Financial Evolution and Income Inequality: Channels and Evidence

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Abstract

The thesis makes original contribution to knowledge in income inequality research area by investigating the links between financial developments and income inequality for a diverse panel of 36 countries over a 26-year period from 1980 to 2005. Based on an extensive literature review and use of a new set of stylised facts, the initial chapter of the thesis reviews the association between the evolution of financial aspects of the economy and income distribution. The outcomes demonstrate that financial globalisation, financial development, and financial liberalisation are among the key factors affecting income inequality, setting a clear context for impending empirical investigations. The first empirical chapter investigates the associations between financial globalisation and development, and income inequality. The chapter makes a contribution by investigating that whether different measures of financial globalisation can have opposing effects on inequality. The outcome show that the de jure and de facto measures of financial globalisation affect income inequality in opposing directions where the former abbreviates it, and the latter aggravates it. In an attempt to make further contribution, the chapter proposes that financial development accompanied with robust banking supervision can reduce income inequality. The results show that financial development integrated with a robust banking supervision can reduce income inequality. The second empirical chapter investigates the association between financial liberalisation and income inequality, with particular emphasis on the role of human capital investments. Contributing to income inequality research field, the results show that financial liberalisation, removal of credit controls in particular, reduces income inequality through creating a more convenient path for the low income group to borrow funds, invest in human capital and get better paid skilled-jobs.

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Table of Contents

List of figures:

List of tables:

Chapter 1: Introduction

1.1 Brief Overview

Income inequality has been a momentous socio-economic problem throughout the globe in the past few decades (Wilkinson & Pickett, 2011; Stiglitz, 2012; Piketty, 2015). What makes this a vital issue is that it has been gradually increased in many regions of the world, especially in advanced economies (Cingano, 2014). Although the level of income inequality has been marginally decreased in some developing countries, the level of inequality remains at high levels (Solt, 2009, 2016). As a result, income inequality is an established issue both in developing and advanced economies.

The rise of income inequality parallel with the rapid evolution of the financial aspects of the economy in modern history mirrors the association between finance and inequality (Demirgüç-Kunt, Honohan, & Beck, 2009; De Haan & Sturm, 2017). The subject of the current thesis is the effects of financial aspects of the economy on income inequality. Concisely, the thesis contends that there exists a substantial relationship between recent financial evolution - namely the progress of financial globalisation, financial liberalisation, and financial development - and distribution of income.

The initial motive of the thesis is to investigate for plausible links in which income inequality could be tackled. This is derived from acknowledging the fact that tackling income inequality can lead to improvements in a variety of societal dilemmas (Arestis, 2018). The level of income inequality influences the welfare of the people, where more unequal distribution of income could have deteriorating effects on mental health, physical well-being, educational attainments, and social security (Wilkinson & Pickett, 2010, 2011). In detail, Wilkinson and Pickett (2011) compared the average levels of social problems in countries with low levels of

income inequality with the United States that carried higher levels of income inequality[1], findings that the levels of mental illness, teenage birth rates, and prison population is approximately 65, 50, and 75 percent higher respectively in the United States in compare to nations with low levels of income inequality.

Unravelling such great issues with reduction of income inequality motivates the thesis to investigate for potential routes in which income inequality can be reduced, especially since income inequality has become an epidemical issue many countries around the world (Piketty & Goldhammer, 2014).

Other that these issues, the rise of income gap between the high income group and the low income group is seen as morally erroneous by established international organizations such as the Organisation for Economic Co-operation and Development (OECD) according to whom poverty and inequality "can have a damaging and lasting effect on people's future outcomes, such as cognitive and behavioural development or health outcomes" (OECD, 2015, p. 112).

Moreover, some demonstrations has taken place as the result of rising income inequality. For example, in September 2011, protest movement against the rise of inequality began in New York City, United States. The protest named as Occupy Wall Street (OWS) which received world-wide attention (Graeber, 2014). According to DeLuca, Lawson, & Sun (2012), the protest carried an important message: major segment of the society recognise income inequality as a major problem. This could perhaps awaken academicians and policy makers about the vitality of the issue.

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[1] Wilkinson & Pickett (2011) considered Finland, Sweden, Norway, and Japan as countries with low levels of income inequality, and United States as a country with higher levels of income inequality.

Pluralising the above facts, a clear message would appear: closing the income gap between the rich and the poor is vital to form a healthier society with better welfare. Hence, it is crucial to identify the roots of income inequality, and conceptual ways to reduce it. The purpose of this thesis is to shed more light on the most recent and significant causes of income inequality, as well as making original contributions to knowledge by providing new conceptual frameworks, accompanied with empirical investigations on potential inequality alleviating routes.

