FINANCIAL DEVELOPMENT, INSTITUTIONAL QUALITY, AND INCOME INEQUALITY:
COMPARATIVE ANALYSIS BETWEEN DEVELOPED AND DEVELOPING COUNTRIES

By

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DECLARATION

I hereby declare that the dissertation is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

Name ______________________________

Date ______________________________

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APPROVAL SHEET

This dissertation/thesis entitled "**FINANCIAL DEVELOPMENT, INSTITUTIONAL QUALITY, AND INCOME INEQUALITY: COMPARATIVE ANALYSIS BETWEEN DEVELOPED AND DEVELOPING COUNTRIES"** was prepared by CHEAH SIEW PONG and submitted as partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics at Universiti Tunku Abdul Rahman.

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LIST OF ABBREVIATION

GDP	: Gross Domestic Product
GFDD	: Global Financial Development Database
GMM	: Generalized Method of Moments
ICRG	: International Country Risk Guide
IMF	: Internation Monetary Fund
MDG	: Millennium Development Goals
OECD	: Organization for Economic Co-operation and Development
SDG	: Sustainable Development Goals
SWIID	: Standardized World Income Inequality Database
UNDP	: United Nations Development Programme
WDI	: World Development Indicator

ABSTRACT

Reducing income inequality to a sustainable degree is of utmost importance, as extremely unequal income distribution is harmful to the social and economic wellbeing of any country. Therefore, governments and national leaders were committing or committed to reducing income inequality in their borders, and two of the most recognizable collective efforts are the Millennium Development Goals (MDGs, 2000 to 2015) and the succeeding Sustainable Development Goals (SDGs, 2015 to 2030). However, even after the participating members and organizations have put in enormous efforts and resources, there is, at best, limited achievement in reducing income inequality through the MDGs according to the World Gini index. One of the reasons behind this failure is that majority of the countries focused mainly on a progressive tax system to redistribute income while neglecting the fact that income inequality is multi-faceted. Likewise, this study questions on the potential of channels other than the fiscal taxation approach, namely the financial channel and the institutional channel, as effective alternatives in reducing income inequality in the context of developed and developing countries. Specifically, this study attempts to (i) investigate the roles of financial development and institutional quality in reducing income inequality, (ii) examine the potential interactive role of institutions and financial development in the inequality-finance-institution nexus, and (iii) examine the role of income inequality in endogenously determining institutional quality. Methodological wise, this study employs the System GMM technique on analyzing the panel datasets of 36 developed economies and 62 developing countries over the period from 1996 to 2015. The results revealed the following major findings. First, both financial development and institutional quality played an important role in determining income inequality in both advanced and developing countries. Stronger institutions exert a linear and negative effect on income inequality, and this negative effect holds across all aspects of institutional quality except governmental stability. Financial development, however, exerts nonlinear effects on income inequality, and the nonlinear effects are heterogeneous between developed (a U-shaped curve) and developing countries (an inverted U-shaped curve). Second, there exists a significant substitutional effect between financial development and each of the aspects of institutional quality in terms of reducing income inequality. Third and last, income inequality exhibits both a direct deteriorating effect and an indirect negative effect on institutional quality through reducing democratic accountability. The findings suggest that improving the existing financial and institutional framework could be an alternative policy vehicle to reduce income inequality, on top of the conventional fiscal tools.

Keywords: Income Inequality, Financial Development, Institutional Quality, System GMM

CHAPTER 1

INTRODUCTION

"No other question in economic policy is ever so important as the effect of a measure on the distribution of income."
— John Kenneth Galbraith ([1958] 1998, pp. 69)

On 17th September 2011, a group of protesters gathered at the New York Zuccotti Park and began their protests at the Wall Street financial district (The Occupy Solidarity Network, 2016). This protest movement, which was named "Occupy Wall Street", has gained widespread attention rapidly and soon inflated to an international social-political movement that was ongoing in 951 cities over 82 countries (Adam, 2011, October 15; Thompson, 2011, October 15). The main concerns of this protest movement are, as claimed by the organizer and the founder (The Occupy Solidarity Network, 2016), bring awareness to the public on how large corporations influence the world in ways that benefit the rich and the elite unevenly and demoting democracy. All of the Occupy movements around the world share a slogan "We are the 99%", which resonates with the intolerance of people over the fact that the top 1% of income recipients owned most of the wealth and capital as compared to the rest[1].

[1] Strictly speaking, the figure of 1% here refers to the economic inequality presented in the United States. The origin of the phrase comes from Stiglitz's (2011) article "Of the 1%, by the 1%, for the 1%". In this article, the Stiglitz warned about the adverse impact of economic inequality as 1% of

One year later, a labor strike that occurred at a mining site in Marikana, Rustenburg, South Africa, was ended far from peace. On 16th August 2012, a group of platinum miners went on strike as their earlier demand for raising wages has been rejected by their employer. The group of unarmed miners was later oppressed by open fire from the special elite unit of the South African police force. The consequence is tragic; 34 miners were killed and at least 78 miners were injured (BBC News, 2012, August 18). This incident was later named "The Marikana massacre".

The social-political movements mentioned above, be it violent or nonviolent, were only a few of the many around the world. These movements reflect the clashes between the rich and the poor; the injustice between the Bourgeoisie and the Bolshevik. These social unrests have reminded us about a long-lasting but ongoing major economic issue: income inequality.

The issue of income inequality has long been the central thesis in numerous academic discussions, political debates, and media reports, all of which revolve around the root and cause of income inequality, the social and economic impact of unequal income distributions, and how to effectively reduce income inequality. This thesis will carry out an in-depth discussion pertaining to the economic concerns of income inequality, with the primary goal of expanding the understanding of reducing income inequality.

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the U.S. population owned nearly 25% of the national income and nearly 40% of the national wealth, while the rest of 99% owned significantly less.

1.1 Background

1.1.1 Definition of Income Inequality

The concept of “income inequality” must be carefully elaborated before further discussion. By definition, income inequality simply refers to the degree of disposable income is unevenly distributed within a population (Decancq, Fleurbaey, & Schokkaert, 2015).

Gini coefficient[2] is one of the most commonly employed measures of income inequality. A higher degree of income inequality occurs when the majority of the labor income and non-labor income are concentrated among the top income groups, which are typically a minority of the population. Based on the notation above, one can immediately identify that income inequality could be observed from different angles. Beginning from the broadest scale, there is income inequality *between* countries, where various levels of initial national incomes and income growth rates are found from different countries. In other words, *between*-countries inequality is conceptually similar to the divergence in economic growth among countries. Next, the scale is narrowed to the observation *within*-country, where each country has a different income distribution for the income quintiles. Lastly, and of the most micro-scale, income inequality can be measured by comparing the income

[2] The Gini coefficient is a statistical measure of income distribution. The name of the index comes from the Corrado Gini. The Gini index ranges from 0 to 1, where 0 respresents a perfect equality (everyone owns a same amount of resource) and 1 denotes a case of perfect inequality (only one person owns everything within a population).

and wealth from each person in the world, regardless of their nationality. The last type of inequality is called *global* income inequality as coined by Milanovic (2005, 2013).

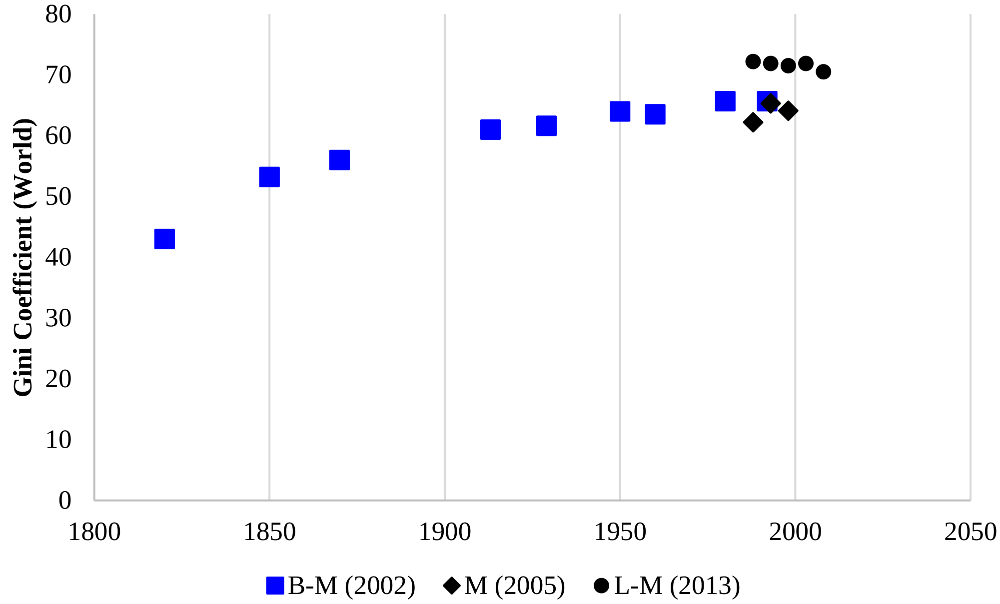
The three types of income inequality described above are similar to the concepts summarized in Milanovic (2005) and Anand and Segal (2015). In the seminal work, Milanovic (2005) has categorized three types of global income inequality and called them Concept 1, Concept 2, and Concept 3 inequality respectively. According to the author, Concept 1 inequality represents the difference between the national income from different countries, without considering the population size. Concept 2 inequality is similar to Concept 1 inequality, but the measurement of national income differences are adjusted to population size. Lastly, Concept 3 inequality is interpersonal as it concerns the differences in personal or household income, regardless of the nationality of the individuals.

Ideally, the Concept 3 inequality is the best representative of income differential among individuals. However, it can be measured only through high-quality household surveys on wealth and income data, which is unavailable in many regions of the world, especially in those poorer countries (Milanovic, 2005). In this regard, Lakner and Milanovic (2015) have compiled data from several national household survey databases (including PovcalNet, World Income Distribution Data, and Luxembourg Income Study) and reorganized it into a unified dataset of global interpersonal income inequality, covering the period of 1988 to 2008. However, while the data of Lakner and Milanovic (2015) appears to be the most comprehensive and closest to the Concept 3 inequality as compared to other databases, it has two limitations that make it not suitable for the proposed analysis of this study. First, the estimates of income inequality in Lakner and Milanovic (2015) are likely underestimated as the accurate income of the top earners are usually underreported, top-coded, or simply taken out as outliers in household surveys. Second, the estimates of income inequality is published in the form of 5-year interval data points rather than a continuous time series on yearly basis. As a result, adoption of the Lakner and Milanovic (2015) inequality data might considerably downplay the dynamic of the time series element in the proposed panel data analysis of this study (see Chapter 3, Section 3.2, page 104 to 107 for more details). Therefore, for the sake of data availability and comparability, most of the discussions in this study are revolving around the *between*-countries and *within*-country income inequality.

1.1.2 Historical Trend of Income Inequality

This section illustrates the historical trend of income inequality. Beginning with a global perspective, Figure 1.1.1 below depicts a very long run of global income inequality since the era of the post-industrial revolution.

Figure 1.1.1: World Gini Coefficient, 1820 – 2011



Source: Bourguignon and Morrisson (2002), Milanovic (2005), Lakner and Milanovic (2016)

The three data series above show the estimates of the world Gini coefficient by Bourguignon and Morrisson (2002) that cover the period from 1820 to 1992. On the other hand, Milanovic (2005) and Lakner and Milanovic (2016) calculated the shorter yet recent estimates of global income inequality for the period from 1988 to 2008. The differences of estimated Gini coefficient among the series above are mainly methodological. The earlier studies such as Bourguignon and Morrisson (2002) commonly estimated the income levels of world citizens by using GDP per capita in constant 1993 $PPP. In contrast, Milanovic (2005) and Lakner and Milanovic (2016) used data of national surveys on income and consumption that comprised of household surveys. The samples covered are also different in the studies above. Bourguignon and Morrisson (2002) used the data of quantile income shares from 33 countries or groups of countries, where 15 countries with large populations or economies are considered individually, and all other countries are clustered into eighteen country groups. The number of national surveys employed in Milanovic (2005) and Lakner and Milanovic (2016) are 345 and 565 respectively, which covered 84 percent to 90 percent of the world population of the time surveyed.

The discussion on the methodological strengths or weaknesses of the studies above is beyond the scope of this section. However, the basic lesson that emerges from these Gini coefficients for a very long time is that the global income inequality did not stop from rising until the mid-20th century since the Industrial Revolution, which caused many European countries and many others to prosper for almost two centuries. This very long period of global inequality first began with an episode of steady increases in global inequality that lasted for almost a century. Then, there are about five decades after World War II when global inequality remained on a high level until finally the very first declining course during the early 21st century. The tiny downward tail of the trend gave some hope that, if the declining trend of global inequality maintains for another 50 years, then there will be a gigantic inverted U-shaped curve, just as how Simon Kuznets (1955) has predicted 60 years ago. Nonetheless, global income inequality remained large by far. Several estimates show that the world Gini coefficient of the year 2013 ranges from 55 to 70 (Lakner & Milanovic, 2016; Milanovic, 2016).

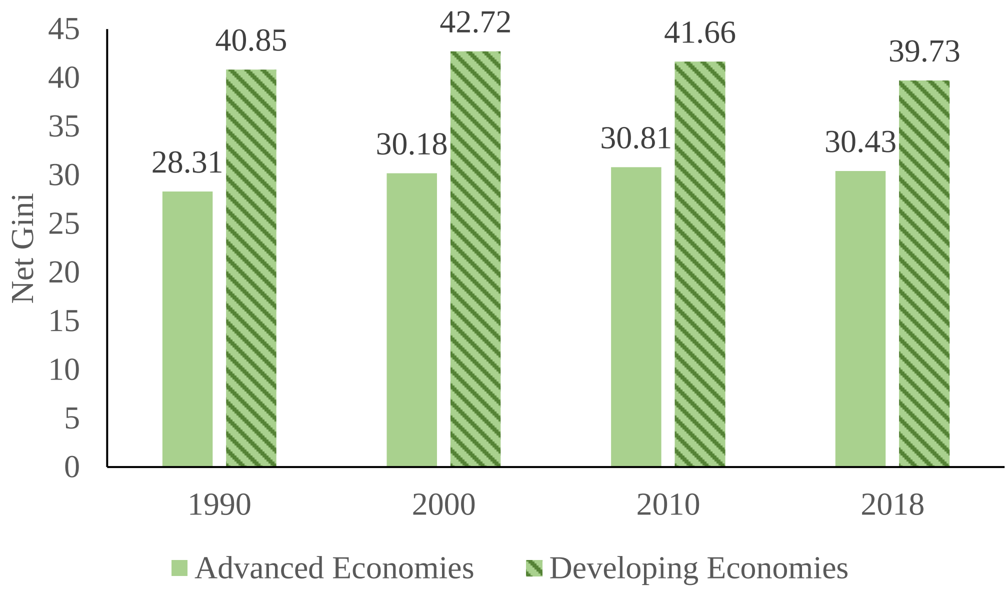
1.1.3 Income Inequality of Developed and Developing Economies

The section above illustrates the trend of global income inequality, in which the measurement does not discriminate against the nationality of individuals. Instead, this section focuses on the within-country income inequality of each country.

There are certain benefits from observing the global pattern of within-country inequality. First, while the global income inequality includes every individual from the poorest to the richest regardless of the national border, the within-country distribution tells relatively clearer in terms of the geographical distribution of income around the world. Second, visualization of the within-country inequality conveniently compares the income distribution of developed countries against developing countries. The second benefit comes in handy for the assessment of the effect of economic development stages on income distribution. Although it is far from definitive, developed countries are generally having smaller income gaps relative to developing countries. This cross-country difference in income disparity can be seen clearly from Figure 1.1.2 below.

Figure 1.1.2 depicts the average net Gini index[3] of developed and developing countries[4,5] for 1990, 2000, 2010, and 2018. By comparing the average levels of Gini indexes of economies with different development status, it is clear that developed countries are having lower average readings of income inequality (from 28.31 to 30.81) than what developing countries have (average 39.73 to 42.72).

Figure 1.1.2: Average Gini Index (Net) of Developed and Developing Countries



Source: Solt (2016; 2020), Standardized World Income Inequality Database (SWIID), and author's calculation

There are several possible causes of this differential between developed and developing countries. Firstly, the majority of the least-unequal countries (e.g. Sweden, Denmark, Netherlands) are developed nations with an average Gini index

[3] The SWIID has categorized the Gini index to market (gross) Gini and net Gini, in which the net Gini are adjusted for tax and transfer from social insurance programs.
[4] The inclusion of countries in the calculation of averages is subject to data availability.
[5] The classifications of country status follow the guidelines set by the International Monetary Fund (2017). The development status of each country are correct as of year 2017.

lower than 30 for more than two decades. Academicians have attributed the sustained egalitarian status in these Nordic countries to the Nordic model, which is a social democratic system that incorporates free-market capitalism and collective bargaining at the national level (Brandal, Bratberg, & Thorsen, 2013; Iqbal & Todi, 2015). Nonetheless, despite the relatively low degree of inequality, the income disparities in many developed nations are worsening since 1990 as told by the Gini measures. These nations included Sweden (from 22.5 to 26.4), Denmark (23.9 to 26.7), Italy (30.4 to 33.7), Japan (27.2 to 32.7), Spain (30.5 to 32.8), and the United States (34.6 to 38.8)[6], among others.

Secondly, it is due to the increasingly severe wealth inequality in some emerging and developing economies. Two of the main contributors to this relatively large income inequality among developing countries are China and South Africa. While China's economic reform in 1978 has made an episode of remarkable economic expansion up to the last decade, in which the growth has effectively narrowed the regional income gap between the Western region and Asian region, it has failed to consider the increasing rural-urban disparities accompanied with the economic expansion (Xie & Zhou, 2014; Zhou & Song, 2016). In the case of South Africa, this country is pigeonholed as one of the most unequal countries in the world. The severity of income inequality in South Africa reflects the consequence of the racially-based apartheid system, which was ended in mid-1991. Although South Africa has earned various success in correcting social inequalities after the first

[6] The first and the second figures are the net Gini (SWIID estimates) in 1990 and 2018, respectively.

democratic election held in 1994 (Christopher, 2001), the income inequality still slightly increased in the past two decades and remained at a dangerous level.

On the positive side, some Latin-America countries such as Brazil and Peru, which previously have been classified as extremely unequal (OECD, 2015; World Bank, 2016), made great progress in steadily reducing income inequality from 1990 to 2010. The Gini index (SWIID 2016 estimates) of Brazil has declined from about 52.8 in 1990 to 51.4 in 2000 (-1.4 points or -2.6 percent), then further dropped to 46.29 in 2010 (-6.55 points or -12.4 percent). During the Annual Meeting of World Economic Forum in Davos, Ibarra and Byanyima (2016) attributed the adequacy of social insurance programs in Brazil as one of the main drivers in reducing inequality and poverty rate. World Bank (2016, p. 104−106) estimated that the *Bolsa Familia* program, the flagship conditional cash transfer program implemented by the Brazilian government in 2003, accounted for 10 to 15% of the reduction in inequality. In terms of Peru, the Gini index (SWIID 2016 estimates) dropped remarkably from 53.6 in 1990 to 47.65 in 2010 or a decline of 11.1 percent. The bottom 40 of Peruvians experienced a large income growth rate of 6.5 percent as compared to the income growth rate of 4.1 percent among the population as a whole between 2004 and 2014 (World Bank, 2016, p. 114−115). As for the reasons behind the improvement in income distribution, the policy reforms in the labor market and educational inclusiveness have contributed to about 80 percent of inequality fall in Peru (World Bank, 2016, p. 115−117). Nonetheless, despite the steady decline of income inequality, the income inequalities in these two Latin American countries are still at considerably high levels. In 2014, the bottom 40 in Brazil held approximately 12 percent of total income, while the top 20 held 56 percent (Alderman, 2011).

Given the lessons learned from the experiences of the Nordic countries, Brazil, and Peru, international institutions including OECD (2015) and UNDP (2015) suggest policy tools that emphasize social and economic inclusion to reduce income gaps. For instance, following the experience of Brazil, OECD (2015) recommended enhancing the implementation and effect of progressive direct tax schemes by closing loopholes and reviewing the rate schedule and relief structure. Nevertheless, adoption of these policy recommendations based on the experience from other countries shall be careful, as the effect of these fiscal policies could be conditional to economic development status, as discussed in Figure 1.1.2 above. Besides, while this thesis does not attempt to undermine the role of fiscal policy in reducing income inequality as a whole, these fiscal policy packages do have some limitations in terms of effectively reducing income inequality. These limitations of fiscal tools are discussed further in the section of the problem statement (Section 1.4, page 21−25).

1.2 Potential Alternatives for Reducing Income Inequality

Given the limitation of fiscal policy packages to act as the one-fit-all solution to reduce income inequality effectively, this study questions whether there are alternative channels or tools for policymakers to improve income distribution. This section discusses some stylized facts of financial development and institutional quality as well as its potential roles in influencing income inequality in the context of developed and developing economies.

1.2.1 Financial Development and Institutional Quality: Some Stylized Facts

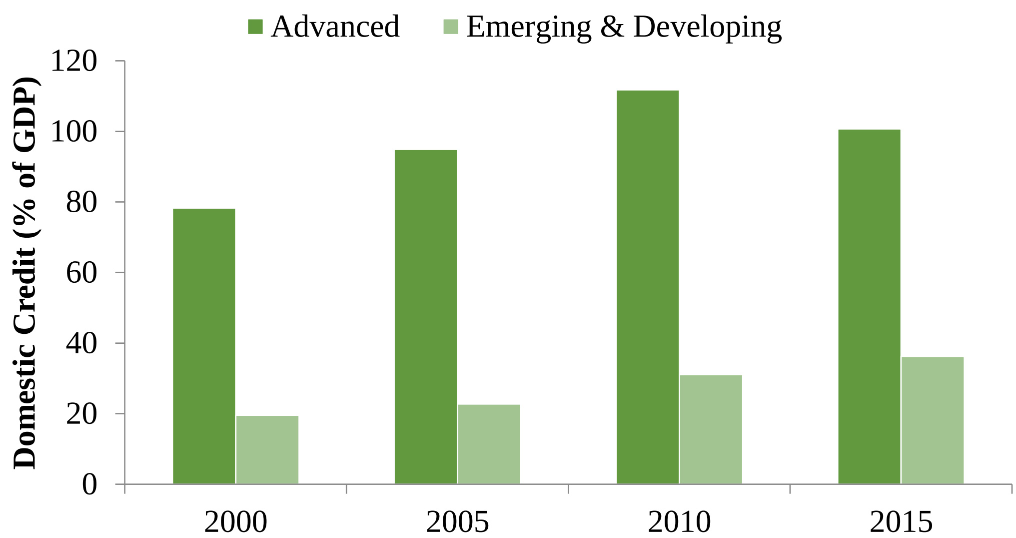
By definition, the term ‘financial development’ refers to the improvement of the financial sector of an economy, in terms of (i) reducing the degree of information asymmetry between lenders and borrowers, (ii) facilitating the transfer and trading of risks, (iii) providing a mean of corporate governance on public enterprises, (iv) allocating resources efficiently, and (v) promoting savings and investment (Levine, 1996). Fundamentally, financial development is about reducing the friction costs incurred on transactions, mainy due to the asymmetric information and other market imperfections.

Institutional quality, on the other hand, is not uniformly defined by scholars to date. Loosely speaking, the term ‘institution’ refers to a set of rules or legal constraints, either formal (*de jure*) or informal (*de facto*), that govern the allocation of resources (which includes power) among economic agents (North, 1981; 1990). According to North (1981; 1990), a country with greater quality of institutions would have stronger *de jure* power in place as opposed to the *de facto* rules (see Section 3.3.2, page 121, for more details).

The literature has largely recognized that both financial development and institutions play significant roles in influencing long term economic development of a country. Extensive volume of theoretical and empirical studies suggest that financial sector development and improvement in institutions tend to promote economic growth (See Demirgüç-Kunt and Levine (2018) for a review on the finance-growth nexus, and Acemoglu (2010) for a review on the institution-growth relation). Unsprisingly, it is a stylized fact where advanced economies tend to associate with well-developed financial system and strong institutions, while less-developed countries are often associated with less-developed financial system and weak institutions, which can be visualized in Figure 1.2.1 and 1.2.2.

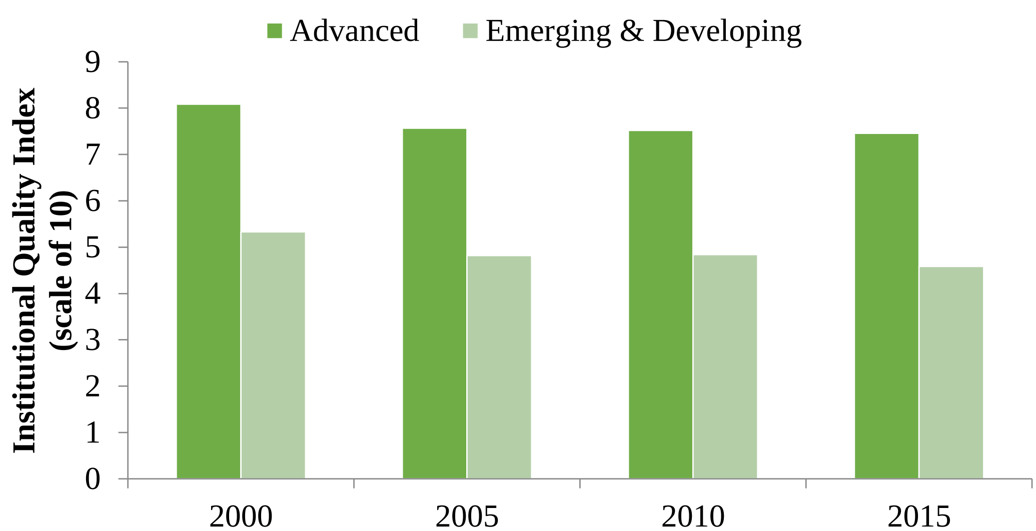
Figure 1.2.1 depicts the average domestic credit to private sector (a proxy of financial development, see Section 3.3.3 for more details) of 36 advanced economies and 62 developing countries in year 2000, 2005, 2010, and 2015, while Figure 1.2.2 shows the average institutional quality indices based on an identical group of countries. As clearly illustrated, financial sectors of advanced economies were considerably more developed (from 78.24% to 111.74% of GDP) as compared to the average development level of emerging and developing markets (from 19.59% to 36.25% of GDP).

Figure 1.2.1: Average Domestic Credit to Private Sector, 2000 – 2015



Source: Global Financial Development Database (GFDD, 2017)

Figure 1.2.2: Average Institutional Quality Index, 2000 – 2015



Source: ICRG Database (PRS group, 2017) and author's calculation

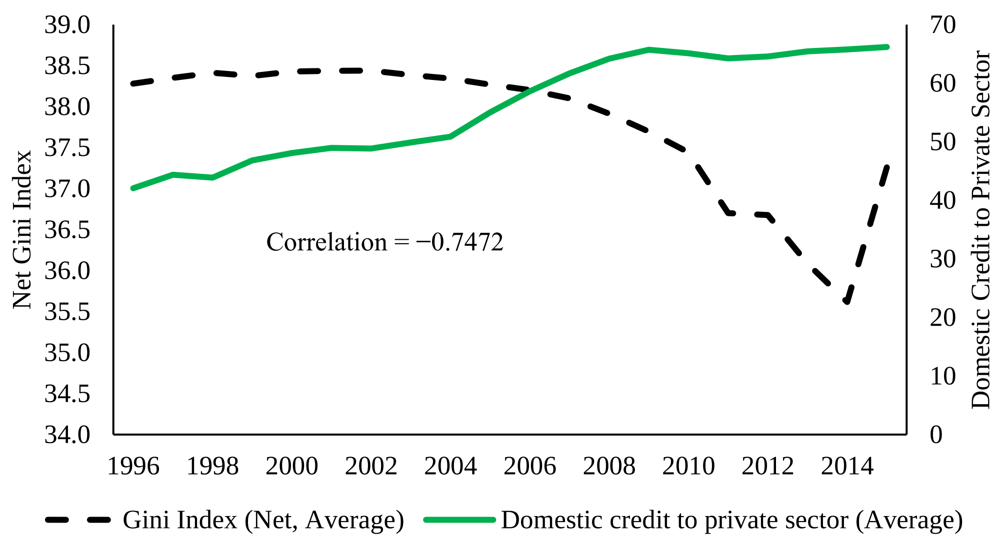
Similarly, there are significant differences between the overall institutional quality in advanced economies (from 7.459 to 8.085) and developing countries (from 4.584 to 5.327). As higher values of the institutional index indicates better institutions, it shows that advanced economies generally outperform developing countries in terms of institutional quality. The illustrations in Figure 1.2.1 and 1.2.2 coincide with the earlier observations where the degree of income inequality is dependent to development status of the country (Figure 1.1.2).

1.2.2 The Role of Financial Development on Income Distribution

The discussion on the potential roles of financial development on income distribution begins with several pioneering experts including Becker and Tomes (1979, 1986), Greenwood and Jovanovic (1990), Galor and Zeira (1993), and Banerjee and Newman (1993). The general idea is that finance can significantly alter the economic opportunities of an individual through its role in reducing information asymmetries, risk pooling and diversification, and its effect on growth and saving rate (King & Levine, 1993a,b). Demirguc-Kunt and Levine (2009) provided an excellent description on the plausible roles of financial sector development on income disparity: "…*financial system influences who can start a business and who cannot, who can pay for education and who cannot, who can attempt to realize one's economic aspirations and who cannot. Thus, finance can shape the gap between the rich and the poor*…"

Intuitively, financial sector development can improve income distribution through its promoting effect on allocative efficiency and lowering costs of financial services, and thus individuals who were initially not using those financial services can access to financial markets and catch up with the rich (Becker & Tomes, 1979; Galor & Zeira, 1993; Banerjee & Newman, 1993). This intuition forms essentially the inequality-narrowing hypothesis in Galor and Zeira (1993) and Banerjee and Newman (1993). However, by incorporating the beneficial effects of finance on individuals who were initially rich and already enjoying those financial services, Greenwood and Jovanovic (1990) stressed that the relationship between finance and income inequality is supposedly nonlinear or inverted U-shaped, where the roles of financial development are conditional on other factors, such as economic development (Galor & Moav, 2004).

Figure 1.2.3: Average Gini Index (Net) and Domestic Credit to Private Sector of All Countries, 1996 − 2015



Sources: SWIID (2017), GFDD (2017)

Interestingly, observations using data of income inequality and financial development resonate very well with the theoretical contradictions above. Figure 1.2.3, 1.2.4, and 1.2.5 illustrate these data and the correlation between financial development (measured by domestic credit to private sector) and income inequality (measured by Gini index) of developed and developing countries from 1996 to 2015.

Figure 1.2.1 shows that the average income inequality (measured by net Gini index) negatively correlates with the financial development level (measured by domestic credit to private sector) in 115 countries[7]. The correlation coefficient of −0.7472 suggests that, on average, a highly developed financial sector tends to follow by a lower degree of income inequality. This observation agrees with the hypothesis that better finance tends to improve income distribution (Galor & Zeira, 1993; Banerjee & Newman, 1993). However, when the data is conditioned on the economic development level of countries, the data tell differently on the co-movement between finance and income inequality.

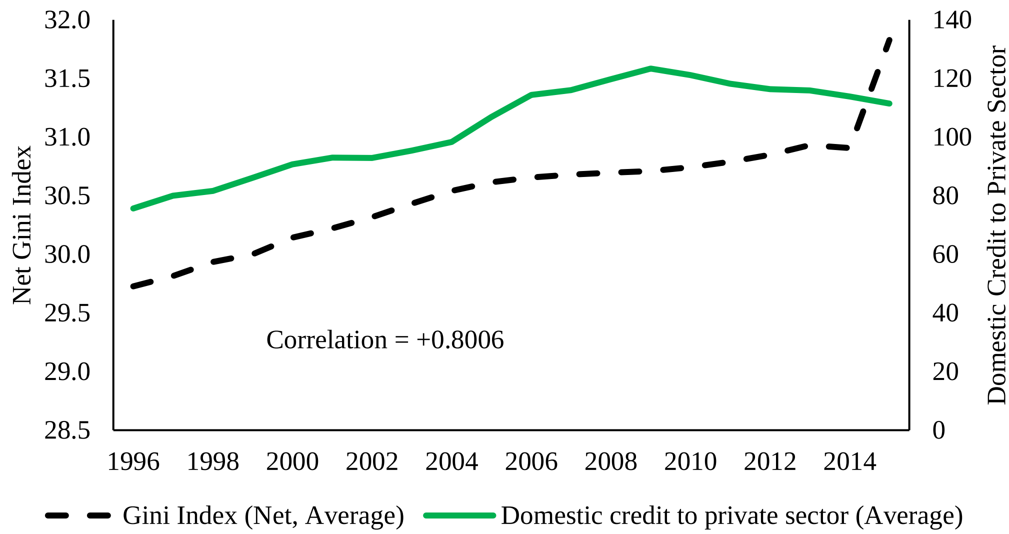
Referring to Figure 1.2.4 and 1.2.5 below, Figure 1.2.4 clearly shows a positive co-movement between the trend of financial development level and income inequality among developed nations on one hand. On the other hand, Figure 1.2.5 displays a negative correlation between financial development and income disparity in emerging and developing economies. Observations based on Figure 1.2.4 and 1.2.5 suggest that the relationship between financial development and

[7] The inclusion of countries and economies are subjected to the data availability of net Gini index

income gap could be conditional on the level of economic development of the country, as argued in Galor and Moav (2004).

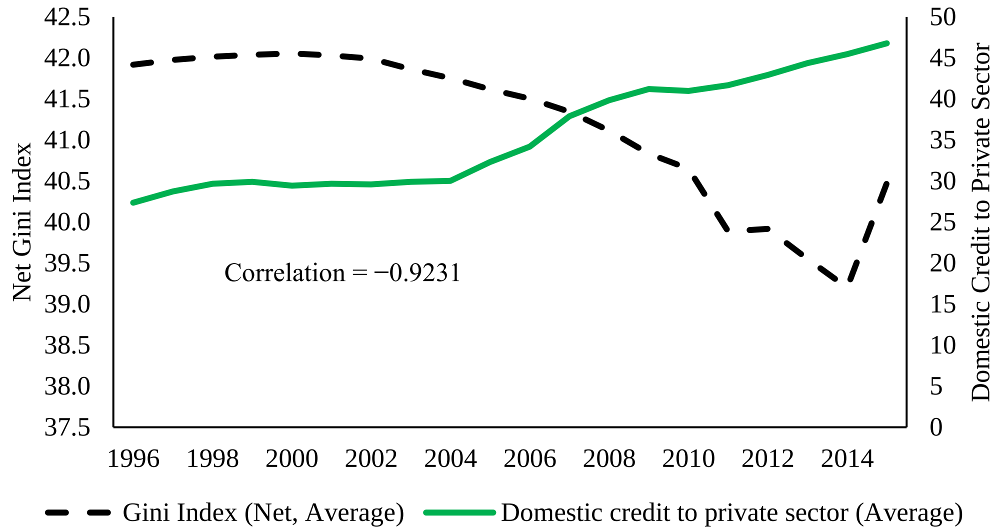
In brief, while financial development might have great potential in improving income inequality, it might have a worsening effect in the context of developed nations. This further suggests that the policymakers in developing countries should be cautious when attempting to borrow the experience of developed countries in setting financial sector policy, especially when the financial sector policy is targeted to influence income distribution.

Figure 1.2.4: Average Gini Index (Net) and Domestic Credit to Private Sector of Developed Countries, 1996 – 2015



Sources: SWIID (2017), GFDD (2017)

Figure 1.2.5: Average Gini Index (Net) and Domestic Credit to Private Sector of Developing Countries, 1996 − 2015



Sources: SWIID (2017), GFDD (2017)

1.2.3 The Role of Institutional Quality on Income Distribution

Apart from financial sector development, improvement in the overall institutional strength of a country can potentially help alleviating the severity of unequal income distribution as well. The general idea is that institutional quality governed the allocative efficiency of social and economic welfare (North, 1990; Knack & Keefer, 1995). Thus, a strong institution in aspects of poverty rights protection, rule of law, governance quality, political and social stability, and corruption control could reduce biasedness in resource allocation and ultimately lead to a fairer distribution of economic resources among the society (Rodrik, 2000; Acemoglu, Johnson, & Robinson, 2005).

While the earlier discussions (see Sen, 1981; 1984; 1999) on the influence of institutional quality on income distribution provided appealing conjectures that better institutions tend to improve income distribution, the existing body of empirical studies is relatively lacking for generalizing a conclusive statement on the impact of institutions on inequality (see Section 2.4, page 57–62 for further discussions). Among these limited number of studies, some (Tebaldi & Mohan, 2010; Dincer & Gunalp, 2011) suggested that higher institutional quality reduces income gap, whereas other (Chong & Calderón, 2000a; Li, Xu & Zou, 2000) found a nonlinear or inverted U-shaped relationship between institutional quality and income gap. In short, while institutional strengthening policy and reform can serve as a way to fight income inequality, it is unwise to do it hastily before a careful investigation on the impact of institutions on income distribution.

1.3 The Needs of reducing Income Inequality

Widening inequality is a major global concern as it carries significant and adverse implications for variaous angles of wellbeings (IMF, 2015). One of the angle is the macroeconomic wellbeing of a country. Based on a sample of 140 countries, Berg, Ostry, and Zettelmeyer (2012) documented that persistent and severe income inequality lead to slower and unsustainable economic growth. Particularly, Berg et al. (2012) showed that a 1 percentage point increase in Gini index associates to a shorter duration of the "growth spell"[8] by 11 to 15%. Ostry, Berg, and Tsangarides (2014) reexamined the findings of Berg et al. (2012) and showed that a 1 percentage point increase in net Gini index leads to lower GDP per capita growth by 7.39% to 14.35%, after controlling the effect of income redistribution. Moreover, Ostry et al. (2014) found that the risk of ending the growth spell is higher by 6.0% when the net Gini index is higher by 1 percentage point. A recent study of Seo, Kim, and Lee (2020) also provide results consistent to the notion that income inequality leads to slower economic growth.

On top of its adverse and direct impact on economic growth, skewed income concentration could transmit to several consequences in the social and economic wellbeing of people. For instance, extremely unequal income distribution would induce concentration of political power to the hands of few elites, who then can use their enhanced power to lobby politicians and result in suboptimal choices in public policy that disproportionately benefited the rich, which ultimately deteriorate the market efficiency and hence inefficient resource allocation in the society (Putnam, 2000; Bourguignon & Dessus, 2009).

In the same vein, high income inequality would increase the difficulty for the public, especially the lower- and the lower-middle income class to access healthcare service, education, skill-demanding employment, entrepreneurial

[8] Berg et al. (2012) coined the term "growth spell" to measure the period where an economy experienced growth that is higher than before. The growth spell begins when there is an upward breakout and ends with a downward breakout along the growth trend.

opportunity, and other social welfare that could help people to alleviate their wealth status. These barriers would in turn deprive the ability of lower-income households to stay healthy and simultaneously accumulate physical and human capital at a reasonable rate (Galor & Moav, 2004; Aghion, Caroli, & Garcia-Penalosa, 1999). Consequently, the productivity level of an unequal society could be lower than what an egalitarian society could perform (Stiglitz, 2012).

Furthermore, extreme wealth and income inequality may damage social capital such as trust and social cohesion, and hence lead to conflicts, social unrests, or possibly, civil wars. It is because income inequality could alter the economics of conflict. Given a high degree of unequal income distribution, the less-fortunate individuals or groups within the society suffer disproportionately from conflict as compared to the rich. The inequality magnifies the pain felt by the less-fortunate, thereby lower the opportunity cost for them to take a violent approach as a way to end conflicts (Lichbach, 1989). It is particularly common among disputes over common resources management, where a peaceful and diplomatic style of resolution is less likely to be executed if the country is highly unequal (Bardhan, 2005).

The evidence discussed above suggest that extreme inequality is unwelcomed. Nonetheless, there are arguments that income inequality is not necessarily something negative, at least when the degree of inequality is not excessively high (Friedman, 2005). A tolerable level of inequality can be incentives for positive entrepreneurial innovations, human capital investment, and economic growth (IMF, 2015). The notion of positive effects of mild inequality can be justified by the neoclassical marginal productivity theory of distribution (Clark, 1891, 1899, 1901; Wicksell, 1902; Ostroy, 1984). The marginal productivity theory suggests that labor wage and income reflect the marginal productivity of each worker contributed to the production process within a competitive labor market. Higher wage or income associates with greater labor productivity and hence contribution to the society and vice versa (Stiglitz, 2016). In other words, the marginal productivity theory implies that income inequality is solely justified by the differences in productivity and contribution among individuals. However, the marginal productivity theory cannot explain the remarkable difference in income levels across countries. For example, while Sweden, Finland, Norway, the United States, and the United Kingdom shared similar characteristics in terms of productivity, technology, and per capita income, the national income gap between the Scandivanian group and the other developed countries has persist for more than two decades (see Section 1.1.3, page 10). This observation suggests that the marginal productivity cannot solely explain the income gaps among individuals and countries because the theory excludes the role of institutions, both economic and political, in influencing income inequality (Beramendi & Anderson, 2008; Stiglitz, 2016)

1.4 Problem Statement

In September 2000, 191 participating member states and at least 22 international organizations have declared to accomplish eight Millennium Development Goals (MDG) by 2015 (United Nations, 2000a). Each of the MDG was designed for then global issues with specific targets and measurable indicators. Among the eight MDGs, Goal number 1 designs to “eradicate extreme poverty and hunger” (United Nations, 2000a). One of the sub-targets associated with Goal 1 is that the participating members agreed to halve the world population of extreme poverty (individuals who lived on or less than $1.25 per day) by 2015 (United Nations, 2000b). By 2015, the number of individuals who live below the hardcore poverty line has declined from 1.9 billion in 1990 to 836 million in 2015. In terms of the developing countries and landlocked regions, who are the major contributor to the poverty rate, the proportion of extreme poverty has dropped from 47% in 1990 to 14% in 2015 (United Nations, 2015, p. 4). Both indicators signal that the involving parties have made a profound achievement in eradicating extreme poverty through enormous collective commitments.

While the world has made significant progress in reducing extreme poverty and hunger in the past two decades, reducing income inequality was off from the agenda in the Millennium summit, even the world had witnessed the possibly ever-rising trend of income inequality since the 1980s. Reducing income inequality was absent in the list of main global issues and agenda until the formation of the

Sustainable Development Goals (SDG) in September 2015, as a successor to the MDGs (United Nations Development Programme, 2015a). Among the 17 SDGs, Goal no. 10 aims to reduce income inequality through 10 specific sub-targets (United Nations Development Programme, 2015b)[9].

Interestingly, it is not difficult to find from these sub-targets of Goal 10 that the United Nations mainly favored the implementation of direct fiscal measures to reduce income inequality within countries, while other types of policy measures are of supporting and secondary nature. Many developed countries namely the U.S. and the U.K. have long implemented income tax policy and alike to reduce income inequality or serve for income redistribution. However, based on the data above (see Figure 1.1.3), most of these developed countries failed to effectively reduce income inequality within these two decades. The Gini coefficients of these countries are at best maintained, if not worsen. Taking the U.S. as an example, the largest economy in the world has long equipped with a complex progressive tax structure[10] that revised annually since the early 1900s (Brownlee, 1996). However, even with the seemingly sophisticated tax system, the income inequality in the U.S. remained relatively high to the OECD average during the last three decades, where the net Gini index steadily inclined from 31.64 in 1980 to 37.79 in 2015 (SWIID estimates). More recently, Jackson, Otrok, and Owyang (2020) show that increases in tax progressivity induces higher income inequality rather than reducing it. This

[9] See Appendix Section App1 for the detailed outlines of these sub-targets.
[10] As Roach (2010) explained, when all taxes in the U.S. are considered, the U.S. tax structure is less progressive as many taxes in the U.S. are actually regressive.

phenomenon sounds an alarming status that we should have a deeper understanding of the causes and the mechanism of these causes of income inequality, and finally design effective policy tools to tackle income and wealth concentration.

At this stage, one shall aware that the fiscal channel is not the only mechanism to cause inequality, and tax-related policy is not the only available tool for improving income distribution. Scholars including Demirguc-Kunt and Levine (2009) and Chong and Calderón (2000a) stressed that there may be also financial channel and institutional channel of income inequality, due to the influential roles of finance and institutions in governing the efficiency of resources allocation of an economy. An in-depth understanding of these alternative mechanisms would aid in designing appropriate policy measures to effectively mitigate income inequality. Moreover, the finance-inequality relationship could vary depending on the status of development of the economy as shown in Figure 1.2.4 and 1.2.5. This implies that the effectiveness of financial development as a tool for reducing inequality in developing economies could be different with the effectiveness in developed economies. Thus, it is vital to examine the distributional effect of financial sector development according to the stage of economic development, rather than assuming financial development has a symmetric effect on income distribution across all stages of development. These motivations lead to the first research objective of this thesis.

Given the possible existence of the alternative channels of income inequality, it is very likely that these alternative channels are dynamically interacting with each other. Taking institutional quality as an example, the empirical evidence has long proven that a sounder institutional quality would promote both financial development (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997; 1998; Rajan & Ramcharan, 2011; Law et al., 2014; Adams & Klodobu, 2016) in a country. These interactions between macroeconomic variables imply that the total impact of these channels consists of direct components (e.g. economic growth, financial development, institutions, etc.) and indirect effects (interactions). It is critical to assess both direct and indirect impacts of the causes of income inequality or else one cannot grasp the full picture of these mechanisms. A proper assessment of these direct and interacting effects of inequality channels will deliberately show the complex mechanism of these factors. For example, one can find out whether a change in institutional quality would transmit to financial development or economic growth or both and finally reach to income distribution pattern. Without this illustration, the net impacts of the direct effects of financial development and institutional quality, as well as the interaction between them, on income inequality are unclear. The motivation to reveal the complex dynamics within the inequality-finance-institution relationship lead to the second research objective.

As aforementioned, an extreme level of inequality would adversely affect drivers of growth, and the institutional quality of an economy is among the list. The rationale behind the causal effect of inequality on institutions is rather straightforward: wealth and income concentration bring huge and unbalanced political power to a few elites, who later used their power to secure their very own interests through lobbying and exploiting the benefit of the rest. The exploitation process would follow by weak institutions, namely higher corruption, poor bureaucratic quality, lower transparency, and accountability of governments. Despite this intuition, the literature has long regarded institutional quality as exogenous. Few exceptions such as Easterly (2001), Keefer and Knack (2002), and Chong and Gradstein (2007) showed that social polarization leads to poorer institutional quality, suggesting that institutions could be endogenously determined by political and economic condition, such as income inequality. Nonetheless, the literature is still lacking in terms of exploring the endogeneity of institutional quality. This research gap leads to the third research objective.

1.5 Research Objectives

The general objective of this study is to examine the roles of financial development and institutional quality on income inequality, as well as to investigate the role of income inequality in influencing institutional quality, by using a panel dataset consisting of 98 countries (36 developed and 62 developing countries)[11] and covering period from 1996 to 2015.

[11] The classification of country's development status follows the IMF (2017) guidelines. Refers to Appendix Section App2 for more details.

The specific objectives of this study are as follow:

i. To examine the roles of financial development and institutional quality in reducing income inequality.

ii. To analyze the potential interactive role of institutional quality and financial development in the inequality-finance-institution nexus.

iii. To examine the role of income inequality in endogenously determining institutional quality.

1.6 Research Questions

Subsequently, this study answers the following research questions in the context of developed and developing countries:

i. How do financial development and institutional quality play an important role in reducing income inequality?

ii. Does the interaction between institutional quality and financial development play a role in influencing the relationship between financial development and income inequality?

iii. How does income inequality in turn endogenously determine institutional quality?

1.7 Significance of Study

There are several significant contributions of this study to different audiences. This study contributes to reappraise the competing theories and empirics on the causes of income inequality in the context of advanced and developing economies. Specifically, this study would contribute to the literature gaps that most of the previous studies solely focused on the causes of inequality other than financial development and institutional quality[12]. By doing so, the findings of this study would expectedly reveal the importance of finance and institutions in mitigating income inequality in advanced and developing countries. Therefore, this contribution provides a hint to the academics and policymakers on whether they should consider financial development and institutional quality as part of the main causes of inequality.

Furthermore, the empirical assessment on the impact of financial development on income inequality might result in different policy suggestions to advanced and developing countries. As aforementioned, the effect of financial development on income distribution might be dependent to the level or status of

[12] See Chapter 2, Section 2.6.2 for more details on the literature gaps.

economic development of the country (Greenwood & Jovanovic, 1990), which suggests a possible nonlinear effect of financial development on inequality. In light of this, the comparative analysis in this study could reveal the nonlinearity lied within the relationship between finance and inequality. The related findings are expected to fill up the literature gap where a relatively large number of studies have only looked upon the sampled countries in aggregate terms.

Last but not least, this study adopts the System Generalized Method of Moments (System GMM) estimator for estimating the relationship between income inequality and its macroeconomic determinants. The employment of system-GMM is excellent for capturing the complex simultaneity and endogeneity within the macroeconomic variables via instrumental variable technique, which is the best alternative for this study. Additionally, the choice of this sophisticated method might resolve the issue of inconclusive findings in the literature that is due to the use of various estimation methods.

1.8 Chapter Layout

Remaining sections of the thesis is as follow. Chapter 2 reviews the relevant theoretical and empirical studies of income inequality. Chapter 3 elaborates the methodology and research design. Chapter 4, 5, and 6 perform the data analysis that corresponds to the first, second, and third research objective, respectively. Chapter 7 concludes and provides implications of the study.

CHAPTER 2

LITERATURE REVIEW

Although the issue of income inequality is recently drawing attention from policymakers, economists, media, and the public again, this issue is not novel. Income distribution has been extensively studied since the mid-18th century until today. Vast evidence under both theoretical and empirical lens has tried to reveal the origins of inequality and its consequences to the society (Gallo, 2002; Heshmati & Kim, 2014).

The organization of Chapter Two is as follows. Section 2.1 reviews the history of discussion and debate among different economic schools of thought on income inequality before the modern era. Section 2.2 discusses the modern views on income inequality, which embarks on the relationship between income inequality and income (economic) growth. Section 2.3 reviews on the past studies of finance-inequality nexus. Section 2.4 focuses on the recently emerging literature of institution-inequality nexus. Section 2.5 discusses the roles of institutional quality in the inequality-finance relation, and Section 2.6 summarizes and identifies the gaps of literature.

2.1 Income Inequality: The History

The literature of income inequality can be dated back to the era of Adam Smith, which, in his *Wealth of Nation*, inequality is taken as granted and the primary concern is put toward economic growth. Smith's (1776) philosophy is that, as long as the size of the pie (the welfare) is growing, then everyone in the society can get a piece from the big pie that will grow proportionately with economic growth. However, even though his main concern was economic growth, he pointed out that the value added is distributed in the forms of wages, profits, and rents, which are earned by workers, capitalists, and rentiers, and he embryonically discussed the conflict between capitalist and workers for the wage determination. He believed that the steady-state level of wages will always be set at the subsistence level due to the greater bargaining power of capitalists as the wage setter. Later, Ricardo (1815) demonstrated that the output will be distributed between rents and wages but the rate of profit is nil at the steady state of the economy. Finally, Marx (1953, originally 1862-1863) introduced the theory of 'surplus value' to the conflict among the three classes. The German philosopher and socialist argued that capitalists' profits rely on the surplus value that capitalists manage to exploit from the productions of workers due to the greater bargaining power of capitalists relative to workers.

With the rise of the neoclassical or marginalist school of thought in the 1870s, the focus of economic analysis changed drastically from the analysis of output and distribution to the analysis of exchanges among individuals that incorporates the problem of scarcity and utility maximization. In terms of wage determination, the level of wages depends on the interaction between labor demand and labor supply. Wicksell (1893) showed that, given a production function and perfectly competitive market, the equilibrium level of wages and rents are equal to their respective marginal productivity. It immediately follows that income inequality is merely a result of the differences in the individual contribution of each productive factor to the output. As the productive factors are paid accordingly to their contribution to production, income inequality is no longer an issue that needs to be addressed explicitly. The implication of the neoclassical view on income inequality coincides with Smith's philosophy that the primary goal should be production growth and poverty. This view has been advocated by a group of economists, which includes Robert Lucas, who quoted vividly that:

> "*…Of the tendencies that are harmful to sound economics, the most seductive, and in my opinion the most poisonous, is to focus on questions of distribution … The potential for improving the lives of poor people by finding different ways of distributing current production is nothing compared to the apparently limitless potential of increasing production...*"
>
> (Lucas, 2004, May, pp. 20).

Gallo (2002) and Guidetti and Rehbein (2014) categorized the type of income inequality discussed in Smith, Ricardo, and Marx as *functional* income inequality, i.e.: income distribution among different social classes, while the income inequality mentioned in marginalists view as *personal* or *size* income inequality. At this point, the conjectures from the pioneers of classical school and marginalists' school of thoughts have each caught a part of the story of inequality.

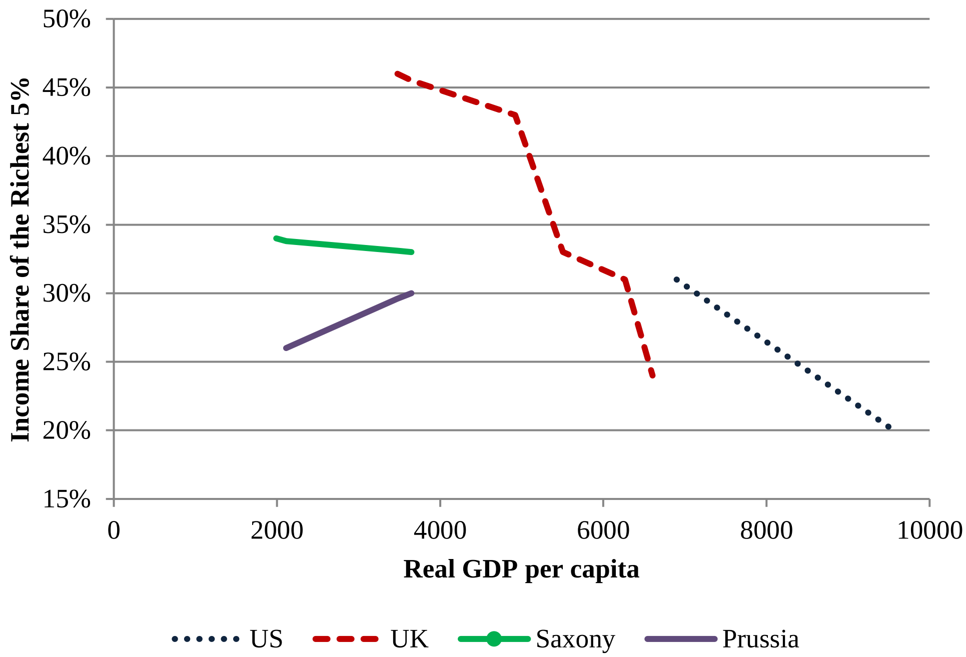
2.2 Modern view on Inequality-Growth nexus

Kuznets (1955) developed the first empirical contribution to the modern economic literature of income inequality. In this seminal work, the author found that the income gap tends to be widened in the early stages of economic development when countries undergo industrialization, and then the gap is narrowed in later stages of economic development as capitalism matures. By using the historical data of the U.S., the U.K., and German (East and West German), Kuznets (1955) showed that the then developing Prussia has an increasing trend of top income shares against real GDP growth, whereas the income shares of the richest 5 percent in the developed U.S. and U.K. are declining with economic growth. Figure 2.2.1 below portrayed the data plot used in the original work of Kuznets (1955).

This conjecture is exactly the famous inverted U-shaped curve of income inequality against income per capita, or commonly known as the Kuznets curve.

Since then, the Kuznets curve has been heavily contested by succeeding works, both theoretically and especially empirically.

Figure 2.2.1: Income Inequality data in Kuznets (1955)



Source: Income shares from Kuznets (1955); Real GDP data from the Maddison Project by Bolt and van Zanden (2014).

2.2.1 Effect of Growth on Income Inequality: Kuznets' view

Albeit Kuznets (1955; 1963) did not develop a theoretical framework for his inverted U-shaped hypothesis, and that he repeatedly warned about the "fragility of the data"[13] in his thesis, economists have long appraised his hypothesis to the level of economic law and it has remained as the center of the debate for more than four decades (Gallo, 2002). The first important study that supports the Kuznets

[13] The study in year 1955 based on only three countries, namely U.S., U.K., and Germany.

curve is Paukert (1973), whose analysis has included 56 countries as the sample. The author revealed that the income disparity increases sharply as the country moves up from the group of less than \$100 to the group of \$101-\$200 and it increases further but less sharply to the group of \$201-\$300 and \$301-\$500. There is a clear reduction of inequality when the country moves further up to higher income levels, especially in the group of above \$2,000. These findings, therefore, agreed with the inverted-U hypothesis. Soon after that, Ahluwalia (1976) formed another pro-Kuznets curve finding. Based on a cross-sectional sample of 60 countries, Ahluwalia (1976) found a non-monotonic U-shaped relationship between income shares of five different percentiles and the growth of GNP per capita, where income shares of all percentiles, except the top 20 percent group, decline initially and rise later as the GNP per capita increases.

The arrival of the cross-country evidence above had made the inverted-U hypothesis an economic paradigm in the 1970s, even though the respective empirical results are associated with several deficiencies. In this regard, Saith (1983) challenged the arguments of Paukert (1973) and Ahluwalia (1976) from a methodological point of view. First, Saith (1983) argued that these studies have little in common with Kuznets' studies as Kuznets (1955) focused on the rich while these studies focused on the poor (bottom 20% or 40% of the population). Second, Saith (1983) criticized the estimation of a single inverted U-shaped curve to represent both developing and developed countries. He opposed Ahluwalia's view that the development stage of the advanced economies reflects the future position of the developing countries as each country has its own social and economic profile that are heterogeneous. In fact, the Kuznets curve no longer holds when Saith (1983) restricted the observation to the same 41 developing countries in Ahluwalia (1976), in which he concluded an inverted L curve could provide a better fit to the relationship between inequality and growth. Ahluwalia, Carter, and Chenery (1979) also found similar results by using a sample of 36 developing countries. Their intertemporal evidence showed that all countries had experienced the initial inequality widening phase of the Kuznets curve, but little evidence for countries at higher income levels that show improvement in narrowing the income gap. These findings suggest that, in the case of poor and developing countries, an inverted L curve could be better than an inverted U curve in depicting the shape of relationship between income inequality and growth.

Apart from the context of low income or developing countries, the debate was extended to developed countries as well. According to Kuznets' view, the relationship between income inequality and economic development for developed countries should follow the declining stage of the inverted U curve. For example, it would be "reasonable" to expect that the US economy would lie on the right-hand side of the Kuznets curve due to its advanced economic nature. However, Ram (1991) disagreed with the Kuznets curve with the use of time series data in the U.S. His results rejected the hypothesis of a decline in income inequality even the U.S. has already reached such a high level of economic development, which suggests that the inverted U-shaped curve is a poor fit to the relationship between economic development and income inequality. Nonetheless, he reserved that using data from 1947 to 1988 might not be sufficiently long to represent the full trend of the Kuznets curve. Still, his work has the merit of avoiding the issue of dealing with country heterogeneity. In the context of other advanced economies, Mátyás, Kónya, and Macquarie (1998) documented that the income inequality in Denmark, Japan, and Sweden were increasing with economic growth instead of declining. Also, Johnson and Webb (1993) and Goodman, Johnson, and Webb (1997) reported that income inequality in the UK has recorded a historically unusual high level from 1977 onwards.

Anyhow, most of the cross-section evidence over the 60s to 90s period was standing for the inverted-U hypothesis. Additional early empirical evidence include Chenery, Ahluwalia, and Bell, (1974), Chenery and Syrquin (1975), Ahluwalia et al. (1979), Papanek and Kyn (1986, 1987), Campano and Salvatore (1988), Ram (1988; 1995), Tsakloglou (1988), Bourguignon and Morrison (1990), Anand and Kanbur (1993), Dawson (1997), Eusufzai (1997), and Mbaku (1997). Notice that, none of these cross-country studies tested Kuznets hypothesis directly as suggested by Kuznets (1955) himself [14]: that income inequality would first follow an increasing trend and later decrease as income grew *within* countries. That is, if there are factors that would determine the income distribution in a specific country, individual country characteristics might explain the cross-sectional pattern rather than a Kuznets process alone.

[14] In fact, Kuznets (1955) urged for large quantity of single-country studies to test whether his inverted-U hypothesis is valid.

Another methodological limitation of the cross-country studies would be the comparability issue. Given the differences in recipient unit choices, sampling techniques, geographic coverage, definitions adopted, measurements, and design of household survey, the resulting cross-sectional evidence do not provide sensible comparison among other studies (Gallo, 2002). To address this problem, Jha (1996) used an expanded data set up to the 1990s and found that country-specific characteristics explained most of the changes in income inequality rather than the data comparability issues listed above. Fields (1988) assessed the lessons learned from the previous studies that have used cross-sectional data, time series data, and microdata and concluded that there exists no predetermined pattern for the relationship between income inequality and the rate of economic growth. Besides, Fields (1988) reviewed the studies that include structural and policy factors as additional determinants of income distribution on top of economic growth. The results indicated that income distribution is associated to factors including formal education, government intervention, population growth, urbanization, and the ratio of agricultural sector contribution to the aggregate production[15]. A few years later, Fields (1991) confirmed his previous finding that it is not growth per se but it is the nature of economic development that primarily determines the level of income inequality. Specifically, Fields (1991) claimed that the effect of economic growth on changes in income inequality depends on certain country-specific characteristics such as the composition of production, the degree of economic dualism, the unemployment structure, the distribution of land and natural resources, the

[15] The studies reviewed by Fields (1988) include Chiswick (1971), Adelman and Morris (1973), Chenery and Syrquin (1975), and Ahluwalia (1976).

operation of capital markets, and the level of human capital. Further support to this view is given by Mátyás et al. (1998), who argued that GDP per capita is not a significant factor of income inequality in two panels of 47 and 62 countries, but rather the country-specific characteristics such as social structure, political system, and natural resources could explain the changes in income inequality.

The arguments above regarding the methodological weakness of cross-country evidence imply the need for empirical evidence from single-country studies, which in turn require sufficient length of time series observations for the respective country. However, as the availability of time series data of income inequality is generally lacking in most countries and merely unavailable in least-developed countries, the expansion progress of time series evidence is disappointing. In the best case, most of the time series evidence concentrated on the North America or Europe region, of which the quantity of available time series data is rich. This problem remains until the first large scale cross-country panel data become available during the mid-1990s when Deininger and Squire (1996) constructed the panel dataset with sufficient observations to reveal the typical path of income inequality within countries.

With the aid of the Deininger and Squire data, scholars have found little or no support for the presence of Kuznets curve if they included country fixed effects in the regressions. For instance, Deininger and Squire (1996, 1998) found that majority of the countries have inequality patterns inconsistent with the Kuznets process. Savvidesa and Stengos (2000) showed that there is no significant relationship between income inequality and income per capita once controlling the country fixed effects, regardless of the measurement used for inequality. In the influential works by Barro (2000), he found that the level and quadratic term of income trend are statistically significant in the baseline model of Kuznets hypothesis, but the baseline model only provides a poor fit to the variation in inequality. The fit is improved only after the author included a few additional explanatory variables to the model[16]. A few years later, Barro (2008) has reached similar findings in the extended study of the relation and concluded that the Kuznets curve is stable until 2000.

Most of the empirical evidence reviewed so far is reached by using simple linear modeling techniques, which are common practice before the advent of sophisticated data analysis methods that are claimed able to overcome the inadequacy of a simple linear framework. These techniques include, but not limited to, cointegration techniques (Engle & Granger, 1987; Johansen, 1988; Pesaran, Shin, & Smith, 2001), threshold regression (Enders & Granger, 1998; Enders & Siklos, 2001), dynamic panel estimation (Stock & Watson, 1994), and the generalized method of moments (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998).

[16] However, this improvement of model fitting has to be interpreted with caution, as the author did not report the adjusted R^2. Hence, the increase of goodness of fit might be merely a result of adding new regressors to the model.

