect.

In the first strand, Banerjee & Newman (1993) and Galor & Zeira (1993) theoretically propose the negative effect of financial development on income inequality. According to Banerjee & Newman (1993), financial development can reduce income inequality as it provides better credit availability that poor households can use for occupational choice to improve their future income. Meanwhile, Galor & Zeira (1993) and Galor & Moav (2004) modellize that financial development reduces income inequality through the channel of human capital investment that poor households gain from credits. Clarke et al. (2006) empirically prove that when financial development is greater income inequality become smaller in the long run for 83 countries between 1960 and 1996, as suggested by Banerjee & Newman (1993), and Galor & Zeira (1993). However, financial development at its initial low level can increase income inequality, consistent with Greenwood and Jovanovic (1990). Meanwhile, results by Beck at al. (2007) indicate that financial development reduces income inequality by proportionately boosting incomes of the poorest quintile and by decreasing poverty. The negative impact of financial development on income inequality is also found due to stimulating demand for low-skilled workers and lowering the fixed costs of accessing financial services for low-income individuals (Demirgüç-Kunt &

Levine, 2009). Recently, Weychert (2020) confirms that financial access decreases income inequality in 52 countries from 2003 to 2014.

Conversely, it is theoretically contended in the second strand that the rich get more benefits than the poor from financial markets because they are much easier and more advantageous for accessing due to entry fees, and this widens the income gap over time (Rajan & Zingales, 2003). Empirically, Jauch & Watzka (2016) find a positive impact of financial development – proxied by private credit to GDP – on income inequality in 138 developed and developing countries over the period 1960–2008. Similarly, De Haan and Sturm (2017) confirm that financial development and financial liberalization exacerbate income inequality for a sample of 121 countries during 1975-2005. Moreover, financial development increases income inequality since expanded financial services raise the demand for high-skilled workers and their relative wages (Demirgüç-Kunt & Levine, 2009). Jaumotte et al. (2013) show that financial globalization is associated with an increasing income inequality in 51 countries from 1981 to 2003. This is explained through the rising demand for skills and education that leads to higher income but incomes disproportionately raise more for those who already have higher levels of education and skills with high incomes. For examining the case of China, Jung and Cha (2021) reveal that although increasing GDP per capita, financial development worsens income inequality in provinces of China because China is not passing the turning point of the inverted U-shaped curve yet – another strand on the impact of financial development proposed by Greenwood and Jovanovic (1990).

In this third strand, Greenwood and Jovanovic (1990) theoretically suggest that income inequality rises at the initial stage because only the rich can afford to access and get profit from financial markets; and declines after a certain level of financial development as the poor can enter in financial markets with the improvement in their

incomes. This theoretical model, a so-called "the financial Kuznets curve", is then illustrated by other scholars. For example, Destek et al. (2017) find the inverted-U-shaped financial Kuznets curve in Turkey for the period 1977-2013. Akan et al. (2017) also prove that the financial Kuznets curve is valid in 20 European member countries for the period from 1992 to 2013. By using annual panel data in the period 1995-2015, Younsi and Bechtini (2018) illustrate that financial development index increases income inequality, and then reduces it in the BRICS countries - consisting of Brazil, Russia, India, China, and South Africa. Similarly, Azam and Raza (2018) show the existence of such financial Kuznets curve in ASEAN-5 countries, including, Malaysia, Indonesia, Thailand, and the Philippines during 1989–2013. in this study (Azam and Raza, 2018), Financial development is measured by stock market capitalization, domestic credit to the private sector, and domestic credit by the banking sector. Nguyen et al. (2019) find similar results of inverted U-shaped relationship between financial development and income inequality for 21 emerging countries over the period 1961–2017. Most recently, Khatatbeh et al. (2022) provide evidence for the financial Kuznets curve in Jordan from 1993 to 2017.

However, the study by Park and Shin (2017) reveals a U-shaped relationship between financial development and income inequality in 162 countries during 1960–2011: financial development reduces inequality up to a point of financial development, then beyond that it worsens inequality. The two scholars also show that the reducing-inequality effect of financial development becomes more effective in condition of improved education and law order. Similarly, Sayar et al. (2020) prove that there is a U-shaped relationship between financial development and income inequality for the period of 1990-2013 in 23 developing countries, and therefore the existence of financial Kuznets curve is not confirmed. Most recently, Destek et al. (2020) find an inverted U-

shaped relationship of income inequality and financial development proxied by overall

financial development and banking sector development, and a decreasing relationship

between income inequality and stock market development in Turkey for the period

1990-2015.