To do so, the thesis provides three main chapters, i.e., chapters 2, 3 and 4. Chapter 2 of the thesis shows that the financial pathway is among the most influential routes affecting inequality. More Specifically, financial globalisation pathway (Freeman, 2010; Figini & Gorg, 2011; Philippon & Reshef, 2012; Jaumotte, Lall, & Papageorgiou, 2013; Furceri, 2015; Bumann & Lensink, 2016), financial development pathway (Beck, Demirgüç-Kunt, & Levine, 2007; Hudon, 2009; Ang, 2010; Shahbaz & Islam, 2011; Jauch & Watzka, 2016), and financial liberalisation pathway (Dobson & Ramlogan-Dobson, 2010; Agnello, Mallick, & Sousa, 2012; Li & Yu, 2014; Christopoulos & McAdam, 2017) are shown to be among major recent elements affecting income inequality. With an extensive review of the literature accompanied with a new set of stylised facts based on 46 countries between 1980-2005, chapter 2 demonstrates substantial associations between financial evolution and income inequality, contextualising for empirical chapters 3 and 4.

Chapter 3 of the thesis empirically analyses the effects of financial development and globalisation on income inequality for a panel of 36 countries between 1980 to 2005. The thesis considers that the mainstream literature did not observe the potentially opposing effects of de jure measure, i.e., capital account openness (Chinn & Ito, 2008) and de facto measure, i.e.,

foreign direct investment (Kose, Prasad, Rogoff, & Wei, 2009) of financial globalisation on income inequality, thus investigates this association. Plus, with introduction of a new conceptual framework chapter 3 proposes that financial development would reduce income inequality if robust banking supervision was in place. To the best of our knowledge, not any other study has investigated the effects of financial development on inequality with emphasising on the role of banking supervision.

With the use of Pooled Ordinary Least Squares (POLS), Within Fixed Effects estimator (WFE), and Generalised Method of Moments (GMM), chapter 3 provides that de jure measure of financial globalisation has a negative association with income inequality, while the de facto measure aggravates income inequality. Moreover, chapter 3 makes original contribution to knowledge by showing that financial development reduces income inequality when robust banking supervision is in place.

Chapter 4 of the thesis empirically analyses the effects of financial liberalisation on income inequality for the same countries and time span used in chapter 3. The thesis extends the model made by Galor & Zeira (1993) in which financial liberalisation is seen as a facilitator promoting human capital investment by the low income group, leading to reduction of income inequality. A large number of research studies (as such: Glomm & Ravikumar, 1992; Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997; Becker, Murphy, & Tamura, 1990; Heckman, 2000; Philippon, & Reshef, 2012) have argued, and in some cases provided empirical evidences, that more educated countries experience lower inequality. Adding to this idea, the thesis provides a framework linking the promotion of human capital investment by the low income group to the rise of financial liberalisation, i.e., the rise of financial liberalisation can reduce income inequality through creating a more convenient path for the low income group to

invest in human capital. The thesis maintains that the majority of the literature did not observe the possible inequality-reducing effects of financial liberalisation with the linkage to human capital investment. Chapter 4 makes original contribution to knowledge by empirically confirming that financial liberalisation reduces income inequality through promotion of human capital investment for the low income group. With the use of POLS, WFE, and GMM, we confirm the robustness of our empirical results.

Overall, the thesis focuses on the financial factors affecting income inequality, particularly the financial development, financial globalisation and financial liberalisation pathways. Thus the following question are focal points of the thesis:

(1) Are de jure and de facto measures of financial globalisation have opposing effects on income inequality?

(2) Does financial development reduce income inequality when it is interacted with robust banking supervision?

(3) How can the relationship between financial liberalisation, human capital investment, and income inequality be explained?

Throughout the thesis income inequality is measured as the Gini coefficient (Deininger & Squire, 1996; Solt, 2009, 2016), which is a statistical measure representing the income distribution of a country's residents. This choice is inspired by two reasons: First, vast majority of the literature that studied income inequality chose the Gini coefficient as the unit of inequality measurement. In order to contribute to knowledge, adjusting the comparability of the results of this thesis to previous research could be helpful. Hence, it is useful to select Gini

coefficient as the measure for inequality. Second, Gini index is perhaps the most reliable inequality measurement to date (Jenkins, 2017), with data being available for most countries, both advanced and developing, for an extensive time span dating back to 1960s (Solt, 2009). Since the analysis of this thesis involves large number of countries and an extensive time span, Gini coefficient would seem to be the most appropriate inequality measure.