However, as Yang and Greaney (2017) highlighted, even the studies later have equipped with these advanced tools (Nissim, 2007; Chambers, 2010; Huang, Fang, Miller, & Yeh, 2015; Rubin & Segal, 2015, among others), they still report mixed results regarding the effect of growth on inequality due to different model specifications, datasets, estimation methods, determinants used, and the complex mechanisms involved in the relationship. For instance, by applying a semiparametric technique, Chambers (2010) found that higher growth tends to widen inequality in all countries over short-run and medium-run growth. In terms of a long run relationship, economic growth tends to reduce inequality in developing countries, while it tends to widen inequality in developed economies. Their results showed that the short run effect and long run effect of growth on inequality could be considerably different. In another cointegration analysis, Yang and Greaney (2017) demonstrated that the long run relationship between growth and inequality is significant, while the short run dynamics are insignificant at all. Moreover, they suggested that the shape of the growth-inequality curve in the U.S., China, Japan, and South Korea follows an S-shape pattern rather than the inverted-U shape. More recently, Younsi and Bechtini (2018) adopted the panel cointegration approaches of Pedroni (1999) and Kao (1999) in their study of the growth-inequality relationship in BRICS countries over the period of 1990 to 2015. The findings in Younsi and Bechtini (2018) strongly supported the Kuznets hypothesis in the context of BRICS countries. In another study employing panel data approaches, Sayed and Peng (2020) found that the relationship curve between economic growth and income inequality appears to be N-shaped (rather than the inverted-U shape) in the US, UK, France, and Germany for 1915 to 2014.

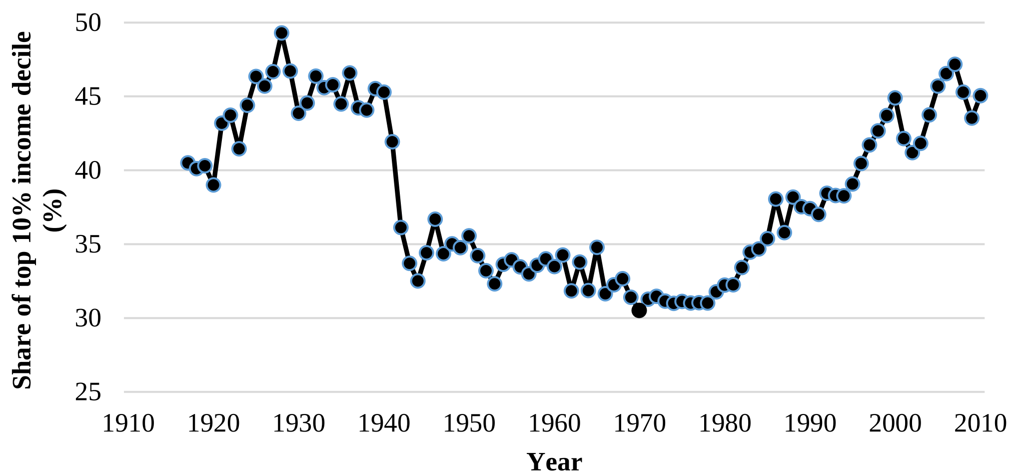
Apart from the previous findings, some recent works believed that there exists a monotonic association between income growth and inequality. Using an overlapping generation model, Nissim (2007) simulated that as an economy is growing and capital stocks are accumulating, the majority of the labors from the working classes will mobilize to the jobs from the better categories and vacant those jobs from the lower classes, hence helps to improve income distribution. On the contrary, Binatli (2012) reported evidence of a negative growth effect on inequality by treating growth volatility and human capital as determinants of inequality. Additionally, he found that higher growth volatility might widen income inequality all the time, but the magnitude of the effect of growth volatility decreases over time. In a study that utilizes US-state level data, Huang et al. (2015) asserted that there is a significant and positive long-run relationship between growth volatility and income inequality, and they showed that the long run effect of growth volatility is asymmetric, in which the positive effect is significant only during the episodes of positive economic growth.

2.2.2 Effect of Growth on Income Inequality: Piketty's view

The preceding discussions clearly showed that, after 60 years of investigation about the Kuznets hypothesis, there is no sufficiently solid and robust evidence to support the existence of the inverted U-shaped curve. At least, the 60-years accumulated knowledge shows that income inequality is not a natural consequence of a country's growth process as per se. Among the criticisms, the literature has provided some insight where country-specific characteristics such as political structure, economic institution, market structure, and level of development would determine the income distribution of the country. Nonetheless, although the literature has consistently rejected the inverted-U curve, there is no formal theoretical framework offered to explain the reasons behind it. Not until the introduction of the book of Thomas Piketty "*Capital in the 21st century*".

In his book, Piketty (2014) provided a detailed criticism of Kuznets' view. In particular, Piketty has constructed a Kuznets curve by using an extensive dataset of inequality that covers hundred years (1910 to 2010) for the three countries tested in Kuznets' (1955) paper (1913 to 1948). He proved that there is no automatic decrease in inequality during the later stages of economic development. According to the inequality evolution of Piketty's version (see Figure 2.2.2), the evolution of the top income decile in the U.S. shared the same pattern as in Kuznets' paper during the period of 1910s to 1950s. The income share then leveled out since the end of World War II until the early 1980s. However, when deregulation and privatization policies began to take place in the U.S. during the 1980s, the top income share skyrocketed. By looking at the 100-year data, the trend depicts a S-shaped rather than an inverted U-shaped curve. Piketty offered two explanations on the drastic increase in income inequality in the 1980s. The first possible reason is that the skills and productivity of the top managers of large firms in the U.S. rose suddenly relative to those of other workers. The second reason, which the author perceived as more plausible, is due to the unbounded power of these top managers in setting their own remuneration.

Figure 2.2.2: Income inequality in the United States, 1910–2010



Source: World Wealth and Income Database (2017)[17], Piketty (2014)

Apart from the length and detail of data covered, another prime difference between Piketty and Kuznets is the role of capital in determining inequality, which is also the central thesis in Piketty's book. Capital owners (typically in small numbers) who owned huge capital income can accumulate more wealth[18]. The sheer amount of initial capital can be invested and in turn enabled them to generate even greater capital and wealth. Greater wealth makes it possible to hire managers who possessed extraordinary know-how in portfolio management, which enhances the capital earning ability even further. In contrast, households who typically owned

[17] Previously known as 'The World Top Incomes Database'.
[18] Although it is arguable, Piketty assumed that capital and wealth are interchangeable in his work.

smaller amount of capital and wealth have less opportunities in terms of accessing to sophisticated investment vehicles and expertise, and ultimately can only make smaller returns on investments.

In other words, Piketti has reminded us about the exponential power of capitalists' returns through unbounded accumulation and inheritance of wealth, which is essentially a Capitalist's implication. As wealth is tend to be more unevenly distributed than labor income, it implies that most of the wealth is generated from the wealth itself rather than from labor in the long run, be it skilled or unskilled. Besides, wealth and capital tend to be increasingly concentrated in the hands of capitalists over time. It is because capitalists who owned larger stocks of wealth tend to enjoy higher rates of return on wealth comparatively to those who own less wealth. It is reasonable where the sheer amount of capital available enabled the investors or entrepreneurs to enjoy better return-to-risk tradeoff by accessing to more investment options and diversification (Piketty, 2014, p. 430–431).

Piketty pointed out that this exponential power was disrupted by World Wars I and II, which destroyed considerable amount of wealth in the world. Over the long run, however, the historical trend of income inequality indicates that the forces of accumulated capital and wealth are still at large. As wealth and capital tend to grow faster than labor-based wages, capital owners are likely the winners among all. Therefore, the richest individuals (capital owners) naturally possess greater influences on the direction of economic and political progression of a country, even if the country adopted democratic system. Piketty provided evidence of these trends of historical data and forcefully argued that it is due to the growth rate of capital (*r*) tends to be higher than the growth rate of income (*g*). In terms of policy suggestion, Piketty proposed a global system of progressive taxes on wealth to reduce income inequality and avoid most of the wealth falls in the hand of few elites.

Piketty's (2014) views have very soon received heated discussion and criticism. On the theoretical side, Stirati (2016), Ghosh (2014), Harcourt (2014), Taylor (2014), and Varoufakis (2014) questioned the capital controversy that was observed during the 1960s. In terms of empirical view, Rubin and Segal (2015) found evidence of a positive growth effect on income inequality in the U.S. during the post-war period (1953-2008). They argued that the high-income group received more wealth income and performance-based compensations than the low-income group when economic growth occurs, as both wealth income and pay-for-performance income (equity compensation) are more sensitive to growth than the hourly based wages. In an early study, Roine, Vlachos, and Waldenström (2009) investigated the effect of economic expansion on income inequality between top income deciles by using a panel dataset of 16 countries over the entire twentieth century. Their results showed that the top 1% income group is disproportionately beneficial from economic growth than the rest of the population. The authors also claimed that a progressive tax scheme will effectively reduce top income shares and if accounting for real dynamic effects.

More recently, Roikonen and Heikkinen (2020) tested on both Kuznets' and Piketty's hypothesis using the historical data of income inequality in Finland for 1865 to 1934. By utilizing both Gini coefficients and data of top income shares, Roikonen and Heikkinen (2020) asserted that the episode of rising income inequality associates the increasing rate of GDP per capita growth over the same window from 1871 to 1904 in Finland. However, the remarkable decline in income inequality after the WWI period (1904 to 1924) is mainly caused by economic and political shocks (including the aftermath effect of WWI, the Finnish civil war during 1917 to 1918, and the introduction of an income tax scheme with the highest marginal tax rate of over 50%) rather than the variation in economic growth. Based on these observations, Roikonen and Heikkinen (2020) argued that the Kuznets view fits well for the Pre-WWI period of rising income inequality in Finland, while the Piketty's hypothesis offers a better explanation on the declining income inequality after 1904.

Another study by Holcombe and Boudreaux (2015) examined whether income distribution is related to different market structures or institutions. By using the data of economic freedom index and two datasets of income inequality, the author reported ambiguous findings. When the top income data is in use (as in Piketty, 2014), the author found a significant relationship between the market institution and income distribution, where a freer or more capitalist-like market tends to increase income inequality. However, when the World Bank data of Gini coefficient is employed, the relationship turns to be insignificant. Holcombe and Boudreaux (2015) explained that these different results might be due to the different coverage of countries in the two datasets. Nonetheless, the author warned about the possibility that the result could be sensitive to the type of inequality data and measurement used.

Conclusively speaking, the heated debate during the half century from the 1960s provided several important lessons regarding the inequality-growth nexus. The first strand of studies concerns the effect of income growth or economic development on income inequality. After six decades since the publication of Kuznets' hypothesis in 1955, scholars attempted to examine and re-examine the same question: Is there a Kuznets curve? The answer is, unfortunately, no. Except for the early findings during the 1960s and 1970s, most of the empirical studies found no solid evidence for the existence of the inverted U-shaped curve. The recent emergence of Piketty's view in 2014 has offered the literature a new angle to look at the old issue. However, it is too soon to draw any consensus from his view. Furthermore, the existing evidence remains diverse for generalizing a definite conclusion on the nature of the growth-inequality relation.

Nonetheless, the literature agreed that the pattern of income inequality is not determined by growth *per se*. Past studies have identified several important factors that come to play when determining the change in income distribution, including country-specific effects, physical and human capital, political and market institutions, governance, asymmetric credit constraints, and initial inequality. In fact, numerous studies (see, for example, Barro, 2008; Huang et al., 2015; Holcombe & Boudreaux, 2015; Yang & Greaney, 2017) found that the growth effect on inequality is weakened when these factors are controlled for the estimation.

Methodological wise, the empirical outcomes are highly sensitive to the choice of estimation method, model specification, and most importantly, the quality of inequality data and proxy employed. Taking estimation methods, for example, the results from most of the early findings during the 1960s to 1990s are reached by using cross-sectional approaches, which tend to support the existence of the Kuznets curve. Once sophisticated methods and data of better quality and length are available in the mid-1990s, the general findings changed drastically. Even though the recent empirical evidence still produces mixed findings, however, the accuracy of estimation has improved over time.

2.3 The Inequality-Finance nexus

From the previous review of the income inequality-economic growth nexus, one may argue that the cause of rising income inequality is not due to growth *per se*. As pointed out by Rajan and Zingales (2004), a lower growth rate that is associated with increasing income inequality may be a consequence of relatively limited opportunities of the poor or low-income groups to accumulate human capital as compared to the rich. If individuals who had the skills and productivity to earn higher income that could help themselves to escape from the bottom, they might fail to do so due to the lack of economic opportunity to gain access to financial capital. This example is based on the intuition that, generally, the entrepreneurial ability of the poor is not likely to be realized if they do not have access to adequate financial capital. In contrast, the rich are free from this constraint, as most probably they owned sufficient stocks of financial capital to engage in productive activities. Therefore, the *opportunity* inequality between the poor and the rich could be one of the origins of rising income inequality.

In this regard, scholars including Becker and Tomes (1986), Greenwood and Jovanovic (1990), Galor and Zeira (1993), and Banerjee and Newman (1993) began to study income distribution by looking at both the distributional impact of economic growth and the distribution impact of economic opportunity, where the latter is commonly proxy by financial development level. However, and similarly to most economic theories, there exist contradict views on the impact of financial development on income inequality.

The first strand of the contradiction predicts that a highly developed financial market might primarily benefit the wealthier populations, especially when the institutions are of poor quality (Rajan & Zingales, 2003). A possible explanation is that the financial system might favor the rich and well connected, who possessed higher credit ratings, higher ability and likelihood to repay debt, and hence channel money mainly to them while excluding the poor. As financial markets deepened, the financial sector would have more to offer to the rich, who have even better capacity to offer collateral due to their higher capital accumulation rate, and continue to reject the poor, who are still stucked at the initial condition and has insufficient resource to provide collateral. If this goes on, the poor are still unable to get the necessary funding for productive investment and remain poor even as the financial sector develops. This situation could get worse if the rich could prevent new borrowers from accessing financial services and in turn lower the chance where the poor to escape from the poverty. If this hypothesis holds, then there will be a positive link between financial development and income inequality. This is the so-called inequality-widening hypothesis of financial development, which is mainly backboned by the capitalist view (Demirguc-Kunt & Levine, 2009).

The second strand offers the opposite prediction. As financial markets mature, it will reduce financial intermediary costs and lower capital requirements and costs of borrowing, and hence ultimately ease the access to finance. Likewise, low-income households previously have no access to the financial service might be the main beneficiaries. Since the poor households cannot offer collateral initially can now access finance more easily, they can obtain funding for investment in human and physical capital or bear the capital requirement associated with entrepreneurial activities, which they are unable to do so without borrowing. In contrast, the high-income households might be less beneficial from the lower borrowing constraints, as they have better ability in investment that comes from their resources that is less dependent on the level of financial development. This is so-called the inequality-narrowing hypothesis of financial development (Demirguc-Kunt & Levine, 2009).

Theories hypothesized by Galor and Zeira (1993) and Banerjee and Newman (1993) predicted this narrowing hypothesis, suggesting that capital market imperfections and indivisible human capital investment might increase income inequality during economic development[19]. Specifically, Galor and Zeira (1993) constructed a two-sector model with allowing bequests between generations and assuming agents who make an indivisible investment in human capital can work in skill-intensive sectors. Given the presence of capital market imperfections, only individuals who owned sufficient bequests or who can borrow external funds can invest in human capital. Consequently, income inequality persists over time through bequests. Likewise, an economy with high initial inequality in wealth and capital market imperfections will grow with persistent income inequality and its growth rate tend to be slower than an economy with lower initial wealth inequality. Similarly, Banerjee and Newman (1993) constructed a three-sector model and assumed two high-return productive technologies that require indivisible investment. Given an imperfectly competitive capital market, only rich individuals can borrow enough to invest in these high-return technologies. Again, the model

[19] See Chapter 3, Section 3.1.1, for a detailed elaboration.

predicts that the initial pattern of wealth distribution of wealth exerts persists and becoming increasingly widen over time in the presence of capital market imperfections. All else being equal, countries with a more imperfect capital market system tend to have more unequal income distribution (Banerjee & Newman, 1993; Galor & Zeira, 1993). Consequently, these models expect a negative relationship between financial development and income inequality.

Offering different views on these theoretical predictions, Greenwood and Jovanovic (1990) proposed a model that combines elements from both perspectives[20]. In their model, individuals are entitled to invest in two technologies. The first opportunity is safe but returns are relatively low. The second technology offers higher but it is riskier. The agent can operate the risky technology only if they can sufficiently reduce the risk through cooperating with financial intermediary. As Townsend (1978, 1982) noted, these coalitions are associated with fixed entrance costs that prevent low-income individuals from entering. Since the poor generally save less and accumulate wealth at a slower pace, income gaps tend to be widen between the rich (those who joined the coalitions) and the poor (those who are outside the coalitions. This creates the widening phase of income inequality during the early stages of financial deepening. However, as the entrance cost to the coalitions is fixed, eventually all individuals will accumulate sufficient capital and be able to join these coalitions and operate the risky technology. Subsequently, this will lead to a reversal in the trend and create the narrowing phase of income

[20] See Chapter 3, Section 3.1.1, for a detailed elaboration.

inequality during the later stages of financial development. In short, Greenwood and Jovanovic (1990) modeled an inverted U-shaped curve for the relationship between income inequality and financial development, where income inequality would increase during the earlier stages of financial development, decrease afterward as more and more people could afford to join the intermediary coalition, and ultimately reach a steady state in the long run. This is so-called the inverted U-shaped hypothesis of financial development, and some authors termed it as the finance Kuznets curve (Clarke, Xu, & Zou, 2006).

Therefore, the inequality-narrowing hypothesis of finance (Banerjee & Newman, 1993; Galor & Zeira, 1993) and finance Kuznets hypothesis (Greenwood & Jovanovic, 1993) dicussed aboved provided conflicting predictions on how financial development could influence income distribution. Turning to the empirics, similar controversies can be found within as well. Clarke et al. (2006) is probably the first notable empirical study that tested these conflicting theories on how financial development affecting income inequality. By using panel data covering 83 advanced and emerging countries over the period of 1960 to 1995, Clarke et al. (2006) examined the relationship between financial development and income distribution. They found that inequality is negatively related to financial development (measured by private credit and bank assets). The findings of Clarke et al. (2006) coincide with the early studies by Li, Squire, and Zou (1998), who showed that financial development significantly narrows income gaps in 40 advanced and developing countries over the period of 1947 to 1994. Similarly, Beck et al. (2007) employed panel data of 72 countries and period of 1960 to 2005 and again revealed an inequality narrowing effect of financial development. Moreover, Beck et al. (2007) showed that the negative relationship is stronger in countries with more matured financial intermediary system. They also showed that financial development disproportionately benefits more to the poor than the rich, thus improves income distribution. The evidence of robust inequality-narrowing effects is also found later by Mookerjee and Kalipioni (2010), Agnello, Mallick, and Sousa (2012), Johansson and Wang (2014), and Boukhatem (2016). Among these studies, Mookerjee and Kalipioni (2010), Johansson and Wang (2014), and Agnello et al. (2012) specifically addressed the effect of financial institutions rather than general indicators of financial sector development. By using a sample of 115 countries over the period 2000 to 2005, Mookerjee and Kalipioni (2010) documented that higher availability of access to financial service and lower barrier to financial service can reduce income inequality. Johansson and Wang (2014) attributed that repressive financial sector policy tends to worsen income distribution by observing 90 countries for the period 1981 to 2005. Similarly, Agnello et al. (2012) showed that financial reform through removals of repressive financial policies such as subsidized directed credit and excessively high reserve requirements and improvements in the securities market policy can improve income distribution.

Standing in sharp contrast, several empirical studies argued that financial development is pro-rich and inequality widening. Using a panel of 49 countries over the period 1994 to 2002 and various indicators for the banking sector and capital market development, Gimet and Lagoarde-Segot (2011) found that domestic banking sector development leads to more unequal income distribution while capital market development has a narrowing effect on income inequality. In the context of the EU, Rodriguez-Pose and Tselios (2009) showed that specialization in the financial sector positively correlated with income inequality. In a more recent study, Jauch and Watzka (2016) used an expanded panel dataset up to 138 countries for the period 1960 to 2008 to examine the link between financial development and income inequality. The authors found a robust and significant positive relationship between financial deepening and income, after controlling for country fixed effects, endogeneity, GDP per capita, and some other control variables. Moreover, the authors found that all income groups are benefited from financial development, but those richer disproportionately gained more than those fall within the lower-income ladder.

Apart from the studies that support linear hypotheses, some recent evidence suggests that the finance-inequality relationship is nonlinear. In a study of top income shares in 16 OECD countries, Roine et al. (2009) documented that the top 1% income group benefited the most from financial development and the pro-rich effect is strongest during the lower stages of economic development of the countries. By using a threshold regression model and a dataset of 65 countries over the period 1960 to 2005, Kim and Lin (2011) found a nonlinear threshold effect within the finance-inequality relationship. Specifically, development in both the banking sector and stock market sector tend to hurt the low-income groups more and widen the income gap when the country has yet to reach the critical threshold level of financial development. Beyond this turning point, however, financial development begin to disproportionately help the poor and hence improves income distribution. In other words, Kim and Lin (2011) found evidence of a finance Kuznets curve for the relationship that takes form of an inverted U-shape. Similar finding of a finance Kuznets curve is reached in Hamori and Hashiguchi (2012) as well. Based on an unbalanced panel dataset of 126 countries over the period of 1963 to 2002, the authors found that financial deepening has a direct and significant negative effect on inequality. However, the interactive effect of financial deepening and economic growth showed that this negative effect diminishes as the economy grows, indicating that the effect of financial development on income distribution can be asymmetric. Turning to the Eurozone, Baiardi and Morana (2016; 2018) found evidence supporting the existence of a finance Kuznets curve across 19 member states of the Euro area over the period 1985 to 2013. Similarly, Nguyen et al. (2019) also found an inverted-U shaped curve for the relationship between financial development and income inequality within a group of 21 emerging economies for 1967 to 2017.

In sum, these studies showed strong support for the inverted U-shaped hypothesis of Greenwood and Jovanovic (1990). Tan and Law (2012) also found evidence of a threshold relationship between financial development and income inequality. However, they argued that the nonlinear relation is U-shaped in developing countries. A similar finding of a U-shaped finance-inequality relationship is also documented in Park and Shin (2017), who modeled the relationship using a panel sample of 162 countries and 42 years (1960 to 2011). The evidence of a U-shaped finance-inequality relationship implies that any development of financial systems helps to reduce income inequality before it reached the threshold level, but once the development exceeds the optimal level, further development would widen the income gap.

Apart from the multi-country studies, some authors focus on country-specific evidence. By adopting an autoregressive-distributed lag (ARDL) framework, Shahbaz and Islam (2011) found a negative relationship between income inequality and financial development but a positive relationship between financial instability and income gap in Pakistan. On the other hand, Destek, Sinha, and Sarkodie. (2020) examined the impact of stock market development and banking sector development on income distribution in Turkey. The authors found a nonlinear inverted-U shaped relationship between income inequality and banking sector development but a linear and negative relationship between income inequality and stock market development. Similarly, Bittencourt (2006) analyzed the relationship in Brazil and concluded that financial sector development generally improves equality. Bahmani-Oskooee and Zhang (2014) estimated an error correction model for each of the 17 countries to examine the finance-inequality relation, Among the 17 countries examined, they found that financial development exerts an equalizing effect on income distribution for 10 countries but widening effect for another 5 countries in the short run. In terms of the long run effect of financial development, only 3 countries are observed with inequality-narrowing effect, while the rest showed an insignificant or positive effect on income inequality.

In the Asia-Pacific region, Jalil and Feridun (2014) examined the long-run relationship between financial development and income distribution in China over the period of 1978 to 2006. The results indicated that financial development tends to decrease the level of income inequality. Their results confirmed the earlier finding by Liang (2006a, 2006b), who found similar results using provincial data of China over the period of 1986 to 2000. The evidence above tell that the finance-inequality relationship in China appears in a linear fashion. However, Zhang and Cheng (2015) argued that there exists a finance Kuznets curve in China, where financial development would increase income inequality during the earlier stages of development and decrease income inequality upon the mature stage of development[21].

Apart from China, Ang (2010) and Sehrawat and Giri (2015) on the finance-inequality relation in India. Both authors estimated an ARDL model for their analysis, but their findings contradicted each other. Ang (2010) covered the observation period from 1951 to 2004 and found that financial development significantly improves income distribution in the long run, but financial liberalization worsens income distribution. However, Sehrawat and Giri (2015)

[21] Note that the authors used certain unconventional indicators to measure financial development in China.

asserted that financial development enlarges income inequality in the long run as it hurts the poor and benefits the rich. Nonetheless, both pieces of evidence do not support the nonlinear hypothesis of Greenwood and Jovanovic (1990).

In the context of Southeast Asia, Motonishi (2006) found that financial development promote a more egalitarian distribution of income in Thailand over the period of 1975 to 1998. Using an ARDL model and different measures of financial development, Law and Tan (2009) suggested that financial development in Malaysia generally does not exert significant effect on income inequality for 1980 to 2000. Following a new angle, Ibrahim (2018) revisited the inequality-finance relationship by looking at the impact of the size of financial sectors. The author documented a U-shaped quadratic relationship between income inequality and the size of financial sectors in four Southeast Asia countries, Hong Kong, India, Japan, and South Korea.

Briefly speaking, the reviews in this section demonstrate that financial development played some important roles in determining income distribution. However, as several theoretical frameworks provide contradictory hints on the relationship between financial development and income inequality, empirical studies have reached different evidence on the nature of this relationship across various empirical settings.

Apart from the direct effect of finance on income distribution as described in Banerjee and Newman (1993), Galor and Zeira (1993), and Greenwood and Jovanovic (1990), promising works such as King and Levine (1993a,b) suggested that financial development and economic growth are endogenously linked and hence implied the possibly complex interactions among finance, growth, and income inequality. Even though there is yet a rigorous framework for describing the dynamic interactions among finance, growth, and inequality, it is still too costly to ignore the endogenous interactions and solely focus on the direct effect. Therefore, finance and growth should not be separated when one intends to assess their impact on inequality.

2.4 Relationship between Income Inequality and Institutional Quality

This section reviews the studies on the relationship between income inequality and institutional quality. While there is a large number of studies focused on the relationship between institutions and economic development (see, for example, Knack & Keefer, 1995; Hall & Jones, 1999; Acemoglu et al., 2002; 2005 Rodrik, Subramanian, & Trebbi, 2004), the studies that discussed on the linkage between institutional quality and income distribution remained scarce.

However, the literature has already stressed the importance of institutional quality in determining income distribution since the early 90s. For instance, Sen

(1981, 1984, 1999) argued that the degree of poverty in an economy depends primarily on the overall institutional effectiveness of that economy in allocating resources to the poor and the needy equitably and efficiently. Poor institutional strength in terms of lacking equality or efficiency will result in poverty incidence. Moreover, Rodrik (2000) mentioned that the creation of laws might favor the private optimum of certain social groups rather than the social optimum of all individuals if weak institutions are in place.

Chong and Calderón (2000a) is the first study that empirically investigated the effect of institutions on income distribution. By observing 105 countries that covered the period of 1982−1995, their cross-sectional evidence displayed a quadratic relationship between institutions (measured using a composite index) and income inequality. Specifically, a better institution will lead to higher income inequality for poor countries, while the same improvement in institutional quality will decrease income inequality for rich countries.

Instead of looking at the effect of the composite institution, some authors examined the linkage between a specific dimension of institutions rather than the overall institutional quality on the level of income inequality. Interestingly, one would quickly notice that the linkage between corruption and income distribution has drawn the most attention within this strand of studies as compared to other aspects of institutions. For instance, Li, Xu, and Zou (2000) found an inverted U-shaped relationship between corruption on inequality for 47 countries and the period of 1982−1994, in which the finding is similar to Chong and Calderón (2000a). Besides, they found that corruption alone could explain a large portion of the variation in income inequality differential between developing and advanced economies. Similarly, Gupta, Davoodi, and Alonso-Terme (2002) reported that an increase of one standard deviation in the corruption index would lead to a higher Gini index by 11 points. Using alternative measures of institutions, Tebaldi and Mohan (2010) found that robust control of corruption, effective governance, and a stable political environment is effective in reducing income inequality. Dincer and Gunalp (2011) investigated the effects of corruption on income distribution in the U.S. By using alternative measures of income inequality and corruption index, they found a robust positive effect of corruption on income inequality, suggesting that poor institutions might weaken income distribution in developed countries. Using the data of 34 OECD member states over the period 1995 to 2011, Policardo, Carrera, and Risso (2019) found a bi-directional causality running between corruption and income inequality, with significant and positive effects in both directions. Their result of a feedback effect between corruption and income gap suggests that the possibility of a corruption-inequality trap (Chong & Gradstein, 2007).

Nonetheless, some studies documented strong evidence against the inequality-worsening effect of corruption. In other words, these studies imply that higher level of corruption *helps* to reduce income inequality rather than widen the gap. The first empirical evidence showing a negative relationship between degree of corruption and income inequality is documented in Dobson and Ramlogan-Dobson (2010), who showed that a higher level of corruption improves income distribution by observing a small group of Latin America countries. The authors argued that the large size of informal sectors might explain the trade-off between corruption control and income disparity in these Latin America countries, and later formally examined the linkage between corruption, income inequality, and the informal sector using an unbalanced panel of 113 countries (Dobson & Ramlogan-Dobson, 2012). The result from the latter reveals that the size of the informal sector causes corruption to be less harmful to income distribution. Similar findings are also found in Chan, Dang, and Li (2019), who examined the corruption-inequality relationship in China, and Berggren and Bjørnskov (2020), who also examined the effect of de facto judicial accountability on income inequality by observing 145 countries and a 54-year period.

From another perspective, scholars have questioned the possibility that institutional quality is actually endogenous. An emerging body of literature has focused on building analytical frameworks to show how political and economic conditions affect the institutional quality (Glaeser, Scheinkman, & Shleifer, 2003; Sonin, 2003; Hoff & Stiglitz, 2004). In particular, there are two major strands of thought in the literature attempted to explain the mechanism of which social polarization and unequal income distribution in affecting institutions.

The first strand emphasizes the unproductive rent-seeking behavior[22] of the agents. For example, Glaeser et al. (2003), who is inspired by the Russian transition, have formulated a micro model to explain the linkage between high inequality and poor institutions. The authors argued that the rich and the politically influential agents in an economy could corrupt the political systems. Then, these politically strong agents expect to prevail in any legal dispute against them since the political institution is already low in accountability. Hence, uneven wealth and power concentration will lead to a corrupted legal system and narrowed property rights protection. In the same vein, Sonin (2003) argued that the rich and economic elite could influence the legal system to work in their favor by bribing the state authorities. This is more commonly recognized as a rent-seeking activity. Chong and Gradstein (2007) extended the work on this rent-seeking mechanism within a dynamic two-way causality framework running between institutional quality and income inequality, which will be discussed shortly (and see Chapter 3). The second strand focuses on the distributive effect of income inequality on society. A higher economic inequality will create distributive conflict within the society where people will feel unjust and unequal, which consequently leads to institutional breakdown. For example, extreme inequality is the driver of socio-political unrest (Figueroa, 1996; Svensson, 1998), weakening social cohesion (Easterly, Ritzen, & Woolcock, 2006), political instability (Agnello, Castro, Jalles, & Sousa, 2017;

[22] By definition, rent-seeking activity is interpretable as an investment in "private" (rather than public) protection of property rights. The rent-seeker will try to protect or gain additional resources through costly lobbying, bribery or activities alike.

Asongu & Odhiambo, 2020), and political violence (Muller & Seligson, 1987; Dutta & Mishra, 2005).

On the empirical side, the evidence that examines the determination of institutional quality is as scant as the theoretical counterpart. Among the few available studies, Easterly (2001) demonstrated that social polarization negatively affects institutional quality, implying that institutional quality is endogenously determined by political and economic conditions. Similarly, Keefer and Knack (2002) found that land and income inequality deterred property rights security (measured as a composite index) in their OLS model. Instead of using the least square method, Easterly (2007) has adopted an instrumental regression approach to overcome the endogeneity issue lied between institutional quality and income inequality. By using agricultural endowments as an instrumental variable, they found a robust negative relationship between income inequality and institutions. This result is in line with the earlier work of Easterly et al. (2006), who have employed a similar instrumental method.

The studies reviewed above have emphasized the one-way causation between institution and inequality; they focused on either the effect of institution on inequality or the effect of inequality on institutions. A seminal contribution of Chong and Gradstein (2007) has reached beyond the scope of one-way causality. By estimating GMM and panel VAR models, they found that large initial inequality induces weak institutional quality, and then the lagged values of institutional quality negatively cause inequality. This result provides strong empirical support to the bi-directional hypothesis between inequality and institution. Moreover, they found that the causality running from inequality to institutions appears to be stronger than its reverse causality. Spruk (2016) confirmed the second link of Chong and Gradstein (2007) by analyzing the long-term trend of political institutions and income distribution for almost two centuries (1810 to 2000). According to Spruk (2016), an economy with a poor political institution in term of a highly skewed distribution of political power tends to slow down economic growth, as the elites can extract rent from the rest of the society from this institutional setup, which ultimately leads to slower growth and failure to catch up with the high-income countries. Moreover, since institution quality tends to persist over time, the resulting income gaps among the poor and the rich countries tend to persist in the long run as well. Spruk (2016) showed that the long-run institutional persistency accounts for up to 67 percent of within-country development paths and up to 83 percent of cross-country development gaps. More recently, Policardo et al. (2019) documented a significant feedback effect between corruption and income gap among 34 OECD countries, suggesting that a higher degree of corruption reinforces income inequality and vice versa.

From the short discussion above, these studies of institutional economics generally suggested that a healthy institutional quality tends to associate with lower income inequality and vice versa. This notion remains largely true even with the impression that there might be a bidirectional causality between inequality and institution. If there exists causation running from income inequality to institutional quality as well, then the nature of this causation is negative, as higher inequality would lead to weaker institutions (Glaeser et al., 2003; Sonin, 2003; Chong & Gradstein, 2007). However, as this section only highlights the direct effect of institutional quality on income distribution, a better grasp of the overall impact of institutional quality can be shown by considering the mediating effect of institutions in the inequality-growth-finance nexus. The next section embarks on this broader review in detail.

2.5 The Roles of Institution in Inequality-Finance Nexus

While the previous section discussed the direct impact of institutions on income inequality, this section will address the indirect or interactive effect of institutions. Specifically, this section reviews the studies that focused on the intermediate roles of institutional quality in the inequality-growth-finance nexus.

The theoretical scaffolding behind this strand of literature mainly relied on the intuition that poor institution quality would first disturb the development in the financial system and economic growth, and subsequently affect income distribution. As aforementioned, there is a vast amount of evidence that supports the adverse effect of weak institutions on economic development. On the other hand, the study on the institutional effect on finance can be traced back to the seminal contribution of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997; 1998).

La Porta et al. (1997; 1998) presented two main contributions to the studies of financial development and legal institution. First, the authors proposed that a strong legal system would protect the right of outside investors from being exploited by the insiders (corporate managers and their alias), and hence promote financial development. Second, the authors demonstrated empirically that legal origins (e.g. English, French, or Roman) of a country systematically represented the strength of the legal protection of that country, and successfully predicted the level of financial development by using legal protection as determinants and legal origin as an instrument. Therefore, La Porta et al. (1997; 1998) have provided a formal theoretical foundation to link institutional quality (legal environment) with the financial development of a country.

Several subsequent studies have followed up the effort of La Porta et al. (1997; 1998)[23] in analyzing the link between institution and finance. For example, Beck et al. (2003) argued that both the legal systems brought by colonizers and the initial endowments in the colonies are significant in explaining stock market development and protection of private property rights. Haber and Perotti (2007) claimed that poor political institutions are the major hurdler for financial development. Similarly, Rajan and Ramcharan (2011) suggested that a weak

[23] The studies of legal origin has also extended to beyond law and finance. They are not discussed here as these studies beyond the scope of this study.

political and legal institution would discourage financial development as the groups with highly concentrated power can restrict the accessibility to financial markets, and this inverse relationship is significant in democratic countries as well.

Despite the potential interactions among these macro variables, there are only a handful of empirical studies closely examined these multi-faceted relationships. One of these studies is the work of Perera and Lee (2013), who questioned on how the strength of institutions and economic growth are linked with both inequality and poverty. By focusing on nine emerging economies in East and South Asia for 1985 to 2009, their system GMM estimations show that there is no significant linkages between economic growth and income distribution. Turning to the distributional effect of institutional quality, the authors found that the overall institutional quality, governmental stability, and rule of law are insignificant to explain income inequality as well. More surprisingly, the study also reached some interesting findings that improvements in control of corruption, democratic accountability, and bureaucratic quality tend to increase poverty levels and income inequality rather than improve them. The authors attributed these counterintuitive findings to the possibility that institutional improvements and reforms can come with huge transaction costs imposed on people, especially in developing and emerging economies. Similar arguments of a positive relationship between inequality and institutional reforms are also found in Chong and Calderon (2000a), Li et al. (2000), Dobson and Ramlogan-Dobson (2010; 2012), and Berggren and Bjørnskov (2020).

In a relatively unique study, Nadia and Teheni (2014) examined the relationship between inequality, finance, and institutional quality (governance) by using a nonparametric approach and a panel of 39 countries over 1996 to 2009. Based on the principal component analysis, the authors found a strong and positive relationship between quality of governance and financial development. In addition, better governance quality are essential condition for financial development especially in Latin America and the Caribbean region. On the other hand, the authors also found that improvements in governance would significantly reduce income inequality. In terms of the link between financial development and income inequality, the authors found a negative relationship between the two variables, but this negative relationship is significant only in 1998 and 2000.

Rather than studying income inequality, Cepparulo, Cuestas, and Intartaglia (2017) paid more attention to the joint influence of finance and institutions in reducing the poverty rate. Using the GMM approach and data of 58 developing countries over the period of 1984 to 2012, the authors found evidence where both financial development and improvement in institutional quality disproportionately benefit the lower income groups than those from high income brackets. Nonetheless, the results reveal a significant substitution effect between financial development and institutions. This implies that, in the context of developing countries, the development of financial sectors could weaken the poverty-reducing effect of better institutions and vice versa.

From another perspective, Law, Tan, and Azman-Saini (2014) questioned what constitutes the nonlinearity within the finance-inequality nexus as stated in Greenwood and Jovanovic (1990). By testing on 81 countries over the period from 1985 to 2010, their results from threshold GMM models suggested that institutional quality drives the nonlinearities within the finance-inequality nexus. Specifically, the results indicated a significant threshold level of institutional quality that governed the inequality-finance relation. For a country with institutional strength below the threshold, development in the financial sector has no significant effect on income inequality. When the institutional strength of the country has surpassed the threshold, financial development turns out to be significant in reducing income inequality. In other words, these findings implied that institutional quality could influence the relationship between financial development and income inequality.

One empirical implication from Law et al. (2014) is that there is likely an important interplay between financial sector development and institutional quality in determining the pattern of income distribution. A recent work by Adams and Klobodu (2016), who examined the finance and corruption on income inequality within the context of the Sub-Saharan region, has questions on this hypothesis. By using data of 21 African countries, the result of their pooled-mean-group (PMG) estimators portrayed that financial development relates positively to income inequality when holding all else constant, while better control of corruption would reduce income inequality over the period of 1985 to 2011. Furthermore, once the authors considered the interaction between financial development and control of corruption, the interactive term has a statistically significant and negative effect on income inequality over the long run[24].

Therefore, Adams and Klobodu (2016) reached similar findings as in Law et al. (2014), where institutional quality matters for the relationship between financial development and income inequality. Nonetheless, notice that these two studies used different indicators for institutions and different panel estimation methods. While Law et al. (2014) covered larger samples and composite index for institutional quality, Adams and Klobodu (2016) focused on the role of corruption only by using Sub-Saharan data. The smaller sample available in Adams and Klobodu (2016) also limits the choice of estimation method, in which the most sophisticated GMM technique used in Law et al. (2014) required a larger sample. Therefore, one has to be cautious when compare their findings.

In short, the importance of institutional quality in determining the interrelationships between inequality, financial development, and economic growth is undeniable. The roles of institutional strength played in the inequality-finance nexus include its interaction with financial development (La Porta et al., 1997; 1998, Rajan & Ramcharan, 2011; Cepparulo et al., 2017). Besides, several important studies revealed that institutional quality could affect income distribution directly (Chong & Calderón, 2000a; Gupta et al., 2002; Chong & Gradstein, 2007) or

[24] This effect is robust to alternative indicator of corruption control (transparency index).

indirectly as an instrumental variable of the nexus (Perera & Lee, 2013; Law et al., 2014, Adams & Klobodu, 2016).

2.6 Conclusions

2.6.1 Summary of Reviewed Studies

This section provides a summary of the reviewed studies and identifies literature gaps in the research of income inequality, financial development, institutional quality, and economic growth. Firstly, there are some major themes displayed throughout the history of economic inequality analysis. The first theme emerged during the period from the mid-1950s to 2000s, of which the theme concerns mainly on the income growth and its distributional pattern. This earliest strand of inequality analysis begins with the seminal work of Kuznets (1955), who proposed a hypothesis of nonlinear or inverted U-shaped trend for the relationship between income growth and income inequality. Following the Kuznets' curve, numerous studies attempted to test the inverted U-shaped hypothesis during this period. The findings are astonishingly mixed, and the validity of most of these findings is questionable in terms of data used and choice of methodology. As a result, the nature of the effect of income growth on income distribution is still debatable to date. Nonetheless, economic growth or income growth is one of the important factors in explaining income inequality as commonly seen in many empirical studies.

The first major theme of growth-inequality analysis does not reach a consensus on the existence of Kuznets' curve. However, one important lesson learned from these studies is that the determination of income inequality is not income growth *per se*. This notion has given rise to the second major theme of income inequality analysis that emerges since the late-1990s. The central thesis of this second theme is to analyze the mechanism of income distribution channels, rather than focus directly on the distributional effect of growth as what the first theme did. There are two subthemes under this broader theme that are worth taking note[25], namely the financial channel of income distribution and the institutional channel of income distribution.

The establishment of the financial channel of income distribution relied upon the general conditions of imperfect financial markets and the indivisibility of capital investment. Generally, individuals have to offer collaterals before they can enjoy the intermediary services offered by the financial sectors. However, as individuals have different endowments of initial wealth, not everyone has the leveled ability to offer sufficient collateral for accessing the financial market. As an underdeveloped financial market tend to associate with high entry fees, a poorly

[25] Other subthemes discuss on the role of, for examples, human capital and trade liberalization on income inequality. They are beyond the scope of detailed discussion in this study, but these will be included as controlled variables in the empirical models (see Chapter 3, Section 3.2).

developed financial market would discriminate against the individuals based on their ability to offer collateral. The rich who owned sufficient wealth can easily pay the entrance fees and accumulate their wealth at a higher rate through risk diversification and information pooling, while the poor remained outside the financial market. Consequently, a less-developed financial market tends to widen income inequality.

The intuitions illustrated above inspired some pioneering works for this theme, which include Galor and Zeira (1993), Banerjee and Newman (1993), and Greenwood and Jovanovic (1990). Interestingly, Galor and Zeira (1993) and Banerjee and Newman (1993) argued for a linear and negative relationship between financial development and income inequality, whereas Greenwood and Jovanovic (1990) predicted an inverted U-shaped hypothesis for the relation. This contradiction appears in empirical discussions as well. While some studies found support for the linear and negative link (Li et al., 1998; Clark et al., 2006; Mookerjee & Kalipioni, 2012; Agnello et al., 2012; Johansson & Wang, 2014), some studies argued that the linear relationship is positive (Gimet & Lagoarde-Segot, 2011; Jauch & Watzka, 2016; Adams & Klobodu, 2016), and some other studies reported evidence for the nonlinear hypothesis (Kim & Lin, 2011; Hamori & Hashiguchi, 2012; Baiardi & Morana, 2016; 2018).

Turning to the institutional aspect of income inequality, this strand of studies received relatively less attention in the literature than the study on growth-inequality and finance-inequality relations. Despite the small number of studies, there is very likely a strong link exists between institutional quality and income inequality of an economy. An economy with weak institutional quality tends to associate with poor income distribution, as the weak institutions failed to facilitate the optimal distribution of economic and political resources (and power) to its citizens. Several studies have documented the findings of a negative relationship between institutional quality and income inequality (Gupta et al., 2002; Tebaldi & Mohan, 2010; Dincer & Gunalp, 2011), although there are some argued for a nonlinear relationship between the two variables (Chong & Calderon, 2000; Li et al., 2000). On the other hand, some studies questioned the possibility that income inequality would in turn determine the quality of institutions (Glaeser et al., 2003; Sonin, 2003; Hoff & Stiglitz, 2004; Easterly et al., 2006). Given an economy with high initial inequality, those who possessed concentrated economic and political resources could further improvements in institutional quality, mostly through rent-seeking activities. Several empirical studies found evidence of the negative effect of income inequality on institutional strength (Easterly, 2001; 2007; Keefer & Knack, 2002; Spruk, 2016). Combining the one-way causalities above indicates that there might be a bi-directional causality running between institutional quality and income inequality. This has motivated the seminal work of Chong and Gradstein (2007), who theoretically and empirically demonstrated the existence of the two-way causality.

Later, some ambitious studies have considered income inequality, growth, financial development, and institutional quality altogether to obtain a fuller picture of their interrelationships. This handful of studies (Perera & Lee, 2013; Nadia & Teheni, 2014; Law et al., 2014; Adams & Klobodu, 2016) is closest to the spirit of this thesis, especially Law et al. (2014) and Adams and Klobodu (2016).

Finally, some methodological aspects of the literature on income inequality and institutional quality are worth taken note of. Firstly, the development and robustness of most early studies on inequality (especially those published before 2000) are constrained from serious lacking in data availability. There was no fundamental improvement in the data availability issue until the first systematically compiled panel database of income inequality was published by Deininger and Squire (1996, 1998). Similar data limitations occurred among the studies of institutional quality as well. Secondly, most of the early studies in income inequality adopted cross-sectional approaches. Data limitations mentioned above and insufficient lengths of time series data for individual countries are part of the reason behind this phenomenon. The employment of panel estimation techniques became common since the early 2000s, and it was getting sophisticated after the advent of panel GMM techniques by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998).

2.6.2 Literature Gaps

There are some relevant literature gaps identified from the literature review above:

1. After about sixty years since the publication of the Kuznets curve, the effect of income growth on inequality remained controversial. One of the reasons is that income growth or economic growth itself could not explain solely the pattern of income distribution. This indicates that the results from those past studies that attempted to explain income inequality by economic growth alone are misleading, or at best did not deliver the full picture of income inequality. Therefore, it shows that factors other than economic growth are important in the macro analysis of income inequality. These factors include financial development, institutional quality, and other controlled variables. This study will address this literature gap through the first and the second research objective.

2. The second literature gap is regarding the controversial predictions and mixed findings on the finance-inequality relation. Given the contradicted predictions from the inequality-narrowing hypothesis of finance (Banerjee & Newman, 1993; Galor & Zeira, 1993) and finance Kuznets hypothesis (Greenwood & Jovanovic, 1993), the nature of the effect of financial development on income inequality is thus an empirical question. However,

numerous empirical evidence did not reach a consensus on whether the linear hypothesis or the nonlinear hypothesis is dominant. Therefore, it is necessary to carefully examine the finance-inequality relation on a robust basis. Similarly, this study will fill up this literature gap by the first and the second research objective.

3. As discussed in section 2.5, institutional quality played critical roles in determining income inequality via its direct effect and its interactions with financial development. However, only a limited number of studies in the existing literature have examined the roles of institutional quality in explaining income inequality. Among the few exceptions, Law et al. (2014) assumed that there exists a threshold intuitional quality and treated it as an instrument for their inequality-finance regression. While their model has captured the role of institutional quality, it does not directly examine the interaction between institutional quality and financial development. On the other hand, Adams and Klobodu (2016) do examine the interaction and direct effect of institutional quality, but the samples used in this study are limited to the Sub-Saharan region and therefore might not be generalized to other regions. In this regard, this study will attempt to investigate the roles of institutional quality in the inequality-finance nexus by extending the effort of Law et al. (2014) and Adams and Klobodu (2016). The achievement of the second research objective will fill up this literature gap.

4. Next, the discussions in section 2.4 presented that income inequality could endogenously determine institutional quality. As this strand of studies is contradictory to the conventional assumption of exogenous institutions, the size of this strand of literature is considerably small and awaits for development. The third objective of this study will attempt to contribute to this literature gap.

5. The fifth literature gap identified related to methodological aspects in the study of income distribution, financial development, and institutional quality. As discussed above, most of the earlier findings are limited in terms of data availability and the use of less-sophisticated estimation methods. In this regard, the use of updated databases of income inequality and institutional quality as well as the employment of advanced panel estimation methods could overcome this issue. Therefore, this study will utilize the SWIID (2016) database for income inequality, the ICRG data for institutional quality, and the system GMM technique for estimating income inequality and institutional quality.

6. Lastly, as the stages of economic development matter for income distribution (Galor & Moav, 2004; Beck et al., 2007), it is fruitful to examine the income inequality for panel countries according to their development stages. However, this practice is far from common in the existing literature. Thus, this study will tackle this literature gap by

examining the income inequality of developed countries, developing countries, and the world panel as well.

CHAPTER 3

THEORETICAL FRAMEWORK AND METHODOLOGY

3.1 Theoretical Framework

This section elaborates on the relevant theoretical frameworks in accordance with the research objectives. As to complement the previous brief discussions in Chapter 2, this section focuses on the technical aspects of the theoretical linkage between income inequality and finance, as well as the theoretical relations between income inequality and institutional quality.

3.1.1 Income Inequality and Financial Development

As aforementioned, several theories provide different predictions on the linkage between income inequality and financial development. These competing theories suggested by Banerjee & Newman (1993), Galor and Zeira (1993), and Greenwood and Jovanovic (1993) are part of the reasons that lead to controversies in past empirical studies[26]. Broadly speaking, two major theoretical views describe the relationship between inequality and finance. The first strand stands on the linear hypothesis for the relationship (Galor & Zeira, 1993; Banerjee & Newman, 1993),

[26] See section 2.3 for more details.

while the second strand conjectures the nonlinear or inverted U-shaped hypothesis (Greenwood & Jovanovic, 1990) for the relationship between the two variables.

3.1.1.1 Linear Hypothesis on Inequality-Finance Relationship

As one of the pioneers of the linear hypothesis, Galor and Zeira (1993) developed an overlapping-generation model to capture the economic dynamics of wealth inequality. The authors built their equilibrium model in an open economy setting with an open bequest motive. In addition, the authors made two major assumptions for this economy that first, the credit market is imperfect, and second, investment in human capital is indivisible[27]. The investment in human capital requires initial outlay equals to h where $h > 0$. Since the credit market is imperfect, all borrowings from financial markets come with an interest rate i and i is always greater than the lending rate r.

In terms of production, two types of production technologies, i.e. the skilled-intensive technology or the unskilled-intensive process can be used to produce a consumption good.

All individuals in the economy (agent) live for two periods. The agents choose one out of two options for the investment decision. The agent who chooses the first option will invest in human capital during the first period and work as

[27] The authors borrowed the idea of indivisible investment in human capital from Becker (1975) and Atkinson (1975).

skilled labor during the second period. The agent who chooses the second option will work as unskilled laborers in both periods. At the end of the second period, the skilled agents will leave a large bequest whereas the unskilled agents will leave less and their offspring inherit less. As a result, even though agents are assumed homogenous in ability, but they are different in opportunity[28] depending on the wealth they inherited from their parents.

Consider now the skilled and unskilled agents supply their labor in a perfectly competitive market and earn skilled wages W_S and unskilled wages W_U, respectively, where W_S always greater than W_U. Assumed that an agent with wealth y will leave a bequest with size b to his or her offspring, with $b = y - c$ where c is the amount of consumption during the second period.

Agents now attempt to answer their individual optimization questions. Assumed that the utility function of the agent is as follow

$$\max\{U = c^{\alpha} b^{1-\alpha}\}, \text{ subject to } \quad y = c + b \qquad (3.1.1)$$

where the optimal solution is $b^{*} = (1-\alpha)y$ and $U^{*} = \theta y$, with $\theta = \alpha^{\alpha}(1-\alpha)^{1-\alpha}$. Now, there are few different variants of the lifetime utility function governed by the choice of the agent with the assumption that the agent is initially

[28] The author emphasized that individuals are different in term of "opportunities" rather than "abilities" here.

inherited with an amoung of x. For the first variant, the agent prefers not to invest in human capital, the lifetime utility function can be expressed as follow:

$$U_U^*(x) = \theta[(x + W_U)(1 + r) + W_U] \tag{3.1.2}$$

For the second variant, the amount inherited is at least equal to the indivisible capital requirement for human capital investment ($x \geq h$) and the agent chooses to invest in human capital, the lifetime utility function appears as:

$$U_{SL}^*(x) = \theta[(x - h)(1 + r) + W_s] \tag{3.1.3}$$

where the balance of $x - h$ can be invested and earn return of r.

For the third and last variant, the amount inherited is less than than the investment requirement ($x < h$) and hence the agent chooses to invest in human capital with borrowing at rate i, the corresponding lifetime utility function is given by:

$$U_{SB}^*(x) = \theta[(x - h)(1 + i) + W_s] \tag{3.1.4}$$

The equations above provide several propositions. Equation (3.1.2) and (3.1.3) show that individuals will go for the path of skilled labor if and only if the lifetime utility gained from skilled laboring is at least equal to the lifetime utility gained from unskilled labor ($U_{SL}^{*} \geq U_{U}^{*}$). This proposition is analogous to the condition where

$$W_S - h(1+r) \geq W_U(2+r) \tag{3.1.5}$$

If condition (3.1.5) does not hold, then all individuals would prefer to avoid investment in human capital and work as unskilled. Based on Equation (3.1.2) and (3.1.4), those who have to borrow for human capital investment are willing to do so if and only if $U_{SB}^{*} \geq U_{U}^{*}$. The condition derived from this proposition is:

$$x \geq f \equiv \frac{1}{i-r}[W_U(2+r) - W_S + h(1+i)] \tag{3.1.6}$$

Condition (3.1.6) is interpretable as the initial condition for an individual to pursuit the path of being a skilled labor. It predicts that only individuals with sufficiently large amount of inital inheritance from the past generations will consider to invest in education and work as skilled laborers afterward, while others will remain unskilled when $x < f$. The lifetime utility equations above then lead to the determination of bequests in each generation. Let x_t represents the amount of inheritance passed to an individual who born at time t, the bequest that the individual will leave for the next generation at time $t+1$ can be written as:

$$b(x_t) = \begin{cases} (1-\alpha)[(x_t + W_U)(1+r) + W_U] & if\ x_t < f \\ (1-\alpha)[(x_t - h)(1+i) + W_S] & if\ f \leq x_t < h \\ (1-\alpha)[(x_t - h)(1+r) + W_S] & if\ x_t \geq h \end{cases} \tag{3.1.7}$$

Equation (3.1.7) has some important implications in terms of wealth distribution. It shows that the initial wealth distribution and the choice of human capital investment do not only matters for the short run (one-period), but it does matter for the long run equilibrium of income and its distribution as well. This in turn implies that the initial wealth inequality would persist over generations through bequests motives. Consequently, there will be a bi-polarized distribution of wealth that increasingly widen the wealth gaps between the rich and the poor in the long run. As coined by Galor and Zeira (1993), the wealthy individuals and families will converge to a high-income steady state and create rich-dynasties over generations, while the less-fortunates will converge to a low-income steady state and create poor-dynasties that persist over time.

When the individual decisions are generalized to aggregate economic activity, the current level of income inequality is dependent on historical income inequality. In other words, the income distribution of the nation is related to the proportion of rich and poor families in the nation. If there are no relevant exogenous shocks, the divergence of wealth accumulation between the rich and the poor is persistent through generations.

In a separate study, Banerjee and Newman (1993) reached similar conclusions as in Galor and Zeira (1993). Given the similar adoption of an imperfect credit market, Galor and Zeira (1993) focused on the roles of human capital and initial wealth on income distribution, while Banerjee and Newman

(1993) emphasized the relationship between occupational choices and income distribution.

The initial setting of agents' behavior in Banerjee and Newman (1993) is similar to Equation (3.1.1). Assuming all agents are risk-neutral. Their preference over the consumption goods are $c^{\alpha}b^{1-\alpha} - z$ where c is the agent's consumption during period t, b is the bequest left to the next generation during period t + 1, and z is the total labor supplied. Each agent then has a lifetime utility of $\delta y - z$, where y denotes income realization and $\delta = \alpha^{\alpha}(1-\alpha)^{1-\alpha}$.

Next, the open economy model has three distinct production or investment technologies. The first technology is a passive, divisible and low-risk investment that gives a fixed gross return $\hat{r} = 1/(1-\alpha)$. The second technology involves a risky and indivisible investment that required an initial investment of size I and one unit of labor. The project bears with a random return of rI, where $r = r_0$ with probability $1-q$ or $r = r_1$ with probability q and $0 < r_0 < r_1$. The third technology is similar to the second technology in terms of risk level and return, but it permits aggregate production where an entrepreneur can employ and monitor $m, m > 1$ number of workers to operate the project at a competitive wage v. This aggregate production will yield similar random returns as in the second technology such that $r' = r$.

There are four occupational choices in the economy. Agents who invest in safe technology choose to be idle, where they only intend to satisfy their subsistence with no labored effort. Those who choose to participate in the operation of the aggregate production make the second choice of being a worker. Agents will choose to work as long as the competitive wage $v \geq 1/\alpha$ or else they rather be idle. The third occupational choice is to engage in self-employment through investing in the second technology. This option is feasible so long as the agent enjoyed a production of

$$I(\bar{r} - \hat{r}) - (\frac{1}{\alpha}) \geq \max\{0, I(r_0 - \hat{r})\}.$$

Finally, the entrepreneurs choose to employ μ workers to run aggregate production. With identical random returns, however, the entrepreneurial technology is more profitable than the self-employment as

$$\mu\left[I(\bar{r} - \hat{r}) - (\frac{1}{\alpha})\right] \geq \max\left\{I(\bar{r} - \hat{r}) - (\frac{1}{\alpha}), I(r_0' - \hat{r}) - (\frac{1}{\alpha})\right\}.$$

Assuming that each agent has an initial wealth w that distributed with function $G(w)$, where w can be used as collateral for borrowing. Note that agents need to borrow only when they want to finance the capital requirement of self-employment (I) and entrepreneurship (μI). A wannabe self-employed with $w < I$ will be able to borrow I if he or she can offer a minimum wealth $w^* = I - (\pi F/\hat{r})$ as the collateral, where π is the probability of being caught when default and F is the nonmonetary punishment of the fleeing. Similarly, the minimum wealth required for borrowing the capital of entrepreneurship is $w^{**} = \mu I - (\pi F/\hat{r})$.

Now, given the conditions above, the determination of the equilibrium wage in the labor market is:

$$v = \begin{cases} \underline{v}, & if\ G_t(w^*) > \mu[1 - G_t(w^{**})] \\ \overline{v}, & if\ G_t(w^*) < \mu[1 - G_t(w^{**})] \end{cases} \tag{3.1.8}$$

Several important propositions follow the conditions of labor market clearance in (3.1.8). First, individuals with initial wealth $w < w^*$ will choose to be a worker. Second, agents with initial wealth $w^* < w < w^{**}$ will end up become self-employed. Next, wealthy individuals with initial wealth $w > w^{**}$ will become an entrepreneur as long as $v < \overline{v}$. A special scenario occurs when all individuals have an initial wealth of less than w^*, then becoming idle is the only occupational option as no one in the economy could initiate self-employment and entrepreneurial production. The static equilibrium in each period will then transmit to the next period through bequests with different sizes. This indicates that the initial wealth distribution pattern will determine future income distribution and its persistence via occupational choices. Therefore, Banerjee and Newman (1993) have reached similar conclusions as in Galor and Zeira (1993).

Briefly speaking, both theoretical works above demonstrate how an imperfect capital market and indivisibility can influence income inequality. They implied a general message that the presence of capital market constraint and investment indivisibility, or poor financial system as a whole, income inequality will widen as generations go on. This implies a critical relationship that financial development might have a monotoni unequalizing effect that worsens distributions as long as the imperfections remain in the financial system. As the financial market deepens, the financial market will become more efficient and more competitive. This in turn reduces the capital market imperfection and lowers transaction and intermediary fees. Consequently, it alleviates the initial credit constraints faced by the poor individuals that have relatively less or none to offer for collateral. The easier entrance to capital markets will then enable more individuals to invest in education or high-returns bearing investments, and ultimately reduces the income gap between the rich and the poor.

3.1.1.2 Nonlinear Hypothesis on Inequality-Finance Relationship

The seminal work of Greenwood and Jovanovic (1990) offers a strong contradiction to the linear hypothesis of the finance-inequality relationship as discussed above. In their theoretical paper, the authors adopted an endogenous growth model to frame the finance-inequality relationship. First, consider an economy consisted of a continuum of agents. Each of the agents attempts to maximize their expected lifetime utility as

$$\max \left\{ E\left[\sum_{t=0}^{\infty} \beta^t \ln(c_t) \right] \right\}$$

where β is the discount rate $\beta \in (0,1)$ and c_t is the consumption at time t.

Two types of linear production technologies are available in the said economy for operation or investment. The first production technology is relatively safer and thus provides relatively low investment return with factor δ for each i units of capital invested at period $t-1$, or $y_t = \delta i_{t-1}$. The second production technology is riskier but offers a higher return of $y_t = (\theta_t + \varepsilon_t) i_{t-1}$, where $(\theta_t + \varepsilon_t)$ denotes the composite technology shock and $\theta_t + \varepsilon_t > 0$. The first component of the composite shock $\theta_t = [\underline{\theta}, \overline{\theta}]$ represents the aggregate shock with $E(\theta) > \delta > 1/\beta$. The second part $\varepsilon_t = [-\overline{\varepsilon}, \overline{\varepsilon}]$ is the idiosyncratic shock that associated with the individual project with $E(\varepsilon_t) = 0$.

Each agent will own a certain amount of wealth $k_t = c_t + i_t$ at period t for disposal. They will then allocate their wealth either for current consumption or reserve for investment in production technologies in the next period. If an agent chooses to invest in production technologies, he or she will fully analyze the magnitude of the aggregate and idiosyncratic shocks of their own project. However, agents have to participate in networks (i.e. financial market) to obtain full information about the true aggregate shock θ_t due to certain reasons. First, financial intermediations can potentially reveal the actual value of the aggregate shock by analyzing the information contained in many risky individual projects. Second, the trading mechanisms can naturally diversify the idiosyncratic shock ε_t via the pooling of projects.

Nonetheless, as Townsend (1978; 1982) mentioned, the participation in the financial intermediary network can be costly. Assumed that the permanent access to the financial market required a lump sum entry fee of q, not all agents will participate in the financial market as it requires a minimum wealth of at least equal to q. Likewise, there will be two clusters of agents at any period: the participant (those who entered the financial market) and the non-participant (those who are outside the financial market).

In the cases of financial market participants, the financial intermediaries promised a random return of $r(\theta_t)$ for per unit of capital invested by the participants at each period. Therefore, the wealth of a financial market participant at the beginning of period $t+1$ is

$$k_{t+1} = i_t r(\theta_t) \tag{3.1.9}$$

where the idiosyncratic shock is absent in Equation (3.1.9) since it has been diversified completely. For the non-participants that are outside of the financial market at period t, the wealth of these non-participants at the beginning of period $t+1$ is

$$k_{t+1} = i_t[\emptyset_t(\theta_t + \varepsilon_t) + (1 - \emptyset_t)\delta] \tag{3.1.10}$$

where $\emptyset_t$ denotes the fraction of risky investment in their investment portfolio at period t. Equation (3.1.10) shows that the uncertainty of the idiosyncratic shock significantly influences the wealth of the non-participants.

Now, let $F(\theta)$ and $G(\varepsilon)$ be the cumulative distribution function of θ and ε, respectively, the participants will make their investment decision by answering the following optimization question, which is a constrainted value function:

$$v(k) = \max_{i_t} \{\ln(k_t - i_t) + \beta \int \max[v(k_{t+1})] \, dF(\theta_{t+1})\}$$

$$\text{subject to: } k_{t+1} = i_t r(\theta_t) \tag{3.1.11}$$

The value function of the non-participants follows as:

$$w(k) = \max_{i_t, \emptyset_t} \left\{\ln(k_t - i_t) + \beta \int \max[w(k_{t+1}), v(k_{t+1} - q)] \, dF(\theta_{t+1}) dG(\varepsilon_{t+1})\right\}$$

$$\text{subject to: } k_{t+1} = i_t[\emptyset_t(\theta_t + \varepsilon_t) + (1 - \emptyset_t)\delta] \tag{3.1.12}$$

The value functions in (3.1.11) and (3.1.12) are also the dynamic programming problems that governed the decision of agents on whether to enter and whether to stay within the market. Given that $v(k) > w(k)$ for any endowment of capital k, it follows that the wealth of financial market participants are always greater than the wealth of non-participants. Therefore, the non-participants will always choose to enter the market once they optimized function (3.1.12) and the existing participants will never exit the market once they joined.