Inconsistent findings on the impact of financial development on income inequality

as reviewed above can be due to using different proxies for financial development. Most

of the previous studies use traditional variables to measure financial development, such

as: domestic credit to private sector by banks, domestic credit to private sector,

domestic credit to private sector by financial sector, liquid liabilities to GDP, stock

market capitalization, and private credit by deposit money bank to GDP… However,

most of these proxies focus on measuring financial depth, ignoring the complex

multidimensional nature of financial development. In a more inclusive approach, we

employ a new broad-based index of financial development from International Monetary

Fund (IMF) database (Svirydzenka, 2016) with nine indicators, including overall

financial development (FD), overall financial institutions development (FI), financial

institutions access (FIA), financial institutions depth (FID), financial institutions

efficiency (FIE), overall financial markets development (FM), Financial markets access

(FMA), financial markets depth (FMD), and financial markets efficiency (FME). We

argue that the effect of financial development on income inequality may depend on

different dimensions of financial development

Hypothesis 1: Each proxy of financial development may have a negative or positive

effect on income inequality, ceteris paribus.

2.2. The impact of institutional quality on income inequality

The important role of institutional quality has been demonstrated in the literature of

various economic fields. For example, it not only drives for economic development

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(Acemoglu et al., 2005), but also reduces the harmful impact of climate change on economic growth (Hoang & Huynh, 2021). Instituional quality also enhances the beneficial impact of FDI on environmental quality (Huynh & Hoang, 2019), and moderates the impact of FDI on income inequality (Huynh, 2021). Especially, it can lead to a more equal distribution of income because the poor can be protected by an independent judicial system (Chong & Gradstein, 2007). Similarly, Carmignani (2009) proves that weak institutions lead to higher income inequality. Meanwhile, Gradstein et al. (2001) contend that the impact of democracy on inequality depends on the ideology and political systems. They find that democratization substantially reduces inequality in Judeo-Christian societies, but not much in those of Confucian, Buddhist, and Hindu. Besides, inequality is negatively affected by democracy in in countries with a parliamentary than a presidential system. Other studies also show the negative impact of institutional quality on regional income disparities (Kyriacou & Roca-Sagalés, 2013; Ezcurra & Rodrìguez-Pose, 2014). In the current study, we confirm the negative impact of instional quality on income inequality.

Hypothesis 2: Institutional quality negatively affects income inequality, ceteris paribus.

2.3. *The joint effects of financial development and institutional quality on income inequality*

There has been no research on the joint effect of financial development and institutional quality on income inequality. However, we include this simultaneous effect in our research for the following reasons. *First*, using the same variable for financial development (domestic credit to private sector) to examine its impact on income inequality, but Beck et al. (2007) find negative one while De Haan and Sturm (2017) show positive one, implying that this impact may depend on another factor. *Second*, this factor can be institutional quality as Velthoven et al. (2019) demonstrate income

inequality caused by finance is associated to more income redistribution than inequality caused by other factors, implying that the inequality-increasing effect of finance can be redressed by policy makers who can affect various dimensions of institutional quality. *Third*, better institutional quality stimulates financial development via the rules of law, voice accountability, and government effectiveness (Khan H et al., 2020), and financial development reduces income inequality by giving the poor more financial access to improve their incomes (Beck at al., 2007; Weychert, 2020). *Fourth*, if financial development increases income inequality, the improvement in institutional quality helps reduce this detrimental impact since better institutional quality provides better conditions to protect the poor (Chong & Gradstein, 2007). *Fifth*, Le et al. (2020) also show that financial development increases income inequality, but this harmful effect diminishes with the further development of financial system - which is largely attributed by better institutional quality (Khan MA et al., 2020). Hence, we postulate that institutional quality can moderate the impact of financial development on income inequality.

Hypothesis 3: Institutional quality may increase/decrease the beneficial/detrimental impacts of financial development on income inequality, ceteris paribus.

3. Empirical model, data and econometric methodology

3.1. Empirical model and data

Based on theoretical background proposed Banerjee & Newman (1993), previous studies, and the above arguments, we investigate the impact of financial development and institutional quality as well as their interaction on income inequality by employing the following panel data model:

$$GINI_{it} = \alpha_0 + \alpha_1 FD_{it} + \alpha_2 IQ_{it} + \alpha_3 FD_{it} * IQ_{it} + X'_{it} \beta_j + \varepsilon_{it} \qquad (1)$$

where:

i and t represent country and time, respectively; α_1, α_2, α_3, and β_j are the respective coefficients; and ε_{it} is the residual term.