In sum, Greenwood and Jovanovic (1990) again make some important theoretical predictions on finance and income inequality. Initially, during the early stages of development, the financial intermediaries are still in the infant stage and its maximum potential is yet to be reached. In the meantime, only agents with sufficiently large initial wealth could participate in the financial system, while most remain non-participating. As the economy progresses slowly to the intermediate stage, rate of growth in both financial sector and real economics catch up with the speed of widening income inequality. Finally, when the economy and the financial market approach to the mature stage of development, more agents can access to the financial services and enjoy higher wealth accumulation. As Greenwood and Jovanovic (1990) showed that the wealth accumulation rate of participants and initially non-participant will converge at a steady state, hence the income inequality will narrow during the later stages of financial development. Therefore, as the economy grows over time, the income inequality will first increase then decrease at the end along with linear development in the financial sector. This notion has given rise to the inverted U-shaped hypothesis of the finance-inequality relationship.

3.1.2 Income Inequality and Institutional Quality

As discussed in the previous chapter[29], there may exist two-way causation between income inequality and institutional quality. More specifically, an economy with an initially poor institutional is likely to induce sub-optimal allocation of

[29] See Section 2.4, p. 57−59.

resources that most beneficial to the rich. Consequently, the wealth gap between the rich and the poor is widened, and therefore income inequality increases. The widened income inequality symbolizes the even larger share of resources concentrated in the hands of the rich. This is equivalent to a greater ability of the rich and elite to finance their rent-seeking behavior to protect their wealth and gain an even larger share of resources. This in turn further deteriorates the institutional quality.

From the intuition above, it is reasonable to claim that institutional quality can be endogenously determined, in this case, by income distribution. However, past studies on institutional economics have long treated institutional quality as an exogenous variable (Savoia, Easaw, & McKay, 2010). Among the few seminal theoretical contributions to the endogeneity of institutional quality (see Glaeser et al., 2003; Sonin, 2003), Chong and Gradstein (2007) have developed a system of a simple dynamic model to theorize the bi-directional causality between income inequality and institutional quality.

Consider an economy with i units of households or families. Each household consists of a parent and a child at each period t. Given that the initial income level, denotes by y_{i0}, is exogenous, while the subsequent income level y_{it} is endogenously determined at each period t. Further, the pattern of income distribution follows a natural log-normal fashion as $\ln(y_{it}) \sim \mathrm{N}(\mu_t, \sigma_t^2)$. Supposed that each household has a fixed amount of resources at period t and let A represents this amount. During each period, agents will decide the weights of allocating their income either into current consumption c_{it} or investment in the rent-seeking activity r_{it+1} to gain a larger share of resources in the next period. By normalizing prices to one, all households face the following budget constraint:

$$y_{it} = c_{it} + r_{it+1} \tag{3.1.13}$$

It follows that the share of resources that household i appropriated at each period depends on the amount of rent-seeking r_{it+1} and on the institutional weakness w_{t+1}. Algebraically, the amount appropriated by household i is

$$a_{it+1} = A \frac{r_{it+1}^{w_{t+1}}}{\int_0^1 r_{it+1}^{w_{t+1}}\, di}$$

(3.1.14)

It is worth to take note that the authors consider only two extreme cases of institutional strength: $w_{t+1} = 0$ for denoting strong institutions and ($w_{t+1} = w, w \cong 1$) for indicating weak institutions[30].

In terms of the production side, each household can supply their one-unit labor per period. Then, the household income is the product of the ability of the

30 Chong and Gradstein (2007) claimed that only the use of extreme value could yield optimal second-order conditions governing the institutional choice. Nonetheless, this action will not cause much loss in generality.

household and the share of the resources gained. Therefore, the production function of household i is as follow:

$$y_{it} = \varepsilon_{it} a_{it} \tag{3.1.15}$$

where the individual ability, ε_{it}, follows a log-normal distribution with zero mean value and a relatively small variance γ^2 at each period.

Now, assumed that the parents make all decisions in the economy at each period and assumed that the preferences of parents depend on consumption and bequest left to their children, the lifetime expected utility of parents is:

$$V(c_{it}, y_{it}) = \ln(c_{it}) + \ln(y_{it+1}) \qquad (3.1.16)$$ [31]

At each period, parents will collectively observe the level of institutional quality and then allocate their resources accordingly. Lastly, maximization of the utility function (3.1.16) subject to the constraints from (3.1.13) to (3.1.15) leads to the optimal solutions for each household as follow:

$$r_{it+1} = \frac{w_{t+1} y_{it}}{1 + w_{t+1}}, \qquad c_{it+1} = \frac{y_{it}}{1 + w_{t+1}} \tag{3.1.17}$$

[31] Note that the authors assumed that the preferences on consumption and bequest are equal in this case.

which shows that a better institutional quality induces higher current consumption and lower rent-seeking activity. The income level at the next period follows immediately as:

$$y_{it+1} = \varepsilon_{it} A y_{it}^{w_{t+1}} / \int_0^1 y_{it}^{w_{t+1}} \, di \qquad (3.1.18)$$

and if it takes logarithm form:

$$\ln(y_{it+1}) = \ln(\varepsilon_{it}) + \ln(A) + w_{t+1} \ln(y_{it+1}) - \ln\left(\mathrm{E}\, y_{it}^{w_{t+1}}\right) \qquad (3.1.19)$$

Then, the next-period inequality is

$$\sigma_{t+1}^2 = \gamma^2 + w_{t+1} \sigma_{t+1}^2 \qquad (3.1.20)$$

Equation (3.1.20) concludes the first section of the theoretical model in Chong and Gradstein (2007). It shows that when institutions are strong ($w_{t+1} = 0$), then income inequality is constant and depending only on the individual ability differences. On the contrary, if institutions are weak ($w_{t+1} = w$), then income inequality may increase over time, as $\sigma_{t+1}^2 - \sigma_t^2 = \gamma^2 + (w-1)\sigma_t^2 > 0$ as long as the current income inequality is not zero.

To this point, Chong and Gradstein (2007) have shown how poor institutions can negatively affect income distribution. Next, they showed the determination of institutional quality due to income distribution.

Assumed that the determination of institutional quality at each period follows a political process that generally favored the rich. A simple way to capture this political process is through observing the identity of the decisive voter y_{dt} as

$$\ln(y_{dt}) = \mu_t + \beta\sigma_t^2 \tag{3.1.21}$$

where β represents the severity of political bias in favor of the rich. If $\beta = 0$, then political bias is absent in the determination of institutional quality and the median-income voter is decisive. If $\beta = 1/2$, then the average-income voter is decisive. In the case when $\beta > 1/2$, then political bias exists. Furthermore, the household utility corresponding to the two bi-polar cases of institutional quality are

$$U_{it}^{\text{strong}} = \ln(y_{it}) + \ln(\varepsilon_{it}A) \tag{3.1.22}$$

and

$$U_{it}^{\text{weak}} = \ln(y_{it}/2) + \ln[\varepsilon_{it}Ay_{it}^{w}/E(y_{it}^{w})] \tag{3.1.23}$$

respectively. The resulting utility differential is

$$U_{it}^{\text{weak}} - U_{it}^{\text{strong}} = \ln(1/2) + \ln[y_{it}^{w}/E(y_{it}^{w})] \qquad (3.1.24)$$

It shows that the utility differential changes negatively with respect to income level. Combining Equation (3.1.21) and (3.1.24) gives

$$U_{it}^{\text{weak}} - U_{it}^{\text{strong}} = \ln(1/2) + \ln[y_{dt}^{w}/E(y_{it}^{w})]$$

$$= \ln\left(\frac{1}{2}\right) + w(\mu_t + \beta\sigma_t^2) - w(\mu_t + \sigma_t^2/2)$$

$$= \ln\left(\frac{1}{2}\right) + (w\beta - 1/2)\sigma_t^2 \qquad (3.1.24)$$

which shows the utility differential of the decisive voter. Equation (3.1.24) carries some interesting propositions: when $\beta \leq 1/2$, the utility differential is negative, implying that a strong institution will emerge at the steady state. However, if $\beta > 1/2$, the political bias is considerably large and hence the rich households are relatively decisive during the voting process. Therefore, when income inequality is large enough, then the political process may end with the minimal level of institutional quality at the period, in which in favor of the rich.

Finally, Chong and Gradstein (2007) elaborated on how the initial level of inequality dynamically affects the institutional quality of the economy. From Equation (3.1.24), a small initial level of inequality σ_0^2 will lead to a high level of institutional quality. The strong institutions will further lead to a fixed level of income inequality according to Equation (3.1.20). If the initial income inequality is large, then weak institutions prevail. If the institution is weak enough and w is close to one, substituting it into Equation (3.1.24) shows the strong and biased political support for maintaining weak institutions. As a result, income inequality remains high and converges to $\sigma_{t+1}^2 = \gamma^2/(1 - w^2) > \gamma^2$.

In short, Chong and Gradstein (2007) documented a possible inequality-institution nexus, in which there may exist a negative linear causality running from one to another.

3.1.3 Summary of Theoretical Framework and Hypotheses of the Study

Section 3.1 discusses several theories related to the finance-inequality and institution-inequality relationships. In terms of the finance-inequality relationship, the works of Banerjee and Newman (1993) as well as Galor and Zeira (1993) proposed a linear and negative relationship between financial development and income inequality, whereas Greenwood and Jovanovic (1993) suggested a nonlinear hypothesis regarding the finance-inequality relationship, in which an inverted-U shaped curve would appear if the relationship is illustrated on a XY graph. In sum, Banerjee and Newman (1993), Galor and Zeira (1993), and Greenwood and Jovanovic (1993) suggested that financial development could be an important determinant of income inequality but the theoretical relationship between finance and inequality is ambiguous, as it could appear linear or nonlinear. Therefore, this study examines the nature of the relationship between financial development and income inequality by assuming a quadratic function on the relationship, which can be seen in the following Section 3.2. The estimated empirical model will be tested thereafter to see whether the relationship is linear or nonlinear.

Turning to the institution-inequality relationship, the work of Chong and Gradstein (2007) conjectures a two-way causal and negative relationship between institutional strength and income inequality. This two-way causal hypothesis suggests that institutional could explain the degree of income inequality and the reversal of the relationship is possibly true as well. This study therefore includes institutional quality as one of the determinants of income inequality. Besides, this study hypothesizes that income inequality in turn determines the strength of institutions. In both cases, the priori expectation on the relationships is linear and negative as suggested in Chong and Gradstein (2007), the estimated empirical model in Section 3.2 will be tested to see if the hypotheses hold.

The hypotheses of the study are as follow:

H1: Financial development significantly explains income inequality in both advanced and developing countries.

H2: Institutional quality significantly explains income inequality in both advanced and developing countries.

H3: There exists a significant interaction effect between financial development and institutional quality in determining income inequality.

H4: Income inequality significantly explains institutional quality in both advanced and developing countries.

3.2 Empirical Modeling

In accordance with the research objectives and the theoretical frameworks, this study proposes the following empirical models to analyze the roles of financial development and institutional quality in determining income inequality.

3.2.1 Model 0: Baseline Model for Income Inequality

To begin with, consider the following long run econometric model of income inequality for country i and time t:

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it} Y_{it} + \beta_{2,it} Y_{it}^2 + \sum_{j=3}^{k} \beta_{j,it} X_{j,it} + \varepsilon_{it} \qquad (3.2.1)$$

where $INEQ$ denotes income inequality, Y is economic growth, X encompasses other controlled variables (see Section 3.2.5 for the discussion), β_j, $j = 0, 1, \ldots, k$

are the long run parameters, and ε captures the white-noise disturbance terms. The econometric model in (3.2.1) assumed a panel data fashion, and it treated income inequality as the dependent variable on the left-hand-side (LHS). All variables on the right-hand-side (RHS) of (3.2.1) are the explanatory or independent variables that are theoretically important in explaining the changes in income inequality.

It is apparently that Equation (3.2.1) is a close replicate of the Kuznets' (1955) curve, which emphasizes the possible inverted U-shaped curve of the growth-inequality relationship. The seminal contribution of Kuznets (1955) is the main motivation behind the inclusion of economic growth and its squared term in the model. It is also a common practice in the studies of income inequality that treating economic growth as one of the explanatory variables. If the marginal effect of growth on inequality is positive ($\beta_1 > 0$) and the partial coefficient of the quadratic term of growth is negative ($\beta_2 < 0$), then the existence of Kuznets' curve is evident and one cannot reject the inverted U-shaped hypothesis. If $\beta_1 \neq 0$ but $\beta_2 = 0$, then there is only a linear relationship between economic growth and income inequality.

Equation (3.2.1) or Model 0 is the baseline model for this study, which serves as a comparative benchmark for other comprehensive models that incorporate the effect of financial development and institutional quality.

3.2.2 Model 1: Model for Inequality-Growth-Finance-Institution Relation

Now, consider the following long run model:

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it}Y_{it} + \beta_{2,it}Y_{it}^2 + \beta_{3,it}FD_{it} + \beta_{4,it}FD_{it}^2 + \beta_{5,it}Q_{it} + \sum_{j=6}^{k} \beta_{j,it}X_{j,it} + \varepsilon_{it} \tag{3.2.2}$$

where FD represents the level of financial development, Q is the indicator of institutional quality, and interpretations for other symbols remained the same as in Equation (3.2.1). The long run model in Equation (3.2.2) is an extension from the baseline model with the inclusion of financial sectors and institutional quality as additional explanatory variables. In this regard, Model 1 is tailored for empirical analysis for the first research objective of the thesis.

The addition of financial sector development as one of the major determinants of income inequality is in accordance with the theoretical suggestions from Greenwood and Jovanovic (1990), Galor and Zeira (1993), and Banerjee and Newman (1993). The expected sign of $\beta_{3,it}$ are ambiguous[32]. The linear hypothesis of Galor and Zeira (1993) and Banerjee and Newman (1993) suggested that $\beta_{3,it}$ is negative and $\beta_{4,it}$ is zero as development in financial sectors tends to linearly reduce income inequality. However, if the nonlinear hypothesis of Greenwood and

[32] Refer to Chapter 2, Section 2.3 and Chapter 3, Section 3.1.1 for the discussions.

Jovanovic (1990) is valid, then the expected sign of $\beta_{4,it}$ is negative and the sign of $\beta_{3,it}$ is positive as portrayed by an inverted U-shaped curve.

Turning to the institutional quality, the main motivation of including Q_{it} as one of the factors of inequality came from Chong and Calderón (2000), Rodrik (2000), and Chong and Gradstein (2007). $\beta_{5,it}$ is expectedly negative as in line with the priori that better institutions tend to associate with lower income inequality.

3.2.3 Model 2: Model with Interaction between Finance and Institutions

Now, following the theoretical suggestions of La Porta et al. (1997, 1998) and the empirical implications from Law et al. (2014) and Adams and Klobodu (2016), the interaction between institutional quality and financial development is potentially crucial in explaining income inequality. Therefore, the RHS of Equation (3.2.2) could include the interactive term of institutional quality and financial development as

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it}Y_{it} + \beta_{2,it}Y_{it}^2 + \beta_{3,it}FD_{it} + \beta_{4,it}FD_{it}^2 + \beta_{5,it}Q_{it} + \beta_{6,it}(FD \times Q)_{it} + \sum_{j=7}^{k} \beta_{j,it}X_{j,it} + \varepsilon_{it} \quad (3.2.3)$$

The parameter $\beta_{6,it}$ captures the nature of the interaction between financial markets and institutional strength as designed. The sign of $\beta_{6,it}$ tells whether financial development complements or substitutes institutional quality in affecting income distribution. Specifically, $\beta_{6,it}$ can be expressed as the following partial derivatives

$$\frac{\partial INEQ}{\partial FD} = (\beta_3 + 2\beta_4) + \beta_6 \times IQ$$

and

$$\frac{\partial INEQ}{\partial IQ} = \beta_5 + \beta_6 \times FD$$

where the former is the marginal elasticity of financial development on income inequality and the latter is the marginal elasticity of institutional quality. It is clear from here that a significant and positive estimate of $\beta_{6,it}$ implies that the two continuous variables are substitutes, whereas a significant and negative estimate of the coefficient implies the complementary nature between financial sector development and quality of institutions. In terms of the expected sign, there is no formidable overarching theory that explains the interplay between financial development, institutional quality, and income inequality. Adams and Klobodu (2016) reported that $\beta_{6,it}$ is significantly negative in the long run based on the PMG estimates, while Cepparulo et al. (2017) found a positive estimate for the interactive coefficient. More importantly, the addition of the interactive term in Equation (3.2.3) is mainly for capturing the unobserved effect in Equation (3.2.2), as this addition might alter the individual long run effect of financial development ($\beta_{3,it}$ and $\beta_{4,it}$) and institutional quality ($\beta_{5,it}$) on income inequality. Consequently, Equation (3.2.3) or Model 2 is specifically designed for the second research objective.

3.2.4 Model 3: Model for Institutional Quality

Next, following the suggestions of Chong and Gradstein (2007) and Savoia et al. (2010), a model of endogenous institutional quality of i country and time t can be written as follow:

$$Q_{it} = \alpha_{0,it} + \alpha_{1,it} INEQ_{it} + a_{2,it} DEMO_{it} + \sum_{j=3}^{k} \alpha_{j,it} XX_{j,it} + \varepsilon_{it} \quad (3.2.4)$$

where $DEMO$ indicates the democratic quality, XX_j includes the controlled variables of determining the institutional quality Q_{it}, and α_j, $j = 0, 1, \ldots, k$ are the long run parameters. Equation (3.2.4) treated income inequality $INEQ_{it}$ as one of the endogenous factors that determine institutional strength, and the parameter $\alpha_{1,it}$ would capture this effect. According to Glaeser, et al. (2003), Sonin (2003), and Chong and Gradstein (2007), the value of $\alpha_{1,it}$ is supposedly negative, which indicates that an increase in income inequality tends to weaken institutional strength. The reason for selecting democracy as one of the regressors is due to its significant role in explaining overall institutions (Savoia et al., 2010), though that the literature on the link between democracy and institutional quality is relatively recent. Generally, the positive link between democracy and institutional quality came mostly from historical observations, in which democratic countries tend to associate with better protection in property rights, more inclusive economic developments, and better governance (Acemoglu & Robinson, 2000; Acemoglu et al., 2005; Gerring, Bond, Barndt, & Moreno, 2005; Acemoglu, Johnson, Robinson, & Yared, 2008). However, some recent studies like Kotschy and Sunde (2017) argued that democracy is not necessarily associated with better institutions, especially when income inequality is high. Likewise, the structure of Equation (3.2.4) or Model 3 is aligned with the third research objective in this study.

3.2.5 The Controlled Variables

This section dedicates to discuss on the controlled variables included in Model 1, 2, and 3. To begin with, consider the controlled variables in Model 1 and 2. Algebraically,

$$X_j = \{INEQ_{t-1}, EDUC, OPEN, INFL\}$$

where $INEQ_{t-1}$ is the lagged income inequality or initial income inequality, $EDUC$ denotes educational attainment or human capital, $OPEN$ refers to trade openness or trade liberalization, and $INFL$ is the inflation rate. The identification of these controlled variables follows suggestions from the literature. Taking the instance of initial inequality, income inequality could be perceived as a first-order autoregressive process of its historical value, where the degree of past inequality affects present inequality. Empirical evidence (Agnello et al., 2012; Perera & Lee, 2013; Law et al., 2014; Adams & Klodobu, 2016) showed a significant negative correlation between initial inequality and current income inequality. Next, the inclusion of human capital reflects the factor endowments of income distribution that are partially explained in endogenous growth theory. This study adopts educational attainment as the indicator of human capital, where higher investment in human capital tends to reduce income inequality (Beck et al., 2007; Ang, 2010; Law et al., 2014; Yang & Qiu, 2016). Trade openness is also reflecting the role of the globalization process, in which its significance on income distribution is evident in several empirical studies (Kraay, 2006; Wu & Hsu, 2012; Asteriou, Dimelis, & Moudatsou, 2014). However, the effect of trade openness on income inequality is theoretically ambiguous and depending on the economic development status of the country (Goldberg & Pavcnik, 2007; Guidetti & Rehbein, 2014). Lastly, inflation rate partly captures the impact of monetary policy on income distribution. The literature suggests that changes in inflation rate could induce income redistribution through various channels, thereby affecting income inequality. However, these multiple channels suggest differently on whether the change in inflation rate improve or worsen income distribution. For instances, the financial segmentation channel (Williamson, 2009; Ledoit, 2011) and the portfolio channel (Erosa & Ventura, 2002; Albanesi, 2007) conjecture that expansionary monetary shocks (which associate with high inflation rates) tend to increase income inequality. On the other hand, the savings redistribution channel (Doepke & Schneider, 2006) and the earnings heterogeneity channel (Carpenter & Rogers, 2004; Heathcote, Perry,

& Violante, 2010) suggest otherwise that expansionary monetary shocks tend to decrease income inequality. Therefore, the effect of inflation on income inequality is theoretically ambiguous and subject to empirical investigation.

Next, the controlled variables in Model 3 are

$$XX_j = \{GROWTH, EDUC\}$$

where $GROWTH$ and $EDUC$ share the same denotations as above. The addition of economic growth and educational attainment is to control for omitted variable bias and systematic variation captured in the country-fixed effect, as in Kotschy and Sunde (2017).

3.3 The Measurements and Data Sources

This section discusses the choice of proxy for the variables and the data sources. From the following discussions, one will find that the choice of measurement and database are of utmost importance in this study, especially for measuring income inequality, institutional quality, and financial developments.

3.3.1 Income Inequality

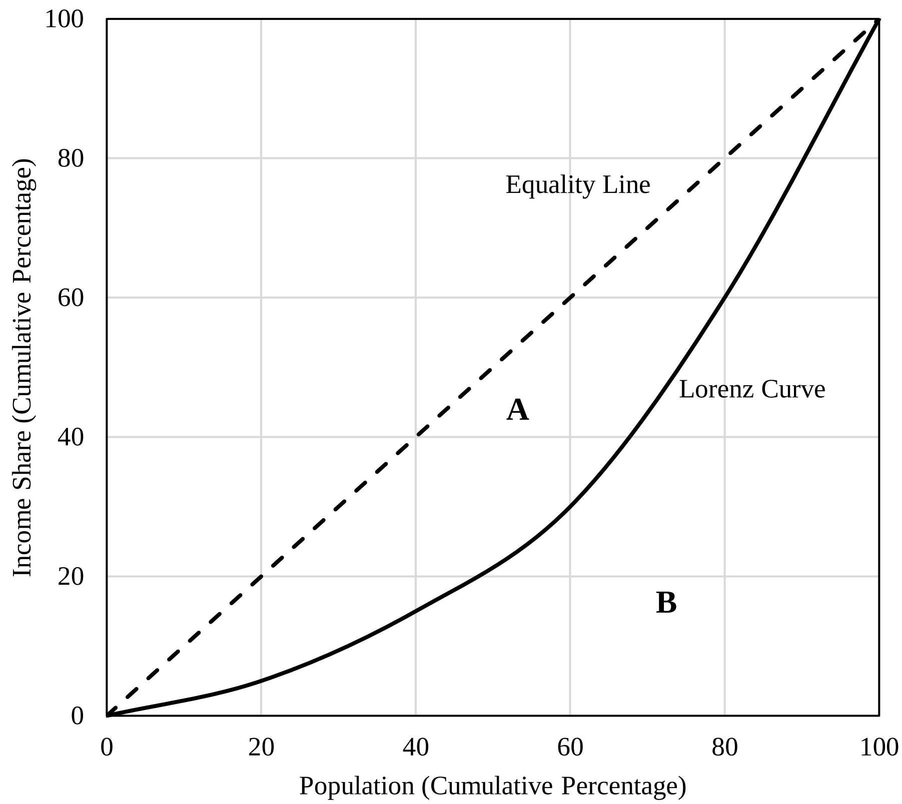
The choice of a proper metric for representing income inequality was never a simple question. There is a long and heated debate on which measurement suits the best in representing inequality. Ideally, the household income data from national censuses seems like the best candidate, but the process of data collection would inevitably suffer from certain errors as in many other primary data collections. This section discusses several common metrics used in macroeconomic analysis of income inequality, namely the Gini Coefficient, income shares ratio, Generalized Entropy index, and their variants.

3.3.1.1 Gini Coefficient

The Gini coefficient or Gini index is an inequality measurement derived directly from the Lorenz curve. Figure 3.3.1 shows a sample of the Lorenz curve based on hypothetical data.

Taking the Lorenz curve in Figure 3.3.1 as an example, it plots the cumulative percentages of income shares against cumulative percentages of the population. In the case of perfect equality, each income quintiles would own 20 percent of the total income and result in a proportionate change in cumulative income shares and population as represented by the 45° line. In other more practical cases of certain inequality, then the Lorenz curve will capture the marginally inclining change in cumulative income shares versus income quintiles, and show in the typical concave curve.

Figure 3.3.1: The Lorenz Curve



Source: Author's hypothetical data.

The Gini coefficient, measured as the ratio of the area between the 45° line and the Lorenz curve (A) to the total area below the 45° line (A+B), hence comes with a lower boundary of zero (perfectly equal distribution) and an upper boundary of one (perfectly unequal distribution). This feature of the Gini index made it the most commonly used metric in studies of inequality to date, as scholars can use the Gini coefficient to generate a highly comparable statistic of income inequality. Besides, the interpretation of the Gini index is intuitive. However, one major drawback of the Gini index is that it does not reflect the compositions of inequality. For instance, two countries with different patterns of income distribution could share similar Gini coefficient values[33] (Atkinson, 1974; Campano & Salvatore, 2006). This limitation of the Gini index occurs when it does not reflect the dynamic changes of income distribution compositions of a country as well. On top of this limitation, the Gini coefficient is very sensitive to changes in inequality within the middle-income class (Hey & Lambert, 1980).

3.3.1.2 Generalized Entropy Index

Given that the Gini coefficient is not disposable, some inequality metrics have been developed to overcome the limitation, which includes the Generalized Entropy (GE) index. More formally, the GE index is a family of inequality measures, as a specific value of the GE index is attached with a sensitivity parameter (α) that varies according to the weight assigned to inequalities in different income spectrums. The algebraic expression of GE index is

[33] Assume that there are two countries: Country I and Country II. For Country I, 50% of the population have no income and the other 50% shared the total income equally. For Country II, 25% of the population owned 75% of the total income, while the rest 75% population owned the remaining 25% of the total income. The Gini coefficients for both Country I and Country II are 0.50, even though they are clearly different in income distribution pattern.

$$GE(\alpha) = \begin{cases} \frac{1}{N\alpha(\alpha-1)} \sum_{i=1}^{N} \left[\left(\frac{y_i}{\bar{y}} \right)^{\alpha} - 1 \right], & \alpha \neq 0,1 \\ \frac{1}{N} \sum_{i=1}^{N} \frac{y_i}{\bar{y}} \ln \frac{y_i}{\bar{y}}, & \alpha = 1 \\ \frac{-1}{N} \sum_{i=1}^{N} \ln \frac{y_i}{\bar{y}}, & \alpha = 0 \end{cases}$$

where N is the number of cases (e.g., households or families) and y_i is the income for case i. The range of the GE index comes with a lower bound of zero and without upper bound, with zero value indicates a perfectly equal distribution and greater values represent an increasing degree of inequality. A greater value of α would cause the resulting GE measures more sensitive to changes in top income distribution and vice versa. A special feature of the GE index is that one can compute some other inequality metrics using the GE index by assigning certain values to α. For instance, GE(0) is equivalent to the mean log deviation of income, GE(1) is functionally the Theil inequality index, and GE(2) is half the squared coefficient of variation.

One important advantage of the GE index is that it is decomposable (Shorrocks, 1980). Hence, the GE index and its subclasses are suitable for decomposition analysis such as analyzing within area element and between areas element of inequality. However, some of the drawbacks of the GE index caused this measure less popular than the Gini index. The mathematical structure of the GE index is complex, and its interpretation is far from being intuitive. Further, different values of α assigned would cause the GE measures more sensitive to changes in both ends of income distribution, thus assigning improper value to α might lead to misleading measures of the GE index.

3.3.1.3 Income Ratio

A simple but effective way to measure income inequality is to take the ratio of the income of two different groups, generally "higher over lower". For example, the commonly used 20:20 ratio compares the income shares of the top 20% income earners to the bottom 20% income earners, while the Palma ratio[34] that divides the income shares of the richest 10% to the poorest 40% of a given population. A theoretical result of a 1:1 ratio indicates perfectly equal distribution, while a higher ratio indicates higher inequality. Another related class of ratios is the income share, which measures the portion of national income accrued to different percentiles of the population.

Given the properties of income ratios, they are particularly useful for studying the income concentration of top earners, e.g. top 10%, top 1%, top 0.1%, or top 100, etc. Another benefit of computing income ratios is that it enables sensitivity analyses. For instance, one can compare the correlations between economic welfare (or other variables) and the 20:20,

[34] See Palma (2011) for more details.

20:40, 40:60, or any other ratios. Nonetheless, the use of income ratios often ignores the dynamics within the middle-income groups. Furthermore, since the income ratio is a relative measure of income inequality, it tends to ignore the absolute income inequality. Thus, the use of income ratios shall come with certain precautions.

After considering the pros and cons of these alternatives, this study decided to use the Gini coefficient to measure income inequality. Albeit that there are some unfavorable properties of the Gini coefficient as an inequality measure, it is excellent in terms of comparability among inequalities of different countries. Moreover, the availability of systematic databases of the Gini coefficient allows for systematic comparisons of income inequality among a large number of countries. This feature is absent for other inequality metrics, where the development of databases is less sophisticated than the Gini index. The choice of using Gini index for measuring income inequality is in line with the common practice in the related literature (see Chong & Gradstein, 2007; Law et al., 2014; Huang et al., 2015; Adams & Klodobu, 2016; Bumann & Lensink, 2016, just to name a few)

This study cites the data of net Gini index published by the Standardized World Income Inequality Database (SWIID) (Solt, 2016) to measure the degree of inequality of all sampled countries. Frederick Solt (2009, 2016), the author and developer of SWIID, has constructed the database to maximize comparability of cross-country income inequality and extend its coverage of countries and years as largest as possible. To date, the SWIID covered Gini indices of 192 countries from 1960 to the present (Solt, 2016). The SWIID combined, reorganized, and improved information from several previous data sources of income distribution, including the Luxembourg Income Study (LIS), the United Nations University-World Institute for Development Economics Research (UNU-WIDER), and the World Income Inequality Database (WIID). Specifically, this study prefers the net Gini index based on disposable household income (net for transfers and taxes) to measure income inequality.

3.3.2 Institutional Quality

Similar to the case of inequality, the measurement choice of indicator for institutional quality is never straightforward. However, unlike income inequality, the complexity of measuring institutional quality came from the ambiguous conceptual understandings of the term "institution" (Chang, 2007).

Some of the early studies have given a loose definition of institutional quality. For example, Shubik (1975) and Schotter (1981) defined institutional quality generally as the rules that governed how the game is played, in which the "game" here refers to the market mechanism of resource allocation. Later, some scholars defined institutional quality with broader concepts. For instance, North (1981; 1990) defined institutions as humanly devised constraints that shape interactions between individuals. These constraints are either formal (*de jure*) rules or informal (*de facto*) rules and improvements in institutions would reduce the constraints imposed on *de jure* executive power. In the same vein, Ostrom (1990, p. 136) defined institutions as:

> "…*The sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed and constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions*…"

Moving to the early twentieth century, Acemoglu et al. (2001; 2002; 2005) defined institutions by taken account on both *de jure* and *de facto* powers, and the authors broaden the scope of the power here by adding political and economic power to the executive power in North (1981; 1990). Under this complex setting, strong institutions are a proper balance of powers, where the rights, properties, investments, technological endeavors, and the likes of individuals are protected *de facto* (Acemoglu et al., 2001). More recently, Easterly (2013) emphasized the elements of rights (legal and political) and the opportunities of individuals in defining the overall quality of institutions. Easterly (2013) also argued that bureaucratic quality has an integral role that determines the realization of legal and political rights.

In short, while scholars of institutional studies have varying views on the definition, institutional quality certainly encompassed a broad range of factors. These factors include rules and order, individual rights, governance quality, and some of them are difficult to be measured objectively. At this end, this study will utilize the political risk indices from the International Country Risk Guide (ICRG) database to measure the overall strength and the sub-components of institutional quality of the sampled countries.

The ICRG database is published by the PRS group (2017). It has the longest available data on institutional quality of 140 countries covering the period early as 1984. This study utilizes four out of twelve Political Risk ratings from ICRG data, namely bureaucracy quality, corruption, government stability, and law and order[35]. Bureaucracy quality has a scale ranges from 0 to 4, government stability has a scale ranges from 0 to 12, and the rest of the political risk components above have a scale ranges from 0 to 6. The value 0 indicates the lowest institutional quality and greater values indicate higher quality in all components. Besides, this study will construct a composite index of institutional quality using the four political risk components as the base. Specifically, this study will first rescale each component to a scale of 0 to 10, where the indices of law and order and corruption control are multiplied by 5/3, government stability is multiplied by 5/6, while bureaucratic quality is multiplied by 5/2. The rescaled indices are then sum up to get the composite index.

[35] The other eight components are Ethnic Tension, Socioeconomic Conditions, Investment Profile, Internal Conflict, External Conflict, Military in Politics, Religious Tensions, and Democratic Accountability.

The composite index through simple aggregation consequently has a range of 0 to 40.

3.3.3 Financial Development

In terms of measuring financial sector development, this thesis chooses domestic credit issued to private sectors, measured as a ratio to GDP, as the indicator. The private sector credit is the total value of credits issued by financial intermediaries to the private sector, which effectively represents the size and depth of financial institutions in an economy. Ideally, the proxy of financial development shall incorporate both financial institutions and financial markets to represent the bigger picture of the financial system development of a country. However, bank credits are the only feasible financing sources for most of the developing countries, as stated in Law et al. (2014) and the data of stock market development is too limited for sample splitting in the comparative analysis between developed and developing countries. Besides, it seems that banking sector development will bring a stronger effect on income inequality than what stock market development does (Gimet & Lagoarde-Segot, 2011). On top of the said reasons above, domestic credit to private sectors to GDP ratio is the most commonly used indicator to measure financial development or deepening in related literature (see, for example, Kim & Lin, 2011; Law & Azman-Saini, 2012; Law et al., 2014; Adams & Klobodu, 2016). The data source of the private sector credit is the Global Financial Development

Database (GFDD) developed recently by Cihak, Demirguc-Kunt, Feyen, and Levine (2012).

3.3.4 Other Variables

In terms of other variables, this study uses real GDP growth to measure economic growth, trade to GDP ratio as the indicator for trade openness, average years of secondary schooling as a proxy for educational attainment, and democracy index for measuring the degree of democracy. The data sources of real GDP growth, average years of secondary schooling, and trade to GDP ratio are all from the World Development Indicator (WDI, 2016). Lastly, the source of democratic quality is from the ICRG database of the PRS group (2017). Appendix Section App3 tabulated the detailed descriptions for each measurement employed in this study.

3.3.5 Summary of the Data

In summary, all data employed in this study are secondary data at an annual frequency. The dataset covers 36 developed countries and 62 developing economies[36] from the year 1996 to 2015, hence resulting in a panel dataset with 98 cross sections ($N = 98$) and 20 time series ($T = 20$). Besides, this study will attempt an additional practice to split the dataset into two sub-datasets: one for developed economies ($N = 36$, $T = 20$) and another for developing economies ($N = 62$, $T = 20$),

[36] Refers to Appendix Section App2 for the full list of developed and developing countries.

to cater for the research objectives. Of all cases, the dimensions of the datasets employed to satisfy the requirement of System GMM estimator, in which the cross sections must be greater than the time series ($N > T$). The next section will discuss the GMM class estimators and the System GMM approach in detail.

3.4 The Generalized Method of Moments (GMM) Estimation

Econometric study or regression analysis often begins with some economic phenomenon that is of interest to people. When someone wants to deepen their understanding of the economic phenomenon, they would first turn to economic theory to see what insights it can offer. With certain assumptions, the economic theory would describe the phenomena in terms of the key economic variables and model parameters. One could then quantify these parameters with the appropriate choice of econometric models and estimators.

In its classic form, a regression model would treat the dependent or LHS variable as an endogenous variable, and attempt to explain it through the changes in each of the explanatory variables on the RHS. As one of the classic assumptions in regression analysis, the right-hand side variables should be exogenous, or as least weakly exogenous that they are independent of the disturbance term. Violation of this condition will lead to biased and inconsistent estimates for the ordinary least square (OLS) and the generalized least square (GLS) estimators. This violation typically happens when one or some of the RHS variables are endogenously determined. This situation occurs frequently, if not always, in econometric studies that involved multiple macroeconomic variables due to their endogenous nature. For example, an inflation-targeting policy would induce the monetary policymaker to determine the policy rate after they observed the changes in real economic activities such as the output gap and expected inflation rate. The implemented policy rate would then feedback to the real economic sectors through its effect on money demand and price level. Similar examples of endogeneity can be found in many others, and the dynamics of income inequality are of no exception. Moreover, the severity of endogeneity would get worsen if the study involves cross-countries data.

The complicated endogeneity among economic variables has motivated the development of a sophisticated econometric technique that could handle the endogeneity issue. One of the strong candidates that can provide unbiased and consistent estimates under the presence of endogenous variables is exactly the instrumental variable-generalized method of moments (IV-GMM) estimator, in which Arellano and Bond (1991) popularized its application in macroeconomic studies. The following section dedicates to briefly review the development of the Generalized Method of Moments (GMM) class estimator in the context of panel data analysis.

3.4.1 A Review

To begin with, the development of GMM estimators has predominantly grown out since the pioneering works by Hansen (1982) and Anderson and Hsiao (1982). Prior to the era of GMM techniques, the traditional static panel estimation methods dominated in macro-econometric studies, which include the OLS and the LSDV (Least Squares Dummy Variable) estimators. However, it is now widely recognized that static panel approaches are poor in delivering consistent estimation for panel data analysis. Furthermore, it is well known that the OLS and the LSDV estimators are biased when some of the RHS variables are endogenous.

One possible way to overcome the limitations of OLS and the LSDV estimators is to adopt an instrumental variable (IV) technique. By design, proper identification of IV estimators can resolve the endogeneity issue found in OLS and the LSDV estimators. However, the identification of appropriate instruments is tedious and always subjected to a certain degree of subjectivity. This finally led to the introduction of IV-GMM estimators that have several favorable properties. For instance, Hansen (1982) showed that GMM estimators are asymptotically normal and strongly consistent in large samples given the stationary explanatory variables. Very soon later, Anderson and Hsiao (1982) initiated the work of consistent estimators for dynamic panel data analysis by combining the IV method and methods of moments. The resulting GMM estimator in their works is exactly the Anderson-Hsiao (AH) estimator. Some scholars such as Holtz-Eakin, Newey, and

Rosen (1988), and Arellano and Bond (1991) advanced the work of Anderson and Hsiao (1982) afterward. In particular, Holtz-Eakin et al. (1988) considered the AH estimator for vector autoregressions, while Arellano and Bond (1991) improved the AH estimator by utilizing the instruments efficiently to obtain the optimal GMM estimates and using the first-differencing transformation to get rid of unobserved individual-specific effects. The work of Arellano and Bond (1991) has given rise to the Arellano-Bond (AB) estimator, which is more commonly known as the first-difference GMM estimator.

Although the AB estimators have excellent asymptotic properties, it suffers a downward bias especially when the sample is finite. Moreover, an autoregressive term that is close to but less than one as well as a relatively high correlation between the variance of the individual effects and the variance of the idiosyncratic error might create a similar issue as well (Arellano & Bover, 1995; Blundell & Bond, 1998). Therefore, the AB estimator might not be suitable for a dynamic panel data model with small samples. As a result, Blundell and Bond (1998) proposed an estimator by jointly restricting the standard moment conditions and the stationarity moment conditions (Ahn & Schmidt, 1995; Arellano & Bover, 1995) [37] to mitigate the finite sample bias in difference GMM estimator. The proposal of Blundell and Bond (1998) in turn results in the Blundell-Bond (BB) or the System GMM estimator. The System GMM estimator is an excellent successor of all previous

[37] See Equation (3.3.1).

versions that retained the merits while improved. The following section describes the important properties of the System GMM estimator.

3.4.2 System GMM

As aforementioned, Blundell and Bond (1998) proposed an alternative version of the GMM estimator that includes lagged differences of variables as instruments for equations in levels, and lagged levels as instruments for equations in first differences. This alternative GMM estimator is better known as the System GMM estimator in the literature.

To begin with, consider the AB estimator or the First-Difference GMM (FD-GMM) estimator[38] with the following level equations for country i = 1, 2, …, N at period t and the additional first-difference moment conditions:

$$\mathrm{E}\left(\varepsilon_{it}\,\Delta z_{j,i,t\text{-}s}(\gamma)\right) = 0 \quad \text{for } j = 1, 2;\ t = 3, \ldots, T \text{ and } 0 \le s \le t\text{-}3 \qquad (3.3.1)$$

where the process of γ_{it} is mean-stationary and the instruments in the first difference are independent of the disturbance terms. From Equation (3.3.1), the resulting level GMM estimator and IV matrices are derived respectively as follow:

[38] See Hall (2005) for the derivation.

$$W^l_{1i}(\gamma) = \begin{bmatrix} \Delta z_{1,i3}(\gamma) & 0 & \cdots & 0 \\ 0 & \Delta z_{1,i3}(\gamma), \Delta z_{1,i4}(\gamma) & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & \Delta z_{1,i3}(\gamma), \ldots, \Delta z_{1,iT}(\gamma) \end{bmatrix} \tag{3.3.2}$$

$$W^l_{2i}(\gamma) = \begin{bmatrix} \Delta z_{2,i3}(\gamma) & 0 & \cdots & 0 \\ 0 & \Delta z_{2,i3}(\gamma), \Delta z_{2,i4}(\gamma) & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & \Delta z_{2,i3}(\gamma), \ldots, \Delta z_{2,iT}(\gamma) \end{bmatrix}, \tag{3.3.3}$$

with a dimension of $(T - 2) \times m_l$, $m_l = 0.5(T - 2)(T - 1)$, for both $W^l_{1i}(\gamma)$ and $W^l_{2i}(\gamma)$. The combination of Equation (3.3.2) and (3.3.3) yields

$$W^l_i(\gamma) = \left(W^l_{1i}(\gamma), W^l_{2i}(\gamma)\right), \quad i = 1, 2, \ldots, N; \; W^l(\gamma) = \begin{bmatrix} W^l_1(\gamma) \\ \vdots \\ W^l_{\mathrm{N}}(\gamma) \end{bmatrix} \tag{3.3.4}$$

Then, the level equations can be conveniently expressed as

$$y = Z(\gamma)\phi + \varepsilon \tag{3.3.5}$$

where the expanded view of the moment conditions are given as:

$$\mathrm{y} = \begin{bmatrix} y_1 \\ \vdots \\ y_N \end{bmatrix}_{N(T\text{-}2)\times 1}, \; \mathrm{Z}(\gamma) = \begin{bmatrix} z_1(\gamma) \\ \vdots \\ z_N(\gamma) \end{bmatrix}_{N(T\text{-}2)\times 2}, \; \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \vdots \\ \varepsilon_N \end{bmatrix}_{N(T\text{-}2)\times 1}$$

$$\mathrm{y_i} = \begin{bmatrix} y_{i3} \\ \vdots \\ y_{iT} \end{bmatrix}_{(T\text{-}2)\times 1}, \; z_i(\gamma) = \begin{bmatrix} z_{i3}(\gamma) \\ \vdots \\ z_{iT}(\gamma) \end{bmatrix}_{(T\text{-}2)\times 2}, \; \varepsilon_\mathrm{i} = \begin{bmatrix} \varepsilon_{i3} \\ \vdots \\ \varepsilon_{iT} \end{bmatrix}_{(T\text{-}2)\times 1}$$

which can be further written compactly as:

$$\mathrm{E}\left(W^l(\gamma)'\varepsilon\right) = 0. \tag{3.3.6}$$

Now, the one-step level GMM estimators $\hat{\phi}_1^l(\gamma)$ and two-step level GMM estimators $\hat{\phi}_2^l(\gamma)$ can be obtained through:

$$\hat{\phi}_1^l(\gamma) = \left\{Z(\gamma)'W^l(\gamma)V_1^l(\gamma)^{-1}W^l(\gamma)'Z(\gamma)\right\}^{-1}\left\{Z(\gamma)'W^l(\gamma)V_1^l(\gamma)^{-1}W^l(\gamma)'y\right\}, \tag{3.3.7}$$

$$\hat{\phi}_2^l(\gamma) = \left\{Z(\gamma)'W^l(\gamma)V_2^l(\gamma)^{-1}W^l(\gamma)'Z(\gamma)\right\}^{-1}\left\{Z(\gamma)'W^l(\gamma)V_2^l(\gamma)^{-1}W^l(\gamma)'y\right\}, \tag{3.3.8}$$

where

$$V_1^l(\gamma) = \sum_{i=1}^{N} W_i^l(\gamma)'W_i^l(\gamma),$$

and

$$V_2^l(\gamma) = \sum_{i=1}^{N} W_i^l(\gamma)'\hat{\varepsilon}_i(\gamma)\hat{\varepsilon}_i'(\gamma)W_i^l(\gamma) \text{ with } \hat{\varepsilon}_i(\gamma) = y_i - z_i(\gamma)\hat{\phi}_1^l(\gamma).$$

From the equations above, one can prove that the level GMM estimator provides consistent estimates for ϕ as long as the covariance matrices are normally distributed asymptotically. The covariance matrices can be expressed as follow:

$$\mathrm{Var}\left(\widehat{\phi}_1^l(\gamma)\right) = \left\{Z(\gamma)'W^l(\gamma)V_1^l(\gamma)^{-1}W^l(\gamma)'Z(\gamma)\right\}^{-1} \tag{3.3.9}$$

$$\mathrm{Var}\left(\widehat{\phi}_2^l(\gamma)\right) = \left\{Z(\gamma)'W^l(\gamma)V_2^l(\gamma)^{-1}W^l(\gamma)'Z(\gamma)\right\}^{-1} \tag{3.3.10}$$

Finally, by merging the level equations in Equation (3.3.5) and the first-differences equations as shown in Arellano and Bond (1991) yields the System GMM estimator as follow:

$$Y = X(\gamma)\phi + u \tag{3.3.11}$$

where

$$\mathrm{Y} = \begin{bmatrix} Y_1 \\ \vdots \\ Y_N \end{bmatrix}_{N(T\text{-}2)\times 1}, \ \mathrm{X}(\gamma) = \begin{bmatrix} X_1(\gamma) \\ \vdots \\ X_N(\gamma) \end{bmatrix}_{N(T\text{-}2)\times 2}, \ \mathrm{u} = \begin{bmatrix} u_1 \\ \vdots \\ u_N \end{bmatrix}_{N(T\text{-}2)\times 1},$$

$$\mathrm{Y_i} = \begin{bmatrix} \Delta y_i \\ y_i \end{bmatrix}_{2(T\text{-}2)\times 1}, \ \mathrm{X_i}(\gamma) = \begin{bmatrix} \Delta z_i(\gamma) \\ z_i(\gamma) \end{bmatrix}_{2(T\text{-}2)\times 2}, \ \mathrm{u_i} = \begin{bmatrix} \Delta v_i \\ \varepsilon_i \end{bmatrix}_{2(T\text{-}2)\times 1}.$$

in which Equation (3.3.11) is identical to the expressions in Blundell and Bond (1998) and Blundell, Bond, and Windmeijer (2000).

According to Hayakawa (2007), there are three important varieties of System GMM estimators namely $\hat{\phi}^{all}(\gamma)$, $\hat{\phi}^{min}(\gamma)$, and $\hat{\phi}^{BB}(\gamma)$ that worth to be noted. Firstly, $\hat{\phi}^{all}(\gamma)$ employs all the moment conditions of the equation both in levels and in first differences and hence forms the following matrix:

$$W_i^{all}(\gamma) = \begin{bmatrix} W_i^d(\gamma) & 0 \\ 0 & W_i^l(\gamma) \end{bmatrix}, \; i = 1, \ldots, N; \; W^{all}(\gamma) = \begin{bmatrix} W_1^{all}(\gamma) \\ \vdots \\ W_N^{all}(\gamma) \end{bmatrix} \qquad (3.3.12)$$

Next, $\hat{\phi}^{min}(\gamma)$ restricts the moment conditions to $2(T-2)$ as the minimum necessary requirement of the equation both in levels and in first differences as:

$$W_{ji}^{d,min}(\gamma) = \begin{bmatrix} z_{j,i2}(\gamma) & 0 & \cdots & 0 \\ 0 & z_{j,i3}(\gamma) & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & z_{j,i,T\text{-}1}(\gamma) \end{bmatrix}, \; j = 1, 2 \qquad (3.3.13)$$

$$W_{ji}^{l,min}(\gamma) = \begin{bmatrix} \Delta z_{j,i3}(\gamma) & 0 & \cdots & 0 \\ 0 & \Delta z_{j,i4}(\gamma) & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & \Delta z_{j,1i,T}(\gamma) \end{bmatrix}, \; j = 1, 2 \qquad (3.3.14)$$

Thus, the corresponding moment matrix will be:

$$W_i^{min}(\gamma) = \begin{bmatrix} W_i^{d,min}(\gamma) & 0 \\ 0 & W_i^{l,min}(\gamma) \end{bmatrix}, \; i = 1, \ldots, N; \; W^{min}(\gamma) = \begin{bmatrix} W_1^{min}(\gamma) \\ \vdots \\ W_N^{min}(\gamma) \end{bmatrix} (3.3.15)$$

Lastly, $\hat{\phi}^{BB}(\gamma)$ combines the entire set of moment conditions of $W_i^d(\gamma)$ from the differences equations and a subset of moment conditions of $W_i^{l,min}(\gamma)$ from level equations. The corresponding moment matrix of the estimator is:

$$W_i^{BB}(\gamma) = \begin{bmatrix} W_i^d(\gamma) & 0 \\ 0 & W_i^{l,min}(\gamma) \end{bmatrix}, \; i = 1, \ldots, N; \; W^{BB}(\gamma) = \begin{bmatrix} W_1^{BB}(\gamma) \\ \vdots \\ W_N^{BB}(\gamma) \end{bmatrix}. \quad (3.3.16)$$

Consequently, the one-step and two-step System GMM estimators where h = *all*, *min*, and *BB* can be derived from:

$$\hat{\phi}_1^h(\gamma) = \{X(\gamma)'W^h(\gamma)V_1^h(\gamma)^{-1}W^h(\gamma)'X(\gamma)\}^{-1}\{X(\gamma)'W^h(\gamma)V_1^h(\gamma)^{-1}W^h(\gamma)'Y\}$$

(3.3.17)

And

$$\hat{\phi}_2^h(\gamma) = \{X(\gamma)'W^h(\gamma)V_2^h(\gamma)^{-1}W^h(\gamma)'X(\gamma)\}^{-1}\{X(\gamma)'W^h(\gamma)V_2^h(\gamma)^{-1}W^h(\gamma)'Y\}$$

(3.3.18)

Where

$$V_1^h(\gamma) = \sum_{i=1}^N W_i^h(\gamma)'HW_i^h(\gamma), \quad H = \begin{bmatrix} G & 0 \\ 0 & I_{T-2} \end{bmatrix}$$

$$V_2^h(\gamma) = \sum_{i=1}^N W_i^h(\gamma)'\hat{u}_i^h(\gamma)\hat{u}_i^{h'}(\gamma)W_i^h(\gamma), \quad \hat{u}_i^h(\gamma) = Y_i - X_i(\gamma)\hat{\phi}_1^h(\gamma)$$

with γ and large N. Again, the System GMM estimator provides consistent estimates for ϕ in Equation (3.3.11) with asymptotically normally distributed covariance matrices as follow:

$$\mathrm{Var}\left(\hat{\phi}_1^h(\gamma)\right) = \left\{X(\gamma)' W^h(\gamma) V_1^h(\gamma)^{-1} W^h(\gamma)' X(\gamma)\right\}^{-1}, \; h = all, min, BB \quad (3.3.19)$$

$$\mathrm{Var}\left(\hat{\phi}_2^h(\gamma)\right) = \left\{X(\gamma)' W^h(\gamma) V_2^h(\gamma)^{-1} W^h(\gamma)' X(\gamma)\right\}^{-1}, \; h = all, min, BB \quad (3.3.20)$$

In conclusion, the FD-GMM and the System GMM are identical in term of instrument counts, yet System GMM is prevalent as it addresses the possible finite sample bias that caused by weak instruments in the FD-GMM. Moreover, since institutional quality and income inequality are statistically persistent, estimating these persistent variables as an explanatory variable by using the difference GMM approach will lead to biased estimates (Arellano & Bover, 1995). Therefore, Section 3.4 suggests that System GMM is the most appropriate technique for estimating Model 1, Model 2, and Model 3 of this study. The next section will highlight the specification of the System GMM models in this study.

3.5 System GMM Model Specification

This study employs the System GMM technique in estimating Model 1 (Equation 3.2.2), Model 2 (Equation 3.2.3), and Model 3 (Equation 3.2.4). Following the framework in Blundell and Bond (1998; 2000), this study includes both the levels and the differences of endogenous variables as instrumental variables.

Lastly, Arellano and Bond (1991) and Arellano and Bover (1995) have suggested two specification tests to evaluate the validity of the instruments in GMM models: The Sargan test and the Arellano-Bond serial correlation tests.

Originally developed for instrumental variables from cross-sectional and time series data (Sargan, 1958), Hansen (1982) proved that the Sargan test can be extended for testing over-identifying restrictions for GMM models. The Sargan-Hansen test first assumed the parameters are identified by the priori moment conditions used and then tests the validity of over-identifying restrictions. The corresponding null hypothesis is that the instruments are independent of the error term. The *J*-statistic of the null follows a chi-square distribution asymptotically with $(m - k)$ degrees of freedom, where m is the number of instruments and k is the number of endogenous variables. Likewise, failure to reject the null hypothesis implies that the instruments are valid.

The Arellano-Bond (AB) serial correlation test examines whether the error terms from the differences equation are serially correlated at the first (AR(1)) and the second autoregressive order (AR(2)). The null hypothesis of the AB serial correlation test is that the differenced error terms are not correlated with their lags up to the specified autoregressive order. However, rejection of the null under AR(1) is quite likely, even when the error terms in levels are independent. Therefore, the literature emphasizes more on the test for AR(2), in which the failure to reject the null hypothesis suggests that the error terms in levels are serially uncorrelated, and therefore the GMM estimators are consistent.

In conclusion, the specification for every estimated models in this study shall pass the Sargan-Hansen test and the AB serial correlation test before proceeding to result interpretation and making inferences. The following chapters (Chapter 4, 5, 6) will report the results of model estimations and specification tests.

CHAPTER 4

ROLES OF FINANCIAL DEVELOPMENT AND INSTITUTIONAL QUALITY IN REDUCING INCOME INEQUALITY

4.1 Introduction

To answer the first research question, this section estimates the long run model of income inequality (equation 3.2.2) using the 2-step System GMM framework with robust standard errors. The main objective of the estimation is to identify the direct impact of changes in financial development and institutional quality on income inequality. The study categories the sampled countries into three groups namely All Countries, Advanced Economies, and Emerging and Developing Economies as specified in the IMF classification of development status (see Appendix Section App2, page 209). As aforementioned, the proxy for income inequality is the net Gini index published by SWIID (2016), the proxy for financial sector development is the domestic credit issued to private sectors to GPD ratio. The study utilizes the ICRG political risk data to generate the institutional quality aggregate index. Besides, the study includes the analysis of each of the four sub-indices of the institutional quality, which are bureaucratic quality, control of corruption, government stability, and rule of law. Section 4.2 below estimates, reports and discusses the empirical results. Section 4.3 summarizes.

4.2 Results and Discussions

To begin with, recall the long run model of income inequality as described in Equation 3.2.2:

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it}Y_{it} + \beta_{2,it}Y_{it}^2 + \beta_{3,it}FD_{it} + \beta_{4,it}FD_{it}^2 + \beta_{5,it}Q_{it} + \sum_{j=6}^{k}\beta_{j,it}X_{j,it} + \varepsilon_{it} \quad (3.2.2)$$

where $INEQ$ denotes income inequality, Y is economic growth, FD represents the level of financial development, Q is the indicator of institutional quality. The controlled variables X_j are described as follow:

$$X_j = \{INEQ_{t-1}, EDUC, OPEN, INFL\}$$

where $INEQ_{t-1}$ is the lagged income inequality or initial income inequality, $EDUC$ denotes educational attainment or human capital, $OPEN$ refers to trade openness or trade liberalization, and $INFL$ is the inflation rate.

Table 4.1 below reports the estimation results that include all sample countries as the cross sections. Five models (Model I – V) are reported with respect to alternative measures of institutional quality, namely the averaged aggregate index, bureaucratic quality, corruption control, government stability, and law and order.

Table 4.1 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: All Countries
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
$Inequality_{t-1}$	0.8379^{***} (0.000)	0.8342^{***} (0.000)	0.8345^{***} (0.000)	0.8426^{***} (0.000)	0.8242^{***} (0.000)
Income Growth	0.0300^{**} (0.038)	0.0668^{***} (0.000)	0.0256^{*} (0.075)	0.0544^{***} (0.000)	0.0574^{***} (0.000)
Income $Growth^2$	-0.0024^{***} (0.003)	-0.0047^{***} (0.000)	-0.0022^{***} (0.005)	-0.0038^{***} (0.000)	-0.0040^{***} (0.000)
Fin. Development	0.0013 (0.788)	-0.0070 (0.206)	-0.0039 (0.469)	0.0013 (0.753)	-0.0016 (0.672)
Fin. $Development^2$	0.0006 (0.379)	0.0017^{**} (0.037)	0.0014^{*} (0.063)	0.0005 (0.456)	0.0012^{*} (0.056)
Institutional Quality	-0.0177^{***} (0.000)	-0.0104^{**} (0.000)	-0.0053^{***} (0.001)	0.0083^{***} (0.000)	-0.0091^{***} (0.002)
Trade Openness	0.0100 (0.647)	-0.0002 (0.910)	0.0013 (0.459)	-0.0024 (0.319)	0.0020 (0.339)
Human Capital	0.0076 (0.124)	0.0036 (0.352)	0.0090^{**} (0.039)	0.0043 (0.350)	0.0033 (0.470)
Inflation	-0.0121^{***} (0.000)	-0.0066^{***} (0.000)	-0.0088^{***} (0.000)	-0.0113^{***} (0.000)	-0.0105^{***} (0.000)
No. of Obs	1208	1208	1208	1208	1208
No. of IV	69	69	69	69	69
Sargan-Hansen	57.13 (0.545)	60.22 (0.431)	67.15 (0.218)	55.84 (0.593)	59.72 (0.218)
AR(1)	-2.18 (0.029)	-2.07 (0.039)	-2.12 (0.034)	-2.26 (0.024)	-2.01 (0.044)
AR(2)	-1.42 (0.145)	-1.50 (0.133)	-1.51 (0.131)	-1.54 (0.124)	-1.32 (0.167)

Notes: ***, **, and * represent null rejection at 1%, 5%, and 10% level of significance, respectively. Figures in bracket are p-values.

Overall, each of the five estimated models in Table 4.1 is adequately specified based on the results of diagnostic tests (bottom panel). The Sargan-Hansen's test results show that the null hypothesis (over-identifying restrictions are valid) is not rejected at the conventional significance level. In terms of the Arellano-Bond test for serial correlation, the null hypothesis of the AR(1) test is rejected at 5% level for all models, which is expected due to the lagged dependent term of income inequality ($Inequality_{t-1}$). Nonetheless, the null hypothesis at the second order (AR(2)) is not rejected for all models, indicating that the models are free from disturbance of serial correlation. Moreover, the lagged dependent variable of income inequality is statistically significant for all models, which implies that the GMM estimator is appropriate to estimate Equation 3.2.2 and the empirical results are valid for statistical inference.

The first panel shows the estimated system GMM estimates that reveal some key findings. First, Model I reports a significant and positive estimate (0.0300) for income growth at the 5% level of significance, which indicates that higher national income growth tends to widen the income gap in the context of all sample countries. However, Model I shows a significant and negative estimate (-0.0024) for the squared term of income growth at the 1% significance level. These results point to the presence of the inverted U-shaped Kuznets curve on income growth and inequality when all countries are of concern. Specifically, higher income growth initially leads to worsening income distribution, but further increases in income growth will begin to improve income distribution after the growth rate surpasses a threshold rate[39]. Similarly, Model II, III, IV, and V report the inverted U-shaped relationship between income growth and inequality, suggesting that the presence of the Kuznets curve is robust to the alternative measures of institutional quality. The finding of the Kuznets curve in a large and un-stratified group of countries is consistent with the seminal cross-sectional studies of Deininger and Squire (1996; 1998), Barro (2000; 2008), and Lin, Huang, and Weng (2006). Apart from the cross-sectional evidence, Desbordes and Verardi (2012) also documented pro-Kuznets hypothesis evidence by using data of 113 countries from 1960 to 2000. However, Desbordes and Verardi (2012) also stressed that the empirical existence of the Kuznets curve is sensitive to the endogeneity of income growth. The relationship between income growth and inequality turns to be monotonically negative once the endogeneity of income growth is accounted for in the panel data estimation. Additionally, Angeles (2010) failed to find supporting evidence of the Kuznets hypothesis by treating employment in non-agriculture sectors as the proxy for economic development.

In terms of financial development, all models report insignificant estimates for the linear term of financial development, which indicates that financial development exert insignificant linear effect on affecting income inequality. Next, Model II, III, and V report significant estimates for the squared term of financial development. However, the statistically significant coefficients for the squared financial development have no practical importance, as there is no linear

[39] The estimated threshold rates of income growth for each models are 518.01, 1,219.73, 336.36, 1,284.20, and 1,306.36, in constant US dollar 2010, respectively.

relationship exists between financial development and income inequality. The finding of an insignificant effect of financial development on income inequality is consistent with evidence from Law and Tan (2009), who showed that financial development exhibits no significant explanatory power in determining income distribution in the context of Malaysia. Still, the finding above contradicts to numerous past studies who found a significant effect of finance on income distribution (see, among others, Law et al., 2014; Denk & Cournède, 2015; Baiardi & Morana, 2018; Ibrahim, 2018; Destek et al., 2020). Nonetheless, it is possible that the insignificant effects found are due to the heterogeneous country-specific characteristics of advanced and developing economies. This will be elaborated further in the following discussions pertaining to advanced economies (Table 4.2) and developing economies (Table 4.3).

Turning to the effect of institutional quality, all models show that a change in institutional quality has a significant effect on income inequality. Specifically, Model I shows that a 1% increase in the composite index of institutional quality induces a 0.0177% decrease in income inequality, implying that improvement in overall institutional quality helps to enhance income distribution. The finding of a negative relationship between institutions and income inequality is consistent with the empirical findings of Keefer and Knack (2002), Sonin (2003), Easterly (2001; 2007), Chong and Gradstein (2007), Telbadi and Mohan (2010), and Spruk (2016). In terms of the sub-indices, the Model II, III, and IV also indicate a significant and negative relationship between each angles of institutions and income gap, in which improvement in bureaucratic quality, corruption control, and rule of law, tends to reduce income inequality. The key message delivered from the studies above is that weak institutional quality weakens the ability of the poor to extract rents from economic growth as compared to the rich. Thus, effective government, better control of corruption, rule of law, as well as the overall institutional quality is essential to combat unequal distributions of income. However, the model of government stability (Model IV) shows a contradiction, in which better government stability has a significant and positive effect on income inequality. This interesting finding suggests a possible situation where a stable government tends to create a more unequal distribution of income rather than mitigate it. A possible reason for this result is that a long-lasting party in-house can attract more lobbying activities between the officials in power, businessperson, and the rich in general, which in turn promotes the rent-seeking power and frequency of the elites (Spinesi, 2009).

Turning to the controlled variables, all models agree that trade openness is statistically insignificant in explaining income distribution. Similarly, human capital, as measured in years of secondary schooling, has no significant effect in reducing income inequality. Nonetheless, rising inflation rates tend to negatively associate with lower income inequality at the 1% level of significance. Following the discussion in Section 3.2.5 (page 113), the reported negative effects of inflation rate on income inequality are better explained by the savings redistribution channel (Doepke & Schneider, 2006). An expansionary monetary shock (with lower interest rates and higher inflation rates) tend to benefit borrowers and hurt savers. Since net borrowers generally fall under middle- or low-income household, thus higher inflation rates might lower the income gap between the rich and the poor.