The dependent variable is income inequality (GINI), measured by the GINI index from the Standardized World Income Inequality Database – SWIID (Frederick, 2020) GINI is "the estimate of Gini index of inequality in equivalized (square root scale) household market (post-tax and post-transfer) income, using Luxembourg Income Study data as the standard" (Frederick, 2020). This index, with higher value indicating higher income inequality, provides the best available country-level indicator of income inequality for international studies (Gimpelson & Treisman, 2018). This index has been used in various prior studies, such as those by Afesorgbor & Mahadevan (2016), Le et al. (2020), and Lee et al. (2020).

The independent variables are financial development (FD), and institutional quality (IQ). FD is measured by nine financial indicators from International Monetary Fund (IMF): the overall financial development index (OFD), two sub-indices for OFD named the financial institutions index (FI) and the financial markets index (FI), and six proxies for various dimensions of the two sub-indices namely financial institutions depth (FID), financial institutions access (FIA), financial institutions efficiency (FIE), financial markets depth (FMD), financial markets access (FMA), and financial markets efficiency (FME). All of these nine indicators are estimated numbers, ranking from 0 (lowest development) to 1 (highest development). The calculation for each indicator is apparently described by Svirydzenka (2016). Using these nine indicators will provide a more comprehensive and inclusive analysis on the impacts of financial development with various dimensions on income inequality. Besides, we recruit the quality of governance index from Worldwide Governance Indicators – WGI (World Bank, 2020a), ranked from - 2.5 (lowest quality) to + 2.5 (highest quality) to measure IQ. This

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is a composite index of institutional quality, captured by six constituents, consisting of Rule of Law, Government Effectiveness, Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Regulatory Quality, and Control of Corruption.

FD*IQ designates the interaction between FD and IQ. The marginal effect of FD on GINI in the presence of IQ is calculated by taking the partial derivative of Eq. (1) with respect to FD:

$$\frac{\partial(GINI_{it})}{\partial(FD_{it})} = \alpha_1 + \alpha_3 \, IQ_{it} \qquad\qquad (2)$$

Because measuring FD by nine indicators (including OFD, FI, FM, FID, FIA, FIE, FMD, FMA, and FME), we will calculate the marginal effects of all these nine indicators of FD on income inequality in the moderating effect of IQ by alternatively using Eq. (2).

Finally, X is a vector of control variables, including Trade openness (OPEN), Inflation (INF), Education (EDU), Natural resource allocation (LAND), and Employment (EMP). The justification of these variables is given as follows:

Trade openness: Trade openness can narrow income inequality (Borraz & Lopez-Cordova, 2007; Salimi et al., 2014) or can widen it (Mahesh, 2016; Wong, 2016). To some authors, this impact may depend on factor endowments. For example, Barro (2000) shows evidence that trading openness lowers income inequality in poor countries but raises it in rich countries. We measure trade openness by the share of import and export in GDP, collected from WDI (World Bank, 2020b).

Inflation: Rising inflation rate can reduce income inequality through raising the nominal income or decreasing the real value of private debt (Rice & Lozada, 1983; Mocan, 1999; Heer & Maußner, 2005; Sun, 2011). Inflations is also found to worsen relative income by lowering the purchasing power of the poor (Siami-Namini & Hudson, 2019; Law & Soon, 2020). However, Balcilar et al. (2018) find a nonlinear

impact of inflation on income inequality, i.e., inflation exacerbates income inequality at a certain threshold of inflation, below this level inflation lessens income inequality. In our study, inflation is measured by Consumer Price Index (CPI), extracted from WDI (World Bank, 2020b).

Education: It is contended that education helps reduce income inequality through the channel of improving skill and income (Mincer, 1970; Gregorio & Lee, 2002; and O'neill, 1995). However, Battistón et al. (2014) debate that the convexity of returns to education leads to more income dispersion. Meanwhile, Yang and Qiu (2016) prove that income gaps are mainly caused by the difference in early education investment. Notwithstanding, other scholars find no significant impact of education on income inequality (Park, 1996; Digdowiseiso, 2009). Tertiary school enrolment is proxied for education in our study, extracted from WDI (World Bank, 2020b).