Table 4.2 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: Advanced Economies
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
$Inequality_{t-1}$	0.8675^{***}	0.8246^{***}	0.8739^{***}	0.7440^{***}	0.8336^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income Growth	0.6116^{***}	0.9742^{***}	0.4012^{**}	0.7823^{***}	0.6702^{***}
	(0.000)	(0.000)	(0.027)	(0.000)	(0.000)
Income $Growth^2$	-0.0297^{***}	-0.0453^{***}	-0.0195^{**}	-0.0380^{***}	-0.0318^{***}
	(0.000)	(0.000)	(0.029)	(0.000)	(0.000)
Fin. Development	0.2510^{***}	0.1537^{***}	0.2220^{***}	0.1574^{***}	0.2047^{**}
	(0.000)	(0.000)	(0.000)	(0.001)	(0.011)
Fin. $Development^2$	-0.0261^{***}	-0.0150^{***}	-0.0232^{***}	-0.0148^{***}	-0.0200^{**}
	(0.000)	(0.000)	(0.000)	(0.004)	(0.020)
Institutional Quality	-0.0184^{**}	-0.1789^{***}	-0.1025^{***}	0.0069^{***}	-0.1089^{***}
	(0.015)	(0.000)	(0.007)	(0.005)	(0.003)
Trade Openness	0.0137^{***}	0.0202^{***}	0.0104^{***}	0.0223^{***}	0.0188^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Human Capital	-0.0086	-0.0033	-0.0146^{**}	0.0020	0.0129
	(0.350)	(0.785)	(0.013)	(0.808)	(0.171)
Inflation	-0.0220^{*}	-0.0461^{***}	-0.0115^{***}	-0.0129^{*}	-0.0465^{***}
	(0.056)	(0.000)	(0.005)	(0.093)	(0.000)
No. of Obs	312	312	312	312	312
No. of IV	55	44	46	46	55
Sargan-Hansen	27.94	29.51	24.38	23.91	25.69
	(0.978)	(0.688)	(0.930)	(0.939)	(0.991)
AR(1)	-2.07	-2.20	-2.02	-2.06	-2.34
	(0.038)	(0.028)	(0.043)	(0.039)	(0.019)
AR(2)	-1.36	-1.15	-1.48	-1.49	-1.35
	(0.158)	(0.206)	(0.138)	(0.136)	(0.179)

Notes: ***, **, and * represent null rejection at 1%, 5%, and 10% level of significance, respectively. Figures in bracket are p-values.

Next, Table 4.2 tabulates the estimation results that include only advanced economies as the sample cross sections. Similar to the previous results in Table 4.1, all five models reported in Table 4.2 statistically pass the three diagnostic tests for GMM model specification. Besides, the coefficients of the lagged dependent terms (Inequality_{t-1}) are statistically significant across all estimated models. The estimated models are therefore valid for further statistical inferences.

Taking a glance at the first panel, all models in Table 4.2 present significant and positive estimates for income growth at the 5% level of significance. This set of results is similar to the ones including all countries as sampled observations, which implies that higher income growth tends to increase income inequality among advanced and developed economies. Next, all models unanimously report a significant and negative estimate for the squared term of income growth at the 5% significance level[40]. These results again suggest that the Kuznets curve exists within advanced economies. The finding of the Kuznets curve in developed countries is consistent with a recent piece of evidence from Kavya and Shijin (2020), which suggests that the relationship between economic development and income inequality takes an inverted U-shaped form in 28 high-income countries.

In terms of financial development, all models report significant and positive estimates for the linear term of financial development at the 5% level of significance. This indicates financial development tends to induce large income

[40] The estimated threshold rates of the Kuznets curve for each models are 29,622.70, 46,758.88, 29,353.86, 29,537.65, and 37,712.08, in constant US dollar 2010, respectively.

gaps within the society of developed countries. However, all models report significant and negative estimates for the squared term of financial development. Combining the results above, Table 4.2 tells the presence of an inverted U-shaped relationship between financial development and income inequality. In other words, there exists a turning point in the finance-inequality relationship: any development in the financial system below the turning point tends to widen the income gap, while any financial development beyond the turning point narrows the income gap[41]. This finding is consistent with the theoretical conjecture of Greenwood and Jovanovic (1990), and empirical evidence provided by Nikoloski (2013), Baiardi and Morana (2016; 2018), and Destek et al. (2020). Specifically, Nikoloski (2013) revealed that the Kuznets phenomenon also exists within the relationship between financial sector development and income inequality for advanced and developing countries for the period of 1962 to 2006. Baiardi and Morana (2016; 2018) argued that a financial Kuznets curve appears over the entire euro area since the mid-1980s. Moreover, Destek et al. (2020) showed an inverted U-shaped pattern relationship between income inequality and overall financial development as well as banking sector development in Turkey. Likewise, the results above oppose to studies that support the linear hypotheses of finance-distribution relationship, which include Denk and Cournède (2015) and Destek et al. (2020). The former showed that greater credit intermediation and stock market development lead to a more unequal income distribution in the OECD countries, while the latter argued that stock market development monotonically narrows income inequality in Turkey.

[41] The estimated turning points of the finance Kuznets curve are 122.54%, 167.89%, 119.64%, 203.89%, and 166.92%, measured as domestic credit to GDP, respectively.

Next, the results indicate that improvement in overall institutional quality significantly reduces the income inequality of advanced economies at the 5% significance level. Specifically, a 1% increase in overall institutional quality associates with a 0.018% decrease in the net Gini index. This result suggests the promising effect of better institutions in promoting an egalitarian society among the advanced economies. Likewise, the finding above is consistent with Chong and Calderón (2000a), who claimed that higher institutional quality (represented by composite index) reduces income inequality. Besides, Model II, III, and V also reveal a negative and significant relationship between income distribution and different sub-indices of institutional quality at the 1% level of significance. Specifically, a 1% improvement in bureaucratic quality, corruption control, and rule of law tends to reduce income inequality by 0.1789%, 0.1025%, and 0.1089%, respectively. The results regarding the dimensions of institutions on income inequality are consistent with several past evidence, including Keefer and Knack (2002), Spinesi (2009), Dincer and Gunalp (2011), Bašná (2019), and Policardo et al. (2019). Lastly, Model IV again shows that improvement in government stability tends to widen income inequality rather than reducing it. This counter-intuitive finding contradicts past evidence found in some studies (Nadia & Tehedi, 2014; Spruk, 2016). Still, it could happen when the party in-house stayed in power for a sufficiently long period and so can attract more lobbying activities between the officials in power, businessperson, and the rich in general, which in turn promotes the rent-seeking power and frequency of the elites (Spinesi, 2009).

Table 4.3 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: Developing and Emerging Economies
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
$Inequality_{t-1}$	0.8713***	0.8401***	0.8532***	0.8532***	0.8525***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income Growth	0.2083***	0.1186***	0.1701***	0.2046***	0.2487***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income $Growth^2$	-0.0128***	-0.0073***	-0.0105***	-0.0127***	-0.0153***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fin. Development	-0.0033***	-0.0016	-0.0098***	-0.0073***	-0.0047**
	(0.007)	(0.574)	(0.000)	(0.000)	(0.016)
Fin. $Development^2$	0.0035***	0.0019***	0.0043***	0.0044***	0.0039***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Institutional Quality	0.0017	-0.0380***	-0.0105***	0.0103***	-0.0164***
	(0.609)	(0.000)	(0.000)	(0.000)	(0.000)
Trade Openness	-0.0140***	-0.0086***	-0.0126***	-0.0080***	-0.0142***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Human Capital	-0.0221***	-0.0179***	-0.0186***	-0.0250***	-0.0244***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.0090***	-0.0083***	-0.0115***	-0.0061***	-0.0116***
	(0.008)	(0.000)	(0.000)	(0.000)	(0.000)
No. of Obs	957	957	957	957	957
No. of IV	55	55	55	55	55
Sargan-Hansen	53.50	40.36	42.00	50.81	43.00
	(0.493)	(0.668)	(0.600)	(0.598)	(0.557)
AR(1)	0.77	0.24	0.43	0.67	0.53
	(0.441)	(0.809)	(0.667)	(0.506)	(0.594)
AR(2)	-0.93	-0.96	-1.45	-1.15	-1.09
	(0.354)	(0.338)	(0.148)	(0.250)	(0.277)

Notes: ***, **, and * represent null rejection at 1%, 5%, and 10% level of significance, respectively. Figures in bracket are p-values.

In terms of the controlled variables, all models point out that trade openness leads to higher income inequality among advanced economies. This result coincides with the view of some scholars on the negative impact of globalization. Next, rising inflation rates tend to negatively associate with lower income inequality at the conventional levels of significance. Finally, human capital has no significant effect on reducing income inequality.

Table 4.3 reports the estimation results in the context of developing and emerging countries. Similar to the previous results, all reported models in Table 4.3 again pass the three essential diagnostic tests for GMM model specification, namely the Sargan-Hansen test and the Arenallo-Bond test for serial autocorrelation in the first and second order. Moreover, the coefficients of the lagged dependent term are significant at 1% level for all models. These results of diagnostic tests indicate that the models in Table 4.3 are appropriate for statistical inferences.

First, focusing on the coefficients of income growth in Table 4.3. All models (Model I to V) show significant and positive estimates for the linear term of income growth at the 1% level of significance. These estimates again indicate that higher growth of national income promotes income inequality within the group of developing economies. Next, all models show significant and negative estimates for the squared term of income growth at the 1% significance level. These results again support the Kuznets hypothesis of growth-inequality relationship in the cases of emerging and developing countries[42]. Considering as well the findings on

[42] The estimated threshold rates of the Kuznets curve for each models are 3,417.69, 3,372.09, 3,294.47, 3,149.88, and 3,386.16, in constant US dollar 2010, respectively.

income growth when only advanced economies are sampled, it is evident that the Kuznets curve exists in the relationship between income growth and distribution regardless of the income status of the nation. The pro-Kuznets curve evidence in developing or emerging economies is consistent with Chambers (2010), who documented that higher growth tends to widen inequality over the short-run and medium-run but reduce inequality over the long run in developing countries. Moreover, Younsi and Bechtini (2018) also supported the Kuznets hypothesis of income growth and distribution in BRICS countries.

Next, the reported estimates for financial development and squared financial development reveal some interesting findings. First, all models report significant and negative estimates for the linear term of financial development. The only exception comes from Model II, which suggests that financial development has no linear impact on income distribution when institutional quality is measured by bureaucratic quality. Nonetheless, all models report significant and positive estimates for the squared term of financial development. A combination of the estimates for both linear and squared terms of financial development implies a U-shaped curve relationship between financial development and income inequality. In other words, there exists an *inverted* finance Kuznets curve among developing countries[43]. This finding sharply contradicts the result shown in Table 4.2, which displays an inverted U-shaped relationship between financial sector development and income inequality among advanced and high-income countries. This

[43] The estimated turning points of the inverted finance Kuznets curve are, measured as domestic credit to GDP, 1.60%, 3.13%, 2.29%, and 1.83% for Model I, III, IV and V of Table 4.3, respectively.

contradiction might reveal part of the reasons why financial development exhibit an insignificant impact on income distribution when all countries are included indiscriminately as samples (as shown in Table 4.1). The finding above coincides with some past empirical studies, which provide evidence of a nonlinear U-shaped relationship between financial deepening and income inequality in 35 developing countries (Tan & Law, 2012) and 8 Asian countries (Ibrahim, 2018).

Turning to the effect of institutional quality, the results shown in each model are heterogeneous. Specifically, Model I displays an insignificant relationship between the change in overall institutional quality and income gap, as the positive estimate of 0.0017 is associated with a *p*-value of greater than the conventional levels of significance. Model II, III, and V indicate a significant and negative relationship between institutions and the income gap, in which improvement in bureaucratic quality, corruption control, and rule of law tends to reduce income inequality. Lastly, Model IV again tells a positive and significant relationship between government stability and income inequality in the context of developing countries. The inequality-widening effect of government stability might explain the insignificant effect of the overall institutional quality on distribution, as it partially offsetting the inequality-narrowing effects of bureaucratic quality, corruption control, and rule of law. The results pertaining to institutional quality are therefore similar to the results reported for advanced economies.

Turning to the controlled variables, all models display that all three controlled variables are significant to explain the income inequality of developing and emerging economies. Specifically, higher trade openness tends to narrow the income inequality of developing countries at the 1% level of significance. Compared with the results from advanced economies, trade openness is beneficial to developing countries but hurting the income distribution of developed countries. In the case of human capital, a higher enrollment rate at the secondary level significantly reduces the severity of income inequality among developing economies. This shows that formal education is an effective tool to combat income gaps in the context of developing economies. Finally, higher inflation rates tend to associate with a lower level of income inequality of developing countries at the 1% level of significance.

4.3 Summary

This chapter estimates, report, and discusses the effect of income growth, financial development, and institutional quality on income inequality, by controlling the effect of human capital, trade openness, and inflation. The panel data employed has been organized into three groups according to the development status of countries, namely world panel, advanced economies, and developing economies. Table 4.1, 4.2, and 4.3 tabulated the empirical results, which delivered some important messages as follows.

First, all system GMM models estimated here provide support to the Kuznets hypothesis, in which the growth-inequality relationship appears in an inverted U-shaped curve over the observation period. These results are robust to different types of institutional quality and development status of the sampled countries, implying that the Kuznets curve generally presents in all economies regardless of the development status.

Second, the relationships between financial development and income distribution are nonlinear. In the context of advanced or developed countries, the effect of finance on income inequality appears to be an inverted U-shaped curve, which can be called as a finance Kuznets curve. However, the nonlinear relationship is U-shaped in the cases of developing and poorer economies. In this regard, the distributional effect of financial sector development on income is heterogeneous countries, in which the effect is dependent on the development status of the country.

Third and last, improvement in institutional quality exhibits a significant effect in narrowing income gaps. This result generally holds for the improvement in overall institutions, bureaucratic quality, corruption control, and rule of law. On the other hand, greater government stability tends to enlarge income inequality rather than mitigating it. The distributional effect of institutional quality holds across advanced and emerging economies.

CHAPTER 5

THE INTERACTIVE ROLE OF INSTITUTIONAL QUALITY AND FINANCIAL DEVELOPMENT IN THE INEQUALITY-FINANCE-INSTITUTION NEXUS

5.1 Introduction

This section aims to answer the second research question of the thesis: Does the interaction between institutional quality and financial development play a role in influencing the relationship between financial development and income inequality? To answer the research question, this section estimates the long run model of income inequality (equation 3.2.3) using the two-step System GMM framework with robust standard errors. The main objective of the estimation is to identify the interaction effect between finance and institutions on the inequality-finance-institution nexus.

The study categories the sampled countries into three groups namely All Countries, Advanced Economies, and Emerging and Developing Economies as specified in the IMF classification of development status (see Appendix Section App2, page 209). As aforementioned, the proxy for income inequality is the net Gini index published by SWIID (2016), the indicator for financial sector development is the domestic private credit to GPD ratio. The study utilizes the ICRG political risk data to generate the institutional quality aggregate index. In addition, the study measures the strength of institutional quality using different indices of institutional quality, which includes the aggregate composite index, bureaucratic quality, control of corruption, government stability, and lastly rule of law. Section 5.2 below estimates, reports and discusses the results. Section 5.3 summarizes.

5.2 Results and Discussions

To begin with, recall the long run model of income inequality as described in Equation 3.2.3:

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it}Y_{it} + \beta_{2,it}Y_{it}^2 + \beta_{3,it}FD_{it} + \beta_{4,it}FD_{it}^2 + \beta_{5,it}Q_{it} + \beta_{6,it}(FD \times Q)_{it} + \sum_{j=7}^{k} \beta_{j,it}X_{j,it} + \varepsilon_{it} \tag{3.2.3}$$

where $INEQ$ denotes income inequality, Y is economic growth, FD represents the level of financial development, Q is the indicator of institutional quality. As aforementioned (Section 3.2.3, page 102), the addition of the interactive term in Equation (3.2.3) is mainly for capturing the unobserved and potential interactive effect from Equation (3.2.2). The controlled variables X_j are described as follow:

$$X_j = \{INEQ_{t-1}, EDUC, OPEN, INFL\}$$

where $INEQ_{t-1}$ is the lagged income inequality or initial income inequality, $EDUC$ denotes educational attainment or human capital, $OPEN$ refers to trade openness or trade liberalization, and $INFL$ is the inflation rate.

Tables 5.1, 5.2, and 5.3 below report the estimation and diagnostics test results. Each table presents the corresponding results of using all countries, only advanced economies, and only developing economies as the sample, respectively. Five models (Model I – V) are reported with respect to alternative measures of institutional quality, namely the averaged aggregate index, bureaucratic quality, corruption control, government stability, and law and order.

Table 5.1 shows the estimation results using all sampled countries as the cross-sectional elements. The top panel of the table presents the estimated coefficients for each regressor. The bottom panel displays the results from essential diagnostic tests for two-step System GMM estimation.

Table 5.1 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: All Countries
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
$Inequality_{t-1}$	0.8368*** (0.000)	0.8065*** (0.000)	0.7997*** (0.000)	0.7316*** (0.000)	0.7022*** (0.000)
Income Growth	0.0964*** (0.000)	0.1081*** (0.004)	0.1159*** (0.001)	0.2338*** (0.001)	0.1761*** (0.001)
Income $Growth^2$	-0.0059*** (0.000)	-0.0069*** (0.001)	-0.0071*** (0.000)	-0.0147*** (0.000)	-0.0110*** (0.000)
Fin. Development	-0.0128 (0.192)	-0.0096 (0.305)	-0.0258** (0.017)	-0.0195** (0.013)	-0.0257** (0.032)
Fin. $Development^2$	-0.0002 (0.812)	0.0012 (0.356)	0.0013 (0.449)	-0.0002 (0.775)	0.0022 (0.181)
Institutional Quality	-0.0640*** (0.003)	0.0009 (0.953)	-0.0596*** (0.000)	0.0337*** (0.004)	-0.0386*** (0.195)
FD × IQ	0.0120** (0.026)	0.0026 (0.572)	0.0144*** (0.000)	-0.0069*** (0.010)	0.0220** (0.011)
Trade Openness	0.0018 (0.518)	0.0033 (0.184)	0.0037 (0.170)	0.0108*** (0.003)	0.0069* (0.074)
Human Capital	-0.0002 (0.970)	-0.0042 (0.539)	-0.0078 (0.311)	0.0062 (0.527)	-0.0000 (0.997)
Inflation	-0.0123*** (0.000)	-0.0060** (0.011)	-0.0070*** (0.002)	-0.0123*** (0.000)	-0.0199*** (0.000)
No. of Observation	1117	1034	1034	759	759
No. of IV	54	53	53	50	50
Sargan-Hansen	48.44 (0.263)	41.90 (0.475)	41.91 (0.475)	37.81 (0.475)	32.12 (0.774)
AR(1)	-2.02 (0.044)	-1.93 (0.054)	-1.97 (0.049)	-1.32 (0.188)	-1.31 (0.192)
AR(2)	-1.04 (0.232)	-1.31 (0.190)	-1.34 (0.180)	-1.42 (0.157)	-1.39 (0.164)

Notes: ***, **, and * represent null rejection at 1%, 5%, and 10% level of significance, respectively. Figures in bracket are p-values.

First, each of the five estimated models in Table 5.1 is adequately specified based on the results of diagnostic tests (bottom panel). The Sargan-Hansen's test results show that the null hypothesis (over-identifying restrictions are valid) is not rejected at the conventional significance level. In terms of the Arellano-Bond test for serial correlation, the null hypothesis of the absence of the first-order serial correlation is rejected at 5% level for all models, which is expected due to the lagged dependent term of income inequality (Inequality_{t-1}). Nonetheless, the null hypothesis of the Arellano-Bond test is not rejected at the second order, indicating that the models are free from disturbance of serial correlation. Besides, the lagged dependent variable of income inequality is statistically significant for all models, which implies that the GMM estimator is appropriate to estimate Equation 3.2.2 and the empirical results are valid for statistical inference.

Proceeding to the top panel of Table 5.1, all models report a significant and positive estimate for the linear term of income growth at the 1% level of significance, with the magnitudes range from 0.7022 to 0.8365. Next, all models also report a significant and negative estimate for the squared term of income growth at the 1% significance level, with magnitudes ranging from -0.0147 to -0.0059. This familiar set of estimates again point to the presence of the Kuznets curve on income growth and inequality, which is similar to the previous results shown in Table 4.1. Thus, it is evident that the validity of the Kuznets curve is robust to the alternative use of measures of institutional quality, as well as the inclusion of interactive terms between financial development and institutional quality in the model.

In terms of financial development, Model I and Model II report an insignificant estimate for the linear term of financial development, which tells that financial development exhibits insignificant influence on the change of income inequality when the composite institutional quality index and bureaucratic quality are of concern. However, Model III, IV, and V report a significant and negative estimate for the linear term of financial sector development, suggesting that finance significantly explains the changes in income distribution when institutional quality is proxied by corruption control, government stability, or rule of law. On the other hand, all models reveal that squared financial development has no significant effect on income inequality. The finding of an insignificant effect of financial development on income inequality is again consistent with Law and Tan (2009).

Turning to the effect of institutional quality, all models except Model II suggest that that institutional quality significantly affects income inequality at the 1% level of significance. Specifically, Model I shows that a 1% increase in the composite institutional quality index leads to, on average, a 0.064% decrease in income inequality. Similarly, the Model III and V indicate that a 1% improvement in corruption control and law and order tends to reduce income inequality, respectively. However, while there exists a significant link between government stability and income distribution, Model IV reveals that the relationship is negative.

This result is consistent with the one reported in Table 4.1, in which the interactive term is excluded. Thus, the result suggests again that better government stability tends to promote income widening rather than narrowing.

Moving on to the interactive term (FD × IQ), the estimated coefficients are statistically significant in Model I, III, IV, and V at the conventional levels of significance. As aforementioned (Section 3.2.3, page 102), the sign of the coefficient of the interactive term tells whether financial development complements or substitutes institutional quality in affecting income distribution. In the context of Equation (3.2.3), a significant and positive estimate of the coefficient implies that the two continuous variables are substitutes, whereas a significant and negative estimate of the coefficient implies the complementary nature between financial sector development and quality of institutions. Taking Model I as an example, the positive estimate (0.0120) of $\hat{\beta}_6$ implies that the interaction between financial development and institutional quality tends to reduce the effectiveness of financial development and institutional quality in alleviating unequal distribution. Algebraically, the marginal elasticity of financial development on income inequality is

$$\frac{\partial Gini}{\partial FD} = \left(\hat{\beta}_3 + 2\hat{\beta}_4\right) + \hat{\beta}_6(IQ) = 0.0120 * IQ \tag{5.1.1}$$

as both β_3 and β_4 are statistically indifferent to zero in this case. Similarly, the algebraic expression for the marginal elasticity of institutional quality is

$$\frac{\partial Gini}{\partial IQ} = \hat{\beta}_5 + \hat{\beta}_6(FD) = -0.0640 + 0.0120 * FD$$

(5.1.2)

Both equations (5.1.1) and equation (5.1.2) show that the interactive term of FD × IQ weakens the partial contribution of financial development and institutional quality. Apart from the model of the composite index of institutions, Model III reveals a significant substitution effect between finance and corruption control, and that Model V reports a significant substitution effect between finance and law and order. These results suggest that there is a substitution effect between financial sector development and institutions in reducing income inequality. One possible explanation of the substitution effect is that some of the distributional effects of a well-functioning financial sector overlapped with the roles of institutions with high quality. The finding of the substitution effect between finance and institution is similar to some studies in the close discipline. In a study that focuses on poverty alleviation, Cepparulo, Cuesta, and Intartaglia (2017) documented that the interaction between banking sector development and political institutions reduce the pro-poor effect of banking sector development and political institutions, respectively. Compton and Giedeman (2011) examined the finance-growth relationship and found that the interaction between institution and finance weakens the growth promotion effect of financial development.

Conversely, Model IV shows that government stability significantly complements financial development in reducing income inequality. Considering the effect of rising government stability in creating a more unequal society, the interaction effect tends to reduce the pro-rich effect of government stability. One possible cause behind the complementary effect is that a stable government equipped with dominant power against the opposition parties tends to have more resources to spare for developing financial sectors rather than spend the resources to secure seats for the next election, thereby strengthening the pro-equal distribution effect of financial sector development.

In terms of the controlled variables, the inflation rate is significantly and negatively linked with income inequality at conventional levels of significance. However, it appears that human capital is insignificant to explain the changes in income inequality regardless of the proxy for institutional quality. Additionally, trade openness has significant explanatory power to income distribution only when government stability and rule of law measure the quality of institutions.

Next, the following discussion emphasizes the results pertaining to advanced economies. Table 5.2 tabulates the results of the estimations of the two-step system GMM.

Table 5.2 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: Advanced Economies
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
$Inequality_{t-1}$	0.7438^{***}	0.8671^{***}	0.9692^{***}	0.7718^{***}	0.7957^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income Growth	0.2717^{*}	0.4563^{***}	0.6026^{***}	0.5756^{***}	0.4616^{**}
	(0.066)	(0.000)	(0.000)	(0.003)	(0.012)
Income Growth^2	-0.0138^{*}	-0.0206^{***}	-0.0301^{***}	-0.0279^{***}	-0.0232^{***}
	(0.056)	(0.000)	(0.000)	(0.003)	(0.010)
Fin. Development	0.2155^{***}	0.1607^{***}	0.3014^{***}	0.1361^{***}	0.3398^{***}
	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)
Fin. Development^2	-0.0176^{***}	-0.0113^{***}	-0.0255^{***}	-0.0141^{***}	-0.0124^{***}
	(0.000)	(0.009)	(0.000)	(0.001)	(0.005)
Institutional Quality	-0.1585^{***}	-0.0733^{**}	-0.1430^{***}	-0.0172	-0.0938^{***}
	(0.002)	(0.015)	(0.000)	(0.627)	(0.005)
FD × IQ	0.0352^{***}	0.0169^{**}	0.0318^{***}	0.0039	0.1614^{***}
	(0.005)	(0.047)	(0.000)	(0.587)	(0.000)
Trade Openness	0.0119^{***}	0.0099^{**}	0.0054^{*}	0.0187^{***}	0.0164^{***}
	(0.008)	(0.032)	(0.064)	(0.000)	(0.000)
Human Capital	-0.0021	-0.0120	-0.0205^{**}	0.0043	0.0083
	(0.864)	(0.321)	(0.033)	(0.631)	(0.401)
Inflation	0.0022	-0.0290^{***}	0.0056	-0.0236^{***}	-0.0311^{***}
	(0.830)	(0.000)	(0.640)	(0.004)	(0.004)
No. of Observation	642	348	276	312	348
No. of IV	59	50	49	50	51
Sargan-Hansen	22.40	27.13	23.76	18.55	22.75
	(0.999)	(0.924)	(0.966)	(0.998)	(0.987)
AR(1)	-2.17	-1.94	-1.73	-2.30	-1.77
	(0.030)	(0.052)	(0.084)	(0.021)	(0.076)
AR(2)	-1.21	-1.17	-0.99	-1.63	-1.14
	(0.226)	(0.201)	(0.244)	(0.104)	(0.208)

Notes: ***, **, and * represent null rejection at 1%, 5%, and 10% level of significance, respectively. Figures in bracket are p-values.

First, the bottom panel of Table 5.2 reveals that each of the five models is adequately specified as they passed various essential diagnostic tests for GMM specification. For instance, the chi-square statistics for Hansen's test are not significant at any conventional levels of significance, suggesting that the null hypothesis of valid instruments is not rejected. The reported Z-statistics for the Arellano-Bond test at first-order and second-order serial correlation meet with the typical expectation, in which the statistics are significant at the first order but insignificant at the second order, indicating that the system GMM models are free from disturbance of serial correlation. Lastly, the lagged dependent variable of income inequality is statistically significant for all models, implying that the empirical results shown in the top panel are valid for statistical inference.

Turning to the top panel of Table 5.2, all models indicate the presence of the Kuznets curve on income growth and income distribution in the context of advanced economies. These results show that the validity of the Kuznets curve is robust to the development status of economies and the use of alternative measures for institutional quality. A similar inverted U-shaped relationship is also found between financial development and income inequality, in which all models report significantly positive estimates for the linear term of financial development and significantly negative estimates for the squared term of financial development. These results are again consistent with the ones shown in Chapter 4, in which the estimations exclude the interactive term.

In terms of the distributional effects of institutional quality, it appears that the overall quality of institutions of advanced economies significantly reduces income inequality at the 1% level of significance. Specifically, a 1% increase in the composite institutional quality index induces a 0.1585% decline in the net Gini index. On top of that, each of the sub-indices of institutional quality exhibits a significant and negative effect on income inequality. A 1% improvement in bureaucratic quality, corruption control, and law and order tend to reduce income inequality by 0.0733%, 0.1430%, and 0.0938%, respectively. However, government stability appears to be an exception among the list, which shows an insignificant effect on income distribution at the conventional levels of significance. The results above indicate again that institutional quality is an effective tool for combating unequal income distribution in advanced and developed countries.

Moving on to the interactive terms. All models display that each of the coefficients of the interactive term is statistically significant, except for Model IV, which uses government stability as the proxy of institutional quality. Each of the significant coefficients is positive, suggesting that there are substitution effects between financial development and different aspects of institutional quality among the advanced economies. In other words, the interaction effect between finance and institution tend to weaken the individual effect of financial development and improvement in institutions in reducing income inequality. Table 5.2.1 below reports the marginal elasticities of income inequality against the changes in financial development ($\frac{\partial INEQ}{\partial FD}$) for each model. Table 5.2.2 tabulates the marginal elasticities of institutional quality on income inequality ($\frac{\partial INEQ}{\partial IQ}$) for each model.

Table 5.2.1 Marginal elasticities of financial development on income inequality

Model	$\frac{\partial INEQ}{\partial FD} = \left(\hat{\beta}_3 + 2\hat{\beta}_4\right) + \hat{\beta}_6 * IQ$	Proxy of Institutional Quality
I	$0.1803 + 0.0352 * IQ$	Composite index
II	$0.1381 + 0.0169 * IQ$	Bureaucratic quality
III	$0.2504 + 0.0318 * IQ$	Control of corruption
IV	0.1079	Government stability
V	$0.3150 + 0.1614 * IQ$	Law and order

Source: Author's calculations

Table 5.2.2 Marginal elasticities of institutional quality on income inequality

Model	$\frac{\partial INEQ}{\partial IQ} = \hat{\beta}_5 + \hat{\beta}_6 * FD$	Proxy of Institutional Quality
I	$-0.1585 + 0.0352 * FD$	Composite index
II	$-0.0733 + 0.0169 * FD$	Bureaucratic quality
III	$-0.1430 + 0.0318 * FD$	Control of corruption
IV	0	Government stability
V	$-0.0938 + 0.1614 * FD$	Law and order

Source: Author's calculations

One can observe from Table 5.2.1 and 5.2.2 that the marginal effects in Model IV distinct to other models, as coefficients $\hat{\beta}_5$ and $\hat{\beta}_6$ are statistically indifferent to zero. In this regard, the marginal effect of financial development on income inequality is dependent solely on the change in financial development but not on the change in government stability. The marginal effect of government stability on income inequality, on the other hand, is insignificant and close to zero, at least in the context of advanced countries. Apart from government stability, other sub-indices of institutional quality and the composite institutional index exhibit significant interaction with financial sector development, thereby leading to the substitutional effects between finance and institution.

Turning to the controlled variables, higher trade openness appears to create a more unequal distribution of income in advanced economies, as the coefficients of trade openness are significant at conventional levels across all models. Inflation rates, however, appear significant to reduce income inequality only in Model II, IV, and V, in which the institutional quality is measured by bureaucratic quality, government stability, and rule of law. Lastly, human capital is generally insignificant in explaining income distributions of developed countries, except when the institutional quality is measured by corruption control.

The following section focuses on the results pertaining to developing or emerging economies. Table 5.3 tabulates the results of the estimations. Looking at the bottom panel, the results of diagnostic tests show that all five estimated models in Table 5.3 are adequately specified. The Sargan-Hansen’s tests conclude that the instruments used are valid at the conventional significance level. The Arellano-Bond test for first and second-order serial correlation suggests that the models are free from disturbance of second-order autocorrelation. In addition, the lagged dependent variable of income inequality is statistically significant for all models, which implies that the GMM estimator is appropriate to estimate Equation 3.2.3 and the empirical results are valid for further statistical inferences.

Table 5.3 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: Developing and Emerging Economies
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
$Inequality_{t-1}$	0.8461^{***}	0.8071^{***}	0.8707^{***}	0.8551^{***}	0.8353^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income Growth	0.2121^{***}	0.1690^{***}	0.2285^{***}	0.3006^{***}	0.2714^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income $Growth^2$	-0.0133^{***}	-0.0104^{***}	-0.0142^{***}	-0.0185^{***}	-0.0167^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fin. Development	-0.0553^{***}	-0.0230^{***}	-0.0246^{***}	-0.0243^{***}	-0.0474^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fin. $Development^2$	0.0019^{***}	0.0002	0.0046^{***}	0.0035^{***}	0.0041^{***}
	(0.000)	(0.380)	(0.000)	(0.000)	(0.000)
Institutional Quality	-0.0901^{***}	-0.0443^{***}	-0.0355^{***}	0.0336^{***}	-0.0775^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FD × IQ	0.0359^{***}	0.0252^{***}	0.1056^{***}	0.1083^{***}	0.0243^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Trade Openness	-0.0199^{***}	-0.0233^{***}	-0.0201^{***}	-0.0187^{***}	-0.0272^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Human Capital	-0.0197^{***}	-0.0243^{***}	-0.0223^{***}	-0.0348^{***}	-0.0272^{***}
	(0.864)	(0.864)	(0.864)	(0.864)	(0.864)
Inflation	-0.0101^{***}	-0.0104^{***}	-0.0156^{***}	-0.0099^{***}	-0.0127^{***}
	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)
No. of Observation	957	957	957	960	960
No. of IV	61	61	61	61	61
Sargan-Hansen	45.31	46.44	48.01	49.03	47.41
	(0.662)	(0.617)	(0.553)	(0.512)	(0.578)
AR(1)	0.85	1.08	0.43	0.85	1.22
	(0.395)	(0.282)	(0.666)	(0.395)	(0.222)
AR(2)	-1.43	-1.07	-1.47	-1.40	-1.20
	(0.152)	(0.284)	(0.140)	(0.161)	(0.230)

Notes: ***, **, and * represent null rejection at 1%, 5%, and 10% level of significance, respectively. Figures in bracket are p-values.

Now turning to the top panel of Table 5.3, one can observe that the results reported in Chapter 4 Table 4.3 are largely similar to the results shown in Table 5.3, even after the inclusion of the interactive term. For instance, Model I to V unanimously support the Kuznets hypothesis in the context of developing economies. This result suggests that the relationship between income growth and income inequality in developing and emerging countries is inverted U-shaped. Income growth would initially worsen the income distribution of the nations before the growth rate reaches the turning point that forms the maxima of the inverted U-shaped curve, but further income growth beyond the turning would help to close up the income disparity between the rich and the poor.

In terms of the distributional effect of financial development, Table 5.3 replicates the finding of a U-shaped finance-inequality relationship in developing and emerging countries as in Table 4.3. The U-shaped curve is evident given the significant coefficients of the linear term of financial development with a negative sign, while significant coefficients of the squared term of financial development with a positive sign. Model II appears to be the only exception as the change in squared financial development is not significant to explain income distribution. Model II hence suggests that financial sector development exhibit a linear and negative effect on income inequality when institutional quality is measured by bureaucratic quality. In short, the finding of an inverted finance Kuznets curve in developing countries is robust to the addition of the interactive term. These findings are again consistent with the early empirical studies evidence by Tan and Law

(2012) and Ibrahim (2018), who reported a nonlinear U-shaped relationship between financial deepening and income inequality.

Moving on now to institutional quality. The results reveal that the overall quality of institutions as well as each of the four dimensions of institutions affect income inequality significantly at the 1% level. It appears that a 1% increase in the composite institutional quality index, bureaucratic quality, control of corruption, and rule of law tend to reduce income inequality by 0.0355% to 0.0901%. In contrast, a 1% increase in government stability tends to widen income inequality by 0.0336%. Thus, the results of significant negative effects of institutional quality but a positive effect of government stability on income inequality are evident in developing countries as well.

Focusing on interactive terms. All models show that the interaction between financial development and institutional quality exhibits a significant power in explaining income distribution. The marginal effects are derived and reported in Table 5.3.1 and 5.3.2.

Table 5.3.1 summarizes the marginal elasticities of financial development on income inequality ($\frac{\partial INEQ}{\partial FD}$) for each model, while Table 5.3.2 tabulates the marginal elasticities of institutional quality on income inequality ($\frac{\partial INEQ}{\partial IQ}$) for each model.

Table 5.3.1 Marginal elasticities of financial development on income inequality

Model	$\frac{\partial INEQ}{\partial FD} = (\hat{\beta}_3 + 2\hat{\beta}_4) + \hat{\beta}_6 * IQ$	Proxy of Institutional Quality
I	$-0.0515 + 0.0359 * IQ$	Composite index
II	$-0.0230 + 0.0252 * IQ$	Bureaucratic quality
III	$-0.0154 + 0.1056 * IQ$	Control of corruption
IV	$-0.0173 + 0.1083 * IQ$	Government stability
V	$-0.0392 + 0.0243 * IQ$	Law and order

Source: Author's calculations

Table 5.3.2 Marginal elasticities of institutional quality on income inequality

Model	$\frac{\partial INEQ}{\partial IQ} = \hat{\beta}_5 + \hat{\beta}_6 * FD$	Proxy of Institutional Quality
I	$-0.0901 + 0.0359 * FD$	Composite index
II	$-0.0443 + 0.0252 * FD$	Bureaucratic quality
III	$-0.0355 + 0.1056 * FD$	Control of corruption
IV	$0.0336 + 0.1083 * FD$	Government stability
V	$-0.0775 + 0.0243 * FD$	Law and order

Source: Author's calculations

Given that the interactive term in all models is significantly positive, there exist substitution effects between different dimensions of institutional quality and financial development in affecting the income inequality of developing countries. As displayed in Table 5.3.1, stronger institutions weaken the individual effect of financial development in creating a more egalitarian distribution of income. Similarly, in Table 5.3.2, further financial development tends to weaken the equalizing effect of institutional quality on income distribution. The above findings of the substitution effect between financial development and institutional strength are consistent with the argument in Aluko and Ibrahim (2020). Using data from Sub-Saharan Africa, the authors show that while financial development is critical for real economics in both low-institution and high-institution countries, the effect appears to be stronger among low-institution countries. This implies that strong institutions may provide similar functional roles as what a well developed financial sector performs. Interestingly, the strongest substitution effects come from the interaction between finance and government stability (0.1083) as well as finance and control of corruption (0.1056) magnitude wise. These show that the distributional role of corruption control and government stability are strongly overlapped with financial development in developing countries, as compared to the cases of rule of law and bureaucratic quality.

Concerning the controlled variables, it appears that trade openness, human capital, and inflation significantly reduce income inequality in developing countries at the 1% level of significance. The result holds across different measures of institutional quality.

5.3 Summary

This chapter analyzes how the interaction between finance and different aspects of institutions salter the individual effect of financial development and institutions in affecting income inequality. It adopts similar datasets as in Chapter 4, in which the panel data are organized into three groups, namely world panel, advanced economies, and developing economies. Table 5.1, 5.2, and 5.3 tabulated the empirical results.

Overall, the interaction between financial development and institutional quality exhibit significant substitution effects between the two variables. A more developed financial sector tends to weaken the effectiveness of better institutions in reducing income inequality. Likewise, improved quality of institutions tends to weaken the effect of financial development in promoting equal distribution of income. The substitution effect between finance and institution presents in both advanced and developing economies, and largely holds across different proxy for measuring institutional quality.

Additionally, the reported partial effects of income growth, financial development, and institutional quality on income inequality in Chapter 5 appear similarly with those presented in Chapter 4, even after considering the interactive effect between finance and institution. For instance, there exists a finance Kuznets curve that explains the relationship between financial sector development and income inequality among advanced and rich countries, while the nonlinear relationship is U-shaped in the context of developing countries. Next, improvement in almost all forms of institutional quality significantly reduces income inequality, except for government stability. Lastly, the presence of the Kuznets curve is observed in all models, suggesting that the hypothesis of an inverted U-shaped curve holds across all samples employed.

CHAPTER 6

THE ROLE OF INCOME INEQUALITY IN ENDOGENOUSLY DETERMINING INSTITUTIONAL QUALITY

6.1 Introduction

This section aims to answer the third and last research question: How does income inequality in turn endogenously determine institutional quality? To answer the research question, this section treats the income inequality, measured using the net Gini index (SWIID, 2016), as one of the regressors in the long run model of institutional quality. The estimator is again the 2-step System GMM estimator with robust standard errors.

6.2 Results and Discussions

To begin with, recall the long run model of income inequality as described in Equation 3.2.4:

$$Q_{it} = \alpha_{0,it} + \alpha_{1,it}INEQ_{it} + \alpha_{2,it}DEMO_{it} + \sum_{j=3}^{k} \alpha_{j,it}XX_{j,it} + \varepsilon_{it} \quad (3.2.4)$$

where Q is the indicator of institutional quality, $INEQ$ denotes income inequality, and $DEMO$ measures the democratic quality. The controlled variables XX_j are described as follow:

$$XX_j = \{GROWTH, EDUC\}$$

where $GROWTH$ represents economic growth and $EDUC$ denotes educational attainment or human capital. As aforementioned (Section 3.2.4, page 104), the reason for including democracy as one of the regressors is due to its significant role in explaining overall institutions (Savoia *et al*., 2010). It is expected that a positive link would establish between democracy and institutional quality, based on the observation that democratic countries tend to associate with better protection in property rights, more inclusive economic developments, and better governance (Acemoglu & Robinson, 2000; Gerring *et al*., 2005; Acemoglu *et al*., 2008).

Table 6.1 below presents the estimation results for Equation 3.2.4. Model I is estimated with data of all sampled countries, while Model II and III are estimated using data of advanced and developing countries, respectively. The bottom panel displays the results of diagnostic tests, which suggest that each of the three estimated models is statistically fit for inference. Particularly, the results of Sargan-Hansen's test show that the instruments used for the System GMM models are not invalid at the conventional significance levels. In terms of serial correlation, the results of the Arellano-Bond test reveal that all models reported are free from the disturbance of second-order autocorrelation. Lastly, the lagged dependent variable of institutional quality (Institutional Quality$_{t-1}$) is statistically significant for all models, which implies that the GMM estimator is appropriate to estimate Equation 3.2.4.

Table 6.1 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Dependent Variable: Institutional Quality

	Model I	**Model II**	**Model III**
Sample:	All Countries	Advanced	Developing
Ind. Var			
Institutional Quality$_{t-1}$	0.2185***	0.0732***	0.4083***
	(0.000)	(0.000)	(0.000)
Inequality	-0.7635***	-0.8052***	-0.5486***
	(0.000)	(0.000)	(0.001)
Democratic Quality	0.1045***	0.4422***	0.1309*
	(0.003)	(0.003)	(0.053)
Income Growth	0.0605***	0.0557***	0.0598
	(0.001)	(0.001)	(0.239)
Human Capital	0.1034***	-0.0879	0.1892***
	(0.009)	(0.547)	(0.010)
No. of Observation	1603	649	954
No. of IV	34	44	39
Sargan-Hansen	23.14	34.95	27.90
	(0.726)	(0.611)	(0.719)
AR(1)	-2.55	-2.72	-2.10
	(0.010)	(0.007)	(0.036)
AR(2)	-0.99	-0.78	-1.05
	(0.322)	(0.433)	(0.293)

Notes: ***, **, and * represent null rejection at 1%, 5%, and 10% level of significance, respectively. Figures in bracket are p-values.

The top panel of Table 6.1 reports the GMM estimates. First, the estimated coefficients of inequality appear statistically significant and negative in all Models at the 1% level of significance. This indicates that more unequal distributions of income tend to deter the quality of institutions of a country. The negative effect of income inequality on institutional quality holds across different development and income status of countries. Nonetheless, the negative effect appears, in the absolute sense, to be stronger among advanced economies (-0.8052) as compared to developing countries (-0.5486). The negative and significant impact of income inequality on institutions is tally with the theoretical expectation as explained in Chapter 3 (Section 3.1.2, page 92 – 98). Empirically, several existing studies support the findings above, including Alesina and Perotti (1996), Easterly (2001), and Keefer and Knack (2002), who found similar cross-country evidence, as well as Chong and Gradstein (2007), who provide evidence using dynamic panel methodology.

Moving on to the control variables, democratic quality seems to exert significant and positive effects on the overall institutional strength, which constitutes bureaucratic quality, control of corruption, governmental stability, and rule of law. All else being equal, a 1% increase in the democratic quality index tends to improve the overall institutional quality by 0.104% (all countries), 0.442% (advanced economies), and 0.1309% (developing countries), respectively. The positive effect of democratic quality on the overall institutional strength is significant at the 1% level in the cases of Model I and Model II, whereas the effect is significant at only the 10% level of significance in the case of Model III. Therefore, the results above suggest that the driving force of democratic quality in enhancing institutional strength is more pronounced among advanced countries as compared to developing countries. The finding of a positive and monotonic relationship between democracy and institutional quality is intuitively convincing and is consistent with the theoretical predictions of Acemoglu & Robinson (2000), Gerring *et al*. (2005), and Acemoglu *et al*. (2008). There is, however, no existing empirical study could offer support to the result of a linear positive relationship between democratic quality and institutional quality. On the contrary, Kotschy and Sunde (2017) argued that there is a nonmonotonic relationship between democratic quality and institutional quality that is moderated by income distributions.

Income Growth and Human Capital, however, show contradictory results between Model II and Model III. For instance, income growth appears to exert a significant and positive effect on improving the quality of institutions in the context of all countries or only advanced economies, but it appears insignificant to explain institutional quality in the case of developing economies. Human capital, on the other hand, shows a significant and positive effect on institutional quality when the sample data considers all countries or only developing economies, while the effect of human capital is insignificant when the sample data consider only developed economies. Nonetheless, the results above are similar to the recent work of Alonso *et al*. (2020), who documented that income growth and education are among the list of factors that endogenously and positively determine institutional quality.

Next, the thesis performs an additional exercise. That is, to re-estimate Equation 3.2.4 by considering the interactive effect between income inequality and democratic quality on institutional quality. The additional exercise is motivated by the theoretical works of Acemoglu and Robinson (2008) and Acemoglu *et al*. (2013) as well as the empirical work of Kotschy and Sunde (2017). These important works proposed a hypothesis that the beneficial effect of democracy on institutional quality is dependent on the degree of income equality. This in turn implies that there may be a stage-dependent relationship between democratic quality and the overall institutional quality moderated by income inequality. Table 6.2 reports the results from re-estimating Equation 3.2.4 with the inclusion of an interactive term between democratic quality and income inequality (DQ × INEQ). The extended model is expressed as follow:

$$Q_{it} = \alpha_{0,it} + \alpha_{1,it} INEQ_{it} + \alpha_{2,it} DEMO_{it} + \alpha_{3,it} (DEMO \times INEQ)_{it} + \alpha_{4,it} GROWTH_{it} + \alpha_{5,it} EDUC_{it} + \varepsilon_{it} \tag{3.2.4E}$$

where Q is the indicator of institutional quality, $INEQ$ denotes income inequality, and $DEMO$ measures the democratic quality. The controlled variables XX_j are described as follow:

$$XX_j = \{GROWTH, EDUC\}$$

where $GROWTH$ represents economic growth and $EDUC$ denotes educational attainment or human capital.

Table 6.2 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Dependent Variable: Institutional Quality

	Model I	**Model II**	**Model III**	**Model IV**	**Model V**	**Model VI**
Sample:	All Countries	Advanced	Developing	All Countries	Advanced	Developing
Ind. Var						
Institutional Quality$_{t-1}$	0.2185*** (0.000)	0.0732*** (0.000)	0.4083*** (0.000)	0.3382*** (0.000)	0.3562*** (0.000)	0.3728*** (0.000)
Inequality	-0.7635*** (0.000)	-0.8052*** (0.000)	-0.5486*** (0.001)	-0.9468*** (0.000)	-0.6274*** (0.000)	-1.1892*** (0.000)
Democratic Quality	0.1045*** (0.003)	0.4422*** (0.003)	0.1309* (0.053)	0.8438** (0.014)	0.8390*** (0.000)	1.1149*** (0.003)
DEMO × INEQ	-	-	-	-0.2170** (0.040)	-0.2337*** (0.000)	-0.3335*** (0.001)
Income Growth	0.0605*** (0.001)	0.0557*** (0.001)	0.0598 (0.239)	0.0276 (0.144)	-0.0085 (0.482)	0.0529*** (0.000)
Human Capital	0.1034*** (0.009)	-0.0879 (0.547)	0.1892*** (0.010)	0.2323** (0.000)	0.1689*** (0.000)	0.1026*** (0.000)
No. of Obs.	1603	649	954	1603	649	954
No. of IV	34	44	39	43	43	43
Sargan-Hansen	23.14 (0.726)	34.95 (0.611)	27.90 (0.719)	33.11 (0.606)	30.78 (0.715)	32.09 (0.655)
AR(1)	-2.55 (0.010)	-2.72 (0.007)	-2.10 (0.036)	-2.70*** (0.007)	-1.62 (0.106)	-2.42** (0.016)
AR(2)	-0.99 (0.322)	-0.78 (0.433)	-1.05 (0.293)	-1.01 (0.312)	-0.85 (0.397)	-0.99 (0.321)

Notes: ***, **, and * represent null rejection at 1%, 5%, and 10% level of significance, respectively. Figures in bracket are p-values.

Table 6.2 also includes the results reported in Table 6.1 previously for easier comparisons. Model IV, V, and VI are the extended versions of Model I, II, and III, respectively.

Firstly, the results showed in the left panel and the right panel are quantitatively similar in terms of the effect of inequality and democratic quality. In particular, an increasing degree of income inequality deteriorates the overall institutional strength and vice versa, while better democratic quality tends to promote stronger institutions. While the results are statistically consistent across different samples used, the effect of both democratic quality and income inequality on institutions are relatively stronger (in term of coefficients' magnitude) in developing countries than advanced economies.

Turning to the interactive term, the effect of the interaction between democratic quality and income inequality is captured by the coefficient $\hat{\alpha}_3$. It appears that the interaction between democratic quality and income distribution has a significant and negative effect on the institutional quality at least a 5% level of significance. The sign and magnitude of $\hat{\alpha}_3$ suggest that the beneficial effect of democratic quality on institutional quality in both developed and developing countries tends to be eroded when the level of income inequality is higher than a threshold value. It can be expressed algebraically as

$$\frac{\partial Q}{\partial DEMO} = \hat{\alpha}_2 + \hat{\alpha}_3 * INEQ$$

where $\hat{\alpha}_2$ is the estimated coefficient of democratic quality as shown in Model IV, V, and VI. The threshold levels of *log(INEQ)* estimated for all countries, advanced economies, and developing countries are 3.8885, 3.5901, and 3.3430, respectively[44]. The positive marginal effect of better democratic quality in improving institutional quality will be lowered as the income inequality is getting severer, and will even

[44] These values are equivalent to 48.838, 36.238, and 28.304, as measured in the net Gini index.

turn to a negative effect when the level of income inequality is higher than the computed threshold values and vice versa. The finding of a negative interaction effect between democratic quality and income inequality in determining institutional quality is conceptually similar to Acemoglu and Robinson (2008) and Acemoglu *et al*. (2013). The two theoretical works proposed that democracy could exhibit a non-monotonic effect on institutional quality, in which the effect is conditional on 'economic institution' as represented by the degree of unequal wealth distribution. The finding above is quantitatively similar to Kotschy and Sunde (2017) as well, except that the authors reached their findings by measuring income equality rather than income inequality.

Lastly, the reported results for the control variables, namely income growth and human capital are considerably different after the inclusion of the interactive term. Specifically, the effect of income growth on institutional quality appears to be significant only in the case of developing countries, while the determinant is insignificant in the context of all countries and advanced economies. These results suggest that income growth is a positive driver for achieving stronger institutions among developing countries. However, a similar growth in income is not as important to drive institutional quality among developed countries. Next, human capital exhibits a significant and positive effect on institutional quality in all samples employed, suggesting that formal education is important for improving and sustaining the quality of institutions in all aspects.

6.3 Summary

This chapter analyzes on how income inequality and democratic quality determine the quality of institutions, by controlling the effect of income growth and education. The panel data employed has been organized into three groups, namely the world panel, advanced economies, and developing economies.

The analysis is performed in two stages. The first stage emphasizes the individual effect of income inequality and democratic quality on institutional strength, without considering the interaction between democracy and income distribution. The key messages delivered from the first-stage analysis is that an unequal distribution of income significantly decreases, and democratic quality improves, the quality of institutions in both developed and developing countries.

The second-stage analysis extends the investigation by incorporating the interactive effect between income inequality and democratic quality into the model. The empirical results indicate that the effect of democracy on institutional quality is non-monotonic and dependent on the degree of income inequality of the country. Specifically, improved democratic quality is associated with stronger institutions of a country provided if the income inequality is not excessively high. The same effect of democratic quality on institutional strength would turn negative if the income inequality is higher than a threshold level. The threshold inequality level (measures as net Gini index) is around 48.838, 36.238, and 28.304 for all countries, advanced economies, and developing countries, respectively.

CHAPTER 7

CONCLUSION

7.1 Summary of the Study

This study begins with the introduction of two historical events, namely the 'Occupy Wall Street' movement, and the less-known 'Marikana Massacre', hoping to deliver the message that the severity and damage done by extremely unequal distributions of wealth and income to our society can never be over-emphasized.

As discussed in the first Chapter, governments and NGOs have invested an enormous amount of resources to combat the rising global income inequality, which is ever-increasing since the era of the Industrial Revolution. To date, after the 20-year international collaborative effort since the implementation of MDGs and the succeeding SDGs, the outcome is still far from promising. Given that most of the implemented policy measures are fiscal in nature, such as imposing wealth tax, progressive income tax scheme, and subsequent redistribution scheme, it is arguable that solely depending on fiscal-based policies is insufficient and ineffective in reducing income gaps. Likewise, this study questions whether there are alternative ways for reducing the severity of global income inequality.

With the objective in mind, this thesis provides a humble contribution to the literature body of income inequality, by examining the roles of financial development and institutional quality on income inequality, as well as to investigate the role of income inequality in endogenously influencing institutional quality. Specifically, this thesis aims to answer the following research questions: (i) how do financial development and institutional quality play an important role in reducing income inequality? (ii) does the interaction between institutional quality and financial development play a role in influencing the relationship between financial development and income inequality? (iii) how does income inequality in turn endogenously determine institutional quality?

Through the employment of panel data and System GMM estimators, the empirical results discussed in Chapters 4, 5, and 6 yield several major findings, which will be summarized in Section 7.2. Section 7.3 elaborates on the implications of these major findings. Section 7.4 identifies the limitations of the study and recommendations for future research.

7.2 Summary of Major Findings

Overall, the results suggest that both financial development and stronger institutional quality do significantly affect the degree of income inequality in both advanced and developing countries. Firstly, it is evident that financial sector development exerts a nonlinear and significant effect in explaning the level of income inequality. The effect of finance on income inequality takes an inverted U-shaped curve among advanced and rich countries, which is consistent with the theoretical prediction of Greenwood and Jovanovic (1990). However, the same relationship appears to be a U-shaped curve when developing and poorer countries are of concern. The finding of a U-shaped finance-inequality relationship is similar to the finding reported in Ibrahim (2018) and Park and Shin (2017). The U-shaped relationship can be justified in the following notions. As financial markets expanded and deepened, a more developed financial market increase both (1) opportunities for poorer people to gain access to financial services and entrepreneurial capital, as well as (2) the returns to capital and pays to the highly skilled labor markets in the financial sector. Therefore, a U-shaped relationship is possible when the effect of the second effect (higher return to capital and wage of highly-skilled labor) dominates the first (increase opportunity to financial and human capital). These interesting findings suggest that financial development has a heterogenous distributional effect on the income of wealthier and poorer nations.

In terms of institutional quality, all models agree that better quality of institutions is effective for reducing income inequality, regardless of developed or developing countries. The inequality-narrowing effect of institutional quality is held in each dimension of the overall institutions, namely bureaucratic quality, control of corruption, and rule of law. Government stability, on the contrary, exhibits an inequality-widening effect.

This study also examines the distributional effect of the interaction between financial sector development and institutional strength. The results indicate a robust and significant substitutional effect between finance and institutions. The effectiveness of better institutional quality in reducing income inequality tends to be weakened as the financial sector is further deepened or developed. Similarly, improved quality of institutions tends to weaken the effect of financial development in promoting equal distribution of income. The substitution presents in both advanced and developing economies, and largely holds across different measures of institutional quality.

In addition, all empirical results support the validity of the Kuznets curve of the relationship between income growth and income inequality. These results are consistent across all samples employed, suggesting that the presence of the Kuznets curve is robust.

Apart from examining the effect of finance and institution on income distribution, this study also analyzes how do income inequality and democratic quality determine the level of institutional quality. Overall, unequal distributions of income significantly deteriorate the quality of institutions in both developed and developing countries. These findings are consistent with the general intuition and early empirical evidence as in Easterly (2001), Keefer and Knack (2002), and Chong and Gradstein (2007).

The effect of democracy on institutional quality, however, is non-monotonic and dependent on the degree of income inequality of the country. Improved democratic quality is associated with stronger institutions of a country provided if the income inequality is not excessively high. The same effect of democratic quality on institutional strength would turn negative if the income inequality is higher than a threshold level, regardless of whether the country is developed or developing. The threshold inequality level (measures as net Gini index) is around 48.838, 36.238, and 28.304 for all countries, advanced economies, and developing countries, respectively. While the finding of a non-monotonic relationship between democracy and institutional quality is counter-intuitive, it is consistent with the theoretical works of Acemoglu and Robinson (2008) and Acemoglu *et al*. (2013) and similar with the empirical evidence provided by Kotschy and Sunde (2017).

In sum, the major findings in this study are expected to fill the existing literature gaps, as well as providing humble implications to related parties, including policymakers in both governmental and NGO bodies. The detailed implications of the study will be discussed in the following section.

7.3 Implications of Study

The implications of the major findings in this study are several-fold. First, financial development and improvement in institutional quality are effective in reducing the national income inequality of both developed and developing countries. In other words, policies that aim to strengthen the existing financial and institutional framework could be a strategic choice, on top of the mainstream fiscal tools, to alleviate the problem of income inequality. As an alternative way to combat against income gap, better institutional quality exhibits a monotonic effect in promoting a more egalitarian society. This is consistent with the stylized fact that countries with strong institutions tend to associate with a lower degree of income inequality, while countries with poor institutional quality tend to associate with more uneven distribution of income. The inequality-narrowing effect of institutional quality can be achieved through improvement in different angles of the overall institutional quality, namely better control of corruption, improving bureaucratic quality, as well as bringing in a better legal and judicial system. Government stability, however, has a pro-inequality effect in both advanced and developing countries. The counter-intuitive finding pointed out a possible scenario if the existing government stayed in power for an excessively long period, the party in-house could then attract lobbying activities between the government officials in power and the rich, thereby promoting the rent-seeking power of the elites. This finding implies a lesson where, holding all else constant, a regular switch of the ruling party through a fair and transparent democratic system could reduce the degree of uneven distributions of income.

The effect of financial development in reducing income inequality, however, is less-straightforward as compared to the case of institutional quality. Considering the nonlinear quadratic relationship between financial development and income inequality, policymakers are advised to check the existing level of development of the financial system before putting in resources for further expansion. For developing countries, financial development at its early stages could help in narrowing income gaps. The inequality-narrowing effect of financial development will be weaker and eventually turn to inequality-widening once the level of financial development surpasses the critical turning point of the U-shaped relationship curve. To harness the inequality-narrowing effect of financial development, policymakers of developing and emerging countries are advised to prioritize the development of its financial system and sectors during the early phase. Once the financial sector is relatively mature and reached the turning point, policymakers are advised to switch their priority to other facets, such as strengthen institutional quality. In the case of advanced countries, however, the income-narrowing effect of financial development appears only if the financial sectors are sufficiently matured given the inverted-U shaped curve of the finance-inequality relationship. It is therefore recommended that the early development of financial systems in developed countries should be progressed with extra attention paid to the poor, as they might not be equally benefited from the financial development as compared to the rich.

Second, there exists a significant interplay between finance and institutions on top of the partial contributions of finance and institutions on alleviating income inequality. The substitutional effect between finance and institutions implies that the distributional roles of the two factors are partially overlapped with each other. In light of this, policymakers could consider setting the development priority disproportionately that focuses on one side, either financial development and institutions, over the other at one point in time. Nonetheless, this finding is by no means an excuse for national leaders to undermine the importance of institutional quality and financial development. It is crucial for policymakers to continuously strengthen the institutions to ensure a better control for corruption, an efficient bureaucratic system, and upholding the rule of law, among others.

Third, the investigation on factors that endogenously determine institutional quality revealed that both income inequality and democratic quality significantly explain institutional strength in both advanced and developing countries. The findings are expected to provide some new insights into the emerging body of literature that aims to understand what is meant by institutions. Based on the findings, while a proper democratic system does indeed help in improving the overall institutions, the beneficial effect of democratic quality is preconditioned on the current state of income inequality. It implies that democracy can be detrimental to the overall institutional quality if a society is highly unequal. Taking the interactions between income inequality and democratic quality, the finding suggests that equality (or at most a moderate level of inequality) is an essential prerequisite to ensure that democratic quality has a long-lasting positive effect on the overall institutional quality.

Conclusively speaking, financial sector development and institutional quality are playing important roles in narrowing income inequality in both developed and developing nations. Policymakers should therefore utilize these two alternative ways to combat rising income inequality, on top of the conventional tools including progressive tax schemes and income redistribution policies. As one of the universal goals in the list of Sustainable Development Goals, it is undeniable that reducing global inequality and sustaining it at an acceptable level is of utmost urgency for all countries. Apart from the potential damages on economic and social welfare, highly unequal income distribution could deteriorate the overall quality of institutions of a country, causing it even more challenging for the country to achieve a more egalitarian society and ultimately sustainable development. Thus, policymakers should make inequality reduction a primary goal of national policy planning and employ all possible ways to optimize the effectiveness.

7.4 Limitations of Study and Recommendations for Future Research

This study has, by and large, successfully answer the research objectives and filled up the literature gaps by robust findings. However, this study has suffered from several limitations.

The first notable limitation is the number of sampled countries included for the data analysis, especially the panel of developing countries. As of the end of 2015, there are 39 developed nations and 153 developing and low-income countries

(IMF, 2017) in the world. However, this study has included only 36 out of 39 developed countries and only 62 out of 153 developing economies as the sampled observations. Besides, the observation period ranges from 1996 to 2015. The sampled countries and observation periods are selected based on the compromisation between comprehensiveness and data availability, in which the data of the net Gini index, domestic credit to private sectors, and institutional quality indices, are relatively incompleted for most of the less-developed economies.

The second limitation is related to the panel data estimation method. While panel data estimation methods are effective in capturing the dynamic relationships for a group of cross-sections, but it does not identify the dynamics of the unique characteristic of each cross-section. Time series analysis methods are indeed a better alternative for studying the relationship of a specific country, however, as highlighted in the first limitation, the current data available for most countries are likely insufficient for meaningful time series analysis, except for certain advanced economies.

The third and last limitation is attributed to the measure of income inequality, namely the net Gini index. As discussed in Section 1.1, the conceptually *best* indicator of income inequality is Concept 3 income inequality (Milanovic, 2005; 2013), which measures the income gap between individuals around the globe, regardless of their nationality. Indeed, the Concept 3 income inequality can be obtained only through high-quality household surveys on wealth and income data with a sufficiently large number of representatives. However, such individual income data is simply not available in most developing and poor countries, in which the data quality, availability, and transparency are often lacking. Moreover, even if such micro-data is available in most countries, the cross-country comparability of the data will be another foreseeable challenge for researchers.

Conclusively speaking, the limitations of this study is mainly due to data availability. Most of the limitations discussed will not be an issue if the relevant data is readily available, with a reasonable level of comparativeness and quality, in most countries. It is therefore recommended to revisit the research questions by using a more comprehensive dataset with most if not all countries included when the corresponding data are available.

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Appendix

App1. Sub-targets of SDG Goal no. 10 – Reduce Inequalities

- By 2030, progressively achieve and sustain income growth of the bottom 40 percent of the population at a rate higher than the national average

- By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status

- Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies, and practices and promoting appropriate legislation, policies, and action in this regard

- Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality

- Improve the regulation and monitoring of global financial markets and institutions and strengthen the implementation of such regulations

- Ensure enhanced representation and voice for developing countries in decision-making in global international economic and financial institutions in order to deliver more effective, credible, accountable and legitimate institutions

- Facilitate orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies

- Implement the principle of special and differential treatment for developing countries, in particular, least developed countries, in accordance with World Trade Organization agreements

- Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, in particular, least developed countries, African countries, small island developing States and landlocked developing countries, in accordance with their national plans and programs

- By 2030, reduce to less than 3 percent the transaction costs of migrant remittances and eliminate remittance corridors with costs higher than 5 percent

Source: United Nations Development Programme (2015b)

App2. IMF Classification of Development Status for selected Countries

Panel A: Developed or Advanced Economies		
Australia	Hong Kong SAR, China	New Zealand
Austria	Iceland	Norway
Belgium	Ireland	Poland
Canada	Israel	Portugal
Cyprus	Italy	Singapore
Czech Republic	Japan	Slovak Republic
Denmark	Korea, Rep.	Slovenia
Estonia	Latvia	Spain
Finland	Lithuania	Sweden
France	Luxembourg	Switzerland
Germany	Malta	United Kingdom
Greece	Netherlands	United States

Panel B: Developing or Emerging Economies		
Albania	Ghana	Pakistan
Argentina	Guatemala	Panama
Armenia	Guinea	Paraguay
Bangladesh	Honduras	Peru
Belarus	Hungary	Philippines
Bolivia	India	Romania
Botswana	Indonesia	Russian Federation
Brazil	Jordan	Senegal
Bulgaria	Kazakhstan	South Africa
Burkina Faso	Lebanon	Sudan
Cameroon	Madagascar	Tanzania
Chile	Malawi	Thailand
China	Malaysia	Tunisia
Colombia	Mexico	Turkey
Costa Rica	Moldova	Uganda
Croatia	Mongolia	Ukraine
Dominican Republic	Morocco	Uruguay
Ecuador	Mozambique	Venezuela, RB
Egypt, Arab Rep.	Nicaragua	Vietnam
El Salvador	Niger	Zambia
Gambia	Nigeria	

Source: International Monetary Fund (2017, April, p. 178−181).

App3. Variables and Measurements: Source and Description

Variable	Source	Description
Gini Index	SWIID	Gini coefficient of net income inequality after adjusted for taxes and transfers, both in absolute and relative numbers.
Corruption	ICRG	This is an assessment of corruption within the political system.
Law and Order	ICRG	"Law and Order" form a single component, but its two elements are assessed separately, with each element being scored from zero to three points. To assess the "Law" element, the strength and impartiality of the legal system are considered, while the "Order" element is an assessment of popular observance of the law. Thus, a country can enjoy a high rating – 3 – in terms of its judicial system, but a low rating – 1 – if it suffers from a very high crime rate if the law is routinely ignored without effective sanctions.
Bureaucracy Quality	ICRG	The institutional strength and quality of the bureaucracy is another shock absorber that tends to minimize revisions of a policy when governments change. Therefore, high points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. In these low-risk countries, the bureaucracy tends to be somewhat autonomous from political pressure and to have an established mechanism for recruitment and training. Countries that lack the cushioning effect of a strong bureaucracy receive low points because a change in government tends to be traumatic in terms of policy formulation and day-to-day administrative functions.
Government Stability	ICRG	This is an assessment both of the government's ability to carry out its declared program(s), and its ability to stay in office. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk. The subcomponents are: ▪ Government Unity ▪ Legislative Strength ▪ Popular Support
Domestic credit to private sectors	GFDD	Domestic credit to private sectors refers to financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits, and other accounts receivable, that establish a

		claim for repayment. For some countries, these claims include credit to public enterprises.
GDP Growth	WDI	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.
Trade to GDP ratio	WDI	Trade is the sum of exports and imports of goods and services measured as a ratio to gross domestic product.
Democratic Quality	ICRG	This is a measure of how responsive government is to its people, on the basis that the less responsive it is, the more likely it is that the government will fall, peacefully in a democratic society, but possibly violently in a non-democratic one. The points in this component are awarded on the basis of the type of governance enjoyed by the country in question. For this purpose, we have defined the following types of governance: ▪ Alternating Democracy ▪ Dominated Democracy ▪ De Facto One-Party State ▪ De Jure One-Party State ▪ Autarchy In an autarchy, the leadership might indulge in some quasi-democratic processes. In its most developed form this allows competing political parties and regular elections, through popular franchise, to an assembly with restricted legislative powers (approaching the category of a de jure or de facto one-party state). However, the defining feature is whether the leadership, i.e. the head of government, is subject to election in which political opponents are allowed to stand. In general, the highest number of risk points (lowest risk) is assigned to Alternating Democracies, while the lowest number of risk points (highest risk) is assigned to Autarchies.
Average Years of Schooling Attained	WDI	Average years of the total education attained by the population aged 15 and above.

Note: SWIID = Standardized World Income Inequality Database
ICRG = International Country Risk Guide
GFDD = Global Financial Development Database
WDI = World Development Indicator

FACULTY OF BUSINESS AND FINANCE

UNIVERSITI TUNKU ABDUL RAHMAN

Date: 14 December 2022

SUBMISSION OF FINAL YEAR PROJECT /DISSERTATION/THESIS

It is hereby certified that CHEAH SIEW PONG (ID No: 16ABD07639) has completed this ~~final year project/ dissertation/~~ thesis* entitled "FINANCIAL DEVELOPMENT, INSTITUTIONAL QUALITY, AND INCOME INEQUALITY: COMPARATIVE ANALYSIS BETWEEN DEVELOPED AND DEVELOPING COUNTRIES" under the supervision of DR. LAU LIN SEA (Supervisor) from the Department of Economics, Faculty of Business and Finance, and PROF. CHOONG CHEE KEONG (Co-Supervisor)* from the Department of Economics, Faculty of Business and Finance.

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Thesis (2)

by Siew Pong Cheah

ABSTRACT

Reducing income inequality to a sustainable degree is of utmost importance, as extremely unequal income distribution is harmful to the social and economic wellbeing of any country. Therefore, governments and national leaders were committing or committed to reducing income inequality in their borders, and two of the most recognizable collective efforts are the Millennium Development Goals (MDGs, 2000 to 2015) and the succeeding Sustainable Development Goals (SDGs, 2015 to 2030). However, even after the participating members and organizations have put in enormous efforts and resources, there is, at best, limited achievement in reducing income inequality through the MDGs according to the World Gini index. One of the reasons behind this failure is that majority of the countries focused mainly on a progressive tax system to redistribute income while neglecting the fact that income inequality is multi-faceted. Likewise, this study questions on the potential of channels other than the fiscal taxation approach, namely the financial channel and the institutional channel, as effective alternatives in reducing income gap in the context of developed and developing countries. Specifically, this study attempts to (i) investigate the roles of financial development and institutional quality in reducing income inequality, (ii) examine the potential interactive role of institutions and financial development in the inequality-finance-institution nexus, and (iii) examine the role of income inequality in endogenously determining institutional quality. Methodological wise, this study employs the System GMM technique on analyzing the panel datasets of 36 developed economies and 62 developing countries over the period from 1996 to 2015. The results revealed the following major findings. First, both financial development and institutional quality played an important role in determining income inequality in both advanced and developing countries. Stronger institutions exert a linear and negative effect on income inequality, and this negative effect holds across all aspects of institutional quality except governmental stability. Financial development, however, exerts nonlinear effects on income inequality, and the nonlinear effects are heterogeneous between developed (a U-shaped curve) and developing countries (an inverted U-shaped curve). Second, there exists a significant substitutional effect between financial development and each of the aspects of institutional quality in terms of reducing income inequality. Third and last, income inequality exhibits both a direct deteriorating effect and an indirect negative effect on institutional quality through reducing democratic accountability. The findings suggest that improving the existing financial and institutional framework could be an alternative policy vehicle to reduce income inequality, on top of the conventional fiscal tools.

Keywords: Income Inequality, Financial Development, Institutional Quality, System GMM

CHAPTER 1

INTRODUCTION

"No other question in economic policy is ever so important as the effect of a measure on the distribution of income."
— John Kenneth Galbraith ([1958] 1998, pp. 69)

On 17th September 2011, a group of protesters gathered at the New York Zuccotti Park and began their protests at the Wall Street financial district (The Occupy Solidarity Network, 2016). This protest movement, which was named "Occupy Wall Street", has gained widespread attention rapidly and soon inflated to an international social-political movement that was ongoing in 951 cities over 82 countries (Adam, 2011, October 15; Thompson, 2011, October 15). The main concerns of this protest movement are, as claimed by the organizer and the founder (The Occupy Solidarity Network, 2016), bring awareness to the public on how large corporations influence the world in ways that benefit the rich and the elite unevenly and demoting democracy. All of the Occupy movements around the world share a slogan "We are the 99%", which resonates with the intolerance of people over the fact that the top 1% of income recipients owned most of the wealth and capital as compared to the rest[1].

[1] Strictly speaking, the figure of 1% here refers to the economic inequality presented in the United States. The origin of the phrase comes from Stiglitz's (2011) article "Of the 1%, by the 1%, for the 1%". In this article, the Stiglitz warned about the adverse impact of economic inequality as 1% of

One year later, a labor strike that occurred at a mining site in Marikana, Rustenburg, South Africa, was ended far from peace. On 16th August 2012, a group of platinum miners went on strike as their earlier demand for raising wages has been rejected by their employer. The group of unarmed miners was later oppressed by open fire from the special elite unit of the South African police force. The consequence is tragic; 34 miners were killed and at least 78 miners were injured (BBC News, 2012, August 18). This incident was later named "The Marikana massacre".

The social-political movements mentioned above, be it violent or nonviolent, were only a few of the many around the world. These movements reflect the clashes between the rich and the poor; the injustice between the Bourgeoisie and the Bolshevik. These social unrests have reminded us about a long-lasting but ongoing major economic issue: income inequality.

The issue of income inequality has long been the central thesis in numerous academic discussions, political debates, and media reports, all of which revolve around the root and cause of income inequality, the social and economic impact of unequal income distributions, and how to effectively reduce income inequality. This thesis will carry out an in-depth discussion pertaining to the economic concerns of income inequality, with the primary goal of expanding the understanding of reducing income inequality.

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the U.S. population owned nearly 25% of the national income and nearly 40% of the national wealth, while the rest of 99% owned significantly less.

1.1 Background

1.1.1 Definition of Income Inequality

The concept of "income inequality" must be carefully elaborated before further discussion. By definition, income inequality simply refers to the degree of disposable income is unevenly distributed within a population (Decancq, Fleurbaey, & Schokkaert, 2015).

Gini coefficient[2] is one of the most commonly employed measures of income inequality. A higher degree of income inequality occurs when the majority of the labor income and non-labor income are concentrated among the top income groups, which are typically a minority of the population. Based on the notation above, one can immediately identify that income inequality could be observed from different angles. Beginning from the broadest scale, there is income inequality *between* countries, where various levels of initial national incomes and income growth rates are found from different countries. In other words, *between*-countries inequality is conceptually similar to the divergence in economic growth among countries. Next, the scale is narrowed to the observation *within*-country, where each country has a different income distribution for the income quintiles. Lastly, and of the most micro-scale, income inequality can be measured by comparing the income

[2] The Gini coefficient is a statistical measure of income distribution. The name of the index comes from the Corrado Gini. The Gini index ranges from 0 to 1, where 0 respresents a perfect equality (everyone owns a same amount of resource) and 1 denotes a case of perfect inequality (only one person owns everything within a population).

and wealth from each person in the world, regardless of their nationality. The last type of inequality is called *global* income inequality as coined by Milanovic (2005, 2013).

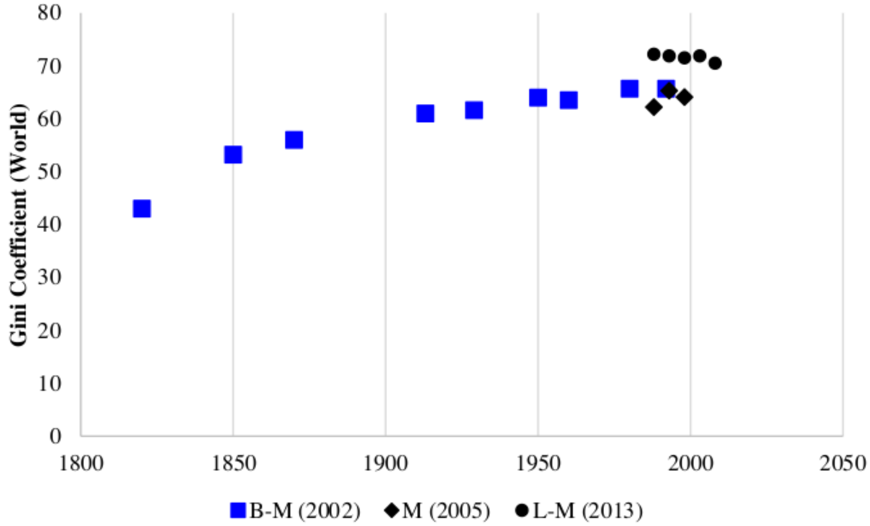
The three types of income inequality described above are similar to the concepts summarized in Milanovic (2005) and Anand and Segal (2015). In the seminal work, Milanovic (2005) has categorized three types of global income inequality and called them Concept 1, Concept 2, and Concept 3 inequality respectively. According to the author, Concept 1 inequality represents the difference between the national income from different countries, without considering the population size. Concept 2 inequality is similar to Concept 1 inequality, but the measurement of national income differences are adjusted to population size. Lastly, Concept 3 inequality is interpersonal as it concerns the differences in personal or household income, regardless of the nationality of the individuals.

Ideally, the Concept 3 inequality is the best representative of income differential among individuals. However, it can be measured only through high-quality household surveys on wealth and income data, which is unavailable in many regions of the world, especially in those poorer countries (Milanovic, 2005). In this regard, Lakner and Milanovic (2015) have compiled data from several national household survey databases (including PovcalNet, World Income Distribution Data, and Luxembourg Income Study) and reorganized it into a unified dataset of global interpersonal income inequality, covering the period of 1988 to 2008. However, while the data of Lakner and Milanovic (2015) appears to be the most comprehensive and closest to the Concept 3 inequality as compared to other databases, it has two limitations that make it not suitable for the proposed analysis of this study. First, the estimates of income inequality in Lakner and Milanovic (2015) are likely underestimated as the accurate income of the top earners are usually underreported, top-coded, or simply taken out as outliers in household surveys. Second, the estimates of income inequality is published in the form of 5-year interval data points rather than a continuous time series on yearly basis. As a result, adoption of the Lakner and Milanovic (2015) inequality data might considerably downplay the dynamic of the time series element in the proposed panel data analysis of this study (see Chapter 3, Section 3.2, page 104 to 107 for more details). Therefore, for the sake of data availability and comparability, most of the discussions in this study are revolving around the *between*-countries and *within*-country income inequality.

1.1.2 Historical Trend of Income Inequality

This section illustrates the historical trend of income inequality. Beginning with a global perspective, Figure 1.1.1 below depicts a very long run of global income inequality since the era of the post-industrial revolution.

Figure 1.1.1: World Gini Coefficient, 1820 – 2011



Source: Bourguignon and Morrisson (2002), Milanovic (2005), Lakner and Milanovic (2016)

The three data series above show the estimates of the world Gini coefficient by Bourguignon and Morrisson (2002) that cover the period from 1820 to 1992. On the other hand, Milanovic (2005) and Lakner and Milanovic (2016) calculated the shorter yet recent estimates of global income inequality for the period from 1988 to 2008. The differences of estimated Gini coefficient among the series above are mainly methodological. The earlier studies such as Bourguignon and Morrisson (2002) commonly estimated the income levels of world citizens by using GDP per capita in constant 1993 $PPP. In contrast, Milanovic (2005) and Lakner and Milanovic (2016) used data of national surveys on income and consumption that comprised of household surveys. The samples covered are also different in the studies above. Bourguignon and Morrisson (2002) used the data of quantile income shares from 33 countries or groups of countries, where 15 countries with large populations or economies are considered individually, and all other countries are clustered into eighteen country groups. The number of national surveys employed in Milanovic (2005) and Lakner and Milanovic (2016) are 345 and 565 respectively, which covered 84 percent to 90 percent of the world population of the time surveyed.

The discussion on the methodological strengths or weaknesses of the studies above is beyond the scope of this section. However, the basic lesson that emerges from these Gini coefficients for a very long time is that the global income inequality did not stop from rising until the mid-20th century since the Industrial Revolution, which caused many European countries and many others to prosper for almost two centuries. This very long period of global inequality first began with an episode of steady increases in global inequality that lasted for almost a century. Then, there are about five decades after World War II when global inequality remained on a high level until finally the very first declining course during the early 21st century. The tiny downward tail of the trend gave some hope that, if the declining trend of global inequality maintains for another 50 years, then there will be a gigantic inverted U-shaped curve, just as how Simon Kuznets (1955) has predicted 60 years ago. Nonetheless, global income inequality remained large by far. Several estimates show that the world Gini coefficient of the year 2013 ranges from 55 to 70 (Lakner & Milanovic, 2016; Milanovic, 2016).

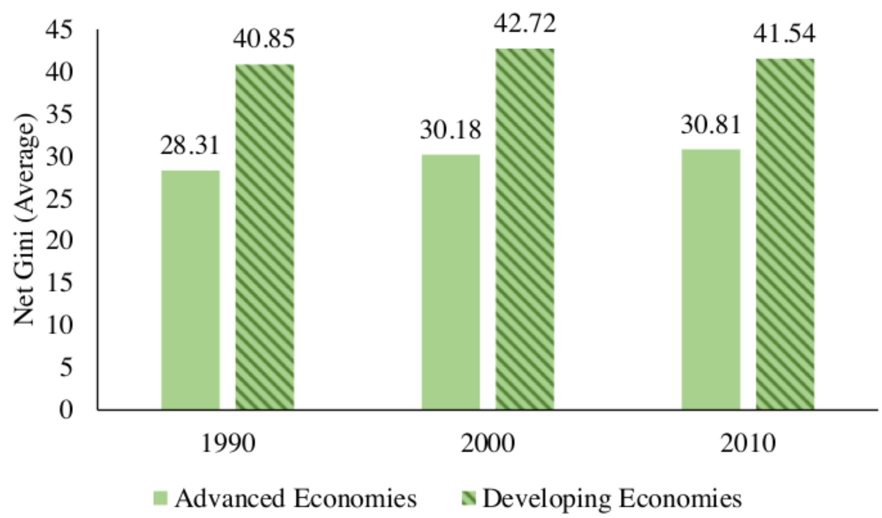
1.1.3 Income Inequality of Developed and Developing Economies

The section above illustrates the trend of global income inequality, in which the measurement does not discriminate against the nationality of individuals. Instead, this section focuses on the within-country income inequality of each country.

There are certain benefits from observing the global pattern of within-country inequality. First, while the global income inequality includes every individual from the poorest to the richest regardless of the national border, the within-country distribution tells relatively clearer in terms of the geographical distribution of income around the world. Second, visualization of the within-country inequality conveniently compares the income distribution of developed countries against developing countries. The second benefit comes in handy for the assessment of the effect of economic development stages on income distribution. Although it is far from definitive, developed countries are generally having smaller income gaps relative to developing countries. This cross-country difference in income disparity can be seen clearly from Figure 1.1.2 below.

Figure 1.1.2 depicts the average net Gini index [3] of developed and developing countries[4,5] for 1990, 2000, and 2010. By comparing the average levels of Gini indexes of economies with different development status, it is clear that developed countries are having lower average readings of income inequality (from 28.31 to 30.81) than what developing countries have (average 40.85 to 41.54).

Figure 1.1.2: Average Gini Index (Net) of Developed and Developing Countries



Source: Solt (2016), Standardized World Income Inequality Database (SWIID), and author's calculation

There are several possible causes of this differential between developed and developing countries. Firstly, the majority of the least-unequal countries (e.g. Sweden, Denmark, Netherlands) are developed nations with an average Gini index

[3] The SWIID has categorized the Gini index to market (gross) Gini and net Gini, in which the net Gini are adjusted for tax and transfer from social insurance programs.
[4] The inclusion of countries in the calculation of averages is subject to data availability.
[5] The classifications of country status follow the guidelines set by the International Monetary Fund (2017). The development status of each country are correct as of year 2017.

lower than 30 for more than two decades. Academicians have attributed the sustained egalitarian status in these Nordic countries to the Nordic model, which is a social democratic system that incorporates free-market capitalism and collective bargaining at the national level (Brandal, Bratberg, & Thorsen, 2013; Iqbal & Todi, 2015). Nonetheless, despite the relatively low degree of inequality, the income disparities in many developed nations are worsening since 1990 as told by the Gini measures. These nations included Sweden (from 22.5 to 25.3), Denmark (23.9 to 25.3), Japan (27.2 to 30.4), the United Kingdom (33.3 to 33.5), and the United States (34.6 to 37.0)[6], among others.

Secondly, it is due to the increasingly severe wealth inequality in some emerging and developing economies. Two of the main contributors to this relatively large income inequality among developing countries are China and South Africa. While China's economic reform in 1978 has made an episode of remarkable economic expansion up to the last decade, in which the growth has effectively narrowed the regional income gap between the Western region and Asian region, it has failed to consider the increasing rural-urban disparities accompanied with the economic expansion (Xie & Zhou, 2014; Zhou & Song, 2016). In the case of South Africa, this country is pigeonholed as one of the most unequal countries in the world. The severity of income inequality in South Africa reflects the consequence of the racially-based apartheid system, which was ended in mid-1991. Although South Africa has earned various success in correcting social inequalities after the first

[6] The first and the second figures are the net Gini (SWIID estimates) in 1990 and 2010, respectively.

democratic election held in 1994 (Christopher, 2001), the income inequality still slightly increased in the past two decades and remained at a dangerous level.

On the positive side, some Latin-America countries such as Brazil and Peru, which previously have been classified as extremely unequal (OECD, 2015; World Bank, 2016), made great progress in steadily reducing income inequality from 1990 to 2010. The Gini index (SWIID 2016 estimates) of Brazil has declined from about 52.8 in 1990 to 51.4 in 2000 (-1.4 points or -2.6 percent), then further dropped to 46.29 in 2010 (-6.55 points or -12.4 percent). During the Annual Meeting of World Economic Forum in Davos, Ibarra and Byanyima (2016) attributed the adequacy of social insurance programs in Brazil as one of the main drivers in reducing inequality and poverty rate. World Bank (2016, p. 104–106) estimated that the *Bolsa Familia* program, the flagship conditional cash transfer program implemented by the Brazilian government in 2003, accounted for 10 to 15% of the reduction in inequality. In terms of Peru, the Gini index (SWIID 2016 estimates) dropped remarkably from 53.6 in 1990 to 47.65 in 2010 or a decline of 11.1 percent. The bottom 40 of Peruvians experienced a large income growth rate of 6.5 percent as compared to the income growth rate of 4.1 percent among the population as a whole between 2004 and 2014 (World Bank, 2016, p. 114–115). As for the reasons behind the improvement in income distribution, the policy reforms in the labor market and educational inclusiveness have contributed to about 80 percent of inequality fall in Peru (World Bank, 2016, p. 115–117). Nonetheless, despite the steady decline of income inequality, the income inequalities in these two Latin American countries are still at considerably high levels. In 2014, the bottom 40 in Brazil held approximately 12 percent of total income, while the top 20 held 56 percent (Alderman, 2011).

Given the lessons learned from the experiences of the Nordic countries, Brazil, and Peru, international institutions including OECD (2015) and UNDP (2015) suggest policy tools that emphasize social and economic inclusion to reduce income gaps. For instance, following the experience of Brazil, OECD (2015) recommended enhancing the implementation and effect of progressive direct tax schemes by closing loopholes and reviewing the rate schedule and relief structure. Nevertheless, adoption of these policy recommendations based on the experience from other countries shall be careful, as the effect of these fiscal policies could be conditional to economic development status, as discussed in Figure 1.1.2 above. Besides, while this thesis does not attempt to undermine the role of fiscal policy in reducing income inequality as a whole, these fiscal policy packages do have some limitations in terms of effectively reducing income inequality. These limitations of fiscal tools are discussed further in the section of the problem statement (Section 1.4, page 21−25).

1.2 Potential Alternatives for Reducing Income Inequality

Given the limitation of fiscal policy packages to act as the one-fit-all solution to reduce income inequality effectively, this study questions whether there are alternative channels or tools for policymakers to improve income distribution. This section discusses the potential roles of financial development and institutional quality in influencing income inequality, as well as some stylized facts of the two economic factors.

1.2.1 Financial Development and Institutional Quality: Some Stylized Facts

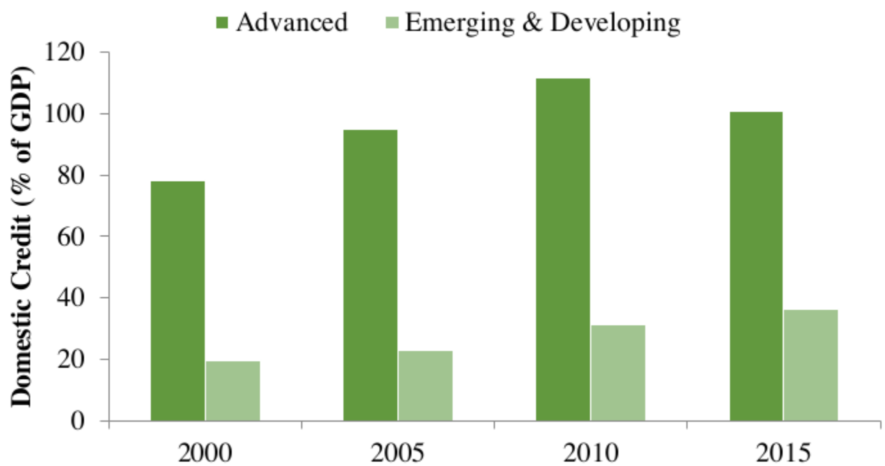
By definition, the term 'financial development' refers to the improvement of the financial sector of an economy, in terms of (i) reducing the degree of information asymmetry between lenders and borrowers, (ii) facilitating the transfer and trading of risks, (iii) providing a mean of corporate governance on public enterprises, (iv) allocating resources efficiently, and (v) promoting savings and investment (Levine, 1996). Fundamentally, financial development is about reducing the friction costs incurred on transactions, mainy due to the asymmetric information and other market imperfections.

Institutional quality, on the other hand, is not uniformly defined by scholars to date. Loosely speaking, the term 'institution' refers to a set of rules or legal constraints, either formal (*de jure*) or informal (*de facto*), that govern the allocation of resources (which includes power) among economic agents (North, 1981; 1990). According to North (1981; 1990), a country with greater quality of institutions would have stronger *de jure* power in place as opposed to the *de facto* rules (refer to Section 3.3.2, page 124, for more information).

The literature has largely recognized that both financial development and institutions play significant roles in influencing long term economic development of a country. Extensive volume of theoretical and empirical studies suggest that financial sector development and improvement in institutions tend to promote economic growth (See Demirgüç-Kunt and Levine (2018) for a review on the finance-growth nexus, and Acemoglu (2010) for a review on the institution-growth relation). Unsprisingly, it is a stylized fact where advanced economies tend to associate with well-developed financial system and strong institutions, while less-developed countries are often associated with less-developed financial system and weak institutions, which can be visualized in Figure 1.2.1 and 1.2.2.

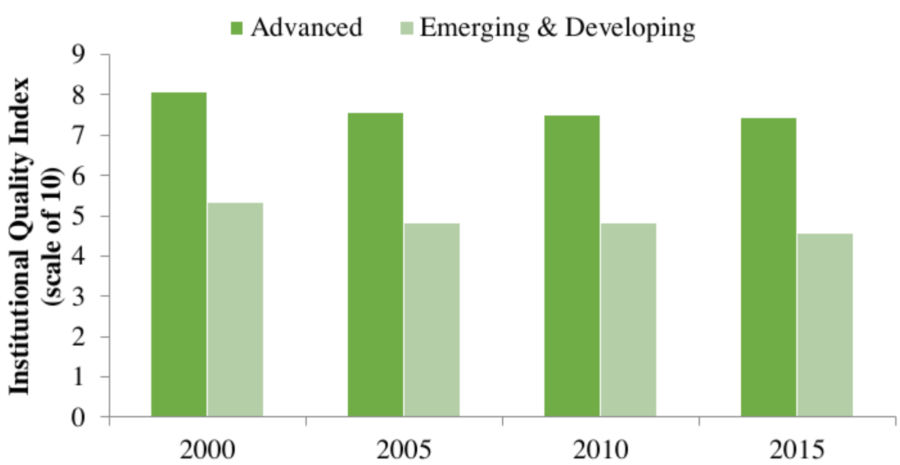
Figure 1.2.1 depicts the average domestic credit to private sector (a proxy of financial development, see Section 3.3.3 for more details) of 36 advanced economies and 62 developing countries in year 2000, 2005, 2010, and 2015, while Figure 1.2.2 shows the average institutional quality indices based on an identical group of countries. As clearly illustrated, financial sectors of advanced economies were considerably more developed (from 78.24% to 111.74% of GDP) as compared to the average development level of emerging and developing markets (from 19.59% to 36.25% of GDP).

Figure 1.2.1: Average Domestic Credit to Private Sector, 2000 − 2015



Source: Global Financial Development Database (GFDD, 2017)

Figure 1.2.2: Average Institutional Quality Index, 2000 − 2015



Source: ICRG Database (PRS group, 2017) and author's calculation

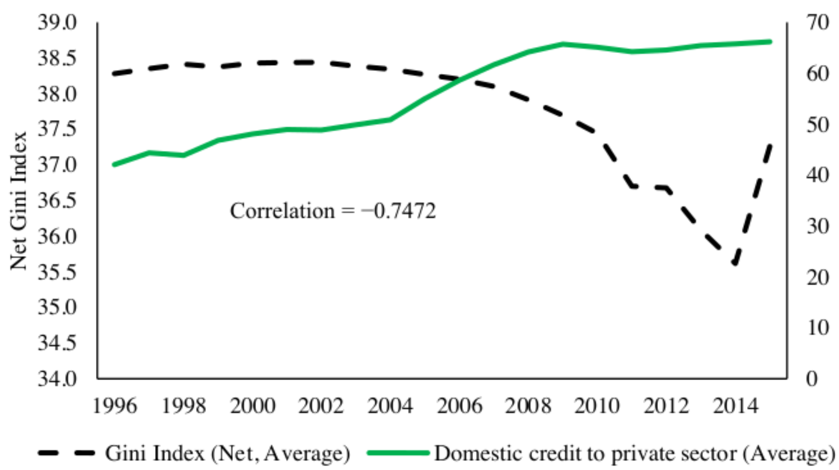
Similarly, there are significant differences between the overall institutional quality in advanced economies (from 7.459 to 8.085) and developing countries (from 4.584 to 5.327). As higher values of the institutional index indicates better institutions, it shows that advanced economies generally outperform developing countries in terms of institutional quality. The illustrations in Figure 1.2.1 and 1.2.2 coincide with the earlier observations where the degree of income inequality is dependent to development status of the country (Figure 1.1.2).

1.2.2 The Role of Financial Development on Income Distribution

The discussion on the potential roles of financial development on income distribution begins with several pioneering experts including Becker and Tomes (1979, 1986), Greenwood and Jovanovic (1990), Galor and Zeira (1993), and Banerjee and Newman (1993). The general idea is that finance can significantly alter the economic opportunities of an individual through its role in reducing information asymmetries, risk pooling and diversification, and its effect on growth and saving rate (King & Levine, 1993a,b). Demirguc-Kunt and Levine (2009) provided an excellent description on the plausible roles of financial sector development on income disparity: "…*financial system influences who can start a business and who cannot, who can pay for education and who cannot, who can attempt to realize one's economic aspirations and who cannot. Thus, finance can shape the gap between the rich and the poor*…"

Intuitively, financial sector development can improve income distribution through its promoting effect on allocative efficiency and lowering costs of financial services, and thus individuals who were initially not using those financial services can access to financial markets and catch up with the rich (Becker & Tomes, 1979; Galor & Zeira, 1993; Banerjee & Newman, 1993). This intuition forms essentially the inequality-narrowing hypothesis in Galor and Zeira (1993) and Banerjee and Newman (1993). However, by incorporating the beneficial effects of finance on individuals who were initially rich and already enjoying those financial services, Greenwood and Jovanovic (1990) stressed that the relationship between finance and income inequality is supposedly nonlinear or inverted U-shaped, where the roles of financial development are conditional on other factors, such as economic development (Galor & Moav, 2004).

Figure 1.2.3: Average Gini Index (Net) and Domestic Credit to Private Sector of All Countries, 1996 − 2015



Sources: SWIID (2017), GFDD (2017)

Interestingly, observations using data of income inequality and financial development resonate very well with the theoretical contradictions above. Figure 1.2.3, 1.2.4, and 1.2.5 illustrate these data and the correlation between financial development (measured by domestic credit to private sector) and income inequality (measured by Gini index) of developed and developing countries from 1996 to 2015.

Figure 1.2.1 shows that the average income inequality (measured by net Gini index) negatively correlates with the financial development level (measured by domestic credit to private sector) in 115 countries[7]. The correlation coefficient of −0.7472 suggests that, on average, a highly developed financial sector tends to follow by a lower degree of income inequality. This observation agrees with the hypothesis that better finance tends to improve income distribution (Galor & Zeira, 1993; Banerjee & Newman, 1993). However, when the data is conditioned on the economic development level of countries, the data tell differently on the co-movement between finance and income inequality.

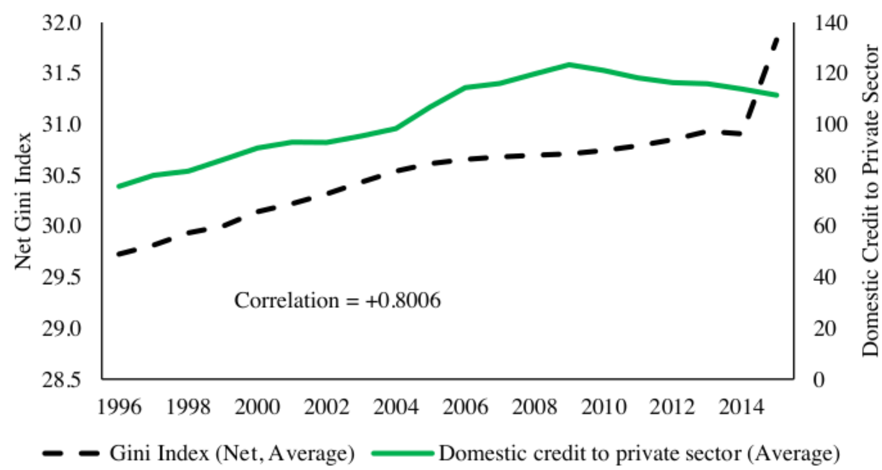
Referring to Figure 1.2.4 and 1.2.5 below, Figure 1.2.4 clearly shows a positive co-movement between the trend of financial development level and income inequality among developed nations on one hand. On the other hand, Figure 1.2.5 displays a negative association between financial development and income disparity in emerging and developing economies. Observations based on Figure 1.2.4 and 1.2.5 suggest that the relationship between financial development and

[7] The inclusion of countries and economies are subjected to the data availability of net Gini index

income gap could be conditional on the level of economic development of the country, as argued in Galor and Moav (2004).

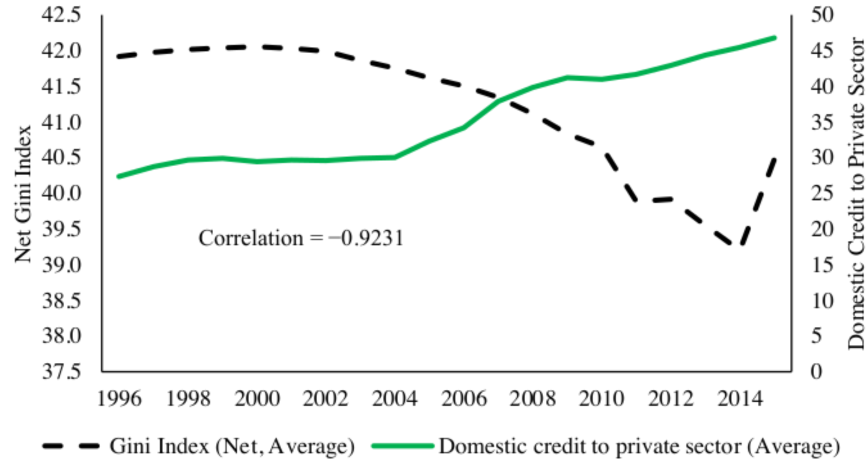
In brief, while financial development might have great potential in improving income inequality, it might have a worsening effect in the context of developed nations. This further suggests that the policymakers in developing countries should be cautious when attempting to borrow the experience of developed countries in setting financial sector policy, especially when the financial sector policy is targeted to influence income distribution.

Figure 1.2.4: Average Gini Index (Net) and Domestic Credit to Private Sector of Developed Countries, 1996 − 2015



Sources: SWIID (2017), GFDD (2017)

Figure 1.2.5: Average Gini Index (Net) and Domestic Credit to Private Sector of Developing Countries, 1996 – 2015



Sources: SWIID (2017), GFDD (2017)

1.2.3 The Role of Institutional Quality on Income Distribution

Apart from financial sector development, improvement in the overall institutional strength of a country can potentially help alleviating the severity of unequal income distribution as well. The general idea is that institutional quality governed the allocative efficiency of social and economic welfare (North, 1990; Knack & Keefer, 1995). Thus, a strong institution in aspects of poverty rights protection, rule of law, governance quality, political and social stability, and corruption control could reduce biasedness in resource allocation and ultimately lead to a fairer distribution of economic resources among the society (Rodrik, 2000; Acemoglu, Johnson, & Robinson, 2005).

While the earlier discussions (see Sen, 1981; 1984; 1999) on the influence of institutional quality on income distribution provided appealing conjectures that better institutions tend to improve income distribution, the existing body of empirical studies is relatively lacking for generalizing a conclusive statement on the impact of institutions on inequality (see Section 2.4, page 57–62 for further discussions). Among these limited number of studies, some (Tebaldi & Mohan, 2010; Dincer & Gunalp, 2011) suggested that higher institutional quality reduces income gap, whereas other (Chong & Calderón, 2000a; Li, Xu & Zou, 2000) found a nonlinear or inverted U-shaped relationship between institutional quality and income gap. In short, while institutional strengthening policy and reform can serve as a way to fight income inequality, it is unwise to do it hastily before a careful investigation on the impact of institutions on income distribution.

1.3 The Needs of reducing Income Inequality

Widening inequality is a major global concern as it carries significant and adverse implications for variaous angles of wellbeings (IMF, 2015). One of the angle is the macroeconomic wellbeing of a country. Based on a sample of 140 countries, Berg, Ostry, and Zettelmeyer (2012) documented that persistent and severe income inequality lead to slower and unsustainable economic growth. Particularly, Berg et al. (2012) showed that a 1 percentage point increase in Gini index associates to a shorter duration of the "growth spell"[8] by 11 to 15%. Ostry, Berg, and Tsangarides (2014) reexamined the findings of Berg et al. (2012) and showed that a 1 percentage point increase in net Gini index leads to lower GDP per capita growth by 7.39% to 14.35%, after controlling the effect of income redistribution. Moreover, Ostry et al. (2014) found that the risk of ending the growth spell is higher by 6.0% when the net Gini index is higher by 1 percentage point. A recent study of Seo, Kim, and Lee (2020) also provide results consistent to the notion that income inequality leads to slower economic growth.

On top of its adverse and direct impact on economic growth, skewed income concentration could transmit to several consequences in the social and economic wellbeing of people. For instance, extremely unequal income distribution would induce concentration of political power to the hands of few elites, who then can use their enhanced power to lobby politicians and result in suboptimal choices in public policy that disproportionately benefited the rich, which ultimately deteriorate the market efficiency and hence inefficient resource allocation in the society (Putnam, 2000; Bourguignon & Dessus, 2009).

In the same vein, high income inequality would increase the difficulty for the public, especially the lower- and the lower-middle income class to access healthcare service, education, skill-demanding employment, entrepreneurial

[8] Berg et al. (2012) coined the term "growth spell" to measure the period where an economy experienced growth that is higher than before. The growth spell begins when there is an upward breakout and ends with a downward breakout along the growth trend.

opportunity, and other social welfare that could help people to alleviate their wealth status. These barriers would in turn deprive the ability of lower-income households to stay healthy and simultaneously accumulate physical and human capital at a reasonable rate (Galor & Moav, 2004; Aghion, Caroli, & Garcia-Penalosa, 1999). Consequently, the productivity level of an unequal society could be lower than what an egalitarian society could perform (Stiglitz, 2012).

Furthermore, extreme wealth and income inequality may damage social capital such as trust and social cohesion, and hence lead to conflicts, social unrests, or possibly, civil wars. It is because income inequality could alter the economics of conflict. Given a high degree of unequal income distribution, the less-fortunate individuals or groups within the society suffer disproportionately from conflict as compared to the rich. The inequality magnifies the pain felt by the less-fortunate, thereby lower the opportunity cost for them to take a violent approach as a way to end conflicts (Lichbach, 1989). It is particularly common among disputes over common resources management, where a peaceful and diplomatic style of resolution is less likely to be executed if the country is highly unequal (Bardhan, 2005).

The evidence discussed above suggest that extreme inequality is unwelcomed. Nonetheless, there are arguments that income inequality is not necessarily something negative, at least when the degree of inequality is not excessively high (Friedman, 2005). A tolerable level of inequality can be incentives for positive entrepreneurial innovations, human capital investment, and economic growth (IMF, 2015). The notion of positive effects of mild inequality can be justified by the neoclassical marginal productivity theory of distribution (Clark, 1891, 1899, 1901; Wicksell, 1902; Ostroy, 1984). The marginal productivity theory suggests that labor wage and income reflect the marginal productivity of each worker contributed to the production process within a competitive labor market. Higher wage or income associates with greater labor productivity and hence contribution to the society and vice versa (Stiglitz, 2016). In other words, the marginal productivity theory implies that income inequality is solely justified by the differences in productivity and contribution among individuals. However, the marginal productivity theory cannot explain the remarkable difference in income levels across countries. For example, while Sweden, Finland, Norway, the United States, and the United Kingdom shared similar characteristics in terms of productivity, technology, and per capita income, the national income gap between the Scandivanian group and the other developed countries has persist for more than two decades (see Section 1.1.3, page 10). This observation suggests that the marginal productivity cannot solely explain the income gaps among individuals and countries because the theory excludes the role of institutions, both economic and political, in influencing income inequality (Beramendi & Anderson, 2008; Stiglitz, 2016)

1.4 Problem Statement

In September 2000, 191 participating member states and at least 22 international organizations have declared to accomplish eight Millennium Development Goals (MDG) by 2015 (United Nations, 2000a). Each of the MDG was designed for then global issues with specific targets and measurable indicators. Among the eight MDGs, Goal number 1 designs to "eradicate extreme poverty and hunger" (United Nations, 2000a). One of the sub-targets associated with Goal 1 is that the participating members agreed to halve the world population of extreme poverty (individuals who lived on or less than $1.25 per day) by 2015 (United Nations, 2000b). By 2015, the number of individuals who live below the hardcore poverty line has declined from 1.9 billion in 1990 to 836 million in 2015. In terms of the developing countries and landlocked regions, who are the major contributor to the poverty rate, the proportion of extreme poverty has dropped from 47% in 1990 to 14% in 2015 (United Nations, 2015, p. 4). Both indicators signal that the involving parties have made a profound achievement in eradicating extreme poverty through enormous collective commitments.

While the world has made significant progress in reducing extreme poverty and hunger in the past two decades, reducing income inequality was off from the agenda in the Millennium summit, even the world had witnessed the possibly ever-rising trend of income inequality since the 1980s. Reducing income inequality was absent in the list of main global issues and agenda until the formation of the

Sustainable Development Goals (SDG) in September 2015, as a successor to the MDGs (United Nations Development Programme, 2015a). Among the 17 SDGs, Goal no. 10 aims to reduce income inequality through 10 specific sub-targets (United Nations Development Programme, 2015b)[9].

Interestingly, it is not difficult to find from these sub-targets of Goal 10 that the United Nations mainly favored the implementation of direct fiscal measures to reduce income inequality within countries, while other types of policy measures are of supporting and secondary nature. Many developed countries namely the U.S. and the U.K. have long implemented income tax policy and alike to reduce income inequality or serve for income redistribution. However, based on the data above (see Figure 1.1.3), most of these developed countries failed to effectively reduce income inequality within these two decades. The Gini coefficients of these countries are at best maintained, if not worsen. Taking the U.S. as an example, the largest economy in the world has long equipped with a complex progressive tax structure[10] that revised annually since the early 1900s (Brownlee, 1996). However, even with the seemingly sophisticated tax system, the income inequality in the U.S. remained relatively high to the OECD average during the last three decades, where the net Gini index steadily inclined from 31.64 in 1980 to 37.79 in 2015 (SWIID estimates). More recently, Jackson, Otrok, and Owyang (2020) show that increases in tax progressivity induces higher income inequality rather than reducing it. This

[9] See Appendix Section App1 for the detailed outlines of these sub-targets.
[10] As Roach (2010) explained, when all taxes in the U.S. are considered, the U.S. tax structure is less progressive as many taxes in the U.S. are actually regressive.

phenomenon sounds an alarming status that we should have a deeper understanding of the causes and the mechanism of these causes of income inequality, and finally design effective policy tools to tackle income and wealth concentration.

At this stage, one shall aware that the fiscal channel is not the only mechanism to cause inequality, and tax-related policy is not the only available tool for improving income distribution. Scholars including Demirguc-Kunt and Levine (2009) and Chong and Calderón (2000a) stressed that there may be also financial channel and institutional channel of income inequality, due to the influential roles of finance and institutions in governing the efficiency of resources allocation of an economy. An in-depth understanding of these alternative mechanisms would aid in designing appropriate policy measures to effectively mitigate income inequality. Moreover, the finance-inequality relationship could vary depending on the status of development of the economy as shown in Figure 1.2.4 and 1.2.5. This implies that the effectiveness of financial development as a tool for reducing inequality in developing economies could be different with the effectiveness in developed economies. Thus, it is vital to examine the distributional effect of financial sector development according to the stage of economic development, rather than assuming financial development has a symmetric effect on income distribution across all stages of development. These motivations lead to the first research objective of this thesis.

Given the possible existence of the alternative channels of income inequality, it is very likely that these alternative channels are dynamically interacting with each other. Taking institutional quality as an example, the empirical evidence has long proven that a sounder institutional quality would promote both financial development (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997; 1998; Rajan & Ramcharan, 2011; Law et al., 2014; Adams & Klodobu, 2016) in a country. These interactions between macroeconomic variables imply that the total impact of these channels consists of direct components (e.g. economic growth, financial development, institutions, etc.) and indirect effects (interactions). It is critical to assess both direct and indirect impacts of the causes of income inequality or else one cannot grasp the full picture of these mechanisms. A proper assessment of these direct and interacting effects of inequality channels will deliberately show the complex mechanism of these factors. For example, one can find out whether a change in institutional quality would transmit to financial development or economic growth or both and finally reach to income distribution pattern. Without this illustration, the net impacts of the direct effects of financial development and institutional quality, as well as the interaction between them, on income inequality are unclear. The motivation to reveal the complex dynamics within the inequality-finance-institution relationship lead to the second research objective.

As aforementioned, an extreme level of inequality would adversely affect drivers of growth, and the institutional quality of an economy is among the list. The rationale behind the causal effect of inequality on institutions is rather straightforward: wealth and income concentration bring huge and unbalanced political power to a few elites, who later used their power to secure their very own interests through lobbying and exploiting the benefit of the rest. The exploitation process would follow by weak institutions, namely higher corruption, poor bureaucratic quality, lower transparency, and accountability of governments. Despite this intuition, the literature has long regarded institutional quality as exogenous. Few exceptions such as Easterly (2001), Keefer and Knack (2002), and Chong and Gradstein (2007) showed that social polarization leads to poorer institutional quality, suggesting that institutions could be endogenously determined by political and economic condition, such as income inequality. Nonetheless, the literature is still lacking in terms of exploring the endogeneity of institutional quality. This research gap leads to the third research objective.

1.5 Research Objectives

The general objective of this study is to examine the roles of financial development and institutional quality on income inequality, as well as to investigate the role of income inequality in influencing institutional quality, by using a panel dataset consisting of 98 countries (36 developed and 62 developing countries)[11] and covering period from 1996 to 2015.

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[11] The classification of country's development status follows the IMF (2017) guidelines. Refers to Appendix Section App2 for more details.

The specific objectives of this study are as follow:

i. To examine the roles of financial development and institutional quality in reducing income inequality.

ii. To analyze the potential interactive role of institutional quality and financial development in the inequality-finance-institution nexus.

iii. To examine the role of income inequality in endogenously determining institutional quality.

1.6 Research Questions

Subsequently, this study answers the following research questions in the context of developed and developing countries:

i. How do financial development and institutional quality play an important role in reducing income inequality?

ii. Does the interaction between institutional quality and financial development matter in influencing the finance-inequality relationship?

iii. How does income inequality in turn endogenously determine institutional quality?

1.7 Significance of Study

There are several significant contributions of this study to different audiences. This study contributes to reappraise the competing theories and empirics on the causes of income inequality in the context of advanced and developing economies. Specifically, this study would contribute to the literature gaps that most of the previous studies solely focused on the causes of inequality other than financial development and institutional quality[12]. By doing so, the findings of this study would expectedly reveal the importance of finance and institutions in mitigating income inequality in advanced and developing countries. Therefore, this contribution provides a hint to the academics and policymakers on whether they should consider financial development and institutional quality as part of the main causes of inequality.

Furthermore, the empirical assessment on the impact of finance on income gaps might result in different policy suggestions to advanced and developing countries. As aforementioned, the effect of financial development on income distribution might be dependent to the level or status of economic development of

[12] See Chapter 2, Section 2.6.2 for more details on the literature gaps.

the country (Greenwood & Jovanovic, 1990), which suggests a possible nonlinear effect of financial development on inequality. In light of this, the comparative analysis in this study could reveal the nonlinearity lied within the relationship between finance and inequality. The related findings are expected to fill up the literature gap where a relatively large number of studies have only looked upon the sampled countries in aggregate terms.

Last but not least, this study adopts the System Generalized Method of Moments (System GMM) estimator for estimating the relationship between income inequality and its macroeconomic determinants. The employment of system-GMM is excellent for capturing the complex simultaneity and endogeneity within the macroeconomic variables via instrumental variable technique, which is the best alternative for this study. Additionally, the choice of this sophisticated method might resolve the issue of inconclusive findings in the literature that is due to the use of various estimation methods.

1.8 Chapter Layout

Remaining sections of the thesis is as follow. Chapter 2 reviews the relevant theoretical and empirical studies of income inequality. Chapter 3 elaborates the methodology and research design. Chapter 4, 5, and 6 perform the data analysis that corresponds to the first, second, and third research objective, respectively. Chapter 7 concludes and provides implications of the study.

CHAPTER 2

LITERATURE REVIEW

Although the issue of income inequality is recently drawing attention from policymakers, economists, media, and the public again, this issue is not novel. Income distribution has been extensively studied since the mid-18th century until today. Vast evidence under both theoretical and empirical lens has tried to reveal the origins of inequality and its consequences to the society (Gallo, 2002; Heshmati & Kim, 2014).

The organization of Chapter Two is as follows. Section 2.1 reviews the history of discussion and debate among different economic schools of thought on income inequality before the modern era. Section 2.2 discusses the modern views on income inequality, which embarks on the relationship between income inequality and income (economic) growth. Section 2.3 reviews on the past studies of finance-inequality nexus. Section 2.4 focuses on the recently emerging literature of institution-inequality nexus. Section 2.5 discusses the roles of institutions in the inequality-finance relation, and Section 2.6 summarizes and identifies the gaps of literature.

2.1 Income Inequality: The History

The literature of income inequality can be dated back to the era of Adam Smith, which, in his *Wealth of Nation*, inequality is taken as granted and the primary concern is put toward economic growth. Smith's (1776) philosophy is that, as long as the size of the pie (the welfare) is growing, then everyone in the society can get a piece from the big pie that will grow proportionately with economic growth. However, even though his main concern was economic growth, he pointed out that the value added is distributed in the forms of wages, profits, and rents, which are earned by workers, capitalists, and rentiers, and he embryonically discussed the conflict between capitalist and workers for the wage determination. He believed that the steady-state level of wages will always be set at the subsistence level due to the greater bargaining power of capitalists as the wage setter. Later, Ricardo (1815) demonstrated that the output will be distributed between rents and wages but the rate of profit is nil at the steady state of the economy. Finally, Marx (1953, originally 1862-1863) introduced the theory of 'surplus value' to the conflict among the three classes. The German philosopher and socialist argued that capitalists' profits rely on the surplus value that capitalists manage to exploit from the productions of workers due to the greater bargaining power of capitalists relative to workers.

With the rise of the neoclassical or marginalist school of thought in the 1870s, the focus of economic analysis changed drastically from the analysis of output and distribution to the analysis of exchanges among individuals that incorporates the problem of scarcity and utility maximization. In terms of wage determination, the level of wages depends on the interaction between labor demand and labor supply. Wicksell (1893) showed that, given a production function and perfectly competitive market, the equilibrium level of wages and rents are equal to their respective marginal productivity. It immediately follows that income inequality is merely a result of the differences in the individual contribution of each productive factor to the output. As the productive factors are paid accordingly to their contribution to production, income inequality is no longer an issue that needs to be addressed explicitly. The implication of the neoclassical view on income inequality coincides with Smith's philosophy that the primary goal should be production growth and poverty. This view has been advocated by a group of economists, which includes Robert Lucas, who quoted vividly that:

> "*...Of the tendencies that are harmful to sound economics, the most seductive, and in my opinion the most poisonous, is to focus on questions of distribution ... The potential for improving the lives of poor people by finding different ways of distributing current production is nothing compared to the apparently limitless potential of increasing production...*"
>
> (Lucas, 2004, May, pp. 20).

Gallo (2002) and Guidetti and Rehbein (2014) categorized the type of income inequality discussed in Smith, Ricardo, and Marx as *functional* income inequality, i.e.: income distribution among different social classes, while the income inequality mentioned in marginalists view as *personal* or *size* income inequality. At this point, the conjectures from the pioneers of classical school and marginalists' school of thoughts have each caught a part of the story of inequality.

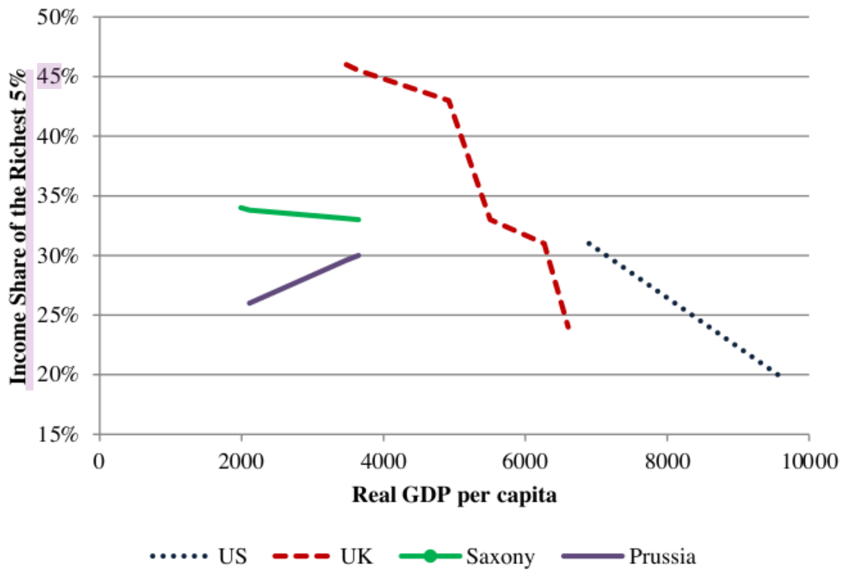
2.2 Modern view on Inequality-Growth nexus

Kuznets (1955) developed the first empirical contribution to the modern economic literature of income inequality. In this seminal work, the author found that the income gap tends to be widened in the early stages of economic development when countries undergo industrialization, and then the gap is narrowed in later stages of economic development as capitalism matures. By using the historical data of the U.S., the U.K., and German (East and West German), Kuznets (1955) showed that the then developing Prussia has an increasing trend of top income shares against real GDP growth, whereas the income shares of the richest 5 percent in the developed U.S. and U.K. are declining with economic growth. Figure 2.2.1 below portrayed the data plot used in the original work of Kuznets (1955).

This conjecture is exactly the famous inverted U-shaped curve of income inequality against income per capita, or commonly known as the Kuznets curve.

Since then, the Kuznets curve has been heavily contested by succeeding works, both theoretically and especially empirically.

Figure 2.2.1: Income Inequality data in Kuznets (1955)



Source: Income shares from Kuznets (1955); Real GDP data from the Maddison Project by Bolt and van Zanden (2014).

2.2.1 Effect of Growth on Income Inequality: Kuznets' view

Albeit Kuznets (1955; 1963) did not develop a theoretical framework for his inverted U-shaped hypothesis, and that he repeatedly warned about the "fragility of the data"[13] in his thesis, economists have long appraised his hypothesis to the level of economic law and it has remained as the center of the debate for more than four decades (Gallo, 2002). The first important study that supports the Kuznets

[13] The study in year 1955 based on only three countries, namely U.S., U.K., and Germany.

curve is Paukert (1973), whose analysis has included 56 countries as the sample. The author revealed that the income disparity increases sharply as the country moves up from the group of less than \$100 to the group of \$101-\$200 and it increases further but less sharply to the group of \$201-\$300 and \$301-\$500. There is a clear reduction of inequality when the country moves further up to higher income levels, especially in the group of above \$2,000. These findings, therefore, agreed with the inverted-U hypothesis. Soon after that, Ahluwalia (1976) formed another pro-Kuznets curve finding. Based on a cross-sectional sample of 60 countries, Ahluwalia (1976) found a non-monotonic U-shaped relationship between income shares of five different percentiles and the growth of GNP per capita, where income shares of all percentiles, except the top 20 percent group, decline initially and rise later as the GNP per capita increases.

The arrival of the cross-country evidence above had made the inverted-U hypothesis an economic paradigm in the 1970s, even though the respective empirical results are associated with several deficiencies. In this regard, Saith (1983) challenged the arguments of Paukert (1973) and Ahluwalia (1976) from a methodological point of view. First, Saith (1983) argued that these studies have little in common with Kuznets' studies as Kuznets (1955) focused on the rich while these studies focused on the poor (bottom 20% or 40% of the population). Second, Saith (1983) criticized the estimation of a single inverted U-shaped curve to represent both developing and developed countries. He opposed Ahluwalia's view that the development stage of the advanced economies reflects the future position of the developing countries as each country has its own social and economic profile that are heterogeneous. In fact, the Kuznets curve no longer holds when Saith (1983) restricted the observation to the same 41 developing countries in Ahluwalia (1976), in which he concluded an inverted L curve could provide a better fit to the relationship between inequality and growth. Ahluwalia, Carter, and Chenery (1979) also found similar results by using a sample of 36 developing countries. Their intertemporal evidence showed that all countries had experienced the initial inequality widening phase of the Kuznets curve, but little evidence for countries at higher income levels that show improvement in narrowing the income gap. These findings suggest that, in the case of poor and developing countries, an inverted L curve could be better than an inverted U curve in depicting the shape of relationship between income inequality and growth.

Apart from the context of low income or developing countries, the debate was extended to developed countries as well. According to Kuznets' view, the relationship between income inequality and economic development for developed countries should follow the declining stage of the inverted U curve. For example, it would be "reasonable" to expect that the US economy would lie on the right-hand side of the Kuznets curve due to its advanced economic nature. However, Ram (1991) disagreed with the Kuznets curve with the use of time series data in the U.S. His results rejected the hypothesis of a decline in income inequality even the U.S. has already reached such a high level of economic development, which suggests that the inverted U-shaped curve is a poor fit to the relationship between economic development and income inequality. Nonetheless, he reserved that using data from 1947 to 1988 might not be sufficiently long to represent the full trend of the Kuznets curve. Still, his work has the merit of avoiding the issue of dealing with country heterogeneity. In the context of other advanced economies, Mátyás, Kónya, and Macquarie (1998) documented that the income inequality in Denmark, Japan, and Sweden were increasing with economic growth instead of declining. Also, Johnson and Webb (1993) and Goodman, Johnson, and Webb (1997) reported that income inequality in the UK has recorded a historically unusual high level from 1977 onwards.

Anyhow, most of the cross-section evidence over the 60s to 90s period was standing for the inverted-U hypothesis. Additional early empirical evidence include Chenery, Ahluwalia, and Bell, (1974), Chenery and Syrquin (1975), Ahluwalia et al. (1979), Papanek and Kyn (1986, 1987), Campano and Salvatore (1988), Ram (1988; 1995), Tsakloglou (1988), Bourguignon and Morrison (1990), Anand and Kanbur (1993), Dawson (1997), Eusufzai (1997), and Mbaku (1997). Notice that, none of these cross-country studies tested Kuznets hypothesis directly as suggested by Kuznets (1955) himself[14]: that income inequality would first follow an increasing trend and later decrease as income grew *within* countries. That is, if there are factors that would determine the income distribution in a specific country, individual country characteristics might explain the cross-sectional pattern rather than a Kuznets process alone.

[14] In fact, Kuznets (1955) urged for large quantity of single-country studies to test whether his inverted-U hypothesis is valid.

Another methodological limitation of the cross-country studies would be the comparability issue. Given the differences in recipient unit choices, sampling techniques, geographic coverage, definitions adopted, measurements, and design of household survey, the resulting cross-sectional evidence do not provide sensible comparison among other studies (Gallo, 2002). To address this problem, Jha (1996) used an expanded data set up to the 1990s and found that country-specific characteristics explained most of the changes in income inequality rather than the data comparability issues listed above. Fields (1988) assessed the lessons learned from the previous studies that have used cross-sectional data, time series data, and microdata and concluded that there exists no predetermined pattern for the relationship between income inequality and the rate of economic growth. Besides, Fields (1988) reviewed the studies that include structural and policy factors as additional determinants of income distribution on top of economic growth. The results indicated that income distribution is associated to factors including formal education, government intervention, population growth, urbanization, and the ratio of agricultural sector contribution to the aggregate production[15]. A few years later, Fields (1991) confirmed his previous finding that it is not growth per se but it is the nature of economic development that primarily determines the level of income inequality. Specifically, Fields (1991) claimed that the effect of economic growth on changes in income inequality depends on certain country-specific characteristics such as the composition of production, the degree of economic dualism, the unemployment structure, the distribution of land and natural resources, the

[15] The studies reviewed by Fields (1988) include Chiswick (1971), Adelman and Morris (1973), Chenery and Syrquin (1975), and Ahluwalia (1976).

operation of capital markets, and the level of human capital. Further support to this view is given by Mátyás et al. (1998), who argued that GDP per capita is not a significant factor of income inequality in two panels of 47 and 62 countries, but rather the country-specific characteristics such as social structure, political system, and natural resources could explain the changes in income inequality.

The arguments above regarding the methodological weakness of cross-country evidence imply the need for empirical evidence from single-country studies, which in turn require sufficient length of time series observations for the respective country. However, as the availability of time series data of income inequality is generally lacking in most countries and merely unavailable in least-developed countries, the expansion progress of time series evidence is disappointing. In the best case, most of the time series evidence concentrated on the North America or Europe region, of which the quantity of available time series data is rich. This problem remains until the first large scale cross-country panel data become available during the mid-1990s when Deininger and Squire (1996) constructed the panel dataset with sufficient observations to reveal the typical path of income inequality within countries.