Natural resources: The initial distribution of assets and natural resources is one of important drivers of income inequality (Deininger & Squire, 1998). To Grossman and Helpman (1996), natural resources may worsen income inequality since they promote corruption and greed amongst policy makers. However, Fawaz and Frey (2018) argue that natural resource abundance in less-developed countries rapidly reduces income inequality over time, as long as that country continues on its path of economic growth. Moreover, Fum and Hodler (2010) show that natural resources widen income inequality in ethnically polarized societies, but narrow income inequality in ethnically homogenous societies. We use land per person as a proxy for initial allocation of natural resources, collected from WDI (World Bank, 2020b).

Employment: Unemployment exacerbates income inequality due to the falling income of the poor and vulnerable groups in society. This harmful impact of unemployment on income inequality has been confirmed by many scholars such as Rice

and Lozada (1983), Mocan (1999), Cysne (2009), and Sheng (2011). Hence, employment, especially in services – is considered a solution to lessen income inequality (Huynh & Nguyen, 2020). In the present study, we use employment in services from WDI (World Bank, 2020b) as an indicator for employment.

Due to the availability of all data in the empirical model (1), we collect them for 30 Asian nations in the period 2000 – 2018, including Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Iran, Israel, Japan, Jordan, Kazakhstan, Korea Republic, Kyrgyzstan, Laos, Lebanon, Malaysia, Mongolia, Myanmar, Nepal, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Tajikistan, Thailand, Vietnam, and Yemen. Summary statistics, definitions, and measurements of all variables are provided in Table 1.

Table 1. Summary statistics

Variables	Definitions and measurements	Mean	St.var	Min	Max	Obs
GINI	Gini (estimated number) from SWIID	38.049	5.057	26.3	50.6	560
OFD	Overall financial development (estimated #)	0.355	0.213	0.035	0.901	600
FI	Financial institutions development	0.387	0.190	0.068	0.932	600
FM	financial markets development	0.313	0.262	0.0002	0.896	600
FID	Financial institutions depth	0.239	0.242	0.008	0.905	600
FIA	Financial institutions access	0.289	0.226	0.016	1	600
FIE	Financial institutions efficiency	0.643	0.116	0.016	0.804	600
FMD	Financial markets depth	0.297	0.273	0.0004	0.927	600
FMA	Financial markets access	0.279	0.249	0.000	1	600
FME	Financial markets efficiency	0.354	0.373	0.000	1	600
IQ	Institutional quality (estimated number)	-0.300	0.730	-1.994	1.639	570
OPEN	Trade openness (% GDP)	91.363	66.400	0.167	437.327	576
INF	Inflation, CPI (%)	5.712	6.225	-18.109	57.075	578
EDU	School enrolment, tertiary (% gross)	32.045	21.993	2.379	104.278	548
LAND	Land per person (hectare)	0.102	0.162	0.0001	1.029	552
EMP	Employment in services to total (%)	46.957	17.850	13.817	83.451	570

3.2. Econometric methodology

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The empirical model (1) is estimated by using the Feasible Generalized Least Squares (FGLS) to correct the presence of heteroskedasticity across panels and autocorrelation within panels and (Greene, 2012). However, income inequality may have a feedback effect on financial development, indicating a potential endogeneity in our model. For example, income inequality may contribute to banking crises by stimulating the accumulation of household debt though credit expansion (Destek et al., 2019). Balcilar et al. (2021) also illustrate that rising income inequality can predict financial stress in the United States (US) over the annual period of 1913 to 2016. Hence, the estimation method of two-step System Generalized Method of Moments (SGMM) is employed as a robust check to deal with the issues of potential endogeneity (Blundell & Bond, 1998). When we use SGMM estimator, the model (1) can be rewritten in the form of dynamic model as follows:

$$GINI_{it} = \alpha_0 + \alpha_1 FD_{it} + \alpha_2 IQ_{it} + \alpha_3 FD_{it}* IQ_{it} + \alpha_4 GINI_{it-1} + X'_{it}\beta_j + \varepsilon_{it} \quad (3)$$

By conducting SGMM, the lagged values of dependent variable and the first difference of independent variables are used as instruments for differenced equation, while the lagged differences of the dependent variable are instrumented for level equation. Arellano and Bond (1991) propose two kinds of tests conducted for the post-estimation of SGMM. *First*, conducting the Sargan test aims at examining the validity of instruments and specifications. *Second*, the Arellano and Bond test is performed to check the hypothesis that the errors from the estimations are first-order correlated (AR1) but not second-order correlated (AR2). In addition, year dummies are included in the models (1) & (3) for regressions to control the overall effects of technological changes over time. We also perform the restricted number of lags to control the issue of instrument proliferation.

4. Empirical results and discussions

We check the data stationarity by conducting Fisher stationary test based on the Im–Pesaran–Shin unit root test (Im et al., 2003) and Phillips–Perron unit root test (Choi, 2001) with the null hypothesis that the variable gets unit-roots. Results reject the null hypothesis for GINI, OFD, FI, FM, FID, FIA, FIE, FMA, FME, IQ, INF, and EMP, indicating that these variables are stationary at levels. Nevertheless, we fail to reject the null hypothesis for FMD, OPEN, EDU, and LAND, specifying that these variables are not stationary at levels. Then they are stationary at their first differences. Results of unit-root tests is not presented here to save spaces, but they will be available upon requests.

We begin our regression with Pooled Ordinary Least Square (OLS) estimator for panel data. We detect the presence of autocorrelation but not heteroskedasticity in our specifications by performing Wooldridge test and Breusch-Pagan test. Thus, we employ the estimation methods of FGLS and SGMM to correct issues of autocorrelation and potential endogeneity, respectively. The empirical models (1) and (3) are estimated by FGLS and SGMM, respectively, in three specifications. In the first specification (1), we investigate the impacts of OFD, IQ and their interaction (OFD*IQ) on GINI. Then, we replace OFD by FI and FM in the second specification (2). Finally, we substitute FI by its three dimensions (FID, FIA, and FIE) and FM by its three ones (FMD, FMA, and FME) in the third specification (3). All control variables (OPEN, INF, EDU, LAND, and EMP) are included in all three specifications. Estimation results and relevant tests are reported in Table 2.

Table 2. Estimation results for Eq. (1) by FGLS and SGMM estimators

Dependent variables: GINI						
Regressors	(1)		(2)		(3)	
	FGLS	SGMM	FGLS	SGMM	FGLS	SGMM
GINI (-1)		0.981***		0.977***		0.928***
		(9.43)		(8.65)		(5.05)

	(1)	(2)	(3)	(4)	(5)	(6)
OFD	3.135**	2.514*				
	(2.11)	(1.92)				
FI			-5.403**	-4.864**		
			(2.08)	(2.13)		
FM			6.246***	5.347**		
			(3.54)	(2.34)		
FID					3.678**	2.971**
					(2.25)	(1.98)
FIA					-3.749**	-3.247**
					(2.19)	(2.04)
FIE					-6.567**	-5.141**
					(2.30)	(2.16)
FMD					5.321***	4.184**
					(3.66)	(2.37)
FMA					-2.236**	-2.695**
					(2.17)	(2.09)
FME					1.152	1.696
					(1.38)	(1.31)
IQ	-4.122***	-3.094**	-5.436***	-4.496**	-5.338**	-4.560**
	(4.49)	(2.25)	(5.49)	(2.18)	(2.16)	(2.32)
OFD*IQ	-14.072***	-9.822**				
	(9.16)	(2.41)				
FI*IQ			-12.422***	-10.462**		
			(4.65)	(2.33)		
FM*IQ			-5.653**	-5.101***		
			(2.32)	(3.16)		
FID*IQ					-3.850**	-3.732**
					(2.13)	(1.98)
FIA*IQ					-16.193***	-13.616**
					(7.23)	(2.35)
FIE*IQ					-12.155***	-8.197***
					(3.47)	(3.04)
FMD*IQ					-7.673***	-6.228**
					(2.96)	(2.25)
FMA*IQ					-10.699***	-7.028**
					(5.68)	(2.36)
FME*IQ					-5.101***	-4.926**
					(3.67)	(2.33)