With the aid of the Deininger and Squire data, scholars have found little or no support for the presence of Kuznets curve if they included country fixed effects in the regressions. For instance, Deininger and Squire (1996, 1998) found that majority of the countries have inequality patterns inconsistent with the Kuznets process. Savvidesa and Stengos (2000) showed that there is no significant relationship between income inequality and income per capita once controlling the country fixed effects, regardless of the measurement used for inequality. In the influential works by Barro (2000), he found that the level and quadratic term of income trend are statistically significant in the baseline model of Kuznets hypothesis, but the baseline model only provides a poor fit to the variation in inequality. The fit is improved only after the author included a few additional explanatory variables to the model[16]. A few years later, Barro (2008) has reached similar findings in the extended study of the relation and concluded that the Kuznets curve is stable until 2000.

Most of the empirical evidence reviewed so far is reached by using simple linear modeling techniques, which are common practice before the advent of sophisticated data analysis methods that are claimed able to overcome the inadequacy of a simple linear framework. These techniques include, but not limited to, cointegration techniques (Engle & Granger, 1987; Johansen, 1988; Pesaran, Shin, & Smith, 2001), threshold regression (Enders & Granger, 1998; Enders & Siklos, 2001), dynamic panel estimation (Stock & Watson, 1994), and the generalized method of moments (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998).

[16] However, this improvement of model fitting has to be interpreted with caution, as the author did not report the adjusted R^2. Hence, the increase of goodness of fit might be merely a result of adding new regressors to the model.

However, as Yang and Greaney (2017) highlighted, even the studies later have equipped with these advanced tools (Nissim, 2007; Chambers, 2010; Huang, Fang, Miller, & Yeh, 2015; Rubin & Segal, 2015, among others), they still report mixed results regarding the effect of growth on inequality due to different model specifications, datasets, estimation methods, determinants used, and the complex mechanisms involved in the relationship. For instance, by applying a semiparametric technique, Chambers (2010) found that higher growth tends to widen inequality in all countries over short-run and medium-run growth. In terms of a long run relationship, economic growth tends to reduce inequality in developing countries, while it tends to widen inequality in developed economies. Their results showed that the short run effect and long run effect of growth on inequality could be considerably different. In another cointegration analysis, Yang and Greaney (2017) demonstrated that the long run relationship between growth and inequality is significant, while the short run dynamics are insignificant at all. Moreover, they suggested that the shape of the growth-inequality curve in the U.S., China, Japan, and South Korea follows an S-shape pattern rather than the inverted-U shape. More recently, Younsi and Bechtini (2018) adopted the panel cointegration approaches of Pedroni (1999) and Kao (1999) in their study of the growth-inequality relationship in BRICS countries over the period of 1990 to 2015. The findings in Younsi and Bechtini (2018) strongly supported the Kuznets hypothesis in the context of BRICS countries. In another study employing panel data approaches, Sayed and Peng (2020) found that the relationship curve between economic growth and income inequality appears to be N-shaped (rather than the inverted-U shape) in the US, UK, France, and Germany for 1915 to 2014.

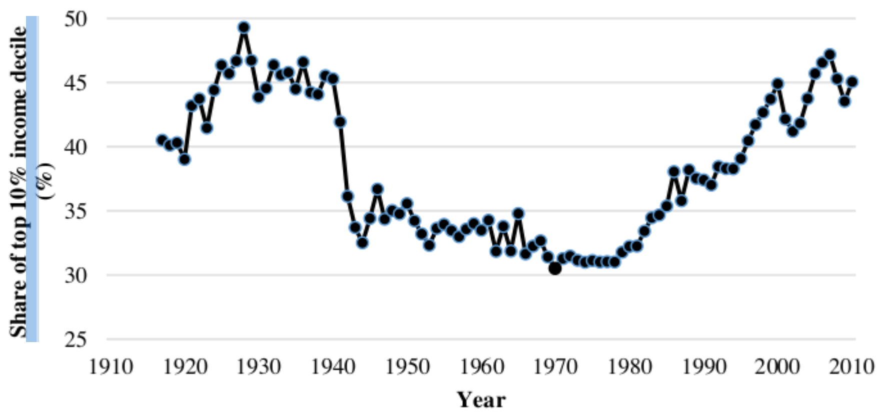
Apart from the previous findings, some recent works believed that there exists a monotonic association between income growth and inequality. Using an overlapping generation model, Nissim (2007) simulated that as an economy is growing and capital stocks are accumulating, the majority of the labors from the working classes will mobilize to the jobs from the better categories and vacant those jobs from the lower classes, hence helps to improve income distribution. On the contrary, Binatli (2012) reported evidence of a negative growth effect on inequality by treating growth volatility and human capital as determinants of inequality. Additionally, he found that higher growth volatility might widen income inequality all the time, but the magnitude of the effect of growth volatility decreases over time. In a study that utilizes US-state level data, Huang et al. (2015) asserted that there is a significant and positive long-run relationship between growth volatility and income inequality, and they showed that the long run effect of growth volatility is asymmetric, in which the positive effect is significant only during the episodes of positive economic growth.

2.2.2 Effect of Growth on Income Inequality: Piketty's view

The preceding discussions clearly showed that, after 60 years of investigation about the Kuznets hypothesis, there is no sufficiently solid and robust evidence to support the existence of the inverted U-shaped curve. At least, the 60-years accumulated knowledge shows that income inequality is not a natural consequence of a country's growth process as per se. Among the criticisms, the literature has provided some insight where country-specific characteristics such as political structure, economic institution, market structure, and level of development would determine the income distribution of the country. Nonetheless, although the literature has consistently rejected the inverted-U curve, there is no formal theoretical framework offered to explain the reasons behind it. Not until the introduction of the book of Thomas Piketty "*Capital in the 21st century*".

In his book, Piketty (2014) provided a detailed criticism of Kuznets' view. In particular, Piketty has constructed a Kuznets curve by using an extensive dataset of inequality that covers hundred years (1910 to 2010) for the three countries tested in Kuznets' (1955) paper (1913 to 1948). He proved that there is no automatic decrease in inequality during the later stages of economic development. According to the inequality evolution of Piketty's version (see Figure 2.2.2), the evolution of the top income decile in the U.S. shared the same pattern as in Kuznets' paper during the period of 1910s to 1950s. The income share then leveled out since the end of World War II until the early 1980s. However, when deregulation and privatization policies began to take place in the U.S. during the 1980s, the top income share skyrocketed. By looking at the 100-year data, the trend depicts a S-shaped rather than an inverted U-shaped curve. Piketty offered two explanations on the drastic increase in income inequality in the 1980s. The first possible reason is that the skills and productivity of the top managers of large firms in the U.S. rose suddenly relative to those of other workers. The second reason, which the author perceived as more plausible, is due to the unbounded power of these top managers in setting their own remuneration.

Figure 2.2.2: Income inequality in the United States, 1910–2010



Source: World Wealth and Income Database (2017)[17], Piketty (2014)

Apart from the length and detail of data covered, another prime difference between Piketty and Kuznets is the role of capital in determining inequality, which is also the central thesis in Piketty's book. Capital owners (typically in small numbers) who owned huge capital income can accumulate more wealth[18]. The sheer amount of initial capital can be invested and in turn enabled them to generate even greater capital and wealth. Greater wealth makes it possible to hire managers who possessed extraordinary know-how in portfolio management, which enhances the capital earning ability even further. In contrast, households who typically owned

[17] Previously known as 'The World Top Incomes Database'.
[18] Although it is arguable, Piketty assumed that capital and wealth are interchangeable in his work.

smaller amount of capital and wealth have less opportunities in terms of accessing to sophisticated investment vehicles and expertise, and ultimately can only make smaller returns on investments.

In other words, Piketti has reminded us about the exponential power of capitalists' returns through unbounded accumulation and inheritance of wealth, which is essentially a Capitalist's implication. As wealth is tend to be more unevenly distributed than labor income, it implies that most of the wealth is generated from the wealth itself rather than from labor in the long run, be it skilled or unskilled. Besides, wealth and capital tend to be increasingly concentrated in the hands of capitalists over time. It is because capitalists who owned larger stocks of wealth tend to enjoy higher rates of return on wealth comparatively to those who own less wealth. It is reasonable where the sheer amount of capital available enabled the investors or entrepreneurs to enjoy better return-to-risk tradeoff by accessing to more investment options and diversification (Piketty, 2014, p. 430–431).

Piketty pointed out that this exponential power was disrupted by World Wars I and II, which destroyed considerable amount of wealth in the world. Over the long run, however, the historical trend of income inequality indicates that the forces of accumulated capital and wealth are still at large. As wealth and capital tend to grow faster than labor-based wages, capital owners are likely the winners among all. Therefore, the richest individuals (capital owners) naturally possess greater influences on the direction of economic and political progression of a country, even if the country adopted democratic system. Piketty provided evidence of these trends of historical data and forcefully argued that it is due to the growth rate of capital (r) tends to be higher than the growth rate of income (g). In terms of policy suggestion, Piketty proposed a global system of progressive taxes on wealth to reduce income inequality and avoid most of the wealth falls in the hand of few elites.

Piketty's (2014) views have very soon received heated discussion and criticism. On the theoretical side, Stirati (2016), Ghosh (2014), Harcourt (2014), Taylor (2014), and Varoufakis (2014) questioned the capital controversy that was observed during the 1960s. In terms of empirical view, Rubin and Segal (2015) found evidence of a positive growth effect on income inequality in the U.S. during the post-war period (1953-2008). They argued that the high-income group received more wealth income and performance-based compensations than the low-income group when economic growth occurs, as both wealth income and pay-for-performance income (equity compensation) are more sensitive to growth than the hourly based wages. In an early study, Roine, Vlachos, and Waldenström (2009) investigated the effect of economic expansion on income inequality between top income deciles by using a panel dataset of 16 countries over the entire twentieth century. Their results showed that the top 1% income group is disproportionately beneficial from economic growth than the rest of the population. The authors also claimed that a progressive tax scheme will effectively reduce top income shares and if accounting for real dynamic effects.

More recently, Roikonen and Heikkinen (2020) tested on both Kuznets' and Piketty's hypothesis using the historical data of income inequality in Finland for 1865 to 1934. By utilizing both Gini coefficients and data of top income shares, Roikonen and Heikkinen (2020) asserted that the episode of rising income inequality associates the increasing rate of GDP per capita growth over the same window from 1871 to 1904 in Finland. However, the remarkable decline in income inequality after the WWI period (1904 to 1924) is mainly caused by economic and political shocks (including the aftermath effect of WWI, the Finnish civil war during 1917 to 1918, and the introduction of an income tax scheme with the highest marginal tax rate of over 50%) rather than the variation in economic growth. Based on these observations, Roikonen and Heikkinen (2020) argued that the Kuznets view fits well for the Pre-WWI period of rising income inequality in Finland, while the Piketty's hypothesis offers a better explanation on the declining income inequality after 1904.

Another study by Holcombe and Boudreaux (2015) examined whether income distribution is related to different market structures or institutions. By using the data of economic freedom index and two datasets of income inequality, the author reported ambiguous findings. When the top income data is in use (as in Piketty, 2014), the author found a significant relationship between the market institution and income distribution, where a freer or more capitalist-like market tends to increase income inequality. However, when the World Bank data of Gini coefficient is employed, the relationship turns to be insignificant. Holcombe and Boudreaux (2015) explained that these different results might be due to the different coverage of countries in the two datasets. Nonetheless, the author warned about the possibility that the result could be sensitive to the type of inequality data and measurement used.

Conclusively speaking, the heated debate during the half century from the 1960s provided several important lessons regarding the inequality-growth nexus. The first strand of studies concerns the effect of income growth or economic development on income inequality. After six decades since the publication of Kuznets' hypothesis in 1955, scholars attempted to examine and re-examine the same question: Is there a Kuznets curve? The answer is, unfortunately, no. Except for the early findings during the 1960s and 1970s, most of the empirical studies found no solid evidence for the existence of the inverted U-shaped curve. The recent emergence of Piketty's view in 2014 has offered the literature a new angle to look at the old issue. However, it is too soon to draw any consensus from his view. Furthermore, the existing evidence remains diverse for generalizing a definite conclusion on the nature of the growth-inequality relation.

Nonetheless, the literature agreed that the pattern of income inequality is not determined by growth *per se*. Past studies have identified several important factors that come to play when determining the change in income distribution, including country-specific effects, physical and human capital, political and market institutions, governance, asymmetric credit constraints, and initial inequality. In fact, numerous studies (see, for example, Barro, 2008; Huang et al., 2015; Holcombe & Boudreaux, 2015; Yang & Greaney, 2017) found that the growth effect on inequality is weakened when these factors are controlled for the estimation.

Methodological wise, the empirical outcomes are highly sensitive to the choice of estimation method, model specification, and most importantly, the quality of inequality data and proxy employed. Taking estimation methods, for example, the results from most of the early findings during the 1960s to 1990s are reached by using cross-sectional approaches, which tend to support the existence of the Kuznets curve. Once sophisticated methods and data of better quality and length are available in the mid-1990s, the general findings changed drastically. Even though the recent empirical evidence still produces mixed findings, however, the accuracy of estimation has improved over time.

2.3 The Inequality-Finance nexus

From the previous review of the income inequality-economic growth nexus, one may argue that the cause of rising income inequality is not due to growth *per se*. As pointed out by Rajan and Zingales (2004), a lower growth rate that is associated with increasing income inequality may be a consequence of relatively limited opportunities of the poor or low-income groups to accumulate human capital as compared to the rich. If individuals who had the skills and productivity to earn higher income that could help themselves to escape from the bottom, they might fail to do so due to the lack of economic opportunity to gain access to financial capital. This example is based on the intuition that, generally, the entrepreneurial ability of the poor is not likely to be realized if they do not have access to adequate financial capital. In contrast, the rich are free from this constraint, as most probably they owned sufficient stocks of financial capital to engage in productive activities. Therefore, the *opportunity* inequality between the poor and the rich could be one of the origins of rising income inequality.

In this regard, scholars including Becker and Tomes (1986), Banerjee and Newman (1993), Galor and Zeira (1993), and Greenwood and Jovanovic (1990) began to study income distribution by looking at both the distributional impact of economic growth and the distribution impact of economic opportunity, where the latter is commonly proxy by financial development level. However, and similarly to most economic theories, there exist contradict views on the impact of finance on income distribution.

The first strand of the contradiction predicts that a highly developed financial market might primarily benefit the wealthier populations, especially when the institutions are of poor quality (Rajan & Zingales, 2003). A possible explanation is that the financial system might favor the rich and well connected, who possessed higher credit ratings, higher ability and likelihood to repay debt, and hence channel money mainly to them while excluding the poor. As financial markets deepened, the financial sector would have more to offer to the rich, who have even better capacity to offer collateral due to their higher capital accumulation rate, and continue to reject the poor, who are still stucked at the initial condition and has insufficient resource to provide collateral. If this goes on, the poor are still unable to get the necessary funding for productive investment and remain poor even as the financial sector develops. This situation could get worse if the rich could prevent new borrowers from accessing financial services and in turn lower the chance where the poor to escape from the poverty. If this hypothesis holds, then there will be a positive link between financial development and income inequality. This is the so-called inequality-widening hypothesis of financial development, which is mainly backboned by the capitalist view (Demirguc-Kunt & Levine, 2009).

The second strand offers the opposite prediction. As financial markets mature, it will reduce financial intermediary costs and lower capital requirements and costs of borrowing, and hence ultimately ease the access to finance. Likewise, low-income households previously have no access to the financial service might be the main beneficiaries. Since the poor households cannot offer collateral initially can now access finance more easily, they can obtain funding for investment in human and physical capital or bear the capital requirement associated with entrepreneurial activities, which they are unable to do so without borrowing. In contrast, the high-income households might be less beneficial from the lower borrowing constraints, as they have better ability in investment that comes from their resources that is less dependent on the level of financial development. This is so-called the inequality-narrowing hypothesis of financial development (Demirguc-Kunt & Levine, 2009).

Theories hypothesized by Galor and Zeira (1993) and Banerjee and Newman (1993) predicted this narrowing hypothesis, suggesting that capital market imperfections and indivisible human capital investment might increase income inequality during economic development[19]. Specifically, Galor and Zeira (1993) constructed a two-sector model with allowing bequests between generations and assuming agents who make an indivisible investment in human capital can work in skill-intensive sectors. Given the presence of capital market imperfections, only individuals who owned sufficient bequests or who can borrow external funds can invest in human capital. Consequently, income inequality persists over time through bequests. Likewise, an economy with high initial inequality in wealth and capital market imperfections will grow with persistent income inequality and its growth rate tend to be slower than an economy with lower initial wealth inequality. Similarly, Banerjee and Newman (1993) constructed a three-sector model and assumed two high-return productive technologies that require indivisible investment. Given an imperfectly competitive capital market, only rich individuals can borrow enough to invest in these high-return technologies. Again, the model

[19] See Chapter 3, Section 3.1.1, for a detailed elaboration.

predicts that the initial pattern of wealth distribution of wealth exerts persists and becoming increasingly widen over time in the presence of capital market imperfections. All else being equal, countries with a more imperfect capital market system tend to have more unequal income distribution (Banerjee & Newman, 1993; Galor & Zeira, 1993). Consequently, these models expect a negative relationship between financial development and income inequality.

Offering different views on these theoretical predictions, Greenwood and Jovanovic (1990) proposed a model that combines elements from both perspectives[20]. In their model, individuals are entitled to invest in two technologies. The first opportunity is safe but returns are relatively low. The second technology offers higher but it is riskier. The agent can operate the risky technology only if they can sufficiently reduce the risk through cooperating with financial intermediary. As Townsend (1978, 1982) noted, these coalitions are associated with fixed entrance costs that prevent low-income individuals from entering. Since the poor generally save less and accumulate wealth at a slower pace, income gaps tend to be widen between the rich (those who joined the coalitions) and the poor (those who are outside the coalitions. This creates the widening phase of income inequality during the early stages of financial deepening. However, as the entrance cost to the coalitions is fixed, eventually all individuals will accumulate sufficient capital and be able to join these coalitions and operate the risky technology. Subsequently, this will lead to a reversal in the trend and create the narrowing phase of income

[20] See Chapter 3, Section 3.1.1, for a detailed elaboration.

inequality during the later stages of financial development. In short, Greenwood and Jovanovic (1990) modeled an inverted U-shaped curve for the relationship between income inequality and financial development, where income inequality would increase during the earlier stages of financial development, decrease afterward as more and more people could afford to join the intermediary coalition, and ultimately reach a steady state in the long run. This is so-called the inverted U-shaped hypothesis of financial development, and some authors termed it as the finance Kuznets curve (Clarke, Xu, & Zou, 2006).

Therefore, the inequality-narrowing hypothesis of finance (Banerjee & Newman, 1993; Galor & Zeira, 1993) and the finance Kuznets hypothesis (Greenwood & Jovanovic, 1993) dicussed aboved provided conflicting predictions on how financial development could influence income distribution. Turning to the empirics, similar controversies can be found within as well. Clarke et al. (2006) is probably the first notable empirical study that tested these conflicting theories on how financial development affecting income inequality. By using panel data covering 83 advanced and emerging countries over the period of 1960 to 1995, Clarke et al. (2006) examined the relationship between financial development and income distribution. They found that inequality is negatively related to financial development (measured by private credit and bank assets). The findings of Clarke et al. (2006) coincide with the early studies by Li, Squire, and Zou (1998), who showed that financial development significantly narrows income gaps in 40 advanced and developing countries over the period of 1947 to 1994. Similarly, Beck et al. (2007) employed panel data of 72 countries and period of 1960 to 2005 and again revealed an inequality narrowing effect of financial development. Moreover, Beck et al. (2007) showed that the negative relationship is stronger in countries with more matured financial intermediary system. They also showed that financial development disproportionately benefits more to the poor than the rich, thus improves income distribution. The evidence of robust inequality-narrowing effects is also found later by Mookerjee and Kalipioni (2010), Agnello, Mallick, and Sousa (2012), Johansson and Wang (2014), and Boukhatem (2016). Among these studies, Mookerjee and Kalipioni (2010), Johansson and Wang (2014), and Agnello et al. (2012) specifically addressed the effect of financial institutions rather than general indicators of financial sector development. By using a sample of 115 countries over the period 2000 to 2005, Mookerjee and Kalipioni (2010) documented that higher availability of access to financial service and lower barrier to financial service can reduce income inequality. Johansson and Wang (2014) attributed that repressive financial sector policy tends to worsen income distribution by observing 90 countries for the period 1981 to 2005. Similarly, Agnello et al. (2012) showed that financial reform through removals of repressive financial policies such as subsidized directed credit and excessively high reserve requirements and improvements in the securities market policy can improve income distribution.

Standing in sharp contrast, several empirical studies argued that financial development is pro-rich and inequality widening. Using a panel of 49 countries over the period 1994 to 2002 and various indicators for the banking sector and capital market development, Gimet and Lagoarde-Segot (2011) found that domestic banking sector development leads to more unequal income distribution while capital market development has a narrowing effect on income inequality. In the context of the EU, Rodriguez-Pose and Tselios (2009) showed that specialization in the financial sector positively correlated with income inequality. In a more recent study, Jauch and Watzka (2016) used an expanded panel dataset up to 138 countries for the period 1960 to 2008 to examine the link between financial development and income inequality. The authors found a robust and significant positive relationship between financial deepening and income, after controlling for country fixed effects, endogeneity, GDP per capita, and some other control variables. Moreover, the authors found that all income groups are benefited from financial development, but those richer disproportionately gained more than those fall within the lower-income ladder.

Apart from the studies that support linear hypotheses, some recent evidence suggests that the finance-inequality relationship is nonlinear. In a study of top income shares in 16 OECD countries, Roine et al. (2009) documented that the top 1% income group benefited the most from financial development and the pro-rich effect is strongest during the lower stages of economic development of the countries. By using a threshold regression model and a dataset of 65 countries over the period 1960 to 2005, Kim and Lin (2011) found a nonlinear threshold effect within the finance-inequality relationship. Specifically, development in both the banking sector and stock market sector tend to hurt the low-income groups more and widen the income gap when the country has yet to reach the critical threshold level of financial development. Beyond this turning point, however, financial development begin to disproportionately help the poor and hence improves income distribution. In other words, Kim and Lin (2011) found evidence of a finance Kuznets curve for the relationship that takes form of an inverted U-shape. Similar finding of a finance Kuznets curve is reached in Hamori and Hashiguchi (2012) as well. Based on an unbalanced panel dataset of 126 countries over the period of 1963 to 2002, the authors found that financial deepening has a direct and significant negative effect on inequality. However, the interactive effect of financial deepening and economic growth showed that this negative effect diminishes as the economy grows, indicating that the effect of financial development on income distribution can be asymmetric. Turning to the Eurozone, Baiardi and Morana (2016; 2018) found evidence supporting the existence of a finance Kuznets curve across 19 member states of the Euro area over the period 1985 to 2013. Similarly, Nguyen et al. (2019) also found an inverted-U shaped curve for the relationship between financial development and income inequality within a group of 21 emerging economies for 1967 to 2017.

In sum, these studies showed strong support for the inverted U-shaped hypothesis of Greenwood and Jovanovic (1990). Tan and Law (2012) also found evidence of a threshold relationship between financial development and income inequality. However, they argued that the nonlinear relation is U-shaped in developing countries. A similar finding of a U-shaped finance-inequality relationship is also documented in Park and Shin (2017), who modeled the relationship using a panel sample of 162 countries and 42 years (1960 to 2011). The evidence of a U-shaped finance-inequality relationship implies that any development of financial systems helps to reduce income inequality before it reached the threshold level, but once the development exceeds the optimal level, further development would widen the income gap.

Apart from the multi-country studies, some authors focus on country-specific evidence. By adopting an autoregressive-distributed lag (ARDL) framework, Shahbaz and Islam (2011) found a negative relationship between income inequality and financial development but a positive relationship between financial instability and income gap in Pakistan. On the other hand, Destek, Sinha, and Sarkodie. (2020) examined the impact of stock market development and banking sector development on income distribution in Turkey. The authors found a nonlinear inverted-U shaped relationship between income inequality and banking sector development but a linear and negative relationship between income inequality and stock market development. Similarly, Bittencourt (2006) analyzed the relationship in Brazil and concluded that financial sector development generally improves equality. Bahmani-Oskooee and Zhang (2014) estimated an error correction model for each of the 17 countries to examine the finance-inequality relation, Among the 17 countries examined, they found that financial development exerts an equalizing effect on income distribution for 10 countries but widening effect for another 5 countries in the short run. In terms of the long run effect of financial development, only 3 countries are observed with inequality-narrowing effect, while the rest showed an insignificant or positive effect on income inequality.

In the Asia-Pacific region, Jalil and Feridun (2014) examined the long-run relationship between financial development and income distribution in China over the period of 1978 to 2006. The results indicated that financial development tends to decrease the level of income inequality. Their results confirmed the earlier finding by Liang (2006a, 2006b), who found similar results using provincial data of China over the period of 1986 to 2000. The evidence above tell that the finance-inequality relationship in China appears in a linear fashion. However, Zhang and Cheng (2015) argued that there exists a finance Kuznets curve in China, where financial development would increase income inequality during the earlier stages of development and decrease income inequality upon the mature stage of development[21].

Apart from China, Ang (2010) and Sehrawat and Giri (2015) on the finance-inequality relation in India. Both authors estimated an ARDL model for their analysis, but their findings contradicted each other. Ang (2010) covered the observation period from 1951 to 2004 and found that financial development significantly improves income distribution in the long run, but financial liberalization worsens income distribution. However, Sehrawat and Giri (2015)

[21] Note that the authors used certain unconventional indicators to measure financial development in China.

asserted that financial development enlarges income inequality in the long run as it hurts the poor and benefits the rich. Nonetheless, both pieces of evidence do not support the nonlinear hypothesis of Greenwood and Jovanovic (1990).

In the context of Southeast Asia, Motonishi (2006) found that financial development promote a more egalitarian distribution of income in Thailand over the period of 1975 to 1998. Using an ARDL model and different measures of financial development, Law and Tan (2009) suggested that financial development in Malaysia generally does not exert significant effect on income inequality for 1980 to 2000. Following a new angle, Ibrahim (2018) revisited the inequality-finance relationship by looking at the impact of the size of financial sectors. The author documented a U-shaped quadratic relationship between income inequality and the size of financial sectors in four Southeast Asia countries, Hong Kong, India, Japan, and South Korea.

Briefly speaking, the reviews in this section demonstrate that financial development played some important roles in determining income distribution. However, as several theoretical frameworks provide contradictory hints on the relationship between financial development and income inequality, empirical studies have reached different evidence on the nature of this relationship across various empirical settings.

Apart from the direct effect of finance on income distribution as described in Banerjee and Newman (1993), Galor and Zeira (1993), and Greenwood and Jovanovic (1990), promising works such as King and Levine (1993a,b) suggested that financial development and economic growth are endogenously linked and hence implied the possibly complex interactions among finance, growth, and income inequality. Even though there is yet a rigorous framework for describing the dynamic interactions among finance, growth, and inequality, it is still too costly to ignore the endogenous interactions and solely focus on the direct effect. Therefore, finance and growth should not be separated when one intends to assess their impact on inequality.

2.4 Relationship between Income Inequality and Institutional Quality

This section reviews the studies on the relationship between income inequality and institutional quality. While there is a large number of studies focused on the relationship between institutions and economic development (see, for example, Knack & Keefer, 1995; Hall & Jones, 1999; Acemoglu et al., 2002; 2005 Rodrik, Subramanian, & Trebbi, 2004), the studies that discussed on the linkage between institutional quality and income distribution remained scarce.

However, the literature has already stressed the importance of institutional quality in determining income distribution since the early 90s. For instance, Sen

(1981, 1984, 1999) argued that the degree of poverty in an economy depends primarily on the overall institutional effectiveness of that economy in allocating resources to the poor and the needy equitably and efficiently. Poor institutional strength in terms of lacking equality or efficiency will result in poverty incidence. Moreover, Rodrik (2000) mentioned that the creation of laws might favor the private optimum of certain social groups rather than the social optimum of all individuals if weak institutions are in place.

Chong and Calderón (2000a) is the first study that empirically investigated the effect of institutions on income distribution. By observing 105 countries that covered the period of 1982–1995, their cross-sectional evidence displayed a quadratic relationship between institutions (measured using a composite index) and income inequality. Specifically, a better institution will lead to higher income inequality for poor countries, while the same improvement in institutional quality will decrease income inequality for rich countries.

Instead of looking at the effect of the composite institution, some authors examined the linkage between a specific dimension of institutions rather than the overall institutional quality on the level of income inequality. Interestingly, one would quickly notice that the linkage between corruption and income distribution has drawn the most attention within this strand of studies as compared to other aspects of institutions. For instance, Li, Xu, and Zou (2000) found an inverted U-shaped relationship between corruption on inequality for 47 countries and the period of 1982−1994, in which the finding is similar to Chong and Calderón (2000a). Besides, they found that corruption alone could explain a large portion of the variation in income inequality differential between developing and advanced economies. Similarly, Gupta, Davoodi, and Alonso-Terme (2002) reported that an increase of one standard deviation in the corruption index would lead to a higher Gini index by 11 points. Using alternative measures of institutions, Tebaldi and Mohan (2010) found that robust control of corruption, effective governance, and a stable political environment is effective in reducing income inequality. Dincer and Gunalp (2011) investigated the effects of corruption on income distribution in the U.S. By using alternative measures of income inequality and corruption index, they found a robust positive effect of corruption on income inequality, suggesting that poor institutions might weaken income distribution in developed countries. Using the data of 34 OECD member states over the period 1995 to 2011, Policardo, Carrera, and Risso (2019) documented a two-way causality running between corruption and income inequality, with significant and positive effects in both directions. Their result of a feedback effect between corruption and income gap suggests that the possibility of a corruption-inequality trap (Chong & Gradstein, 2007).

Nonetheless, some studies documented strong evidence against the inequality-worsening effect of corruption. In other words, these studies imply that higher level of corruption *helps* to reduce income inequality rather than widen the gap. The first empirical evidence showing a negative relationship between degree of corruption and income inequality is documented in Dobson and Ramlogan-Dobson (2010), who showed that a higher level of corruption improves income distribution by observing a small group of Latin America countries. The authors argued that the large size of informal sectors might explain the trade-off between corruption control and income disparity in these Latin America countries, and later formally examined the linkage between corruption, income inequality, and the informal sector using an unbalanced panel of 113 countries (Dobson & Ramlogan-Dobson, 2012). The result from the latter reveals that the size of the informal sector causes corruption to be less harmful to income distribution. Similar findings are also found in Chan, Dang, and Li (2019), who examined the corruption-inequality relationship in China, and Berggren and Bjørnskov (2020), who also examined the effect of de facto judicial accountability on income inequality by observing 145 countries and a 54-year period.

From another perspective, scholars have questioned the possibility that institutional quality is actually endogenous. An emerging body of literature has focused on building analytical frameworks to show how political and economic conditions affect the institutional quality (Glaeser, Scheinkman, & Shleifer, 2003; Sonin, 2003; Hoff & Stiglitz, 2004). In particular, there are two major strands of thought in the literature attempted to explain the mechanism of which social polarization and unequal income distribution in affecting institutions.

The first strand emphasizes the unproductive rent-seeking behavior[22] of the agents. For example, Glaeser et al. (2003), who is inspired by the Russian transition, have formulated a micro model to explain the linkage between high inequality and poor institutions. The authors argued that the rich and the politically influential agents in an economy could corrupt the political systems. Then, these politically strong agents expect to prevail in any legal dispute against them since the political institution is already low in accountability. Hence, uneven wealth and power concentration will lead to a corrupted legal system and narrowed property rights protection. In the same vein, Sonin (2003) argued that the rich and economic elite could influence the legal system to work in their favor by bribing the state authorities. This is more commonly recognized as a rent-seeking activity. Chong and Gradstein (2007) extended the work on this rent-seeking mechanism within a dynamic two-way causality framework running between institutional quality and income inequality, which will be discussed shortly (and see Chapter 3). The second strand focuses on the distributive effect of income inequality on society. A higher economic inequality will create distributive conflict within the society where people will feel unjust and unequal, which consequently leads to institutional breakdown. For example, extreme inequality is the driver of socio-political unrest (Figueroa, 1996; Svensson, 1998), weakening social cohesion (Easterly, Ritzen, & Woolcock, 2006), political instability (Agnello, Castro, Jalles, & Sousa, 2017;

[22] By definition, rent-seeking activity is interpretable as an investment in "private" (rather than public) protection of property rights. The rent-seeker will try to protect or gain additional resources through costly lobbying, bribery or activities alike.

Asongu & Odhiambo, 2020), and political violence (Muller & Seligson, 1987; Dutta & Mishra, 2005).

On the empirical side, the evidence that examines the determination of institutional quality is as scant as the theoretical counterpart. Among the few available studies, Easterly (2001) demonstrated that social polarization negatively affects institutional quality, implying that institutional quality is endogenously determined by political and economic conditions. Similarly, Keefer and Knack (2002) found that land and income inequality deterred property rights security (measured as a composite index) in their OLS model. Instead of using the least square method, Easterly (2007) has adopted an instrumental regression approach to overcome the endogeneity issue lied between institutional quality and income inequality. By using agricultural endowments as an instrumental variable, they found a robust negative relationship between income inequality and institutions. This result is in line with the earlier work of Easterly et al. (2006), who have employed a similar instrumental method.

The studies reviewed above have emphasized the one-way causation between institution and inequality; they focused on either the effect of institution on inequality or the effect of inequality on institutions. A seminal contribution of Chong and Gradstein (2007) has reached beyond the scope of one-way causality. By estimating GMM and panel VAR models, they found that large initial inequality induces weak institutional quality, and then the lagged values of institutional quality negatively cause inequality. This result provides strong empirical support to the bi-directional hypothesis between inequality and institution. Moreover, they found that the causality running from inequality to institutions appears to be stronger than its reverse causality. Spruk (2016) confirmed the second link of Chong and Gradstein (2007) by analyzing the long-term trend of political institutions and income distribution for almost two centuries (1810 to 2000). According to Spruk (2016), an economy with a poor political institution in term of a highly skewed distribution of political power tends to slow down economic growth, as the elites can extract rent from the rest of the society from this institutional setup, which ultimately leads to slower growth and failure to catch up with the high-income countries. Moreover, since institution quality tends to persist over time, the resulting income gaps among the poor and the rich countries tend to persist in the long run as well. Spruk (2016) showed that the long-run institutional persistency accounts for up to 67 percent of within-country development paths and up to 83 percent of cross-country development gaps. More recently, Policardo et al. (2019) documented a significant feedback effect between corruption and income gap among 34 OECD countries, suggesting that a higher degree of corruption reinforces income inequality and vice versa.

From the short discussion above, these studies of institutional economics generally suggested that a healthy institutional quality tends to associate with lower income inequality and vice versa. This notion remains largely true even with the impression that there might be a bidirectional causality between inequality and institution. If there exists causation running from income inequality to institutional quality as well, then the nature of this causation is negative, as higher inequality would lead to weaker institutions (Glaeser et al., 2003; Sonin, 2003; Chong & Gradstein, 2007). However, as this section only highlights the direct effect of institutional quality on income distribution, a better grasp of the overall impact of institutional quality can be shown by considering the mediating effect of institutions in the inequality-growth-finance nexus. The next section embarks on this broader review in detail.

2.5 The Roles of Institution in Inequality-Finance Nexus

While the previous section discussed the direct impact of institutions on income inequality, this section will address the indirect or interactive effect of institutions. Specifically, this section reviews the studies that focused on the intermediate roles of institutional quality in the inequality-growth-finance nexus.

The theoretical scaffolding behind this strand of literature mainly relied on the intuition that poor institution quality would first disturb the development in the financial system and economic growth, and subsequently affect income distribution. As aforementioned, there is a vast amount of evidence that supports the adverse effect of weak institutions on economic development. On the other hand, the study on the institutional effect on finance can be traced back to the seminal contribution of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997; 1998).

La Porta et al. (1997; 1998) presented two main contributions to the studies of financial development and legal institution. First, the authors proposed that a strong legal system would protect the right of outside investors from being exploited by the insiders (corporate managers and their alias), and hence promote financial development. Second, the authors demonstrated empirically that legal origins (e.g. English, French, or Roman) of a country systematically represented the strength of the legal protection of that country, and successfully predicted the level of financial development by using legal protection as determinants and legal origin as an instrument. Therefore, La Porta et al. (1997; 1998) have provided a formal theoretical foundation to link institutional quality (legal environment) with the financial development of a country.

Several subsequent studies have followed up the effort of La Porta et al. (1997; 1998)[23] in analyzing the link between institution and finance. For example, Beck et al. (2003) argued that both the legal systems brought by colonizers and the initial endowments in the colonies are significant in explaining stock market development and protection of private property rights. Haber and Perotti (2007) claimed that poor political institutions are the major hurdler for financial development. Similarly, Rajan and Ramcharan (2011) suggested that a weak

[23] The studies of legal origin has also extended to beyond law and finance. They are not discussed here as these studies beyond the scope of this study.

political and legal institution would discourage financial development as the groups with highly concentrated power can restrict the accessibility to financial markets, and this inverse relationship is significant in democratic countries as well.

Despite the potential interactions among these macro variables, there are only a handful of empirical studies closely examined these multi-faceted relationships. One of these studies is the work of Perera and Lee (2013), who questioned on how the strength of institutions and economic growth are linked with both inequality and poverty. By focusing on nine emerging economies in East and South Asia for 1985 to 2009, their system GMM estimations show that there is no significant linkages between economic growth and income distribution. Turning to the distributional effect of institutional quality, the authors found that the overall institutional quality, governmental stability, and rule of law are insignificant to explain income inequality as well. More surprisingly, the study also reached some interesting findings that improvements in control of corruption, democratic accountability, and bureaucratic quality tend to increase poverty levels and income inequality rather than improve them. The authors attributed these counterintuitive findings to the possibility that institutional improvements and reforms can come with huge transaction costs imposed on people, especially in developing and emerging economies. Similar arguments of a positive relationship between inequality and institutional reforms are also found in Chong and Calderon (2000a), Li et al. (2000), Dobson and Ramlogan-Dobson (2010; 2012), and Berggren and Bjørnskov (2020).

In a relatively unique study, Nadia and Teheni (2014) examined the relationship between inequality, finance, and institutional quality (governance) by using a nonparametric approach and a panel of 39 countries over 1996 to 2009. Based on the principal component analysis, the authors found a strong and positive relationship between quality of governance and financial development. In addition, better governance quality are essential condition for financial development especially in Latin America and the Caribbean region. On the other hand, the authors also found that improvements in governance would significantly reduce income inequality. In terms of the link between financial development and income inequality, the authors found a negative relationship between the two variables, but this negative relationship is significant only in 1998 and 2000.

Rather than studying income inequality, Cepparulo, Cuestas, and Intartaglia (2017) paid more attention to the joint influence of finance and institutions in reducing the poverty rate. Using the GMM approach and data of 58 developing countries over the period of 1984 to 2012, the authors found evidence where both financial development and improvement in institutional quality disproportionately benefit the lower income groups than those from high income brackets. Nonetheless, the results reveal a significant substitution effect between financial development and institutions. This implies that, in the context of developing countries, the development of financial sectors could weaken the poverty-reducing effect of better institutions and vice versa.

From another perspective, Law, Tan, and Azman-Saini (2014) questioned what constitutes the nonlinearity within the finance-inequality nexus as stated in Greenwood and Jovanovic (1990). By testing on 81 countries over the period from 1985 to 2010, their results from threshold GMM models suggested that institutional quality drives the nonlinearities within the finance-inequality nexus. Specifically, the results indicated a significant threshold level of institutional quality that governed the inequality-finance relation. For a country with institutional strength below the threshold, development in the financial sector has no significant effect on income inequality. When the institutional strength of the country has surpassed the threshold, financial development turns out to be significant in reducing income inequality. In other words, these findings implied that institutional quality could influence the relationship between financial development and income inequality.

One empirical implication from Law et al. (2014) is that there is likely an important interplay between financial sector development and institutional quality in determining the pattern of income distribution. A recent work by Adams and Klobodu (2016), who examined the finance and corruption on income inequality within the context of the Sub-Saharan region, has questions on this hypothesis. By using data of 21 African countries, the result of their pooled-mean-group (PMG) estimators portrayed that financial development relates positively to income inequality when holding all else constant, while better control of corruption would reduce income inequality over the period of 1985 to 2011. Furthermore, once the authors considered the interaction between financial development and control of corruption, the interactive term has a statistically significant and negative effect on income inequality over the long run[24].

Therefore, Adams and Klobodu (2016) reached similar findings as in Law et al. (2014), where institutional quality matters for the relationship between financial development and income inequality. Nonetheless, notice that these two studies used different indicators for institutions and different panel estimation methods. While Law et al. (2014) covered larger samples and composite index for institutional quality, Adams and Klobodu (2016) focused on the role of corruption only by using Sub-Saharan data. The smaller sample available in Adams and Klobodu (2016) also limits the choice of estimation method, in which the most sophisticated GMM technique used in Law et al. (2014) required a larger sample. Therefore, one has to be cautious when compare their findings.

In short, the importance of institutional quality in determining the interrelationships between inequality, financial development, and economic growth is undeniable. The roles of institutional strength played in the inequality-finance nexus include its interaction with financial development (La Porta et al., 1997; 1998, Rajan & Ramcharan, 2011; Cepparulo et al., 2017). Besides, several important studies revealed that institutional quality could affect income distribution directly (Chong & Calderón, 2000a; Gupta et al., 2002; Chong & Gradstein, 2007) or

[24] This effect is robust to alternative indicator of corruption control (transparency index).

indirectly as an instrumental variable of the nexus (Perera & Lee, 2013; Law et al., 2014, Adams & Klobodu, 2016).

2.6 Conclusions

2.6.1 Summary of Reviewed Studies

This section provides a summary of the reviewed studies and identifies literature gaps in the research of income inequality, financial development, institutional quality, and economic growth. Firstly, there are some major themes displayed throughout the history of economic inequality analysis. The first theme emerged during the period from the mid-1950s to 2000s, of which the theme concerns mainly on the income growth and its distributional pattern. This earliest strand of inequality analysis begins with the seminal work of Kuznets (1955), who proposed a hypothesis of nonlinear or inverted U-shaped trend for the relationship between income growth and income inequality. Following the Kuznets' curve, numerous studies attempted to test the inverted U-shaped hypothesis during this period. The findings are astonishingly mixed, and the validity of most of these findings is questionable in terms of data used and choice of methodology. As a result, the nature of the effect of income growth on income distribution is still debatable to date. Nonetheless, economic growth or income growth is one of the important factors in explaining income inequality as commonly seen in many empirical studies.

The first major theme of growth-inequality analysis does not reach a consensus on the existence of Kuznets' curve. However, one important lesson learned from these studies is that the determination of income inequality is not income growth *per se*. This notion has given rise to the second major theme of income inequality analysis that emerges since the late-1990s. The central thesis of this second theme is to analyze the mechanism of income distribution channels, rather than focus directly on the distributional effect of growth as what the first theme did. There are two subthemes under this broader theme that are worth taking note[25], namely the financial channel of income distribution and the institutional channel of income distribution.

The establishment of the financial channel of income distribution relied upon the general conditions of imperfect financial markets and the indivisibility of capital investment. Generally, individuals have to offer collaterals before they can enjoy the intermediary services offered by the financial sectors. However, as individuals have different endowments of initial wealth, not everyone has the leveled ability to offer sufficient collateral for accessing the financial market. As an underdeveloped financial market tend to associate with high entry fees, a poorly

[25] Other subthemes discuss on the role of, for examples, human capital and trade liberalization on income inequality. They are beyond the scope of detailed discussion in this study, but these will be included as controlled variables in the empirical models (see Chapter 3, Section 3.2).

developed financial market would discriminate against the individuals based on their ability to offer collateral. The rich who owned sufficient wealth can easily pay the entrance fees and accumulate their wealth at a higher rate through risk diversification and information pooling, while the poor remained outside the financial market. Consequently, a less-developed financial market tends to widen income inequality.

The intuitions illustrated above inspired some pioneering works for this theme, which include Galor and Zeira (1993), Banerjee and Newman (1993), and Greenwood and Jovanovic (1990). Interestingly, Galor and Zeira (1993) and Banerjee and Newman (1993) argued for a linear and negative relationship between financial development and income inequality, whereas Greenwood and Jovanovic (1990) predicted an inverted U-shaped hypothesis for the relation. This contradiction appears in empirical discussions as well. While some studies found support for the linear and negative link (Li et al., 1998; Clark et al., 2006; Mookerjee & Kalipioni, 2012; Agnello et al., 2012; Johansson & Wang, 2014), some studies argued that the linear relationship is positive (Gimet & Lagoarde-Segot, 2011; Jauch & Watzka, 2016; Adams & Klobodu, 2016), and some other studies reported evidence for the nonlinear hypothesis (Kim & Lin, 2011; Hamori & Hashiguchi, 2012; Baiardi & Morana, 2016; 2018).

Turning to the institutional aspect of income inequality, this strand of studies received relatively less attention in the literature than the study on growth-inequality and finance-inequality relations. Despite the small number of studies, there is very likely a strong link exists between institutional quality and income inequality of an economy. An economy with weak institutional quality tends to associate with poor income distribution, as the weak institutions failed to facilitate the optimal distribution of economic and political resources (and power) to its citizens. Several studies have documented the findings of a negative relationship between institutional quality and income inequality (Gupta et al., 2002; Tebaldi & Mohan, 2010; Dincer & Gunalp, 2011), although there are some argued for a nonlinear relationship between the two variables (Chong & Calderon, 2000; Li et al., 2000). On the other hand, some studies questioned the possibility that income inequality would in turn determine the quality of institutions (Glaeser et al., 2003; Sonin, 2003; Hoff & Stiglitz, 2004; Easterly et al., 2006). Given an economy with high initial inequality, those who possessed concentrated economic and political resources could further improvements in institutional quality, mostly through rent-seeking activities. Several empirical studies found evidence of the negative effect of income inequality on institutional strength (Easterly, 2001; 2007; Keefer & Knack, 2002; Spruk, 2016). Combining the one-way causalities above indicates that there might be a bi-directional causality running between institutional quality and income inequality. This has motivated the seminal work of Chong and Gradstein (2007), who theoretically and empirically demonstrated the existence of the two-way causality.

Later, some ambitious studies have considered income inequality, growth, financial development, and institutional quality altogether to obtain a fuller picture of their interrelationships. This handful of studies (Perera & Lee, 2013; Nadia & Teheni, 2014; Law et al., 2014; Adams & Klobodu, 2016) is closest to the spirit of this thesis, especially Law et al. (2014) and Adams and Klobodu (2016).

Finally, some methodological aspects of the literature on income inequality and institutional quality are worth taken note of. Firstly, the development and robustness of most early studies on inequality (especially those published before 2000) are constrained from serious lacking in data availability. There was no fundamental improvement in the data availability issue until the first systematically compiled panel database of income inequality was published by Deininger and Squire (1996, 1998). Similar data limitations occurred among the studies of institutional quality as well. Secondly, most of the early studies in income inequality adopted cross-sectional approaches. Data limitations mentioned above and insufficient lengths of time series data for individual countries are part of the reason behind this phenomenon. The employment of panel estimation techniques became common since the early 2000s, and it was getting sophisticated after the advent of panel GMM techniques by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998).

2.6.2 Literature Gaps

There are some relevant literature gaps identified from the literature review above:

1. After about sixty years since the publication of the Kuznets curve, the effect of income growth on inequality remained controversial. One of the reasons is that income growth or economic growth itself could not explain solely the pattern of income distribution. This indicates that the results from those past studies that attempted to explain income inequality by economic growth alone are misleading, or at best did not deliver the full picture of income inequality. Therefore, it shows that factors other than economic growth are important in the macro analysis of income inequality. These factors include financial development, institutional quality, and other controlled variables. This study will address this literature gap through the first and the second research objective.

2. The second literature gap is regarding the controversial predictions and mixed findings on the finance-inequality relation. Given the contradicted predictions from the inequality-narrowing hypothesis of finance (Banerjee & Newman, 1993; Galor & Zeira, 1993) and finance Kuznets hypothesis (Greenwood & Jovanovic, 1993), the nature of the effect of financial development on income inequality is thus an empirical question. However,

numerous empirical evidence did not reach a consensus on whether the linear hypothesis or the nonlinear hypothesis is dominant. Therefore, it is necessary to carefully examine the finance-inequality relation on a robust basis. Similarly, this study will fill up this literature gap by the first and the second research objective.

3. As discussed in section 2.5, institutional quality played critical roles in determining income inequality via its direct effect and its interactions with financial development. However, only a limited number of studies in the existing literature have examined the roles of institutional quality in explaining income inequality. Among the few exceptions, Law et al. (2014) assumed that there exists a threshold intuitional quality and treated it as an instrument for their inequality-finance regression. While their model has captured the role of institutional quality, it does not directly examine the interaction between institutional quality and financial development. On the other hand, Adams and Klobodu (2016) do examine the interaction and direct effect of institutional quality, but the samples used in this study are limited to the Sub-Saharan region and therefore might not be generalized to other regions. In this regard, this study will attempt to investigate the roles of institutional quality in the inequality-finance nexus by extending the effort of Law et al. (2014) and Adams and Klobodu (2016). The achievement of the second research objective will fill up this literature gap.

4. Next, the discussions in section 2.4 presented that income inequality could endogenously determine institutional quality. As this strand of studies is contradictory to the conventional assumption of exogenous institutions, the size of this strand of literature is considerably small and awaits for development. The third objective of this study will attempt to contribute to this literature gap.

5. The fifth literature gap identified related to methodological aspects in the study of income distribution, financial development, and institutional quality. As discussed above, most of the earlier findings are limited in terms of data availability and the use of less-sophisticated estimation methods. In this regard, the use of updated databases of income inequality and institutional quality as well as the employment of advanced panel estimation methods could overcome this issue. Therefore, this study will utilize the SWIID (2016) database for income inequality, the ICRG data for institutional quality, and the system GMM technique for estimating income inequality and institutional quality.

6. Lastly, as the stages of economic development matter for income distribution (Galor & Moav, 2004; Beck et al., 2007), it is fruitful to examine the income inequality for panel countries according to their development stages. However, this practice is far from common in the existing literature. Thus, this study will tackle this literature gap by

examining the income inequality of developed countries, developing countries, and the world panel as well.

CHAPTER 3

THEORETICAL FRAMEWORK AND METHODOLOGY

3.1 Theoretical Framework

This section elaborates on the relevant theoretical frameworks in accordance with the research objectives. As to complement the previous brief discussions in Chapter 2, this section focuses on the technical aspects of the theoretical linkage between income inequality and finance, as well as the theoretical relations between income inequality and institutional quality.

3.1.1 Income Inequality and Financial Development

As aforementioned, several theories provide different predictions on the linkage between income inequality and financial development. These competing theories suggested by Banerjee & Newman (1993), Galor and Zeira (1993), and Greenwood and Jovanovic (1993) are part of the reasons that lead to controversies in past empirical studies[26]. Broadly speaking, two major theoretical views describe the relationship between inequality and finance. The first strand stands on the linear hypothesis for the relationship (Galor & Zeira, 1993; Banerjee & Newman, 1993),

[26] See section 2.3 for more details.

while the second strand conjectures the nonlinear or inverted U-shaped hypothesis (Greenwood & Jovanovic, 1990) for the relationship between the two variables.

3.1.1.1 Linear Hypothesis on Inequality-Finance Relationship

As one of the pioneers of the linear hypothesis, Galor and Zeira (1993) developed an overlapping-generation model to capture the economic dynamics of wealth inequality. The authors built their equilibrium model in an open economy setting with an open bequest motive. In addition, the authors made two major assumptions for this economy that first, the credit market is imperfect, and second, investment in human capital is indivisible[27]. The investment in human capital requires initial outlay equals to h where $h > 0$. Since the credit market is imperfect, all borrowings from financial markets come with an interest rate i and i is always greater than the lending rate r.

In terms of production, two types of production technologies, i.e. the skilled-intensive technology or the unskilled-intensive process can be used to produce a consumption good.

All individuals in the economy (agent) live for two periods. The agents choose one out of two options for the investment decision. The agent who chooses the first option will invest in human capital during the first period and work as

[27] The authors borrowed the idea of indivisible investment in human capital from Becker (1975) and Atkinson (1975).

skilled labor during the second period. The agent who chooses the second option will work as unskilled laborers in both periods. At the end of the second period, the skilled agents will leave a large bequest whereas the unskilled agents will leave less and their offspring inherit less. As a result, even though agents are assumed homogenous in ability, but they are different in opportunity[28] depending on the wealth they inherited from their parents.

Consider now the skilled and unskilled agents supply their labor in a perfectly competitive market and earn skilled wages W_S and unskilled wages W_U, respectively, where W_S always greater than W_U. Assumed that an agent with wealth y will leave a bequest with size b to his or her offspring, with $b = y - c$ where c is the amount of consumption during the second period.

Agents now attempt to answer their individual optimization questions. Assumed that the utility function of the agent is as follow

$$\max\{U = c^{\alpha} b^{1-\alpha}\}, \text{ subject to } \quad y = c + b \tag{3.1.1}$$

where the optimal solution is $b^* = (1-\alpha)y$ and $U^* = \theta y$, with $\theta = \alpha^{\alpha}(1-\alpha)^{1-\alpha}$. Now, there are few different variants of the lifetime utility function governed by the choice of the agent with the assumption that the agent is initially

[28] The author emphasized that individuals are different in term of "opportunities" rather than "abilities" here.

inherited with an amoung of x. For the first variant, the agent prefers not to invest in human capital, the lifetime utility function can be expressed as follow:

$$U_U^*(x) = \theta[(x + W_U)(1 + r) + W_U] \tag{3.1.2}$$

For the second variant, the amount inherited is at least equal to the indivisible capital requirement for human capital investment ($x \geq h$) and the agent chooses to invest in human capital, the lifetime utility function appears as:

$$U_{SL}^*(x) = \theta[(x - h)(1 + r) + W_s] \tag{3.1.3}$$

where the balance of $x - h$ can be invested and earn return of r.

For the third and last variant, the amount inherited is less than than the investment requirement ($x < h$) and hence the agent chooses to invest in human capital with borrowing at rate i, the corresponding lifetime utility function is given by:

$$U_{SB}^*(x) = \theta[(x - h)(1 + i) + W_s] \tag{3.1.4}$$

The equations above provide several propositions. Equation (3.1.2) and (3.1.3) show that individuals will go for the path of skilled labor if and only if the lifetime utility gained from skilled laboring is at least equal to the lifetime utility gained from unskilled labor ($U^*_{SL} \geq U^*_U$). This proposition is analogous to the condition where

$$W_S - h(1+r) \geq W_U(2+r) \tag{3.1.5}$$

If condition (3.1.5) does not hold, then all individuals would prefer to avoid investment in human capital and work as unskilled. Based on Equation (3.1.2) and (3.1.4), those who have to borrow for human capital investment are willing to do so if and only if $U^*_{SB} \geq U^*_U$. The condition derived from this proposition is:

$$x \geq f \equiv \frac{1}{i-r}[W_U(2+r) - W_S + h(1+i)] \tag{3.1.6}$$

Condition (3.1.6) is interpretable as the initial condition for an individual to pursuit the path of being a skilled labor. It predicts that only individuals with sufficiently large amount of inital inheritance from the past generations will consider to invest in education and work as skilled laborers afterward, while others will remain unskilled when $x < f$. The lifetime utility equations above then lead to the determination of bequests in each generation. Let x_t represents the amount of inheritance passed to an individual who born at time t, the bequest that the individual will leave for the next generation at time $t+1$ can be written as:

$$b(x_t) = \begin{Bmatrix} (1-\alpha)[(x_t + W_U)(1+r) + W_U] & if\ x_t < f \\ (1-\alpha)[(x_t - h)(1+i) + W_S] & if\ f \leq x_t < h \\ (1-\alpha)[(x_t - h)(1+r) + W_S] & if\ x_t \geq h \end{Bmatrix} \tag{3.1.7}$$

Equation (3.1.7) has some important implications in terms of wealth distribution. It shows that the initial wealth distribution and the choice of human capital investment do not only matters for the short run (one-period), but it does matter for the long run equilibrium of income and its distribution as well. This in turn implies that the initial wealth inequality would persist over generations through bequests motives. Consequently, there will be a bi-polarized distribution of wealth that increasingly widen the wealth gaps between the rich and the poor in the long run. As coined by Galor and Zeira (1993), the wealthy individuals and families will converge to a high-income steady state and create rich-dynasties over generations, while the less-fortunates will converge to a low-income steady state and create poor-dynasties that persist over time.

When the individual decisions are generalized to aggregate economic activity, the current level of income inequality is dependent on historical income inequality. In other words, the income distribution of the nation is related to the proportion of rich and poor families in the nation. If there are no relevant exogenous shocks, the divergence of wealth accumulation between the rich and the poor is persistent through generations.

In a separate study, Banerjee and Newman (1993) reached similar conclusions as in Galor and Zeira (1993). Given the similar adoption of an imperfect credit market, Galor and Zeira (1993) focused on the roles of human capital and initial wealth on income distribution, while Banerjee and Newman

(1993) emphasized the relationship between occupational choices and income distribution.

The initial setting of agents' behavior in Banerjee and Newman (1993) is similar to Equation (3.1.1). Assuming all agents are risk-neutral. Their preference over the consumption goods are $c^{\alpha}b^{1-\alpha} - z$ where c is the agent's consumption during period t, b is the bequest left to the next generation during period t + 1, and z is the total labor supplied. Each agent then has a lifetime utility of $\delta y - z$, where y denotes income realization and $\delta = \alpha^{\alpha}(1-\alpha)^{1-\alpha}$.

Next, the open economy model has three distinct production or investment technologies. The first technology is a passive, divisible and low-risk investment that gives a fixed gross return $\hat{r} = 1/(1-\alpha)$. The second technology involves a risky and indivisible investment that required an initial investment of size I and one unit of labor. The project bears with a random return of rI, where $r = r_0$ with probability $1-q$ or $r = r_1$ with probability q and $0 < r_0 < r_1$. The third technology is similar to the second technology in terms of risk level and return, but it permits aggregate production where an entrepreneur can employ and monitor $m, m > 1$ number of workers to operate the project at a competitive wage v. This aggregate production will yield similar random returns as in the second technology such that $r' = r$.

There are four occupational choices in the economy. Agents who invest in safe technology choose to be idle, where they only intend to satisfy their subsistence with no labored effort. Those who choose to participate in the operation of the aggregate production make the second choice of being a worker. Agents will choose to work as long as the competitive wage $v \geq 1/\alpha$ or else they rather be idle. The third occupational choice is to engage in self-employment through investing in the second technology. This option is feasible so long as the agent enjoyed a production of

$$I(\bar{r} - \hat{r}) - (\frac{1}{\alpha}) \geq \max\{0, I(r_0 - \hat{r})\}.$$

Finally, the entrepreneurs choose to employ μ workers to run aggregate production. With identical random returns, however, the entrepreneurial technology is more profitable than the self-employment as

$$\mu\left[I(\bar{r} - \hat{r}) - (\frac{1}{\alpha})\right] \geq \max\left\{I(\bar{r} - \hat{r}) - (\frac{1}{\alpha}), I(r_0' - \hat{r}) - (\frac{1}{\alpha})\right\}.$$

Assuming that each agent has an initial wealth w that distributed with function $G(w)$, where w can be used as collateral for borrowing. Note that agents need to borrow only when they want to finance the capital requirement of self-employment (I) and entrepreneurship (μI). A wannabe self-employed with $w < I$ will be able to borrow I if he or she can offer a minimum wealth $w^* = I - (\pi F/\hat{r})$ as the collateral, where π is the probability of being caught when default and F is the nonmonetary punishment of the fleeing. Similarly, the minimum wealth required for borrowing the capital of entrepreneurship is $w^{**} = \mu I - (\pi F/\hat{r})$.

Now, given the conditions above, the determination of the equilibrium wage in the labor market is:

$$v = \begin{cases} \underline{v}\,, & if\ G_t(w^*) > \mu[1 - G_t(w^{**})] \\ \overline{v}\,, & if\ G_t(w^*) < \mu[1 - G_t(w^{**})] \end{cases} \tag{3.1.8}$$

Several important propositions follow the conditions of labor market clearance in (3.1.8). First, individuals with initial wealth $w < w^*$ will choose to be a worker. Second, agents with initial wealth $w^* < w < w^{**}$ will end up become self-employed. Next, wealthy individuals with initial wealth $w > w^{**}$ will become an entrepreneur as long as $v < \overline{v}$. A special scenario occurs when all individuals have an initial wealth of less than w^*, then becoming idle is the only occupational option as no one in the economy could initiate self-employment and entrepreneurial production. The static equilibrium in each period will then transmit to the next period through bequests with different sizes. This indicates that the initial wealth distribution pattern will determine future income distribution and its persistence via occupational choices. Therefore, Banerjee and Newman (1993) have reached similar conclusions as in Galor and Zeira (1993).

Briefly speaking, both theoretical works above demonstrate how an imperfect capital market and indivisibility can influence income inequality. They implied a general message that the presence of capital market constraint and investment indivisibility, or poor financial system as a whole, income inequality will widen as generations go on. This implies a critical relationship that financial development might have a monotoni unequalizing effect that worsens distributions as long as the imperfections remain in the financial system. As the financial market deepens, the financial market will become more efficient and more competitive. This in turn reduces the capital market imperfection and lowers transaction and intermediary fees. Consequently, it alleviates the initial credit constraints faced by the poor individuals that have relatively less or none to offer for collateral. The easier entrance to capital markets will then enable more individuals to invest in education or high-returns bearing investments, and ultimately reduces the income gap between the rich and the poor.

3.1.1.2 Nonlinear Hypothesis on Inequality-Finance Relationship

The seminal work of Greenwood and Jovanovic (1990) offers a strong contradiction to the linear hypothesis of the finance-inequality relationship as discussed above. In their theoretical paper, the authors adopted an endogenous growth model to frame the finance-inequality relationship. First, consider an economy consisted of a continuum of agents. Each of the agents attempts to maximize their expected lifetime utility as

$$\max\left\{E\left[\sum_{t=0}^{\infty}\beta^{t}\ln(c_{t})\right]\right\}$$

where β is the discount rate $\beta \in (0,1)$ and c_t is the consumption at time t.

Two types of linear production technologies are available in the said economy for operation or investment. The first production technology is relatively safer and thus provides relatively low investment return with factor δ for each i units of capital invested at period $t-1$, or $y_t = \delta i_{t-1}$. The second production technology is riskier but offers a higher return of $y_t = (\theta_t + \varepsilon_t) i_{t-1}$, where $(\theta_t + \varepsilon_t)$ denotes the composite technology shock and $\theta_t + \varepsilon_t > 0$. The first component of the composite shock $\theta_t = \left[\underline{\theta}, \overline{\theta}\right]$ represents the aggregate shock with $E(\theta) > \delta > 1/\beta$. The second part $\varepsilon_t = [-\overline{\varepsilon}, \overline{\varepsilon}]$ is the idiosyncratic shock that associated with the individual project with $E(\varepsilon_t) = 0$.

Each agent will own a certain amount of wealth $k_t = c_t + i_t$ at period t for disposal. They will then allocate their wealth either for current consumption or reserve for investment in production technologies in the next period. If an agent chooses to invest in production technologies, he or she will fully analyze the magnitude of the aggregate and idiosyncratic shocks of their own project. However, agents have to participate in networks (i.e. financial market) to obtain full information about the true aggregate shock θ_t due to certain reasons. First, financial intermediations can potentially reveal the actual value of the aggregate shock by analyzing the information contained in many risky individual projects. Second, the trading mechanisms can naturally diversify the idiosyncratic shock ε_t via the pooling of projects.

Nonetheless, as Townsend (1978; 1982) mentioned, the participation in the financial intermediary network can be costly. Assumed that the permanent access to the financial market required a lump sum entry fee of q, not all agents will participate in the financial market as it requires a minimum wealth of at least equal to q. Likewise, there will be two clusters of agents at any period: the participant (those who entered the financial market) and the non-participant (those who are outside the financial market).

In the cases of financial market participants, the financial intermediaries promised a random return of $r(\theta_t)$ for per unit of capital invested by the participants at each period. Therefore, the wealth of a financial market participant at the beginning of period $t+1$ is

$$k_{t+1} = i_t r(\theta_t) \tag{3.1.9}$$

where the idiosyncratic shock is absent in Equation (3.1.9) since it has been diversified completely. For the non-participants that are outside of the financial market at period t, the wealth of these non-participants at the beginning of period $t+1$ is

$$k_{t+1} = i_t[\emptyset_t(\theta_t + \varepsilon_t) + (1 - \emptyset_t)\delta] \tag{3.1.10}$$

where $\emptyset_t$ denotes the fraction of risky investment in their investment portfolio at period t. Equation (3.1.10) shows that the uncertainty of the idiosyncratic shock significantly influences the wealth of the non-participants.

Now, let $F(\theta)$ and $G(\varepsilon)$ be the cumulative distribution function of θ and ε, respectively, the participants will make their investment decision by answering the following optimization question, which is a constrainted value function:

$$v(k) = \max_{i_t} \{\ln(k_t - i_t) + \beta \int \max[v(k_{t+1})]\, dF(\theta_{t+1})\}$$

$$\text{subject to: } k_{t+1} = i_t r(\theta_t) \qquad (3.1.11)$$

The value function of the non-participants follows as:

$$w(k) = \max_{i_t, \emptyset_t} \left\{\ln(k_t - i_t) + \beta \int \max[w(k_{t+1}), v(k_{t+1} - q)]\, dF(\theta_{t+1}) dG(\varepsilon_{t+1})\right\}$$

$$\text{subject to: } k_{t+1} = i_t[\emptyset_t(\theta_t + \varepsilon_t) + (1 - \emptyset_t)\delta] \qquad (3.1.12)$$

The value functions in (3.1.11) and (3.1.12) are also the dynamic programming problems that governed the decision of agents on whether to enter and whether to stay within the market. Given that $v(k) > w(k)$ for any endowment of capital k, it follows that the wealth of financial market participants are always greater than the wealth of non-participants. Therefore, the non-participants will always choose to enter the market once they optimized function (3.1.12) and the existing participants will never exit the market once they joined.

In sum, Greenwood and Jovanovic (1990) again make some important theoretical predictions on finance and income inequality. Initially, during the early stages of development, the financial intermediaries are still in the infant stage and its maximum potential is yet to be reached. In the meantime, only agents with sufficiently large initial wealth could participate in the financial system, while most remain non-participating. As the economy progresses slowly to the intermediate stage, rate of growth in both financial sector and real economics catch up with the speed of widening income inequality. Finally, when the economy and the financial market approach to the mature stage of development, more agents can access to the financial services and enjoy higher wealth accumulation. As Greenwood and Jovanovic (1990) showed that the wealth accumulation rate of participants and initially non-participant will converge at a steady state, hence the income inequality will narrow during the later stages of financial development. Therefore, as the economy grows over time, the income inequality will first increase then decrease at the end along with linear development in the financial sector. This notion has given rise to the inverted U-shaped hypothesis of the finance-inequality relationship.

3.1.2 Income Inequality and Institutional Quality

As discussed in the previous chapter[29], there may exist two-way causation between income inequality and institutional quality. More specifically, an economy with an initially poor institutional is likely to induce sub-optimal allocation of

[29] See Section 2.4, p. 57–59.

resources that most beneficial to the rich. Consequently, the wealth gap between the rich and the poor is widened, and therefore income inequality increases. The widened income inequality symbolizes the even larger share of resources concentrated in the hands of the rich. This is equivalent to a greater ability of the rich and elite to finance their rent-seeking behavior to protect their wealth and gain an even larger share of resources. This in turn further deteriorates the institutional quality.

From the intuition above, it is reasonable to claim that institutional quality can be endogenously determined, in this case, by income distribution. However, past studies on institutional economics have long treated institutional quality as an exogenous variable (Savoia, Easaw, & McKay, 2010). Among the few seminal theoretical contributions to the endogeneity of institutional quality (see Glaeser et al., 2003; Sonin, 2003), Chong and Gradstein (2007) have developed a system of a simple dynamic model to theorize the bi-directional causality between income inequality and institutional quality.

Consider an economy with i units of households or families. Each household consists of a parent and a child at each period t. Given that the initial income level, denotes by y_{i0}, is exogenous, while the subsequent income level y_{it} is endogenously determined at each period t. Further, the pattern of income distribution follows a natural log-normal fashion as $\ln(y_{it}) \sim \mathrm{N}(\mu_t, \sigma_t^2)$. Supposed that each household has a fixed amount of resources at period t and let A represents this amount. During each period, agents will decide the weights of allocating their income either into current consumption c_{it} or investment in the rent-seeking activity r_{it+1} to gain a larger share of resources in the next period. By normalizing prices to one, all households face the following budget constraint:

$$y_{it} = c_{it} + r_{it+1} \tag{3.1.13}$$

It follows that the share of resources that household i appropriated at each period depends on the amount of rent-seeking r_{it+1} and on the institutional weakness w_{t+1}. Algebraically, the amount appropriated by household i is

$$a_{it+1} = A \frac{r_{it+1}^{w_{t+1}}}{\int_0^1 r_{it+1}^{w_{t+1}}\, di} \tag{3.1.14}$$

It is worth to take note that the authors consider only two extreme cases of institutional strength: $w_{t+1} = 0$ for denoting strong institutions and ($w_{t+1} = w, w \cong 1$) for indicating weak institutions[30].

In terms of the production side, each household can supply their one-unit labor per period. Then, the household income is the product of the ability of the

[30] Chong and Gradstein (2007) claimed that only the use of extreme value could yield optimal second-order conditions governing the institutional choice. Nonetheless, this action will not cause much loss in generality.

household and the share of the resources gained. Therefore, the production function of household i is as follow:

$$y_{it} = \varepsilon_{it} a_{it} \tag{3.1.15}$$

where the individual ability, ε_{it}, follows a log-normal distribution with zero mean value and a relatively small variance γ^2 at each period.

Now, assumed that the parents make all decisions in the economy at each period and assumed that the preferences of parents depend on consumption and bequest left to their children, the lifetime expected utility of parents is:

$$V(c_{it}, y_{it}) = \ln(c_{it}) + \ln(y_{it+1}) \qquad (3.1.16)^{31}$$

At each period, parents will collectively observe the level of institutional quality and then allocate their resources accordingly. Lastly, maximization of the utility function (3.1.16) subject to the constraints from (3.1.13) to (3.1.15) leads to the optimal solutions for each household as follow:

$$r_{it+1} = \frac{w_{t+1} y_{it}}{1 + w_{t+1}}, \qquad c_{it+1} = \frac{y_{it}}{1 + w_{t+1}} \tag{3.1.17}$$

[31] Note that the authors assumed that the preferences on consumption and bequest are equal in this case.

which shows that a better institutional quality induces higher current consumption and lower rent-seeking activity. The income level at the next period follows immediately as:

$$y_{it+1} = \varepsilon_{it} A y_{it}^{w_{t+1}} / \int_0^1 y_{it}^{w_{t+1}} \, di \tag{3.1.18}$$

and if it takes logarithm form:

$$\ln(y_{it+1}) = \ln(\varepsilon_{it}) + \ln(A) + w_{t+1} \ln(y_{it+1}) - \ln\left(\mathrm{E}\, y_{it}^{w_{t+1}}\right) \tag{3.1.19}$$

Then, the next-period inequality is

$$\sigma_{t+1}^2 = \gamma^2 + w_{t+1}\sigma_{t+1}^2 \tag{3.1.20}$$

Equation (3.1.20) concludes the first section of the theoretical model in Chong and Gradstein (2007). It shows that when institutions are strong ($w_{t+1} = 0$), then income inequality is constant and depending only on the individual ability differences. On the contrary, if institutions are weak ($w_{t+1} = w$), then income inequality may increase over time, as $\sigma_{t+1}^2 - \sigma_t^2 = \gamma^2 + (w-1)\sigma_t^2 > 0$ as long as the current income inequality is not zero.

To this point, Chong and Gradstein (2007) have shown how poor institutions can negatively affect income distribution. Next, they showed the determination of institutional quality due to income distribution.

Assumed that the determination of institutional quality at each period follows a political process that generally favored the rich. A simple way to capture this political process is through observing the identity of the decisive voter y_{dt} as

$$\ln(y_{dt}) = \mu_t + \beta\sigma_t^2 \tag{3.1.21}$$

where β represents the severity of political bias in favor of the rich. If $\beta = 0$, then political bias is absent in the determination of institutional quality and the median-income voter is decisive. If $\beta = 1/2$, then the average-income voter is decisive. In the case when $\beta > 1/2$, then political bias exists. Furthermore, the household utility corresponding to the two bi-polar cases of institutional quality are

$$U_{it}^{\text{strong}} = \ln(y_{it}) + \ln(\varepsilon_{it}A) \tag{3.1.22}$$

and

$$U_{it}^{\text{weak}} = \ln(y_{it}/2) + \ln[\varepsilon_{it}Ay_{it}^{w}/E(y_{it}^{w})] \tag{3.1.23}$$

respectively. The resulting utility differential is

$$U_{it}^{\text{weak}} - U_{it}^{\text{strong}} = \ln(1/2) + \ln[y_{it}^{w}/E(y_{it}^{w})] \tag{3.1.24}$$

It shows that the utility differential changes negatively with respect to income level. Combining Equation (3.1.21) and (3.1.24) gives

$$U_{it}^{\text{weak}} - U_{it}^{\text{strong}} = \ln(1/2) + \ln[y_{dt}^{w}/E(y_{it}^{w})]$$

$$= \ln\left(\frac{1}{2}\right) + w(\mu_t + \beta\sigma_t^2) - w(\mu_t + \sigma_t^2/2)$$

$$= \ln\left(\frac{1}{2}\right) + (w\beta - 1/2)\sigma_t^2 \tag{3.1.24}$$

which shows the utility differential of the decisive voter. Equation (3.1.24) carries some interesting propositions: when $\beta \leq 1/2$, the utility differential is negative, implying that a strong institution will emerge at the steady state. However, if $\beta > 1/2$, the political bias is considerably large and hence the rich households are relatively decisive during the voting process. Therefore, when income inequality is large enough, then the political process may end with the minimal level of institutional quality at the period, in which in favor of the rich.

Finally, Chong and Gradstein (2007) elaborated on how the initial level of inequality dynamically affects the institutional quality of the economy. From Equation (3.1.24), a small initial level of inequality σ_0^2 will lead to a high level of institutional quality. The strong institutions will further lead to a fixed level of income inequality according to Equation (3.1.20). If the initial income inequality is large, then weak institutions prevail. If the institution is weak enough and w is close to one, substituting it into Equation (3.1.24) shows the strong and biased political support for maintaining weak institutions. As a result, income inequality remains high and converges to $\sigma_{t+1}^2 = \gamma^2/(1 - w^2) > \gamma^2$.

In short, Chong and Gradstein (2007) documented a possible inequality-institution nexus, in which there may exist a negative linear causality running from one to another.

3.1.3 Summary of Theoretical Framework and Hypotheses of the Study

Section 3.1 discusses several theories related to the finance-inequality and institution-inequality relationships. In terms of the finance-inequality relationship, the works of Banerjee and Newman (1993) as well as Galor and Zeira (1993) proposed a linear and negative relationship between financial development and income inequality, whereas Greenwood and Jovanovic (1993) suggested a nonlinear hypothesis regarding the finance-inequality relationship, in which an inverted-U shaped curve would appear if the relationship is illustrated on a XY graph. In sum, Banerjee and Newman (1993), Galor and Zeira (1993), and Greenwood and Jovanovic (1993) suggested that financial development could be an important determinant of income inequality but the theoretical relationship between finance and inequality is ambiguous, as it could appear linear or nonlinear. Therefore, this study examines the nature of the relationship between financial development and income inequality by assuming a quadratic function on the relationship, which can be seen in the following Section 3.2. The estimated empirical model will be tested thereafter to see whether the relationship is linear or nonlinear.

Turning to the institution-inequality relationship, the work of Chong and Gradstein (2007) conjectures a two-way causal and negative relationship between institutional strength and income inequality. This two-way causal hypothesis suggests that institutional could explain the degree of income inequality and the reversal of the relationship is possibly true as well. This study therefore includes institutional quality as one of the determinants of income inequality. Besides, this study hypothesizes that income inequality in turn determines the strength of institutions. In both cases, the priori expectation on the relationships is linear and negative as suggested in Chong and Gradstein (2007), the estimated empirical model in Section 3.2 will be tested to see if the hypotheses hold.

The hypotheses of the study are as follow:

H1: Financial development significantly explains income inequality in both advanced and developing countries.

H2: Institutional quality significantly explains income inequality in both advanced and developing countries.

H3: There exists a significant interaction effect between financial development and institutional quality in determining income inequality.

H4: Income inequality significantly explains institutional quality in both advanced and developing countries.

3.2 Empirical Modeling

In accordance with the research objectives and the theoretical frameworks, this study proposes the following empirical models to analyze the roles of financial development and institutional quality in determining income inequality.

3.2.1 Model 0: Baseline Model for Income Inequality

To begin with, consider the following long run econometric model of income inequality for country i and time t:

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it}Y_{it} + \beta_{2,it}Y_{it}^2 + \sum_{j=3}^{k} \beta_{j,it}X_{j,it} + \varepsilon_{it} \qquad (3.2.1)$$

where $INEQ$ denotes income inequality, Y is economic growth, X encompasses other controlled variables (see Section 3.2.5 for the discussion), $\beta_j, j = 0, 1, \dots, k$

are the long run parameters, and ε captures the white-noise disturbance terms. The econometric model in (3.2.1) assumed a panel data fashion, and it treated income inequality as the dependent variable on the left-hand-side (LHS). All variables on the right-hand-side (RHS) of (3.2.1) are the explanatory or independent variables that are theoretically important in explaining the changes in income inequality.

It is apparently that Equation (3.2.1) is a close replicate of the Kuznets' (1955) curve, which emphasizes the possible inverted U-shaped curve of the growth-inequality relationship. The seminal contribution of Kuznets (1955) is the main motivation behind the inclusion of economic growth and its squared term in the model. It is also a common practice in the studies of income inequality that treating economic growth as one of the explanatory variables. If the marginal effect of growth on inequality is positive ($\beta_1 > 0$) and the partial coefficient of the quadratic term of growth is negative ($\beta_2 < 0$), then the existence of Kuznets' curve is evident and one cannot reject the inverted U-shaped hypothesis. If $\beta_1 \neq 0$ but $\beta_2 = 0$, then there is only a linear relationship between economic growth and income inequality.

Equation (3.2.1) or Model 0 is the baseline model for this study, which serves as a comparative benchmark for other comprehensive models that incorporate the effect of financial development and institutional quality.

3.2.2 Model 1: Model for Inequality-Growth-Finance-Institution Relation

Now, consider the following long run model:

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it}Y_{it} + \beta_{2,it}Y_{it}^2 + \beta_{3,it}FD_{it} + \beta_{4,it}FD_{it}^2 + \beta_{5,it}Q_{it} + \sum_{j=6}^{k} \beta_{j,it}X_{j,it} + \varepsilon_{it} \tag{3.2.2}$$

where FD represents the level of financial development, Q is the indicator of institutional quality, and interpretations for other symbols remained the same as in Equation (3.2.1). The long run model in Equation (3.2.2) is an extension from the baseline model with the inclusion of financial sectors and institutional quality as additional explanatory variables. In this regard, Model 1 is tailored for empirical analysis for the first research objective of the thesis.

The addition of financial sector development as one of the major determinants of income inequality is in accordance with the theoretical suggestions. The expected sign of $\beta_{3,it}$ are ambiguous[32]: the linear hypothesis of Galor and Zeira (1993) and Banerjee and Newman (1993) suggested that $\beta_{3,it}$ is negative and $\beta_{4,it}$ is zero as development in financial sectors tends to linearly reduce income inequality. However, if the nonlinear hypothesis of Greenwood and Jovanovic

[32] Refer to Chapter 2, Section 2.3 and Chapter 3, Section 3.1.1 for the discussions.

(1990) is valid, then the expected sign of $\beta_{4,it}$ is negative and the sign of $\beta_{3,it}$ is positive as portrayed by an inverted U-shaped curve.

Turning to the institutional quality, the main motivation of including Q_{it} as one of the factors of inequality came from Chong and Calderón (2000), Rodrik (2000), and Chong and Gradstein (2007). $\beta_{5,it}$ is expectedly negative as in line with the priori that better institutions tend to associate with lower income inequality.

3.2.3 Model 2: Model with Interaction between Finance and Institutions

Now, following the theoretical suggestions of La Porta et al. (1997, 1998) and the empirical implications from Law et al. (2014) and Adams and Klobodu (2016), the interaction between institutional quality and financial development is potentially crucial in explaining income inequality. Therefore, the RHS of Equation (3.2.2) could include the interactive term of institutional quality and financial development as

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it}Y_{it} + \beta_{2,it}Y_{it}^2 + \beta_{3,it}FD_{it} + \beta_{4,it}FD_{it}^2 + \beta_{5,it}Q_{it} + \beta_{6,it}(FD \times Q)_{it} + \sum_{j=7}^{k} \beta_{j,it}X_{j,it} + \varepsilon_{it} \quad (3.2.3)$$

The parameter $\beta_{6,it}$ captures the nature of the interaction between financial markets and institutional strength as designed. The sign of $\beta_{6,it}$ tells whether financial development complements or substitutes institutional quality in affecting income distribution. Specifically, $\beta_{6,it}$ can be expressed as the following partial derivatives

$$\frac{\partial INEQ}{\partial FD} = (\beta_3 + 2\beta_4) + \beta_6 \times IQ$$

and

$$\frac{\partial INEQ}{\partial IQ} = \beta_5 + \beta_6 \times FD$$

where the former is the marginal elasticity of financial development on income inequality and the latter is the marginal elasticity of institutional quality. It is clear from here that a significant and positive estimate of $\beta_{6,it}$ implies that the two continuous variables are substitutes, whereas a significant and negative estimate of the coefficient implies the complementary nature between financial sector development and quality of institutions. In terms of the expected sign, there is no formidable overarching theory that explains the interplay between financial development, institutional quality, and income inequality. Adams and Klobodu (2016) reported that $\beta_{6,it}$ is significantly negative in the long run based on the PMG estimates, while Cepparulo et al. (2017) found a positive estimate for the interactive coefficient. More importantly, the addition of the interactive term in Equation (3.2.3) is mainly for capturing the unobserved effect in Equation (3.2.2), as this addition might alter the individual long run effect of financial development ($\beta_{3,it}$ and $\beta_{4,it}$) and institutional quality ($\beta_{5,it}$) on income inequality. Consequently, Equation (3.2.3) or Model 2 is specifically designed for the second research objective.

3.2.4 Model 3: Model for Institutional Quality

Next, following the suggestions of Chong and Gradstein (2007) and Savoia et al. (2010), a model of endogenous institutional quality of i country and time t can be written as follow:

$$Q_{it} = \alpha_{0,it} + \alpha_{1,it} INEQ_{it} + a_{2,it} DEMO_{it} + \sum_{j=3}^{k} \alpha_{j,it} XX_{j,it} + \varepsilon_{it} \quad (3.2.4)$$

where $DEMO$ indicates the democratic quality, XX_j includes the controlled variables of determining the institutional quality Q_{it}, and $\alpha_j, j = 0, 1, \dots, k$ are the long run parameters. Equation (3.2.4) treated income inequality $INEQ_{it}$ as one of the endogenous factors that determine institutional strength, and the parameter $\alpha_{1,it}$ would capture this effect. According to Glaeser, et al. (2003), Sonin (2003), and Chong and Gradstein (2007), the value of $\alpha_{1,it}$ is supposedly negative, which indicates that an increase in income inequality tends to weaken institutional strength. The reason for selecting democracy as one of the regressors is due to its significant role in explaining overall institutions (Savoia et al., 2010), though that the related literature on democracy and institutional quality is relatively recent. Generally, the positive link between democracy and institutional quality came mostly from historical observations, in which democratic countries tend to associate with better protection in property rights, more inclusive economic developments, and better governance (Acemoglu & Robinson, 2000; Acemoglu et al., 2005; Gerring, Bond, Barndt, & Moreno, 2005; Acemoglu, Johnson, Robinson, & Yared, 2008). However, some recent studies like Kotschy and Sunde (2017) argued that democracy is not necessarily associated with better institutions, especially when income inequality is high. Likewise, the structure of Equation (3.2.4) or Model 3 is aligned with the third research objective in this study.

3.2.5 The Controlled Variables

This section dedicates to discuss on the controlled variables included in Model 1, 2, and 3. To begin with, consider the controlled variables in Model 1 and 2. Algebraically,

$$X_j = \{INEQ_{t-1}, EDUC, OPEN, INFL\}$$

where $INEQ_{t-1}$ is the lagged income inequality or initial income inequality, $EDUC$ denotes educational attainment or human capital, $OPEN$ refers to trade openness or trade liberalization, and $INFL$ is the inflation rate. The identification of these controlled variables follows suggestions from the literature. Taking the instance of initial inequality, income inequality could be perceived as a first-order autoregressive process of its historical value, where the degree of past inequality affects present inequality. Empirical evidence (Agnello et al., 2012; Perera & Lee, 2013; Law et al., 2014; Adams & Klodobu, 2016) showed a significant negative correlation between initial inequality and current income inequality. Next, the inclusion of human capital reflects the factor endowments of income distribution that are partially explained in endogenous growth theory. This study adopts educational attainment as the indicator of human capital, where higher investment in human capital tends to reduce income inequality (Beck et al., 2007; Ang, 2010; Law et al., 2014; Yang & Qiu, 2016). Trade openness is also reflecting the role of the globalization process, in which its significance on income distribution is evident in several empirical studies (Kraay, 2006; Wu & Hsu, 2012; Asteriou, Dimelis, & Moudatsou, 2014). However, the effect of trade openness on income inequality is theoretically ambiguous and depending on the economic development status of the country (Goldberg & Pavcnik, 2007; Guidetti & Rehbein, 2014). Lastly, inflation rate partly captures the impact of monetary policy on income distribution. The literature suggests that changes in inflation rate could induce income redistribution through various channels, thereby affecting income inequality. However, these multiple channels suggest differently on whether the change in inflation rate improve or worsen income distribution. For instances, the financial segmentation channel (Williamson, 2009; Ledoit, 2011) and the portfolio channel (Erosa & Ventura, 2002; Albanesi, 2007) conjecture that expansionary monetary shocks (which associate with high inflation rates) tend to increase income inequality. On the other hand, the savings redistribution channel (Doepke & Schneider, 2006) and the earnings heterogeneity channel (Carpenter & Rogers, 2004; Heathcote, Perry,

& Violante, 2010) suggest otherwise that expansionary monetary shocks tend to decrease income inequality. Therefore, the effect of inflation on income inequality is theoretically ambiguous and subject to empirical investigation.

Next, the controlled variables in Model 3 are

$$XX_j = \{GROWTH, EDUC\}$$

where $GROWTH$ and $EDUC$ share the same denotations as above. The addition of economic growth and educational attainment is to control for omitted variable bias and systematic variation captured in the country-fixed effect, as in Kotschy and Sunde (2017).

3.3 The Measurements and Data Sources

This section discusses the choice of proxy for the variables and the data sources. From the following discussions, one will find that the choice of measurement and database are of utmost importance in this study, especially for measuring income inequality, institutional quality, and financial developments.

3.3.1 Income Inequality

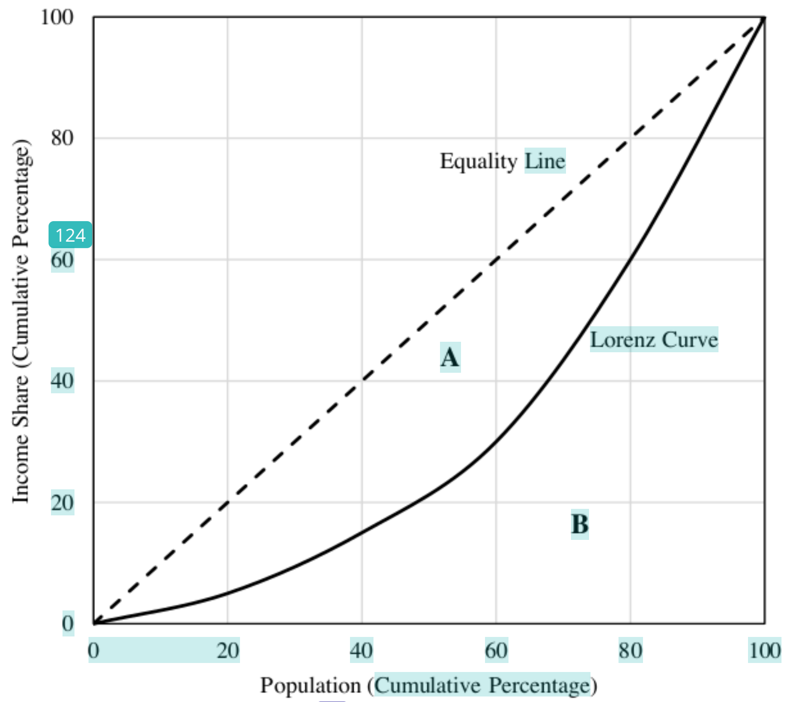
The choice of a proper metric for representing income inequality was never a simple question. There is a long and heated debate on which measurement suits the best in representing inequality. Ideally, the household income data from national censuses seems like the best candidate, but the process of data collection would inevitably suffer from certain errors as in many other primary data collections. This section discusses several common metrics used in macroeconomic analysis of income inequality, namely the Gini Coefficient, income shares ratio, Generalized Entropy index, and their variants.

3.3.3.1 Gini Coefficient

The Gini coefficient or Gini index is an inequality measurement derived directly from the Lorenz curve. Figure 3.3.1 shows a sample of the Lorenz curve based on hypothetical data.

Taking the Lorenz curve in Figure 3.3.1 as an example, it plots the cumulative percentages of income shares against cumulative percentages of the population. In the case of perfect equality, each income quintiles would own 20 percent of the total income and result in a proportionate change in cumulative income shares and population as represented by the 45° line. In other more practical cases of certain inequality, then the Lorenz curve will capture the marginally inclining change in cumulative income shares versus income quintiles, and show in the typical concave curve.

Figure 3.3.1: The Lorenz Curve



Source: Author's hypothetical data.

The Gini coefficient, measured as the ratio of the area between the 45° line and the Lorenz curve (A) to the total area below the 45° line (A+B), hence comes with a lower boundary of zero (perfectly equal distribution) and an upper boundary of one (perfectly unequal distribution). This feature of the Gini index made it the most commonly used metric in studies of inequality to date, as scholars can use the Gini coefficient to generate a highly comparable statistic of income inequality. Besides, the interpretation of the Gini index is intuitive. However, one major drawback of the Gini index is that it does not reflect the compositions of inequality. For instance, two countries with different patterns of income distribution could share similar Gini coefficient values[33] (Atkinson, 1974; Campano & Salvatore, 2006). This limitation of the Gini index occurs when it does not reflect the dynamic changes of income distribution compositions of a country as well. On top of this limitation, the Gini coefficient is very sensitive to changes in inequality within the middle-income class (Hey & Lambert, 1980).

3.3.3.2 Generalized Entropy Index

Given that the Gini coefficient is not disposable, some inequality metrics have been developed to overcome the limitation, which includes the Generalized Entropy (GE) index. More formally, the GE index is a family of inequality measures, as a specific value of the GE index is attached with a sensitivity parameter (α) that varies according to the weight assigned to inequalities in different income spectrums. The algebraic expression of GE index is

[33] Assume that there are two countries: Country I and Country II. For Country I, 50% of the population have no income and the other 50% shared the total income equally. For Country II, 25% of the population owned 75% of the total income, while the rest 75% population owned the remaining 25% of the total income. The Gini coefficients for both Country I and Country II are 0.50, even though they are clearly different in income distribution pattern.

$$GE(\alpha) = \begin{cases} \dfrac{1}{N\alpha(\alpha-1)} \sum_{i=1}^{N} \left[\left(\dfrac{y_i}{\bar{y}} \right)^{\alpha} - 1 \right], & \alpha \neq 0{,}1 \\ \dfrac{1}{N} \sum_{i=1}^{N} \dfrac{y_i}{\bar{y}} \ln \dfrac{y_i}{\bar{y}}, & \alpha = 1 \\ \dfrac{-1}{N} \sum_{i=1}^{N} \ln \dfrac{y_i}{\bar{y}}, & \alpha = 0 \end{cases}$$

where N is the number of cases (e.g., households or families) and y_i is the income for case i. The range of the GE index comes with a lower bound of zero and without upper bound, with zero value indicates a perfectly equal distribution and greater values represent an increasing degree of inequality. A greater value of α would cause the resulting GE measures more sensitive to changes in top income distribution and vice versa. A special feature of the GE index is that one can compute some other inequality metrics using the GE index by assigning certain values to α. For instance, GE(0) is equivalent to the mean log deviation of income, GE(1) is functionally the Theil inequality index, and GE(2) is half the squared coefficient of variation.

One important advantage of the GE index is that it is decomposable (Shorrocks, 1980). Hence, the GE index and its subclasses are suitable for decomposition analysis such as analyzing within area element and between areas element of inequality. However, some of the drawbacks of the GE index caused this measure less popular than the Gini index. The mathematical structure of the GE index is complex, and its interpretation is far from being intuitive. Further, different values of α assigned would cause the GE measures more sensitive to changes in both ends of income distribution, thus assigning improper value to α might lead to misleading measures of the GE index.

3.3.3.3 Income Ratio

A simple but effective way to measure income inequality is to take the ratio of the income of two different groups, generally "higher over lower". For example, the commonly used 20:20 ratio compares the income shares of the top 20% income earners to the bottom 20% income earners, while the Palma ratio[34] that divides the income shares of the richest 10% to the poorest 40% of a given population. A theoretical result of a 1:1 ratio indicates perfectly equal distribution, while a higher ratio indicates higher inequality. Another related class of ratios is the income share, which measures the portion of national income accrued to different percentiles of the population.

Given the properties of income ratios, they are particularly useful for studying the income concentration of top earners, e.g. top 10%, top 1%, top 0.1%, or top 100, etc. Another benefit of computing income ratios is that it enables sensitivity analyses. For instance, one can compare the correlations between economic welfare (or other variables) and the 20:20,

[34] See Palma (2011) for more details.

20:40, 40:60, or any other ratios. Nonetheless, the use of income ratios often ignores the dynamics within the middle-income groups. Furthermore, since the income ratio is a relative measure of income inequality, it tends to ignore the absolute income inequality. Thus, the use of income ratios shall come with certain precautions.

After considering the pros and cons of these alternatives, this study decided to use the Gini coefficient to measure income inequality. Albeit that there are some unfavorable properties of the Gini coefficient as an inequality measure, it is excellent in terms of comparability among inequalities of different countries. Moreover, the availability of systematic databases of the Gini coefficient allows for systematic comparisons of income inequality among a large number of countries. This feature is absent for other inequality metrics, where the development of databases is less sophisticated than the Gini index. The choice of using Gini index for measuring income inequality is in line with the common practice in the related literature (see Chong & Gradstein, 2007; Law et al., 2014; Huang et al., 2015; Adams & Klodobu, 2016; Bumann & Lensink, 2016, just to name a few)

This study cites the data of net Gini index published by the Standardized World Income Inequality Database (SWIID) (Solt, 2016) to measure the degree of inequality of all sampled countries. Frederick Solt (2009, 2016), the author and developer of SWIID, has constructed the database to maximize comparability of cross-country income inequality and extend its coverage of countries and years as largest as possible. To date, the SWIID covered Gini indices of 192 countries from 1960 to the present (Solt, 2016). The SWIID combined, reorganized, and improved information from several previous data sources of income distribution, including the Luxembourg Income Study (LIS), the United Nations University-World Institute for Development Economics Research (UNU-WIDER), and the World Income Inequality Database (WIID). Specifically, this study prefers the net Gini index based on disposable household income (net for transfers and taxes) to measure income inequality.

3.3.2 Institutional Quality

Similar to the case of inequality, the measurement choice of indicator for institutional quality is never straightforward. However, unlike income inequality, the complexity of measuring institutional quality came from the ambiguous conceptual understandings of the term "institution" (Chang, 2007).

Some of the early studies have given a loose definition of institutional quality. For example, Shubik (1975) and Schotter (1981) defined institutional quality generally as the rules that governed how the game is played, in which the "game" here refers to the market mechanism of resource allocation. Later, some scholars defined institutional quality with broader concepts. For instance, North (1981; 1990) defined institutions as humanly devised constraints that shape interactions between individuals. These constraints are either formal (*de jure*) rules or informal (*de facto*) rules and improvements in institutions would reduce the constraints imposed on *de jure* executive power. In the same vein, Ostrom (1990, p. 136) defined institutions as:

> "…*The sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed and constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions*…"

Moving to the early twentieth century, Acemoglu et al. (2001; 2002; 2005) defined institutions by taken account on both *de jure* and *de facto* powers, and the authors broaden the scope of the power here by adding political and economic power to the executive power in North (1981; 1990). Under this complex setting, strong institutions are a proper balance of powers, where the rights, properties, investments, technological endeavors, and the likes of individuals are protected *de facto* (Acemoglu et al., 2001). More recently, Easterly (2013) emphasized the elements of rights (legal and political) and the opportunities of individuals in defining the overall quality of institutions. Easterly (2013) also argued that bureaucratic quality has an integral role that determines the realization of legal and political rights.

In short, while scholars of institutional studies have varying views on the definition, institutional quality certainly encompassed a broad range of factors. These factors include rules and order, individual rights, governance quality, and some of them are difficult to be measured objectively. At this end, this study will utilize the political risk indices from the International Country Risk Guide (ICRG) database to measure the overall strength and the sub-components of institutional quality of the sampled countries.

The ICRG database is published by the PRS group (2017). It has the longest available data on institutional quality of 140 countries covering the period early as 1984. This study utilizes four out of twelve Political Risk ratings from ICRG data, namely bureaucracy quality, corruption, government stability, and law and order[35]. Bureaucracy quality has a scale ranges from 0 to 4, government stability has a scale ranges from 0 to 12, and the rest of the political risk components above have a scale ranges from 0 to 6. The value 0 indicates the lowest institutional quality and greater values indicate higher quality in all components. Besides, this study will construct a composite index of institutional quality using the four political risk components as the base. Specifically, this study will first rescale each component to a scale of 0 to 10, where the indices of law and order and corruption control are multiplied by 5/3, government stability is multiplied by 5/6, while bureaucratic quality is multiplied by 5/2. The rescaled indices are then sum up to get the composite index.

[35] The other eight components are Ethnic Tension, Socioeconomic Conditions, Investment Profile, Internal Conflict, External Conflict, Military in Politics, Religious Tensions, and Democratic Accountability.

The composite index through simple aggregation consequently has a range of 0 to 40.

3.3.3 Financial Development

In terms of measuring financial sector development, this thesis chooses domestic credit issued to private sectors, measured as a ratio to GDP, as the indicator. The private sector credit is the total value of credits issued by financial intermediaries to the private sector, which effectively represents the size and depth of financial institutions in an economy. Ideally, the proxy of financial development shall incorporate both financial institutions and financial markets to represent the bigger picture of the financial system development of a country. However, bank credits are the only feasible financing sources for most of the developing countries, as stated in Law et al. (2014) and the data of stock market development is too limited for sample splitting in the comparative analysis between developed and developing countries. Besides, it seems that banking sector development will bring a stronger effect on income inequality than what stock market development does (Gimet & Lagoarde-Segot, 2011). On top of the said reasons above, domestic credit to private sectors to GDP ratio is the most commonly used indicator to measure financial development or deepening in related literature (see, for example, Kim & Lin, 2011; Law & Azman-Saini, 2012; Law et al., 2014; Adams & Klobodu, 2016). The data source of the private sector credit is the Global Financial Development

Database (GFDD) developed recently by Cihak, Demirguc-Kunt, Feyen, and Levine (2012).

3.3.4 Other Variables

In terms of other variables, this study uses real GDP growth to measure economic growth, trade to GDP ratio as the indicator for trade openness, average years of secondary schooling as a proxy for educational attainment, and democracy index for measuring the degree of democracy. The data sources of real GDP growth, average years of secondary schooling, and trade to GDP ratio are all from the World Development Indicator (WDI, 2016). Lastly, the source of democratic quality is from the ICRG database of the PRS group (2017). Appendix Section App3 tabulated the detailed descriptions for each measurement employed in this study.

3.3.5 Summary of the Data

In summary, all data employed in this study are secondary data at an annual frequency. The dataset covers 36 developed countries and 62 developing economies[36] from the year 1996 to 2015, hence resulting in a panel dataset with 98 cross sections ($N = 98$) and 20 time series ($T = 20$). Besides, this study will attempt an additional practice to split the dataset into two sub-datasets: one for developed economies ($N = 36, T = 20$) and another for developing economies ($N = 62, T = 20$),

[36] Refers to Appendix Section App2 for the full list of developed and developing countries.

to cater for the research objectives. Of all cases, the dimensions of the datasets employed to satisfy the requirement of System GMM estimator, in which the cross sections must be greater than the time series ($N > T$). The next section will discuss the GMM class estimators and the System GMM approach in detail.

3.4 The Generalized Method of Moments (GMM) Estimation

Econometric study or regression analysis often begins with some economic phenomenon that is of interest to people. When someone wants to deepen their understanding of the economic phenomenon, they would first turn to economic theory to see what insights it can offer. With certain assumptions, the economic theory would describe the phenomena in terms of the key economic variables and model parameters. One could then quantify these parameters with the appropriate choice of econometric models and estimators.

In its classic form, a regression model would treat the dependent or LHS variable as an endogenous variable, and attempt to explain it through the changes in each of the explanatory variables on the RHS. As one of the classic assumptions in regression analysis, the right-hand side variables should be exogenous, or as least weakly exogenous that they are independent of the disturbance term. Violation of this condition will lead to biased and inconsistent estimates for the ordinary least square (OLS) and the generalized least square (GLS) estimators. This violation typically happens when one or some of the RHS variables are endogenously determined. This situation occurs frequently, if not always, in econometric studies that involved multiple macroeconomic variables due to their endogenous nature. For example, an inflation-targeting policy would induce the monetary policymaker to determine the policy rate after they observed the changes in real economic activities such as the output gap and expected inflation rate. The implemented policy rate would then feedback to the real economic sectors through its effect on money demand and price level. Similar examples of endogeneity can be found in many others, and the dynamics of income inequality are of no exception. Moreover, the severity of endogeneity would get worsen if the study involves cross-countries data.

The complicated endogeneity among economic variables has motivated the development of a sophisticated econometric technique that could handle the endogeneity issue. One of the strong candidates that can provide unbiased and consistent estimates under the presence of endogenous variables is exactly the instrumental variable-generalized method of moments (IV-GMM) estimator, in which Arellano and Bond (1991) popularized its application in macroeconomic studies. The following section dedicates to briefly review the development of the Generalized Method of Moments (GMM) class estimator in the context of panel data analysis.

3.4.1 A Review

To begin with, the development of GMM estimators has predominantly grown out since the pioneering works by Hansen (1982) and Anderson and Hsiao (1982). Prior to the era of GMM techniques, the traditional static panel estimation methods dominated in macro-econometric studies, which include the OLS and the LSDV (Least Squares Dummy Variable) estimators. However, it is now widely recognized that static panel approaches are poor in delivering consistent estimation for panel data analysis. Furthermore, it is well known that the OLS and the LSDV estimators are biased when some of the RHS variables are endogenous.

One possible way to overcome the limitations of OLS and the LSDV estimators is to adopt an instrumental variable (IV) technique. By design, proper identification of IV estimators can resolve the endogeneity issue found in OLS and the LSDV estimators. However, the identification of appropriate instruments is tedious and always subjected to a certain degree of subjectivity. This finally led to the introduction of IV-GMM estimators that have several favorable properties. For instance, Hansen (1982) showed that GMM estimators are asymptotically normal and strongly consistent in large samples given the stationary explanatory variables. Very soon later, Anderson and Hsiao (1982) initiated the work of consistent estimators for dynamic panel data analysis by combining the IV method and methods of moments. The resulting GMM estimator in their works is exactly the Anderson-Hsiao (AH) estimator. Some scholars such as Holtz-Eakin, Newey, and

Rosen (1988), and Arellano and Bond (1991) advanced the work of Anderson and Hsiao (1982) afterward. In particular, Holtz-Eakin et al. (1988) considered the AH estimator for vector autoregressions, while Arellano and Bond (1991) improved the AH estimator by utilizing the instruments efficiently to obtain the optimal GMM estimates and using the first-differencing transformation to get rid of unobserved individual-specific effects. The work of Arellano and Bond (1991) has given rise to the Arellano-Bond (AB) estimator, which is more commonly known as the first-difference GMM estimator.

Although the AB estimators have excellent asymptotic properties, it suffers a downward bias especially when the sample is finite. Moreover, an autoregressive term that is close to but less than one as well as a relatively high correlation between the variance of the individual effects and the variance of the idiosyncratic error might create a similar issue as well (Arellano & Bover, 1995; Blundell & Bond, 1998). Therefore, the AB estimator might not be suitable for a dynamic panel data model with small samples. As a result, Blundell and Bond (1998) proposed an estimator by jointly restricting the standard moment conditions and the stationarity moment conditions (Ahn & Schmidt, 1995; Arellano & Bover, 1995) [37] to mitigate the finite sample bias in difference GMM estimator. The proposal of Blundell and Bond (1998) in turn results in the Blundell-Bond (BB) or the System GMM estimator. The System GMM estimator is an excellent successor of all previous

[37] See Equation (3.3.1).

versions that retained the merits while improved. The following section describes the important properties of the System GMM estimator.

3.4.2 System GMM

As aforementioned, Blundell and Bond (1998) proposed an alternative version of the GMM estimator that includes lagged differences of variables as instruments for equations in levels, and lagged levels as instruments for equations in first differences. This alternative GMM estimator is better known as the System GMM estimator in the literature.

To begin with, consider the AB estimator or the First-Difference GMM (FD-GMM) estimator[38] with the following level equations for country $i = 1, 2, \ldots, N$ at period t and the additional first-difference moment conditions:

$$\mathrm{E}\left(\varepsilon_{it}\,\Delta z_{j,i,t\text{-}s}(\gamma)\right) = 0 \quad \text{for } j = 1, 2;\ t = 3, \ldots, T \text{ and } 0 \leq s \leq t\text{-}3 \qquad (3.3.1)$$

where the process of γ_{it} is mean-stationary and the instruments in the first difference are independent of the disturbance terms. From Equation (3.3.1), the resulting level GMM estimator and IV matrices are derived respectively as follow:

[38] See Hall (2005) for the derivation.

$$W_{1i}^{l}(\gamma)=\begin{bmatrix}\Delta z_{1,i3}(\gamma) & 0 & \cdots & 0\\ 0 & \Delta z_{1,i3}(\gamma),\Delta z_{1,i4}(\gamma) & \cdots & 0\\ \vdots & \vdots & \vdots & \vdots\\ 0 & 0 & \cdots & \Delta z_{1,i3}(\gamma),\ldots,\Delta z_{1,iT}(\gamma)\end{bmatrix} \tag{3.3.2}$$

$$W_{2i}^{l}(\gamma)=\begin{bmatrix}\Delta z_{2,i3}(\gamma) & 0 & \cdots & 0\\ 0 & \Delta z_{2,i3}(\gamma),\Delta z_{2,i4}(\gamma) & \cdots & 0\\ \vdots & \vdots & \vdots & \vdots\\ 0 & 0 & \cdots & \Delta z_{2,i3}(\gamma),\ldots,\Delta z_{2,iT}(\gamma)\end{bmatrix}, \tag{3.3.3}$$

with a dimension of $(T-2)\times m_l$, $m_l=0.5(T-2)(T-1)$, for both $W_{1i}^{l}(\gamma)$ and $W_{2i}^{l}(\gamma)$. The combination of Equation (3.3.2) and (3.3.3) yields

$$W_i^l(\gamma)=\left(W_{1i}^l(\gamma),W_{2i}^l(\gamma)\right),\quad i=1,2,\ldots,N;\; W^l(\gamma)=\begin{bmatrix}W_1^l(\gamma)\\ \vdots\\ W_{\mathrm{N}}^l(\gamma)\end{bmatrix} \tag{3.3.4}$$

Then, the level equations can be conveniently expressed as

$$y=Z(\gamma)\phi+\varepsilon \tag{3.3.5}$$

where the expanded view of the moment conditions are given as:

$$\mathrm{y}=\begin{bmatrix}y_1\\ \vdots\\ y_N\end{bmatrix}_{N(T-2)\times 1},\ \mathrm{Z}(\gamma)=\begin{bmatrix}z_1(\gamma)\\ \vdots\\ z_N(\gamma)\end{bmatrix}_{N(T-2)\times 2},\ \varepsilon=\begin{bmatrix}\varepsilon_1\\ \vdots\\ \varepsilon_N\end{bmatrix}_{N(T-2)\times 1}$$

$$\mathrm{y_i} = \begin{bmatrix} y_{i3} \\ \vdots \\ y_{iT} \end{bmatrix}_{(T\text{-}2)\times 1}, \; z_i(\gamma) = \begin{bmatrix} z_{i3}(\gamma) \\ \vdots \\ z_{iT}(\gamma) \end{bmatrix}_{(T\text{-}2)\times 2}, \; \varepsilon_\mathrm{i} = \begin{bmatrix} \varepsilon_{i3} \\ \vdots \\ \varepsilon_{iT} \end{bmatrix}_{(T\text{-}2)\times 1}$$

which can be further written compactly as:

$$\mathrm{E}\left(W^l(\gamma)'\varepsilon\right) = 0. \tag{3.3.6}$$

Now, the one-step level GMM estimators $\widehat{\phi}_1^l(\gamma)$ and two-step level GMM estimators $\widehat{\phi}_2^l(\gamma)$ can be obtained through:

$$\widehat{\phi}_1^l(\gamma) = \left\{Z(\gamma)'W^l(\gamma)V_1^l(\gamma)^{-1}W^l(\gamma)'Z(\gamma)\right\}^{-1}\left\{Z(\gamma)'W^l(\gamma)V_1^l(\gamma)^{-1}W^l(\gamma)'y\right\}, \tag{3.3.7}$$

$$\widehat{\phi}_2^l(\gamma) = \left\{Z(\gamma)'W^l(\gamma)V_2^l(\gamma)^{-1}W^l(\gamma)'Z(\gamma)\right\}^{-1}\left\{Z(\gamma)'W^l(\gamma)V_2^l(\gamma)^{-1}W^l(\gamma)'y\right\}, \tag{3.3.8}$$

where

$$V_1^l(\gamma) = \sum_{i=1}^{N} W_i^l(\gamma)'W_i^l(\gamma),$$

and

$$V_2^l(\gamma) = \sum_{i=1}^{N} W_i^l(\gamma)'\hat{\varepsilon}_i(\gamma)\hat{\varepsilon}_i'(\gamma)W_i^l(\gamma) \text{ with } \hat{\varepsilon}_i(\gamma) = y_i - z_i(\gamma)\widehat{\phi}_1^l(\gamma).$$

From the equations above, one can prove that the level GMM estimator provides consistent estimates for ϕ as long as the covariance matrices are normally distributed asymptotically. The covariance matrices can be expressed as follow:

$$\text{Var}\left(\hat{\phi}_1^l(\gamma)\right) = \left\{Z(\gamma)' W^l(\gamma) V_1^l(\gamma)^{-1} W^l(\gamma)' Z(\gamma)\right\}^{-1} \tag{3.3.9}$$

$$\text{Var}\left(\hat{\phi}_2^l(\gamma)\right) = \left\{Z(\gamma)' W^l(\gamma) V_2^l(\gamma)^{-1} W^l(\gamma)' Z(\gamma)\right\}^{-1} \tag{3.3.10}$$

Finally, by merging the level equations in Equation (3.3.5) and the first-differences equations as shown in Arellano and Bond (1991) yields the System GMM estimator as follow:

$$Y = X(\gamma)\phi + u \tag{3.3.11}$$

where

$$\text{Y} = \begin{bmatrix} Y_1 \\ \vdots \\ Y_N \end{bmatrix}_{N(T\text{-}2)\times 1}, \text{X}(\gamma) = \begin{bmatrix} X_1(\gamma) \\ \vdots \\ X_N(\gamma) \end{bmatrix}_{N(T\text{-}2)\times 2}, \text{u} = \begin{bmatrix} u_1 \\ \vdots \\ u_N \end{bmatrix}_{N(T\text{-}2)\times 1},$$

$$\text{Y}_\text{i} = \begin{bmatrix} \Delta y_i \\ y_i \end{bmatrix}_{2(T\text{-}2)\times 1}, \text{X}_\text{i}(\gamma) = \begin{bmatrix} \Delta z_i(\gamma) \\ z_i(\gamma) \end{bmatrix}_{2(T\text{-}2)\times 2}, \text{u}_\text{i} = \begin{bmatrix} \Delta v_i \\ \varepsilon_i \end{bmatrix}_{2(T\text{-}2)\times 1}.$$

in which Equation (3.3.11) is identical to the expressions in Blundell and Bond (1998) and Blundell, Bond, and Windmeijer (2000).

According to Hayakawa (2007), there are three important varieties of System GMM estimators namely $\hat{\phi}^{all}(\gamma)$, $\hat{\phi}^{min}(\gamma)$, and $\hat{\phi}^{BB}(\gamma)$ that worth to be noted. Firstly, $\hat{\phi}^{all}(\gamma)$ employs all the moment conditions of the equation both in levels and in first differences and hence forms the following matrix:

$$W_i^{all}(\gamma) = \begin{bmatrix} W_i^d(\gamma) & 0 \\ 0 & W_i^l(\gamma) \end{bmatrix}, i = 1, \ldots, N;\ W^{all}(\gamma) = \begin{bmatrix} W_1^{all}(\gamma) \\ \vdots \\ W_N^{all}(\gamma) \end{bmatrix} \quad (3.3.12)$$

Next, $\hat{\phi}^{min}(\gamma)$ restricts the moment conditions to $2(T-2)$ as the minimum necessary requirement of the equation both in levels and in first differences as:

$$W_{ji}^{d,min}(\gamma) = \begin{bmatrix} z_{j,i2}(\gamma) & 0 & \cdots & 0 \\ 0 & z_{j,i3}(\gamma) & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & z_{j,i,T\text{-}1}(\gamma) \end{bmatrix}, j = 1, 2 \quad (3.3.13)$$

$$W_{ji}^{l,min}(\gamma) = \begin{bmatrix} \Delta z_{j,i3}(\gamma) & 0 & \cdots & 0 \\ 0 & \Delta z_{j,i4}(\gamma) & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & \Delta z_{j,1i,T}(\gamma) \end{bmatrix}, j = 1, 2 \quad (3.3.14)$$

Thus, the corresponding moment matrix will be:

$$W_i^{min}(\gamma) = \begin{bmatrix} W_i^{d,min}(\gamma) & 0 \\ 0 & W_i^{l,min}(\gamma) \end{bmatrix}, i = 1, \ldots, N;\ W^{min}(\gamma) = \begin{bmatrix} W_1^{min}(\gamma) \\ \vdots \\ W_N^{min}(\gamma) \end{bmatrix} (3.3.15)$$

Lastly, $\hat{\phi}^{BB}(\gamma)$ combines the entire set of moment conditions of $W_i^d(\gamma)$ from the differences equations and a subset of moment conditions of $W_i^{l,min}(\gamma)$ from level equations. The corresponding moment matrix of the estimator is:

$$W_i^{BB}(\gamma) = \begin{bmatrix} W_i^d(\gamma) & 0 \\ 0 & W_i^{l,min}(\gamma) \end{bmatrix}, \; i = 1, \ldots, N; \; W^{BB}(\gamma) = \begin{bmatrix} W_1^{BB}(\gamma) \\ \vdots \\ W_N^{BB}(\gamma) \end{bmatrix}. \quad (3.3.16)$$

Consequently, the one-step and two-step System GMM estimators where *h* = *all*, *min*, and *BB* can be derived from:

$$\hat{\phi}_1^h(\gamma) = \{X(\gamma)'W^h(\gamma)V_1^h(\gamma)^{-1}W^h(\gamma)'X(\gamma)\}^{-1}\{X(\gamma)'W^h(\gamma)V_1^h(\gamma)^{-1}W^h(\gamma)'Y\} \quad (3.3.17)$$

And

$$\hat{\phi}_2^h(\gamma) = \{X(\gamma)'W^h(\gamma)V_2^h(\gamma)^{-1}W^h(\gamma)'X(\gamma)\}^{-1}\{X(\gamma)'W^h(\gamma)V_2^h(\gamma)^{-1}W^h(\gamma)'Y\} \quad (3.3.18)$$

Where

$$V_1^h(\gamma) = \sum_{i=1}^N W_i^h(\gamma)'HW_i^h(\gamma), \quad H = \begin{bmatrix} G & 0 \\ 0 & I_{T-2} \end{bmatrix}$$

$$V_2^h(\gamma) = \sum_{i=1}^N W_i^h(\gamma)'\hat{u}_i^h(\gamma)\hat{u}_i^{h'}(\gamma)W_i^h(\gamma), \quad \hat{u}_i^h(\gamma) = Y_i - X_i(\gamma)\hat{\phi}_1^h(\gamma)$$

with γ and large N. Again, the System GMM estimator provides consistent estimates for ϕ in Equation (3.3.11) with asymptotically normally distributed covariance matrices as follow:

$$\text{Var}\left(\tilde{\phi}_1^h(\gamma)\right) = \{X(\gamma)' W^h(\gamma) V_1^h(\gamma)^{-1} W^h(\gamma)' X(\gamma)\}^{-1}, \quad h = all, min, BB \tag{3.3.19}$$

$$\text{Var}\left(\tilde{\phi}_2^h(\gamma)\right) = \{X(\gamma)' W^h(\gamma) V_2^h(\gamma)^{-1} W^h(\gamma)' X(\gamma)\}^{-1}, \quad h = all, min, BB \tag{3.3.20}$$

In conclusion, the FD-GMM and the System GMM are identical in term of instrument counts, yet System GMM is prevalent as it addresses the possible finite sample bias that caused by weak instruments in the FD-GMM. Moreover, since institutional quality and income inequality are statistically persistent, estimating these persistent variables as an explanatory variable by using the difference GMM approach will lead to biased estimates (Arellano & Bover, 1995). Therefore, Section 3.4 suggests that System GMM is the most appropriate technique for estimating Model 1, Model 2, and Model 3 of this study. The next section will highlight the specification of the System GMM models in this study.

3.5 System GMM Model Specification

This study employs the System GMM technique in estimating Model 1 (Equation 3.2.2), Model 2 (Equation 3.2.3), and Model 3 (Equation 3.2.4). Following the framework in Blundell and Bond (1998; 2000), this study includes both the levels and the differences of endogenous variables as instrumental variables.

Lastly, Arellano and Bond (1991) and Arellano and Bover (1995) have suggested two specification tests to evaluate the validity of the instruments in GMM models: The Sargan test and the Arellano-Bond serial correlation tests.

Originally developed for instrumental variables from cross-sectional and time series data (Sargan, 1958), Hansen (1982) proved that the Sargan test can be extended for testing over-identifying restrictions for GMM models. The Sargan-Hansen test first assumed the parameters are identified by the priori moment conditions used and then tests the validity of over-identifying restrictions. The corresponding null hypothesis is that the instruments are independent of the error term. The J-statistic of the null follows a chi-square distribution asymptotically with $(m-k)$ degrees of freedom, where m is the number of instruments and k is the number of endogenous variables. Likewise, failure to reject the null hypothesis implies that the instruments are valid.

The Arellano-Bond (AB) serial correlation test examines whether the error terms from the differences equation are serially correlated at the first (AR(1)) and the second autoregressive order (AR(2)). The null hypothesis of the AB serial correlation test is that the differenced error terms are not correlated with their lags up to the specified autoregressive order. However, rejection of the null under AR(1) is quite likely, even when the error terms in levels are independent. Therefore, the literature emphasizes more on the test for AR(2), in which the failure to reject the null hypothesis suggests that the error terms in levels are serially uncorrelated, and therefore the GMM estimators are consistent.

In conclusion, the specification for every estimated models in this study shall pass the Sargan-Hansen test and the AB serial correlation test before proceeding to result interpretation and making inferences. The following chapters (Chapter 4, 5, 6) will report the results of model estimations and specification tests.

CHAPTER 4

ROLES OF FINANCIAL DEVELOPMENT AND INSTITUTIONAL QUALITY IN REDUCING INCOME INEQUALITY

4.1 Introduction

To answer the first research question, this section estimates the long run model of income inequality (equation 3.2.2) using the 2-step System GMM framework with robust standard errors. The main objective of the estimation is to identify the direct impact of changes in financial development and institutional quality on income inequality. The study categories the sampled countries into three groups namely All Countries, Advanced Economies, and Emerging and Developing Economies as specified in the IMF classification of development status (see Appendix Section App2, page 209). As aforementioned, the proxy for income inequality is the net Gini index published by SWIID (2016), the proxy for financial sector development is the domestic credit issued to private sectors to GPD ratio. The study utilizes the ICRG political risk data to generate the institutional quality aggregate index. Besides, the study includes the analysis of each of the four sub-indices of the institutional quality, which are bureaucratic quality, control of corruption, government stability, and rule of law. Section 4.2 below estimates, reports and discusses the empirical results. Section 4.3 summarizes.

4.2 Results and Discussions

To begin with, recall the long run model of income inequality as described in Equation 3.2.2:

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it}Y_{it} + \beta_{2,it}Y_{it}^2 + \beta_{3,it}FD_{it} + \beta_{4,it}FD_{it}^2 + \beta_{5,it}Q_{it} + \sum_{j=6}^{k}\beta_{j,it}X_{j,it} + \varepsilon_{it} \tag{3.2.2}$$

where $INEQ$ denotes income inequality, Y is economic growth, FD represents the level of financial development, Q is the indicator of institutional quality. The controlled variables X_j are described as follow:

$$X_j = \{INEQ_{t-1}, EDUC, OPEN, INFL\}$$

where $INEQ_{t-1}$ is the lagged income inequality or initial income inequality, $EDUC$ denotes educational attainment or human capital, $OPEN$ refers to trade openness or trade liberalization, and $INFL$ is the inflation rate.

Table 4.1 below reports the estimation results that include all sample countries as the cross sections. Five models (Model I – V) are reported with respect to alternative measures of institutional quality, namely the averaged aggregate index, bureaucratic quality, corruption control, government stability, and law and order.

Table 4.1 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: All Countries
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
Inequality_{t-1}	0.8379^{***} (0.000)	0.8342^{***} (0.000)	0.8345^{***} (0.000)	0.8426^{***} (0.000)	0.8242^{***} (0.000)
Income Growth	0.0300^{**} (0.038)	0.0668^{***} (0.000)	0.0256^{*} (0.075)	0.0544^{***} (0.000)	0.0574^{***} (0.000)
Income Growth^2	-0.0024^{***} (0.003)	-0.0047^{***} (0.000)	-0.0022^{***} (0.005)	-0.0038^{***} (0.000)	-0.0040^{***} (0.000)
Fin. Development	0.0013 (0.788)	-0.0070 (0.206)	-0.0039 (0.469)	0.0013 (0.753)	-0.0016 (0.672)
Fin. Development^2	0.0006 (0.379)	0.0017^{**} (0.037)	0.0014^{*} (0.063)	0.0005 (0.456)	0.0012^{*} (0.056)
Institutional Quality	-0.0177^{***} (0.000)	-0.0104^{**} (0.000)	-0.0053^{***} (0.001)	0.0083^{***} (0.000)	-0.0091^{***} (0.002)
Trade Openness	0.0100 (0.647)	-0.0002 (0.910)	0.0013 (0.459)	-0.0024 (0.319)	0.0020 (0.339)
Human Capital	0.0076 (0.124)	0.0036 (0.352)	0.0090^{**} (0.039)	0.0043 (0.350)	0.0033 (0.470)
Inflation	-0.0121^{***} (0.000)	-0.0066^{***} (0.000)	-0.0088^{***} (0.000)	-0.0113^{***} (0.000)	-0.0105^{***} (0.000)
No. of Obs	1208	1208	1208	1208	1208
No. of IV	69	69	69	69	69
Sargan-Hansen	57.13 (0.545)	60.22 (0.431)	67.15 (0.218)	55.84 (0.593)	59.72 (0.218)
AR(1)	-2.18 (0.029)	-2.07 (0.039)	-2.12 (0.034)	-2.26 (0.024)	-2.01 (0.044)
AR(2)	-1.42 (0.145)	-1.50 (0.133)	-1.51 (0.131)	-1.54 (0.124)	-1.32 (0.167)

Overall, each of the five estimated models in Table 4.1 is adequately specified based on the results of diagnostic tests (bottom panel). The Sargan-Hansen's test results show that the null hypothesis (over-identifying restrictions are valid) is not rejected at the conventional significance level. In terms of the Arellano-Bond test for serial correlation, the null hypothesis of the AR(1) test is rejected at 5% level for all models, which is expected due to the lagged dependent term of income inequality (Inequality_{t-1}). Nonetheless, the null hypothesis at the second order (AR(2)) is not rejected for all models, indicating that the models are free from disturbance of serial correlation. Moreover, the lagged dependent variable of income inequality is statistically significant for all models, which implies that the GMM estimator is appropriate to estimate Equation 3.2.2 and the empirical results are valid for statistical inference.

The first panel shows the estimated system GMM estimates that reveal some key findings. First, Model I reports a significant and positive estimate (0.0300) for income growth at the 5% level of significance, which indicates that higher national income growth tends to widen the income gap in the context of all sample countries. However, Model I shows a significant and negative estimate (-0.0024) for the squared term of income growth at the 1% significance level. These results point to the presence of the inverted U-shaped Kuznets curve on income growth and inequality when all countries are of concern. Specifically, higher income growth initially leads to worsening income distribution, but further increases in income growth will begin to improve income distribution after the growth rate surpasses a threshold rate[39]. Similarly, Model II, III, IV, and V report the inverted U-shaped relationship between income growth and inequality, suggesting that the presence of the Kuznets curve is robust to the alternative measures of institutional quality. The finding of the Kuznets curve in a large and un-stratified group of countries is consistent with the seminal cross-sectional studies of Deininger and Squire (1996; 1998), Barro (2000; 2008), and Lin, Huang, and Weng (2006). Apart from the cross-sectional evidence, Desbordes and Verardi (2012) also documented pro-Kuznets hypothesis evidence by using data of 113 countries from 1960 to 2000. However, Desbordes and Verardi (2012) also stressed that the empirical existence of the Kuznets curve is sensitive to the endogeneity of income growth. The relationship between income growth and inequality turns to be monotonically negative once the endogeneity of income growth is accounted for in the panel data estimation. Additionally, Angeles (2010) failed to find supporting evidence of the Kuznets hypothesis by treating employment in non-agriculture sectors as the proxy for economic development.

In terms of financial development, all models report insignificant estimates for the linear term of financial development, which indicates that financial development exert insignificant linear effect on affecting income inequality. Next, Model II, III, and V report significant estimates for the squared term of financial development. However, the statistically significant coefficients for the squared financial development have no practical importance, as there is no linear

[39] The estimated threshold rates of income growth for each models are 518.01, 1,219.73, 336.36, 1,284.20, and 1,306.36, in constant US dollar 2010, respectively.

relationship exists between financial development and income inequality. The finding of an insignificant effect of financial development on income inequality is consistent with evidence from Law and Tan (2009), who showed that financial development exhibits no significant explanatory power in determining income distribution in the context of Malaysia. Still, the finding above contradicts to numerous past studies who found a significant effect of finance on income distribution (see, among others, Law et al., 2014; Denk & Cournède, 2015; Baiardi & Morana, 2018; Ibrahim, 2018; Destek et al., 2020). Nonetheless, it is possible that the insignificant effects found are due to the heterogeneous country-specific characteristics of advanced and developing economies. This will be elaborated further in the following discussions pertaining to advanced economies (Table 4.2) and developing economies (Table 4.3).

Turning to the effect of institutional quality, all models show that a change in institutional quality has a significant effect on income inequality. Specifically, Model I shows that a 1% increase in the composite index of institutional quality induces a 0.0177% decrease in income inequality, implying that improvement in overall institutional quality helps to enhance income distribution. The finding of a negative relationship between institutions and income inequality is consistent with the empirical findings of Keefer and Knack (2002), Sonin (2003), Easterly (2001; 2007), Chong and Gradstein (2007), Telbadi and Mohan (2010), and Spruk (2016). In terms of the sub-indices, the Model II, III, and IV also indicate a significant and negative relationship between each angles of institutions and income gap, in which improvement in bureaucratic quality, corruption control, and rule of law, tends to reduce income inequality. The key message delivered from the studies above is that weak institutional quality weakens the ability of the poor to extract rents from economic growth as compared to the rich. Thus, effective government, better control of corruption, rule of law, as well as the overall institutional quality is essential to combat unequal distributions of income. However, the model of government stability (Model IV) shows a contradiction, in which better government stability has a significant and positive effect on income inequality. This interesting finding suggests a possible situation where a stable government tends to create a more unequal distribution of income rather than mitigate it. A possible reason for this result is that a long-lasting party in-house can attract more lobbying activities between the officials in power, businessperson, and the rich in general, which in turn promotes the rent-seeking power and frequency of the elites (Spinesi, 2009).