OPEN	0.067**	0.046***	0.079***	0.056***	0.062***	0.051**
	(2.14)	(3.59)	(3.41)	(2.61)	(5.12)	(2.24)
INF	0.079*	0.052*	0.046	0.058*	0.037*	0.045*
	(1.86)	(1.91)	(1.55)	(1.83)	(1.78)	(1.81)
EDU	-0.071***	-0.044**	-0.077***	-0.056***	-0.083***	-0.065**
	(4.66)	(2.55)	(2.92)	(2.75)	(4.56)	(2.31)
LAND	-14.369***	-11.782**	-14.714***	-10.946*	-18.691***	-12.890**
	(9.46)	(2.59)	(9.78)	(1.89)	(9.39)	(2.13)
EMP	-0.064***	-0.057***	-0.070**	-0.052***	-0.056***	-0.062**
	(3.04)	(4.09)	(2.35)	(3.51)	(2.78)	(2.32)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	42.439***	37.218***	44.106***	40.184***	52.551***	39.115***
Obs	437	418	437	418	437	418
AR(1)-P		0.019		0.011		0.041
AR(2)-P		0.399		0.556		0.254
Sargan-P		0.513		0.488		0.673

Absolute T-statistics appear in brackets. ***, ** and * denote significance at 1%, 5% and 10%, respectively. AR(1)-P: P-value of first-order correlation. AR(2)-P: P-value of second-order correlation. Sargan-P: P-value of Sargan test.

Results in Table 2 highlight interesting findings as follows.

First, the financial institutions development (FI) improves income inequality while the overall financial development (OFD) and the financial markets development (FM) worsen it at statistically significant levels of 1% – 10% in the specifications (1) and (2). Remarkably, the detrimental effect of the FM is stronger the beneficial effects of the FI on income inequality. These results are the novelty of our research because prior studies based on some angles of financial development (such as domestic credit to private sector, domestic credit to private sector by banks, and stock market capitalization) in examining its impact on income inequality. Our finding of a positive impact of the OFD on income inequality is consistent with Rajan & Zingales (2003), Demirgüç-Kunt & Levine (2009), Jauch & Watzka (2016), and De Haan & Sturm (2017). Out of previous explanations by these authors for this finding, we contribute by another important point,

that is, the detrimental effect of the FM is stronger the beneficial effect of the FI on income inequality, leading to the positive effect of overall financial development on income inequality. This implies that the poor may benefit from the FI while the rich may gain more from the FM. The above results support our first hypothesis that each proxy of financial development may have different impacts on income inequality, especially when we examine various dimensions of financial development in the third specification (3).

Second, a decomposed analysis of the FI and the FM into their multi-dimensions shows novel results in the third specification (3). Income inequality is negatively affected by the financial institutions access (FIA), the financial institutions efficiency (FIE) and the financial markets access (FMA); but positively influenced by the financial institutions depth (FID) and the financial markets depth (FMD) at statistically significant levels of 1% – 5%. Besides, the financial markets efficiency is found to have a positive impact on income inequality, but it is statistically insignificant. These results provide an inclusive picture about different impacts of the FI and the FM with their three dimensions (depth, access, and efficiency) on income inequality for the first time in the literature. On the one hand, we explain that the access for financial institutions and financial markets as well as the efficiency of financial institutions can benefit the poor because they can access FI and FM with lower costs and fees, and can improve their incomes with investment in human capital and education. On the other hand, the depth of financial institutions and financial markets may harm the poor due to: i) the rising demand for high-skilled workers and their relative wages for expanded financial services, and ii) the higher returns to capital and higher payment for professionals in financial sectors.

Third, institutional quality (IQ) negatively affects income inequality at statistically

significant levels of 1% – 10% in all specifications, confirming our second hypothesis of the beneficial impact of IQ in reducing income inequality. This finding is in accord with Chong & Gradstein (2007), Carmignani (2009), and Huynh (2021).

Fourth, the role of IQ in moderating the impacts of financial development in terms of multi-dimensional proxies on income inequality is found with interesting results. On the one hand, the positive coefficients of financial development (α_1) represented by OFD, FM, FID, and FMD, and the negative interaction terms of these variables and IQ (α_3) with $\alpha_1 <$ /α_3/ illustrate that OFD, FM, FID, and FMD initially increase income inequality until certain thresholds of IQ, then above those levels of IQ, these proxies of financial development reduce income inequality. This is another important contribution of the present paper to the literature. These thresholds can be computed by setting Eq. (2) = 0 and using coefficients of respective variables estimated by SGMM in the three specifications. By this way, the thresholds of IQ for OFD, FM, FID, and FMD are 0.256, 1.048, 0.796, and 0.672, respectively.

On the other hand, the negative coefficients of financial development (α_1) proxied by FI, FIA, FIE, and FMA, as well as the negative interaction terms of these variables and IQ (α_3) demonstrate that FI, FIA, FIE, and FMA help reduce income inequality, and the improvement in IQ intensifies these beneficial impacts.