Turning to the controlled variables, all models agree that trade openness is statistically insignificant in explaining income distribution. Similarly, human capital, as measured in years of secondary schooling, has no significant effect in reducing income inequality. Nonetheless, rising inflation rates tend to negatively associate with lower income inequality at the 1% level of significance. Following the discussion in Section 3.2.5 (page 113), the reported negative effects of inflation rate on income inequality are better explained by the savings redistribution channel (Doepke & Schneider, 2006). An expansionary monetary shock (with lower interest rates and higher inflation rates) tend to benefit borrowers and hurt savers. Since net borrowers generally fall under middle- or low-income household, thus higher inflation rates might lower the income gap between the rich and the poor.

Table 4.2 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: Advanced Economies
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
Inequality$_{t-1}$	0.8675***	0.8246***	0.8739***	0.7440***	0.8336***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income Growth	0.6116***	0.9742***	0.4012**	0.7823***	0.6702***
	(0.000)	(0.000)	(0.027)	(0.000)	(0.000)
Income Growth^2	-0.0297***	-0.0453***	-0.0195**	-0.0380***	-0.0318***
	(0.000)	(0.000)	(0.029)	(0.000)	(0.000)
Fin. Development	0.2510***	0.1537***	0.2220***	0.1574***	0.2047**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.011)
Fin. Development^2	-0.0261***	-0.0150***	-0.0232***	-0.0148***	-0.0200**
	(0.000)	(0.000)	(0.000)	(0.004)	(0.020)
Institutional Quality	-0.0184**	-0.1789***	-0.1025***	0.0069***	-0.1089***
	(0.015)	(0.000)	(0.007)	(0.005)	(0.003)
Trade Openness	0.0137***	0.0202***	0.0104***	0.0223***	0.0188***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Human Capital	-0.0086	-0.0033	-0.0146**	0.0020	0.0129
	(0.350)	(0.785)	(0.013)	(0.808)	(0.171)
Inflation	-0.0220*	-0.0461***	-0.0115***	-0.0129*	-0.0465***
	(0.056)	(0.000)	(0.005)	(0.093)	(0.000)
No. of Obs	312	312	312	312	312
No. of IV	55	44	46	46	55
Sargan-Hansen	27.94	29.51	24.38	23.91	25.69
	(0.978)	(0.688)	(0.930)	(0.939)	(0.991)
AR(1)	-2.07	-2.20	-2.02	-2.06	-2.34
	(0.038)	(0.028)	(0.043)	(0.039)	(0.019)
AR(2)	-1.36	-1.15	-1.48	-1.49	-1.35
	(0.158)	(0.206)	(0.138)	(0.136)	(0.179)

Next, Table 4.2 tabulates the estimation results that include only advanced economies as the sample cross sections. Similar to the previous results in Table 4.1, all five models reported in Table 4.2 statistically pass the three diagnostic tests for GMM model specification. Besides, the coefficients of the lagged dependent terms ($Inequality_{t-1}$) are statistically significant across all estimated models. The estimated models are therefore valid for further statistical inferences.

Taking a glance at the first panel, all models in Table 4.2 present significant and positive estimates for income growth at the 5% level of significance. This set of results is similar to the ones including all countries as sampled observations, which implies that higher income growth tends to increase income inequality among advanced and developed economies. Next, all models unanimously report a significant and negative estimate for the squared term of income growth at the 5% significance level[40]. These results again suggest that the Kuznets curve exists within advanced economies. The finding of the Kuznets curve in developed countries is consistent with a recent piece of evidence from Kavya and Shijin (2020), which suggests that the relationship between economic development and income inequality takes an inverted U-shaped form in 28 high-income countries.

In terms of financial development, all models report significant and positive estimates for the linear term of financial development at the 5% level of significance. This indicates financial development tends to induce large income

[40] The estimated threshold rates of the Kuznets curve for each models are 29,622.70, 46,758.88, 29,353.86, 29,537.65, and 37,712.08, in constant US dollar 2010, respectively.

gaps within the society of developed countries. However, all models report significant and negative estimates for the squared term of financial development. Combining the results above, Table 4.2 tells the presence of an inverted U-shaped relationship between financial development and income inequality. In other words, there exists a turning point in the finance-inequality relationship: any development in the financial system below the turning point tends to widen the income gap, while any financial development beyond the turning point narrows the income gap[41]. This finding is consistent with the theoretical conjecture of Greenwood and Jovanovic (1990), and empirical evidence provided by Nikoloski (2013), Baiardi and Morana (2016; 2018), and Destek et al. (2020). Specifically, Nikoloski (2013) revealed that the Kuznets phenomenon also exists within the relationship between financial sector development and income inequality for advanced and developing countries for the period of 1962 to 2006. Baiardi and Morana (2016; 2018) argued that a financial Kuznets curve appears over the entire euro area since the mid-1980s. Moreover, Destek et al. (2020) showed an inverted U-shaped pattern relationship between income inequality and overall financial development as well as banking sector development in Turkey. Likewise, the results above oppose to studies that support the linear hypotheses of finance-distribution relationship, which include Denk and Cournède (2015) and Destek et al. (2020). The former showed that greater credit intermediation and stock market development lead to a more unequal income distribution in the OECD countries, while the latter argued that stock market development monotonically narrows income inequality in Turkey.

[41] The estimated turning points of the finance Kuznets curve are 122.54%, 167.89%, 119.64%, 203.89%, and 166.92%, measured as domestic credit to GDP, respectively.

Next, the results indicate that improvement in overall institutional quality significantly reduces the income inequality of advanced economies at the 5% significance level. Specifically, a 1% increase in overall institutional quality associates with a 0.018% decrease in the net Gini index. This result suggests the promising effect of better institutions in promoting an egalitarian society among the advanced economies. Likewise, the finding above is consistent with Chong and Calderón (2000a), who claimed that higher institutional quality (represented by composite index) reduces income inequality. Besides, Model II, III, and V also reveal a negative and significant relationship between income distribution and different sub-indices of institutional quality at the 1% level of significance. Specifically, a 1% improvement in bureaucratic quality, corruption control, and rule of law tends to reduce income inequality by 0.1789%, 0.1025%, and 0.1089%, respectively. The results regarding the dimensions of institutions on income inequality are consistent with several past evidence, including Keefer and Knack (2002), Spinesi (2009), Dincer and Gunalp (2011), Bašná (2019), and Policardo et al. (2019). Lastly, Model IV again shows that improvement in government stability tends to widen income inequality rather than reducing it. This counter-intuitive finding contradicts past evidence found in some studies (Nadia & Tehedi, 2014; Spruk, 2016). Still, it could happen when the party in-house stayed in power for a sufficiently long period and so can attract more lobbying activities between the officials in power, businessperson, and the rich in general, which in turn promotes the rent-seeking power and frequency of the elites (Spinesi, 2009).

Table 4.3 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: Developing and Emerging Economies
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
$Inequality_{t-1}$	0.8713*** (0.000)	0.8401*** (0.000)	0.8532*** (0.000)	0.8532*** (0.000)	0.8525*** (0.000)
Income Growth	0.2083*** (0.000)	0.1186*** (0.000)	0.1701*** (0.000)	0.2046*** (0.000)	0.2487*** (0.000)
Income $Growth^2$	-0.0128*** (0.000)	-0.0073*** (0.000)	-0.0105*** (0.000)	-0.0127*** (0.000)	-0.0153*** (0.000)
Fin. Development	-0.0033*** (0.007)	-0.0016 (0.574)	-0.0098*** (0.000)	-0.0073*** (0.000)	-0.0047** (0.016)
Fin. $Development^2$	0.0035*** (0.000)	0.0019*** (0.000)	0.0043*** (0.000)	0.0044*** (0.000)	0.0039*** (0.000)
Institutional Quality	0.0017 (0.609)	-0.0380*** (0.000)	-0.0105*** (0.000)	0.0103*** (0.000)	-0.0164*** (0.000)
Trade Openness	-0.0140*** (0.000)	-0.0086*** (0.000)	-0.0126*** (0.000)	-0.0080*** (0.000)	-0.0142*** (0.000)
Human Capital	-0.0221*** (0.000)	-0.0179*** (0.000)	-0.0186*** (0.000)	-0.0250*** (0.000)	-0.0244*** (0.000)
Inflation	-0.0090*** (0.008)	-0.0083*** (0.000)	-0.0115*** (0.000)	-0.0061*** (0.000)	-0.0116*** (0.000)
No. of Obs	957	957	957	957	957
No. of IV	55	55	55	55	55
Sargan-Hansen	53.50 (0.493)	40.36 (0.668)	42.00 (0.600)	50.81 (0.598)	43.00 (0.557)
AR(1)	0.77 (0.441)	0.24 (0.809)	0.43 (0.667)	0.67 (0.506)	0.53 (0.594)
AR(2)	-0.93 (0.354)	-0.96 (0.338)	-1.45 (0.148)	-1.15 (0.250)	-1.09 (0.277)

In terms of the controlled variables, all models point out that trade openness leads to higher income inequality among advanced economies. This result coincides with the view of some scholars on the negative impact of globalization.

Next, rising inflation rates tend to negatively associate with lower income inequality at the conventional levels of significance. Finally, human capital has no significant effect on reducing income inequality.

Table 4.3 reports the estimation results in the context of developing and emerging countries. Similar to the previous results, all reported models in Table 4.3 again pass the three essential diagnostic tests for GMM model specification, namely the Sargan-Hansen test and the Arenallo-Bond test for serial autocorrelation in the first and second order. Moreover, the coefficients of the lagged dependent term are significant at 1% level for all models. These results of diagnostic tests indicate that the models in Table 4.3 are appropriate for statistical inferences.

First, focusing on the coefficients of income growth in Table 4.3. All models (Model I to V) show significant and positive estimates for the linear term of income growth at the 1% level of significance. These estimates again indicate that higher growth of national income promotes income inequality within the group of developing economies. Next, all models show significant and negative estimates for the squared term of income growth at the 1% significance level. These results again support the Kuznets hypothesis of growth-inequality relationship in the cases of emerging and developing countries[42]. Considering as well the findings on income growth when only advanced economies are sampled, it is evident that the

[42] The estimated threshold rates of the Kuznets curve for each models are 3,417.69, 3,372.09, 3,294.47, 3,149.88, and 3,386.16, in constant US dollar 2010, respectively.

Kuznets curve exists in the relationship between income growth and distribution regardless of the income status of the nation. The pro-Kuznets curve evidence in developing or emerging economies is consistent with Chambers (2010), who documented that higher growth tends to widen inequality over the short-run and medium-run but reduce inequality over the long run in developing countries. Moreover, Younsi and Bechtini (2018) also supported the Kuznets hypothesis of income growth and distribution in BRICS countries.

Next, the reported estimates for financial development and squared financial development reveal some interesting findings. First, all models report significant and negative estimates for the linear term of financial development. The only exception comes from Model II, which suggests that financial development has no linear impact on income distribution when institutional quality is measured by bureaucratic quality. Nonetheless, all models report significant and positive estimates for the squared term of financial development. A combination of the estimates for both linear and squared terms of financial development implies a U-shaped curve relationship between financial development and income inequality. In other words, there exists an *inverted* finance Kuznets curve among developing countries[43]. This finding sharply contradicts the result shown in Table 4.2, which displays an inverted U-shaped relationship between financial sector development and income inequality among advanced and high-income countries. This contradiction might reveal part of the reasons why financial development exhibit

[43] The estimated turning points of the inverted finance Kuznets curve are, measured as domestic credit to GDP, 1.60%, 3.13%, 2.29%, and 1.83% for Model I, III, IV and V of Table 4.3, respectively.

an insignificant impact on income distribution when all countries are included indiscriminately as samples (as shown in Table 4.1). The finding above coincides with some past empirical studies, which provide evidence of a nonlinear U-shaped relationship between financial deepening and income inequality in 35 developing countries (Tan & Law, 2012) and 8 Asian countries (Ibrahim, 2018).

Turning to the effect of institutional quality, the results shown in each model are heterogeneous. Specifically, Model I displays an insignificant relationship between the change in overall institutional quality and income gap, as the positive estimate of 0.0017 is associated with a *p*-value of greater than the conventional levels of significance. Model II, III, and V indicate a significant and negative relationship between institutions and the income gap, in which improvement in bureaucratic quality, corruption control, and rule of law tends to reduce income inequality. Lastly, Model IV again tells a positive and significant relationship between government stability and income inequality in the context of developing countries. The results pertaining to institutional quality are therefore similar to the results reported for advanced economies.

Turning to the controlled variables, all models display that all three controlled variables are significant to explain the income inequality of developing and emerging economies. Specifically, higher trade openness tends to narrow the income inequality of developing countries at the 1% level of significance. Compared with the results from advanced economies, trade openness is beneficial to developing countries but hurting the income distribution of developed countries. In the case of human capital, a higher enrollment rate at the secondary level significantly reduces the severity of income inequality among developing economies. This shows that formal education is an effective tool to combat income gaps in the context of developing economies. Finally, higher inflation rates tend to associate with a lower level of income inequality of developing countries at the 1% level of significance.

4.3 Summary

This chapter estimates, report, and discusses the effect of income growth, financial development, and institutional quality on income inequality, by controlling the effect of human capital, trade openness, and inflation. The panel data employed has been organized into three groups according to the development status of countries, namely world panel, advanced economies, and developing economies. Table 4.1, 4.2, and 4.3 tabulated the empirical results, which delivered some important messages as follows.

First, all system GMM models estimated here provide support to the Kuznets hypothesis, in which the growth-inequality relationship appears in an inverted U-shaped curve over the observation period. These results are robust to different types of institutional quality and development status of the sampled countries, implying that the Kuznets curve generally presents in all economies regardless of the development status.

Second, the relationships between financial development and income distribution are nonlinear. In the context of advanced or developed countries, the effect of finance on income inequality appears to be an inverted U-shaped curve, which can be called as a finance Kuznets curve. However, the nonlinear relationship is U-shaped in the cases of developing and poorer economies. In this regard, the distributional effect of financial sector development on income is heterogeneous countries, in which the effect is dependent on the development status of the country.

Third and last, improvement in institutional quality exhibits a significant effect in narrowing income gaps. This result generally holds for the improvement in overall institutions, bureaucratic quality, corruption control, and rule of law. On the other hand, greater government stability tends to enlarge income inequality rather than mitigating it. The distributional effect of institutional quality holds across advanced and emerging economies.

CHAPTER 5

THE INTERACTIVE ROLE OF INSTITUTIONAL QUALITY AND FINANCIAL DEVELOPMENT IN THE INEQUALITY-FINANCE-INSTITUTION NEXUS

5.1 Introduction

This section aims to answer the second research question of the thesis: Does the interaction between institutions and finance matter in the finance-inequality relation? To answer the research question, this section estimates the long run model of income inequality (equation 3.2.3) using the two-step System GMM framework with robust standard errors. The main objective of the estimation is to identify the interaction effect between finance and institutions on the inequality-finance-institution nexus.

The study categories the sampled countries into three groups namely All Countries, Advanced Economies, and Emerging and Developing Economies as specified in the IMF classification of development status (see Appendix Section App2, page 209). As aforementioned, the proxy for income inequality is the net Gini index published by SWIID (2016), the indicator for financial sector development is the domestic private credit to GPD ratio. The study utilizes the

ICRG political risk data to generate the institutional quality aggregate index. In addition, the study measures the strength of institutional quality using different indices of institutional quality, which includes the aggregate composite index, bureaucratic quality, control of corruption, government stability, and lastly rule of law. Section 5.2 below estimates, reports and discusses the results. Section 5.3 summarizes.

5.2 Results and Discussions

To begin with, recall the long run model of income inequality as described in Equation 3.2.3:

$$INEQ_{it} = \beta_{0,it} + \beta_{1,it}Y_{it} + \beta_{2,it}Y_{it}^2 + \beta_{3,it}FD_{it} + \beta_{4,it}FD_{it}^2 + \beta_{5,it}Q_{it} + \beta_{6,it}(FD \times Q)_{it} + \sum_{j=7}^{k}\beta_{j,it}X_{j,it} + \varepsilon_{it} \quad (3.2.3)$$

where $INEQ$ denotes income inequality, Y is economic growth, FD represents the level of financial development, Q is the indicator of institutional quality. As aforementioned (Section 3.2.3, page 102), the addition of the interactive term in Equation (3.2.3) is mainly for capturing the unobserved and potential interactive effect from Equation (3.2.2). The controlled variables X_j are described as follow:

$$X_j = \{INEQ_{t-1}, EDUC, OPEN, INFL\}$$

where $INEQ_{t-1}$ is the lagged income inequality or initial income inequality, $EDUC$ denotes educational attainment or human capital, $OPEN$ refers to trade openness or trade liberalization, and $INFL$ is the inflation rate.

Tables 5.1, 5.2, and 5.3 below report the estimation and diagnostics test results. Each table presents the corresponding results of using all countries, only advanced economies, and only developing economies as the sample, respectively. Five models (Model I – V) are reported with respect to alternative measures of institutional quality, namely the averaged aggregate index, bureaucratic quality, corruption control, government stability, and law and order.

Table 5.1 shows the estimation results using all sampled countries as the cross-sectional elements. The top panel of the table presents the estimated coefficients for each regressor. The bottom panel displays the results from essential diagnostic tests for two-step System GMM estimation.

Table 5.1 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: All Countries
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor Inequality$_{t-1}$	0.8368*** (0.000)	0.8065*** (0.000)	0.7997*** (0.000)	0.7316*** (0.000)	0.7022*** (0.000)
Income Growth	0.0964*** (0.000)	0.1081*** (0.004)	0.1159*** (0.001)	0.2338*** (0.001)	0.1761*** (0.001)
Income Growth^2	-0.0059*** (0.000)	-0.0069*** (0.001)	-0.0071*** (0.000)	-0.0147*** (0.000)	-0.0110*** (0.000)
Fin. Development	-0.0128 (0.192)	-0.0096 (0.305)	-0.0258** (0.017)	-0.0195** (0.013)	-0.0257** (0.032)
Fin. Development^2	-0.0002 (0.812)	0.0012 (0.356)	0.0013 (0.449)	-0.0002 (0.775)	0.0022 (0.181)
Institutional Quality	-0.0640*** (0.003)	0.0009 (0.953)	-0.0596*** (0.000)	0.0337*** (0.004)	-0.0386*** (0.195)
FD × IQ	0.0120** (0.026)	0.0026 (0.572)	0.0144*** (0.000)	-0.0069*** (0.010)	0.0220** (0.011)
Trade Openness	0.0018 (0.518)	0.0033 (0.184)	0.0037 (0.170)	0.0108*** (0.003)	0.0069* (0.074)
Human Capital	-0.0002 (0.970)	-0.0042 (0.539)	-0.0078 (0.311)	0.0062 (0.527)	-0.0000 (0.997)
Inflation	-0.0123*** (0.000)	-0.0060** (0.011)	-0.0070*** (0.002)	-0.0123*** (0.000)	-0.0199*** (0.000)
No. of Observation	1117	1034	1034	759	759
No. of IV	54	53	53	50	50
Sargan-Hansen	48.44 (0.263)	41.90 (0.475)	41.91 (0.475)	37.81 (0.475)	32.12 (0.774)
AR(1)	-2.02 (0.044)	-1.93 (0.054)	-1.97 (0.049)	-1.32 (0.188)	-1.31 (0.192)
AR(2)	-1.04 (0.232)	-1.31 (0.190)	-1.34 (0.180)	-1.42 (0.157)	-1.39 (0.164)

First, each of the five estimated models in Table 5.1 is adequately specified based on the results of diagnostic tests (bottom panel). The Sargan-Hansen's test results show that the null hypothesis (over-identifying restrictions are valid) is not rejected at the conventional significance level. In terms of the Arellano-Bond test for serial correlation, the null hypothesis of the absence of the first-order serial correlation is rejected at 5% level for all models, which is expected due to the lagged dependent term of income inequality ($Inequality_{t-1}$). Nonetheless, the null hypothesis of the Arellano-Bond test is not rejected at the second order, indicating that the models are free from disturbance of serial correlation. Besides, the lagged dependent variable of income inequality is statistically significant for all models, which implies that the GMM estimator is appropriate to estimate Equation 3.2.2 and the empirical results are valid for statistical inference.

Proceeding to the top panel of Table 5.1, all models report a significant and positive estimate for the linear term of income growth at the 1% level of significance, with the magnitudes range from 0.7022 to 0.8365. Next, all models also report a significant and negative estimate for the squared term of income growth at the 1% significance level, with magnitudes ranging from -0.0147 to -0.0059. This familiar set of estimates again point to the presence of the Kuznets curve on income growth and inequality, which is similar to the previous results shown in Table 4.1. Thus, it is evident that the validity of the Kuznets curve is robust to the alternative use of measures of institutional quality, as well as the inclusion of interactive terms between financial development and institutional quality in the model.

In terms of financial development, Model I and Model II report an insignificant estimate for the linear term of financial development, which tells that financial development exhibits insignificant influence on the change of income inequality when the composite institutional quality index and bureaucratic quality are of concern. However, Model III, IV, and V report a significant and negative estimate for the linear term of financial sector development, suggesting that finance significantly explains the changes in income distribution when institutional quality is proxied by corruption control, government stability, or rule of law. On the other hand, all models reveal that squared financial development has no significant effect on income inequality. The finding of an insignificant effect of financial development on income inequality is again consistent with Law and Tan (2009).

Turning to the effect of institutional quality, all models except Model II suggest that that institutional quality significantly affects income inequality at the 1% level of significance. Specifically, Model I shows that a 1% increase in the composite institutional quality index leads to, on average, a 0.064% decrease in income inequality. Similarly, the Model III and V indicate that a 1% improvement in corruption control and law and order tends to reduce income inequality, respectively. However, while there exists a significant link between government stability and income distribution, Model IV reveals that the relationship is negative. This result is consistent with the one reported in Table 4.1, in which the interactive term is excluded. Thus, the result suggests again that better government stability tends to promote income widening rather than narrowing.

Moving on to the interactive term (FD × IQ), the estimated coefficients are statistically significant in Model I, III, IV, and V at the conventional levels of significance. As aforementioned (Section 3.2.3, page 102), the sign of the coefficient of the interactive term tells whether financial development complements or substitutes institutional quality in affecting income distribution. In the context of Equation (3.2.3), a significant and positive estimate of the coefficient implies that the two continuous variables are substitutes, whereas a significant and negative estimate of the coefficient implies the complementary nature between financial sector development and quality of institutions. Taking Model I as an example, the positive estimate (0.0120) of $\hat{\beta}_6$ implies that the interaction between financial development and institutional quality tends to reduce the effectiveness of financial development and institutional quality in alleviating unequal distribution. Algebraically, the marginal elasticity of financial development on income inequality is

$$\frac{\partial Gini}{\partial FD} = \left(\hat{\beta}_3 + 2\hat{\beta}_4\right) + \hat{\beta}_6(IQ) = 0.0120 * IQ \tag{5.1.1}$$

as both β_3 and β_4 are statistically indifferent to zero in this case. Similarly, the algebraic expression for the marginal elasticity of institutional quality is

$$\frac{\partial Gini}{\partial IQ} = \hat{\beta}_5 + \hat{\beta}_6(FD) = -0.0640 + 0.0120 * FD \tag{5.1.2}$$

Both equations (5.1.1) and equation (5.1.2) show that the interactive term of FD × IQ weakens the partial contribution of financial development and institutional quality. Apart from the model of the composite index of institutions, Model III reveals a significant substitution effect between finance and corruption control, and that Model V reports a significant substitution effect between finance and law and order. These results suggest that there is a substitution effect between financial sector development and institutions in reducing income inequality. One possible explanation of the substitution effect is that some of the distributional effects of a well-functioning financial sector overlapped with the roles of institutions with high quality. The finding of the substitution effect between finance and institution is similar to some studies in the close discipline. In a study that focuses on poverty alleviation, Cepparulo, Cuesta, and Intartaglia (2017) documented that the interaction between banking sector development and political institutions reduce the pro-poor effect of banking sector development and political institutions, respectively. Compton and Giedeman (2011) examined the finance-growth relationship and found that the interaction between institution and finance weakens the growth promotion effect of financial development.

Conversely, Model IV shows that government stability significantly complements financial development in reducing income inequality. Considering the effect of rising government stability in creating a more unequal society, the interaction effect tends to reduce the pro-rich effect of government stability. One possible cause behind the complementary effect is that a stable government equipped with dominant power against the opposition parties tends to have more resources to spare for developing financial sectors rather than spend the resources to secure seats for the next election, thereby strengthening the pro-equal distribution effect of financial sector development.

In terms of the controlled variables, the inflation rate is significantly and negatively linked with income inequality at conventional levels of significance. However, it appears that human capital is insignificant to explain the changes in income inequality regardless of the proxy for institutional quality. Additionally, trade openness has significant explanatory power to income distribution only when government stability and rule of law measure the quality of institutions.

Next, the following discussion emphasizes the results pertaining to advanced economies. Table 5.2 tabulates the results of the estimations of the two-step system GMM.

Table 5.2 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: Advanced Economies
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
Inequality$_{t-1}$	0.7438*** (0.000)	0.8671*** (0.000)	0.9692*** (0.000)	0.7718*** (0.000)	0.7957*** (0.000)
Income Growth	0.2717* (0.066)	0.4563*** (0.000)	0.6026*** (0.000)	0.5756*** (0.003)	0.4616** (0.012)
Income Growth^2	-0.0138* (0.056)	-0.0206*** (0.000)	-0.0301*** (0.000)	-0.0279*** (0.003)	-0.0232*** (0.010)
Fin. Development	0.2155*** (0.000)	0.1607*** (0.003)	0.3014*** (0.000)	0.1361*** (0.000)	0.3398*** (0.000)
Fin. Development^2	-0.0176*** (0.000)	-0.0113*** (0.009)	-0.0255*** (0.000)	-0.0141*** (0.001)	-0.0124*** (0.005)
Institutional Quality	-0.1585*** (0.002)	-0.0733** (0.015)	-0.1430*** (0.000)	-0.0172 (0.627)	-0.0938*** (0.005)
FD × IQ	0.0352*** (0.005)	0.0169** (0.047)	0.0318*** (0.000)	0.0039 (0.587)	0.1614*** (0.000)
Trade Openness	0.0119*** (0.008)	0.0099** (0.032)	0.0054* (0.064)	0.0187*** (0.000)	0.0164*** (0.000)
Human Capital	-0.0021 (0.864)	-0.0120 (0.321)	-0.0205** (0.033)	0.0043 (0.631)	0.0083 (0.401)
Inflation	0.0022 (0.830)	-0.0290*** (0.000)	0.0056 (0.640)	-0.0236*** (0.004)	-0.0311*** (0.004)
No. of Observation	642	348	276	312	348
No. of IV	59	50	49	50	51
Sargan-Hansen	22.40 (0.999)	27.13 (0.924)	23.76 (0.966)	18.55 (0.998)	22.75 (0.987)
AR(1)	-2.17 (0.030)	-1.94 (0.052)	-1.73 (0.084)	-2.30 (0.021)	-1.77 (0.076)
AR(2)	-1.21 (0.226)	-1.17 (0.201)	-0.99 (0.244)	-1.63 (0.104)	-1.14 (0.208)

First, the bottom panel of Table 5.2 reveals that each of the five models is adequately specified as they passed various essential diagnostic tests for GMM specification. For instance, the chi-square statistics for Hansen's test are not significant at any conventional levels of significance, suggesting that the null hypothesis of valid instruments is not rejected. The reported Z-statistics for the Arellano-Bond test at first-order and second-order serial correlation meet with the typical expectation, in which the statistics are significant at the first order but insignificant at the second order, indicating that the system GMM models are free from disturbance of serial correlation. Lastly, the lagged dependent variable of income inequality is statistically significant for all models, implying that the empirical results shown in the top panel are valid for statistical inference.

Turning to the top panel of Table 5.2, all models indicate the presence of the Kuznets curve on income growth and income distribution in the context of advanced economies. These results show that the validity of the Kuznets curve is robust to the development status of economies and the use of alternative measures for institutional quality. A similar inverted U-shaped relationship is also found between financial development and income inequality, in which all models report significantly positive estimates for the linear term of financial development and significantly negative estimates for the squared term of financial development. These results are again consistent with the ones shown in Chapter 4, in which the estimations exclude the interactive term.

In terms of the distributional effects of institutional quality, it appears that the overall quality of institutions of advanced economies significantly reduces income inequality at the 1% level of significance. Specifically, a 1% increase in the composite institutional quality index induces a 0.1585% decline in the net Gini index. On top of that, each of the sub-indices of institutional quality exhibits a significant and negative effect on income inequality. A 1% improvement in bureaucratic quality, corruption control, and law and order tend to reduce income inequality by 0.0733%, 0.1430%, and 0.0938%, respectively. However, government stability appears to be an exception among the list, which shows an insignificant effect on income distribution at the conventional levels of significance. The results above indicate again that institutional quality is an effective tool for combating unequal income distribution in advanced and developed countries.

Moving on to the interactive terms. All models display that each of the coefficients of the interactive term is statistically significant, except for Model IV, which uses government stability as the proxy of institutional quality. Each of the significant coefficients is positive, suggesting that there are substitution effects between financial development and different aspects of institutional quality among the advanced economies. In other words, the interaction effect between finance and institution tend to weaken the individual effect of financial development and improvement in institutions in reducing income inequality. Table 5.2.1 below reports the marginal elasticities of income inequality against the changes in financial development ($\frac{\partial INEQ}{\partial FD}$) for each model. Table 5.2.2 tabulates the marginal elasticities of institutional quality on income inequality ($\frac{\partial INEQ}{\partial IQ}$) for each model.

Table 5.2.1 Marginal elasticities of financial development on income inequality

Model	$\frac{\partial INEQ}{\partial FD} = (\hat{\beta}_3 + 2\hat{\beta}_4) + \hat{\beta}_6 * IQ$	Proxy of Institutional Quality
I	$0.1803 + 0.0352 * IQ$	Composite index
II	$0.1381 + 0.0169 * IQ$	Bureaucratic quality
III	$0.2504 + 0.0318 * IQ$	Control of corruption
IV	0.1079	Government stability
V	$0.3150 + 0.1614 * IQ$	Law and order

Source: Author's calculations

Table 5.2.2 Marginal elasticities of institutional quality on income inequality

Model	$\frac{\partial INEQ}{\partial IQ} = \hat{\beta}_5 + \hat{\beta}_6 * FD$	Proxy of Institutional Quality
I	$-0.1585 + 0.0352 * FD$	Composite index
II	$-0.0733 + 0.0169 * FD$	Bureaucratic quality
III	$-0.1430 + 0.0318 * FD$	Control of corruption
IV	0	Government stability
V	$-0.0938 + 0.1614 * FD$	Law and order

Source: Author's calculations

One can observe from Table 5.2.1 and 5.2.2 that the marginal effects in Model IV distinct to other models, as coefficients $\hat{\beta}_5$ and $\hat{\beta}_6$ are statistically indifferent to zero. In this regard, the marginal effect of financial development on income inequality is dependent solely on the change in financial development but not on the change in government stability. The marginal effect of government stability on income inequality, on the other hand, is insignificant and close to zero, at least in the context of advanced countries. Apart from government stability, other sub-indices of institutional quality and the composite institutional index exhibit significant interaction with financial sector development, thereby leading to the substitutional effects between finance and institution.

Turning to the controlled variables, higher trade openness appears to create a more unequal distribution of income in advanced economies, as the coefficients of trade openness are significant at conventional levels across all models. Inflation rates, however, appear significant to reduce income inequality only in Model II, IV, and V, in which the institutional quality is measured by bureaucratic quality, government stability, and rule of law. Lastly, human capital is generally insignificant in explaining income distributions of developed countries, except when the institutional quality is measured by corruption control.

The following section focuses on the results pertaining to developing or emerging economies. Table 5.3 tabulates the results of the estimations. Looking at the bottom panel, the results of diagnostic tests show that all five estimated models in Table 5.3 are adequately specified. The Sargan-Hansen's tests conclude that the instruments used are valid at the conventional significance level. The Arellano-Bond test for first and second-order serial correlation suggests that the models are free from disturbance of second-order autocorrelation. In addition, the lagged dependent variable of income inequality is statistically significant for all models, which implies that the GMM estimator is appropriate to estimate Equation 3.2.3 and the empirical results are valid for further statistical inferences.

Table 5.3 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Sample: Developing and Emerging Economies
Dependent Variable: Net Gini index

Model	**I**	**II**	**III**	**IV**	**V**
Proxy for Institutional Quality:	Composite	Bureaucratic Quality	Corruption Control	Government Stability	Law and Order
Regressor					
Inequality_{t-1}	0.8461*** (0.000)	0.8071*** (0.000)	0.8707*** (0.000)	0.8551*** (0.000)	0.8353*** (0.000)
Income Growth	0.2121*** (0.000)	0.1690*** (0.000)	0.2285*** (0.000)	0.3006*** (0.000)	0.2714*** (0.000)
Income Growth^2	-0.0133*** (0.000)	-0.0104*** (0.000)	-0.0142*** (0.000)	-0.0185*** (0.000)	-0.0167*** (0.000)
Fin. Development	-0.0553*** (0.000)	-0.0230*** (0.000)	-0.0246*** (0.000)	-0.0243*** (0.000)	-0.0474*** (0.000)
Fin. Development^2	0.0019*** (0.000)	0.0002 (0.380)	0.0046*** (0.000)	0.0035*** (0.000)	0.0041*** (0.000)
Institutional Quality	-0.0901*** (0.000)	-0.0443*** (0.000)	-0.0355*** (0.000)	0.0336*** (0.000)	-0.0775*** (0.000)
FD × IQ	0.0359*** (0.000)	0.0252*** (0.000)	0.1056*** (0.000)	0.1083*** (0.000)	0.0243*** (0.000)
Trade Openness	-0.0199*** (0.000)	-0.0233*** (0.000)	-0.0201*** (0.000)	-0.0187*** (0.000)	-0.0272*** (0.000)
Human Capital	-0.0197*** (0.864)	-0.0243*** (0.864)	-0.0223*** (0.864)	-0.0348*** (0.864)	-0.0272*** (0.864)
Inflation	-0.0101*** (0.000)	-0.0104*** (0.000)	-0.0156*** (0.000)	-0.0099*** (0.003)	-0.0127*** (0.000)
No. of Observation	957	957	957	960	960
No. of IV	61	61	61	61	61
Sargan-Hansen	45.31 (0.662)	46.44 (0.617)	48.01 (0.553)	49.03 (0.512)	47.41 (0.578)
AR(1)	0.85 (0.395)	1.08 (0.282)	0.43 (0.666)	0.85 (0.395)	1.22 (0.222)
AR(2)	-1.43 (0.152)	-1.07 (0.284)	-1.47 (0.140)	-1.40 (0.161)	-1.20 (0.230)

Now turning to the top panel of Table 5.3, one can observe that the results reported in Chapter 4 Table 4.3 are largely similar to the results shown in Table 5.3, even after the inclusion of the interactive term. For instance, Model I to V unanimously support the Kuznets hypothesis in the context of developing economies. This result suggests that the relationship between income growth and income inequality in developing and emerging countries is inverted U-shaped. Income growth would initially worsen the income distribution of the nations before the growth rate reaches the turning point that forms the maxima of the inverted U-shaped curve, but further income growth beyond the turning would help to close up the income disparity between the rich and the poor.

In terms of the distributional effect of financial development, Table 5.3 replicates the finding of a U-shaped finance-inequality relationship in developing and emerging countries as in Table 4.3. The U-shaped curve is evident given the significant coefficients of the linear term of financial development with a negative sign, while significant coefficients of the squared term of financial development with a positive sign. Model II appears to be the only exception as the change in squared financial development is not significant to explain income distribution. Model II hence suggests that financial sector development exhibit a linear and negative effect on income inequality when institutional quality is measured by bureaucratic quality. In short, the finding of an inverted finance Kuznets curve in developing countries is robust to the addition of the interactive term. These findings are again consistent with the early empirical studies evidence by Tan and Law (2012) and Ibrahim (2018), who reported a nonlinear U-shaped relationship between financial deepening and income inequality.

Moving on now to institutional quality. The results reveal that the overall quality of institutions as well as each of the four dimensions of institutions affect income inequality significantly at the 1% level. It appears that a 1% increase in the composite institutional quality index, bureaucratic quality, control of corruption, and rule of law tend to reduce income inequality by 0.0355% to 0.0901%. In contrast, a 1% increase in government stability tends to widen income inequality by 0.0336%. Thus, the results of significant negative effects of institutional quality but a positive effect of government stability on income inequality are evident in developing countries as well.

Focusing on interactive terms. All models show that the interaction between financial development and institutional quality exhibits a significant power in explaining income distribution. The marginal effects are derived and reported in Table 5.3.1 and 5.3.2.

Table 5.3.1 summarizes the marginal elasticities of financial development on income inequality ($\frac{\partial INEQ}{\partial FD}$) for each model, while Table 5.3.2 tabulates the marginal elasticities of institutional quality on income inequality ($\frac{\partial INEQ}{\partial IQ}$) for each model.

Table 5.3.1 Marginal elasticities of financial development on income inequality

Model	$\frac{\partial INEQ}{\partial FD} = (\hat{\beta}_3 + 2\hat{\beta}_4) + \hat{\beta}_6 * IQ$	Proxy of Institutional Quality
I	$-0.0515 + 0.0359 * IQ$	Composite index
II	$-0.0230 + 0.0252 * IQ$	Bureaucratic quality
III	$-0.0154 + 0.1056 * IQ$	Control of corruption
IV	$-0.0173 + 0.1083 * IQ$	Government stability
V	$-0.0392 + 0.0243 * IQ$	Law and order

Source: Author's calculations

Table 5.3.2 Marginal elasticities of institutional quality on income inequality

Model	$\frac{\partial INEQ}{\partial IQ} = \hat{\beta}_5 + \hat{\beta}_6 * FD$	Proxy of Institutional Quality
I	$-0.0901 + 0.0359 * FD$	Composite index
II	$-0.0443 + 0.0252 * FD$	Bureaucratic quality
III	$-0.0355 + 0.1056 * FD$	Control of corruption
IV	$0.0336 + 0.1083 * FD$	Government stability
V	$-0.0775 + 0.0243 * FD$	Law and order

Source: Author's calculations

Given that the interactive term in all models is significantly positive, there exist substitution effects between different dimensions of institutional quality and financial development in affecting the income inequality of developing countries. As displayed in Table 5.3.1, stronger institutions weaken the individual effect of financial development in creating a more egalitarian distribution of income. Similarly, in Table 5.3.2, further financial development tends to weaken the equalizing effect of institutional quality on income distribution. The above findings of the substitution effect between financial development and institutional strength are consistent with the argument in Aluko and Ibrahim (2020). Using data from Sub-Saharan Africa, the authors show that while financial development is critical for real economics in both low-institution and high-institution countries, the effect appears to be stronger among low-institution countries. This implies that strong institutions may provide similar functional roles as what a well developed financial sector performs. Interestingly, the strongest substitution effects come from the interaction between finance and government stability (0.1083) as well as finance and control of corruption (0.1056) magnitude wise. These show that the distributional role of corruption control and government stability are strongly overlapped with financial development in developing countries, as compared to the cases of rule of law and bureaucratic quality.

Concerning the controlled variables, it appears that trade openness, human capital, and inflation significantly reduce income inequality in developing countries at the 1% level of significance. The result holds across different measures of institutional quality.

5.3 Summary

This chapter analyzes how the interaction between finance and different aspects of institutions salter the individual effect of financial development and institutions in affecting income inequality. It adopts similar datasets as in Chapter 4, in which the panel data are organized into three groups, namely world panel, advanced economies, and developing economies. Table 5.1, 5.2, and 5.3 tabulated the empirical results.

Overall, the interaction between financial development and institutional quality exhibit significant substitution effects between the two variables. A more developed financial sector tends to weaken the effectiveness of better institutions in reducing income inequality. Likewise, improved quality of institutions tends to weaken the effect of financial development in promoting equal distribution of income. The substitution effect between finance and institution presents in both advanced and developing economies, and largely holds across different proxy for measuring institutional quality.

Additionally, the reported partial effects of income growth, financial development, and institutional quality on income inequality in Chapter 5 appear similarly with those presented in Chapter 4, even after considering the interactive effect between finance and institution. For instance, there exists a finance Kuznets curve that explains the relationship between financial sector development and income inequality among advanced and rich countries, while the nonlinear relationship is U-shaped in the context of developing countries. Next, improvement in almost all forms of institutional quality significantly reduces income inequality, except for government stability. Lastly, the presence of the Kuznets curve is observed in all models, suggesting that the hypothesis of an inverted U-shaped curve holds across all samples employed.

CHAPTER 6

THE ROLE OF INCOME INEQUALITY IN ENDOGENOUSLY DETERMINING INSTITUTIONAL QUALITY

6.1 Introduction

This section aims to answer the third and last research question: How does income inequality in turn endogenously determine institutional quality? To answer the research question, this section treats the income inequality, measured using the net Gini index (SWIID, 2016), as one of the regressors in the long run model of institutional quality. The estimator is again the 2-step System GMM estimator with robust standard errors.

6.2 Results and Discussions

To begin with, recall the long run model of income inequality as described in Equation 3.2.4:

$$Q_{it} = \alpha_{0,it} + \alpha_{1,it} INEQ_{it} + \alpha_{2,it} DEMO_{it} + \sum_{j=3}^{k} \alpha_{j,it} XX_{j,it} + \varepsilon_{it} \quad (3.2.4)$$

where Q is the indicator of institutional quality, $INEQ$ denotes income inequality, and $DEMO$ measures the democratic quality. The controlled variables XX_j are described as follow:

$$XX_j = \{GROWTH, EDUC\}$$

where $GROWTH$ represents economic growth and $EDUC$ denotes educational attainment or human capital. As aforementioned (Section 3.2.4, page 104), the reason for including democracy as one of the regressors is due to its significant role in explaining overall institutions (Savoia *et al*., 2010). It is expected that a positive link would establish between democracy and institutional quality, based on the observation that democratic countries tend to associate with better protection in property rights, more inclusive economic developments, and better governance (Acemoglu & Robinson, 2000; Gerring *et al*., 2005; Acemoglu *et al*., 2008).

Table 6.1 below presents the estimation results for Equation 3.2.4. Model I is estimated with data of all sampled countries, while Model II and III are estimated using data of advanced and developing countries, respectively. The bottom panel displays the results of diagnostic tests, which suggest that each of the three estimated models is statistically fit for inference. Particularly, the results of Sargan-Hansen's test show that the instruments used for the System GMM models are not invalid at the conventional significance levels. In terms of serial correlation, the results of the Arellano-Bond test reveal that all models reported are free from the disturbance of second-order autocorrelation. Lastly, the lagged dependent variable of institutional quality (Institutional Quality$_{t-1}$) is statistically significant for all models, which implies that the GMM estimator is appropriate to estimate Equation 3.2.4.

Table 6.1 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE
Dependent Variable: Institutional Quality

Sample: Ind. Var	**Model I** All Countries	**Model II** Advanced	**Model III** Developing
Institutional Quality$_{t-1}$	0.2185*** (0.000)	0.0732*** (0.000)	0.4083*** (0.000)
Inequality	-0.7635*** (0.000)	-0.8052*** (0.000)	-0.5486*** (0.001)
Democratic Quality	0.1045*** (0.003)	0.4422*** (0.003)	0.1309* (0.053)
Income Growth	0.0605*** (0.001)	0.0557*** (0.001)	0.0598 (0.239)
Human Capital	0.1034*** (0.009)	-0.0879 (0.547)	0.1892*** (0.010)
No. of Observation	1603	649	954
No. of IV	34	44	39
Sargan-Hansen	23.14 (0.726)	34.95 (0.611)	27.90 (0.719)
AR(1)	-2.55 (0.010)	-2.72 (0.007)	-2.10 (0.036)
AR(2)	-0.99 (0.322)	-0.78 (0.433)	-1.05 (0.293)

The top panel of Table 6.1 reports the GMM estimates. First, the estimated coefficients of inequality appear statistically significant and negative in all Models at the 1% level of significance. This indicates that more unequal distributions of income tend to deter the quality of institutions of a country. The negative effect of income inequality on institutional quality holds across different development and income status of countries. Nonetheless, the negative effect appears, in the absolute sense, to be stronger among advanced economies (-0.8052) as compared to developing countries (-0.5486). The negative and significant impact of income inequality on institutions is tally with the theoretical expectation as explained in Chapter 3 (Section 3.1.2, page 92 – 98). Empirically, several existing studies support the findings above, including Alesina and Perotti (1996), Easterly (2001), and Keefer and Knack (2002), who found similar cross-country evidence, as well as Chong and Gradstein (2007), who provide evidence using dynamic panel methodology.

Moving on to the control variables, democratic quality seems to exert significant and positive effects on the overall institutional strength, which constitutes bureaucratic quality, control of corruption, governmental stability, and rule of law. All else being equal, a 1% increase in the democratic quality index tends to improve the overall institutional quality by 0.104% (all countries), 0.442% (advanced economies), and 0.1309% (developing countries), respectively. The positive effect of democratic quality on the overall institutional strength is significant at the 1% level in the cases of Model I and Model II, whereas the effect is significant at only the 10% level of significance in the case of Model III. Therefore, the results above suggest that the driving force of democratic quality in enhancing institutional strength is more pronounced among advanced countries as compared to developing countries. The finding of a positive and monotonic relationship between democracy and institutional quality is intuitively convincing and is consistent with the theoretical predictions of Acemoglu & Robinson (2000), Gerring *et al*. (2005), and Acemoglu *et al*. (2008). There is, however, no existing empirical study could offer support to the result of a linear positive relationship between democratic quality and institutional quality. On the contrary, Kotschy and Sunde (2017) argued that there is a nonmonotonic relationship between democratic quality and institutional quality that is moderated by income distributions.

Income Growth and Human Capital, however, show contradictory results between Model II and Model III. For instance, income growth appears to exert a significant and positive effect on improving the quality of institutions in the context of all countries or only advanced economies, but it appears insignificant to explain institutional quality in the case of developing economies. Human capital, on the other hand, shows a significant and positive effect on institutional quality when the sample data considers all countries or only developing economies, while the effect of human capital is insignificant when the sample data consider only developed economies. Nonetheless, the results above are similar to the recent work of Alonso *et al*. (2020), who documented that income growth and education are among the list of factors that endogenously and positively determine institutional quality.

Next, the thesis performs an additional exercise. That is, to re-estimate Equation 3.2.4 by considering the interactive effect between income inequality and democratic quality on institutional quality. The additional exercise is motivated by the theoretical works of Acemoglu and Robinson (2008) and Acemoglu *et al*. (2013)

as well as the empirical work of Kotschy and Sunde (2017). These important works proposed a hypothesis that the beneficial effect of democracy on institutional quality is dependent on the degree of income equality. This in turn implies that there may be a stage-dependent relationship between democratic quality and the overall institutional quality moderated by income inequality. Table 6.2 reports the results from re-estimating Equation 3.2.4 with the inclusion of an interactive term between democratic quality and income inequality (DQ × INEQ). The extended model is expressed as follow:

$$Q_{it} = \alpha_{0,it} + \alpha_{1,it} INEQ_{it} + \alpha_{2,it} DEMO_{it} + \alpha_{3,it} (DEMO \times INEQ)_{it} + \alpha_{4,it} GROWTH_{it} + \alpha_{5,it} EDUC_{it} + \varepsilon_{it} \quad (3.2.4E)$$

where Q is the indicator of institutional quality, $INEQ$ denotes income inequality, and $DEMO$ measures the democratic quality. The controlled variables XX_j are described as follow:

$$XX_j = \{GROWTH, EDUC\}$$

where $GROWTH$ represents economic growth and $EDUC$ denotes educational attainment or human capital.

Table 6.2 Results of Dynamic Panel Two-Step System GMM Estimations with Robust SE

Dependent Variable: Institutional Quality

Sample:	Model I All Countries	Model II Advanced	Model III Developing	Model IV All Countries	Model V Advanced	Model VI Developing
Ind. Var						
Institutional Quality$_{t-1}$	0.2185*** (0.000)	0.0732*** (0.000)	0.4083*** (0.000)	0.3382*** (0.000)	0.3562*** (0.000)	0.3728*** (0.000)
Inequality	-0.7635*** (0.000)	-0.8052*** (0.000)	-0.5486*** (0.001)	-0.9468*** (0.000)	-0.6274*** (0.000)	-1.1892*** (0.000)
Democratic Quality	0.1045*** (0.003)	0.4422*** (0.003)	0.1309* (0.053)	0.8438** (0.014)	0.8390*** (0.000)	1.1149*** (0.003)
DEMO × INEQ	-	-	-	-0.2170** (0.040)	-0.2337*** (0.000)	-0.3335*** (0.001)
Income Growth	0.0605*** (0.001)	0.0557*** (0.001)	0.0598 (0.239)	0.0276 (0.144)	-0.0085 (0.482)	0.0529*** (0.000)
Human Capital	0.1034*** (0.009)	-0.0879 (0.547)	0.1892*** (0.010)	0.2323** (0.000)	0.1689*** (0.000)	0.1026*** (0.000)
No. of Obs.	1603	649	954	1603	649	954
No. of IV	34	44	39	43	43	43
Sargan-Hansen	23.14 (0.726)	34.95 (0.611)	27.90 (0.719)	33.11 (0.606)	30.78 (0.715)	32.09 (0.655)
AR(1)	-2.55 (0.010)	-2.72 (0.007)	-2.10 (0.036)	-2.70*** (0.007)	-1.62 (0.106)	-2.42** (0.016)
AR(2)	-0.99 (0.322)	-0.78 (0.433)	-1.05 (0.293)	-1.01 (0.312)	-0.85 (0.397)	-0.99 (0.321)

Notes: ***, **, and * represent null rejection at 1%, 5%, and 10% level of significance, respectively. Figures in bracket are p-values.

Table 6.2 also includes the results reported in Table 6.1 previously for easier comparisons. Model IV, V, and VI are the extended versions of Model I, II, and III, respectively.

Firstly, the results showed in the left panel and the right panel are quantitatively similar in terms of the effect of inequality and democratic quality. In particular, an increasing degree of income inequality deteriorates the overall institutional strength and vice versa, while better democratic quality tends to promote stronger institutions. While the results are statistically consistent across different samples used, the effect of both democratic quality and income inequality on institutions are relatively stronger (in term of coefficients' magnitude) in developing countries than advanced economies.

Turning to the interactive term, the effect of the interaction between democratic quality and income inequality is captured by the coefficient $\hat{\alpha}_3$. It appears that the interaction between democratic quality and income distribution has a significant and negative effect on the institutional quality at least a 5% level of significance. The sign and magnitude of $\hat{\alpha}_3$ suggest that the beneficial effect of democratic quality on institutional quality in both developed and developing countries tends to be eroded when the level of income inequality is higher than a threshold value. It can be expressed algebraically as

$$\frac{\partial Q}{\partial DEMO} = \hat{\alpha}_2 + \hat{\alpha}_3 * INEQ$$

where $\hat{\alpha}_2$ is the estimated coefficient of democratic quality as shown in Model IV, V, and VI. The threshold levels of *log(INEQ)* estimated for all countries, advanced economies, and developing countries are 3.8885, 3.5901, and 3.3430, respectively[44]. The positive marginal effect of better democratic quality in improving institutional quality will be lowered as the income inequality is getting severer, and will even turn to a negative effect when the level of income inequality is higher than the

[44] These values are equivalent to 48.838, 36.238, and 28.304, as measured in the net Gini index.

computed threshold values and vice versa. The finding of a negative interaction effect between democratic quality and income inequality in determining institutional quality is conceptually similar to Acemoglu and Robinson (2008) and Acemoglu *et al*. (2013). The two theoretical works proposed that democracy could exhibit a non-monotonic effect on institutional quality, in which the effect is conditional on 'economic institution' as represented by the degree of unequal wealth distribution. The finding above is quantitatively similar to Kotschy and Sunde (2017) as well, except that the authors reached their findings by measuring income equality rather than income inequality.

Lastly, the reported results for the control variables, namely income growth and human capital are considerably different after the inclusion of the interactive term. Specifically, the effect of income growth on institutional quality appears to be significant only in the case of developing countries, while the determinant is insignificant in the context of all countries and advanced economies. These results suggest that income growth is a positive driver for achieving stronger institutions among developing countries. However, a similar growth in income is not as important to drive institutional quality among developed countries. Next, human capital exhibits a significant and positive effect on institutional quality in all samples employed, suggesting that formal education is important for improving and sustaining the quality of institutions in all aspects.

6.3 Summary

This chapter analyzes on how income inequality and democratic quality determine the quality of institutions, by controlling the effect of income growth and education. The panel data employed has been organized into three groups, namely the world panel, advanced economies, and developing economies.

The analysis is performed in two stages. The first stage emphasizes the individual effect of income inequality and democratic quality on institutional strength, without considering the interaction between democracy and income distribution. The key messages delivered from the first-stage analysis is that an unequal distribution of income significantly decreases, and democratic quality improves, the quality of institutions in both developed and developing countries.

The second-stage analysis extends the investigation by incorporating the interactive effect between income inequality and democratic quality into the model. The empirical results indicate that the effect of democracy on institutional quality is non-monotonic and dependent on the degree of income inequality of the country. Specifically, improved democratic quality is associated with stronger institutions of a country provided if the income inequality is not excessively high. The same effect of democratic quality on institutional strength would turn negative if the income inequality is higher than a threshold level. The threshold inequality level (measures as net Gini index) is around 48.838, 36.238, and 28.304 for all countries, advanced economies, and developing countries, respectively.

CHAPTER 7

CONCLUSION

7.1 Summary of the Study

This study begins with the introduction of two historical events, namely the 'Occupy Wall Street' movement, and the less-known 'Marikana Massacre', hoping to deliver the message that the severity and damage done by extremely unequal distributions of wealth and income to our society can never be over-emphasized.

As discussed in the first Chapter, governments and NGOs have invested an enormous amount of resources to combat the rising global income inequality, which is ever-increasing since the era of the Industrial Revolution. To date, after the 20-year international collaborative effort since the implementation of MDGs and the succeeding SDGs, the outcome is still far from promising. Given that most of the implemented policy measures are fiscal in nature, such as imposing wealth tax, progressive income tax scheme, and subsequent redistribution scheme, it is arguable that solely depending on fiscal-based policies is insufficient and ineffective in reducing income gaps. Likewise, this study questions whether there are alternative ways for reducing the severity of global income inequality.

With the objective in mind, this thesis provides a humble contribution to the literature body of income inequality, by examining the roles of financial development and institutional quality on income inequality, as well as to investigate the role of income inequality in endogenously influencing institutional quality. Specifically, this thesis aims to answer the following research questions: (i) how do financial development and institutional quality play an important role in reducing income inequality? (ii) does the interaction between institutional quality and financial development matter in influencing the finance-inequality relationship? (iii) how does income inequality in turn endogenously determine institutional quality?

Through the employment of panel data and System GMM estimators, the empirical results discussed in Chapters 4, 5, and 6 yield several major findings, which will be summarized in Section 7.2. Section 7.3 elaborates on the implications of these major findings. Section 7.4 identifies the limitations of the study and recommendations for future research.

7.2 Summary of Major Findings

Overall, the results suggest that both financial development and stronger institutional quality do significantly affect the degree of income inequality in both advanced and developing countries. Firstly, it is evident that financial sector development exerts a nonlinear and significant effect in explaning the level of income inequality. The effect of finance on income inequality takes an inverted U-shaped curve among advanced and rich countries, which is consistent with the theoretical prediction of Greenwood and Jovanovic (1990). However, the same relationship appears to be a U-shaped curve when developing and poorer countries are of concern. The finding of a U-shaped finance-inequality relationship is similar to the finding reported in Ibrahim (2018) and Park and Shin (2017). The U-shaped relationship can be justified in the following notions. As financial markets expanded and deepened, a more developed financial market increase both (1) opportunities for poorer people to gain access to financial services and entrepreneurial capital, as well as (2) the returns to capital and pays to the highly skilled labor markets in the financial sector. Therefore, a U-shaped relationship is possible when the effect of the second effect (higher return to capital and wage of highly-skilled labor) dominates the first (increase opportunity to financial and human capital). These interesting findings suggest that financial development has a heterogenous distributional effect on the income of wealthier and poorer nations.

In terms of institutional quality, all models agree that better quality of institutions is effective for reducing income inequality, regardless of developed or developing countries. The inequality-narrowing effect of institutional quality is held in each dimension of the overall institutions, namely bureaucratic quality, control of corruption, and rule of law. Government stability, on the contrary, exhibits an inequality-widening effect.

This study also examines the distributional effect of the interaction between financial sector development and institutional strength. The results indicate a robust and significant substitutional effect between finance and institutions. The effectiveness of better institutional quality in reducing income inequality tends to be weakened as the financial sector is further deepened or developed. Similarly, improved quality of institutions tends to weaken the effect of financial development in promoting equal distribution of income. The substitution presents in both advanced and developing economies, and largely holds across different measures of institutional quality.

In addition, all empirical results support the validity of the Kuznets curve of the relationship between income growth and income inequality. These results are consistent across all samples employed, suggesting that the presence of the Kuznets curve is robust.

Apart from examining the effect of finance and institution on income distribution, this study also analyzes how do income inequality and democratic quality determine the level of institutional quality. Overall, unequal distributions of income significantly deteriorate the quality of institutions in both developed and developing countries. These findings are consistent with the general intuition and early empirical evidence as in Easterly (2001), Keefer and Knack (2002), and Chong and Gradstein (2007).

The effect of democracy on institutional quality, however, is non-monotonic and dependent on the degree of income inequality of the country. Improved democratic quality is associated with stronger institutions of a country provided if the income inequality is not excessively high. The same effect of democratic quality on institutional strength would turn negative if the income inequality is higher than a threshold level, regardless of whether the country is developed or developing. The threshold inequality level (measures as net Gini index) is around 48.838, 36.238, and 28.304 for all countries, advanced economies, and developing countries, respectively. While the finding of a non-monotonic relationship between democracy and institutional quality is counter-intuitive, it is consistent with the theoretical works of Acemoglu and Robinson (2008) and Acemoglu *et al*. (2013) and similar with the empirical evidence provided by Kotschy and Sunde (2017).

In sum, the major findings in this study are expected to fill the existing literature gaps, as well as providing humble implications to related parties, including policymakers in both governmental and NGO bodies. The detailed implications of the study will be discussed in the following section.

7.3 Implications of Study

The implications of the major findings in this study are several-fold. First, financial development and improvement in institutional quality are effective in reducing the national income inequality of both developed and developing countries. In other words, policies that aim to strengthen the existing financial and institutional framework could be a strategic choice, on top of the mainstream fiscal tools, to alleviate the problem of income inequality. As an alternative way to combat against income gap, better institutional quality exhibits a monotonic effect in promoting a more egalitarian society. This is consistent with the stylized fact that countries with strong institutions tend to associate with a lower degree of income inequality, while countries with poor institutional quality tend to associate with more uneven distribution of income. The inequality-narrowing effect of institutional quality can be achieved through improvement in different angles of the overall institutional quality, namely better control of corruption, improving bureaucratic quality, as well as bringing in a better legal and judicial system. Government stability, however, has a pro-inequality effect in both advanced and developing countries. The counter-intuitive finding pointed out a possible scenario if the existing government stayed in power for an excessively long period, the party in-house could then attract lobbying activities between the government officials in power and the rich, thereby promoting the rent-seeking power of the elites. This finding implies a lesson where, holding all else constant, a regular switch of the ruling party through a fair and transparent democratic system could reduce the degree of uneven distributions of income.

The effect of financial development in reducing income inequality, however, is less-straightforward as compared to the case of institutional quality. Considering the nonlinear quadratic relationship between financial development and income inequality, policymakers are advised to check the existing level of development of the financial system before putting in resources for further expansion. For developing countries, financial development at its early stages could help in narrowing income gaps. The inequality-narrowing effect of financial development will be weaker and eventually turn to inequality-widening once the level of financial development surpasses the critical turning point of the U-shaped relationship curve. To harness the inequality-narrowing effect of financial development, policymakers of developing and emerging countries are advised to prioritize the development of its financial system and sectors during the early phase. Once the financial sector is relatively mature and reached the turning point, policymakers are advised to switch their priority to other facets, such as strengthen institutional quality. In the case of advanced countries, however, the income-narrowing effect of financial development appears only if the financial sectors are sufficiently matured given the inverted-U shaped curve of the finance-inequality relationship. It is therefore recommended that the early development of financial systems in developed countries should be progressed with extra attention paid to the poor, as they might not be equally benefited from the financial development as compared to the rich.

Second, there exists a significant interplay between finance and institutions on top of the partial contributions of finance and institutions on alleviating income inequality. The substitutional effect between finance and institutions implies that the distributional roles of the two factors are partially overlapped with each other. In light of this, policymakers could consider setting the development priority disproportionately that focuses on one side, either financial development and institutions, over the other at one point in time. Nonetheless, this finding is by no means an excuse for national leaders to undermine the importance of institutional quality and financial development. It is crucial for policymakers to continuously strengthen the institutions to ensure a better control for corruption, an efficient bureaucratic system, and upholding the rule of law, among others.

Third, the investigation on factors that endogenously determine institutional quality revealed that both income inequality and democratic quality significantly explain institutional strength in both advanced and developing countries. The findings are expected to provide some new insights into the emerging body of literature that aims to understand what is meant by institutions. Based on the findings, while a proper democratic system does indeed help in improving the overall institutions, the beneficial effect of democratic quality is preconditioned on the current state of income inequality. It implies that democracy can be detrimental to the overall institutional quality if a society is highly unequal. Taking the interactions between income inequality and democratic quality, the finding suggests that equality (or at most a moderate level of inequality) is an essential prerequisite to ensure that democratic quality has a long-lasting positive effect on the overall institutional quality.

Conclusively speaking, financial sector development and institutional quality are playing important roles in narrowing income inequality in both developed and developing nations. Policymakers should therefore utilize these two alternative ways to combat rising income inequality, on top of the conventional tools including progressive tax schemes and income redistribution policies. As one of the universal goals in the list of Sustainable Development Goals, it is undeniable that reducing global inequality and sustaining it at an acceptable level is of utmost urgency for all countries. Apart from the potential damages on economic and social welfare, highly unequal income distribution could deteriorate the overall quality of institutions of a country, causing it even more challenging for the country to achieve a more egalitarian society and ultimately sustainable development. Thus, policymakers should make inequality reduction a primary goal of national policy planning and employ all possible ways to optimize the effectiveness.

7.4 Limitations of Study and Recommendations for Future Research

This study has, by and large, successfully answer the research objectives and filled up the literature gaps by robust findings. However, this study has suffered from several limitations.

The first notable limitation is the number of sampled countries included for the data analysis, especially the panel of developing countries. As of the end of 2015, there are 39 developed nations and 153 developing and low-income countries

(IMF, 2017) in the world. However, this study has included only 36 out of 39 developed countries and only 62 out of 153 developing economies as the sampled observations. Besides, the observation period ranges from 1996 to 2015. The sampled countries and observation periods are selected based on the compromisation between comprehensiveness and data availability, in which the data of the net Gini index, domestic credit to private sectors, and institutional quality indices, are relatively incompleted for most of the less-developed economies.

The second limitation is related to the panel data estimation method. While panel data estimation methods are effective in capturing the dynamic relationships for a group of cross-sections, but it does not identify the dynamics of the unique characteristic of each cross-section. Time series analysis methods are indeed a better alternative for studying the relationship of a specific country, however, as highlighted in the first limitation, the current data available for most countries are likely insufficient for meaningful time series analysis, except for certain advanced economies.

The third and last limitation is attributed to the measure of income inequality, namely the net Gini index. As discussed in Section 1.1, the conceptually *best* indicator of income inequality is Concept 3 income inequality (Milanovic, 2005; 2013), which measures the income gap between individuals around the globe, regardless of their nationality. Indeed, the Concept 3 income inequality can be obtained only through high-quality household surveys on wealth and income data with a sufficiently large number of representatives. However, such individual income data is simply not available in most developing and poor countries, in which the data quality, availability, and transparency are often lacking. Moreover, even if such micro-data is available in most countries, the cross-country comparability of the data will be another foreseeable challenge for researchers.

Conclusively speaking, the limitations of this study is mainly due to data availability. Most of the limitations discussed will not be an issue if the relevant data is readily available, with a reasonable level of comparativeness and quality, in most countries. It is therefore recommended to revisit the research questions by using a more comprehensive dataset with most if not all countries included when the corresponding data are available.

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