Fifth, we also confirm other determinants of income inequality in the context of 30 Asian countries, consisting of trade openness, inflation, education, natural resource allocation, and employment. *On the one hand*, education, natural resource allocation, and employment in services are found to reduce income inequality. The negative impact of education on income inequality supports the viewpoint that education helps reduce income inequality through the channel of improving skill and income (Mincer, 1970; Gregorio & Lee, 2002; and O'neill, 1995). Whereas, the income inequality- decreasing

effect of land distribution is consistent with Deininger & Squire (1998) and Fawaz & Frey (2018). Employment in services is also a tool to lessen income inequality, supported by Sheng (2011), and Huynh & Nguyen (2020). *On the other hand*, we find that trade openness and inflation may worsen income inequality. Trade openness can widen inequality due to the hard competition of skilled and unskilled labourers, as argued by Mahesh (2016) and Wong (2016). Meanwhile, the positive impact of inflation on income inequality is consistent with Siami-Namini & Hudson (20190 and Law & Soon (2020) with the standpoint that inflation can lower the purchasing power of the poor.

5. Conclusion and policy implications

The impact of financial development on income inequality has been ambiguous in the literature, indicating that this impact can be affected by other variables and the impact may depend on different dimensions of financial development. This paper examines the effects of financial development with multi-dimensional analysis (financial depth, financial access and financial efficiency) of two main categories (financial institutions and financial markets) and institutional quality on income inequality in 30 Asian countries in the period 2000 – 2019. Results show that the financial institutions development (FI), the financial institutions access (FIA), the financial institutions efficiency (FIE), and the financial markets access (FMA) reduce income inequality; but the overall financial development (OFD), the financial markets development (FM), the financial institutions depth (FID), and the financial markets depths (FMD) increase it. Notably, better institutional quality not only lessens income inequality, but also moderates the effects of financial development on income inequality. Specifically, the improvement of institutional quality strengthens the beneficial effects of FI, FIA, FIE, and FMA on income inequality. Meanwhile, OFD, FM, FID, and FMD initially

exacerbate income inequality until respective thresholds of institutional quality, and then beyond those levels of IQ, these indicators of financial development reduce income inequality. We calculate that the thresholds of IQ for OFD, FM, FID, and FMD are 0.256, 1.048, 0.796, and 0.672, respectively. Results are robust with estimators FGLS and SGMM, solving issues of heteroskedasticity, autocorrelation, and potential endogeneity.

The findings of this study have a number of practical implications as follows. *First*, policy makers should take advantage of the financial institutions development – instead of the financial markets development – to reduce income inequality. *Second*, policies to lessen income inequality should focus on promoting specific dimensions of financial development, including: the financial institutions access, the financial institutions efficiency, and the financial markets access. *Third*, when making policies to promote financial development through dimensions of financial markets development, financial institutions depth, and financial markets depths, governments should take the poor into consideration with simultaneous policies to narrow income inequality. *Fourth*, the institutional reform plays an important role in the battle against income inequality in Asian countries as it has both direct and indirect impacts on income inequality through its interaction with various dimensions of financial development. Specifically, Asian countries can improve institutional quality to multiply the beneficial impacts of financial institutions development, the financial institutions access, the financial institutions efficiency, and the financial markets access on income equality. Especially, Asian countries can even utilise OFD, FM, FID, and FMD to lessen income inequality when their institutional quality levels are above 0.256, 1.048, 0.796, and 0.672, respectively, because these are the thresholds that the detrimental impact of these dimensions of financial development on income equality turns to the beneficial one. Fifth, other

policies for reducing income inequality in Asia should concentrate on promoting education, efficiently allocating natural resources, and creating more employment in services.

Although trying our best, we cannot avoid the limitations. The motivation of our research is arisen not only from reasons of policy but also from those of theory and practice. The concerned problems of Asia that we are dealing with are: rising income inequality, low institutional quality and variations in different dimensions of financial development. Our results are expected to provide policy-makers helpful information on using different dimensions of financial development combined with different levels of institutional quality to reduce income inequality. Therefore, we did not discuss the economic intuitions behind the findings or new policy initiatives, but policy implications from the findings. Furthermore, future studies should examine other factors that can moderate the impacts of different dimensions of financial development on income inequality.

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