The rest of the chapter is organised as follows. Section 1.2 demonstrates research background and rationale of the three main chapters, followed by brief explanations on key research questions and empirical findings in section 1.3. Clarification on the reasons behind choosing cross-country empirical investigations, as well as potential obstacles associated with it is shown in section 1.4.

1.2. Research background and rationale

1.2.1. Identifying the Main Financial Causes of Income Inequality

There exists plentiful theoretical frameworks and empirical investigations about the causes of income inequality, and many of these inquiries are very well respected (as for noteworthy: Acemoglu, 1998; Card & Dinardo 2002; Wilkinson & Pickett; 2010; Atkinson, Piketty, & Saez,.2011; Figini & Görg 2011; Stiglitz, 2012; Milanovic, 2013, Furceri & Loungani 2013; Autor, 2014; Dabla-Norris, Kochhar, Suphaphiphat, Ricka, & Tsounta, 2015; Milanovic, 2016). However, this does not settle the issue and many efforts are yet to be made, as changes in inequality could be derived from many different factors, some of which may not be investigated yet (Piketty, 2014). In other words, there exists gaps in the literature and the research path is extensively open for scholars to explore the causes of income inequality.

Although there exists large body of research identifying the causes of income inequality, cross-continental empirical studies comparing the significance of the main financial causes are rather limited. There exists some limitations for researchers to assess the importance of the financial causes of income inequality in a global perspective. Lack of substantial data availability is indeed a matter of concern as collecting reliable data for financial causes of income inequality is not entirely available for many nations around the word[2]. This is a crucial issue as a positive research contribution should deliver perceptible empirical results, hence using valid data sources is essential (Yanow & Schwartz-Shea, 2015).

Another shortcomings in the literature, which goes back to understanding the roots causing income inequality, is that the financial pathway affecting inequality is defined in various ways. For example, financial development, financial liberalisation, financial openness, and financial globalisation have been often generally referred to as the same concept, i.e., the surge of global financial integration (Freeman, 2010; Philippon & Reshef, 2012; Furceri & Loungani, 2013; Jaumotte et al., 2013). This may lead to misrepresentations when analysing the financial causes of income inequality. Thus, In order to avoid misrepresentation, meaning of the terms should be cautiously and clearly defined. To the best of our knowledge a unified framework disaggregating and defining the financial aspects of the economy does not exist.

Thus, chapter 2 of the thesis provides a new framework in which financial aspects of the economy are disaggregated in three categories: (a) financial globalisation, (b) financial development, and (c) financial liberalisation. Furthermore, each of these factors have been

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[2] For example collecting a long time-series data for 15 Post-Soviet nations, most sub-Saharan and central African nations, as well as many developing countries around the world could be highly challenging.

clearly defined in accordance to the most wide-spread definitions in the literature, where (a) is capital account openness and foreign direct investment, (b) is domestic credit to private sector by banks, and (c) is pro-liberalisation financial policy reforms.

By clarifying and categorising the financial aspects of the economy, the financial elements affecting inequality can be more precisely and thoroughly investigated. In fact, chapter 2 demonstrates in a set of stylised facts that trends of all financial aspects of the economy followed a similar path as income inequality based on 46 countries between 1980 to 2005, thus indicating positive association between financial evolution and income inequality.

Overall, the purpose of chapter 2 is to provide a coherent context for the impending empirical chapters 3 and 4 through: (i) providing an extensive review of the literature on the association between financial evolution and income inequality showing that financial evolution is among the most influential factors affecting inequality, (ii) providing a new framework in which financial evolution is clearly disaggregated and defined in three categories creating a more straightforward path for impending empirical investigations, (iii) creating a new set of stylised facts supporting the notion that financial evolution tends to be among the key factors linked to income inequality.

1.2.2 Income Inequality and Financial Globalisation

The upsurge of financial globalisation originated from advanced economies in 1970s (Levine, 1997; Levine & Beck, 1999; Rajan & Zingales, 2003; Kindleberger, 2015). Shortly

after, developing countries followed the same route[3] leading to the rise of international financial integration (Hirst, Thompson, & Bromley, 2015). Financial globalisation is seen as one of the pillars for economic growth (Stiglitz, 2000; Easterly, 2003; Klein & Olivei, 2008; Rodrik, 2008; Aizenman, Jinjarak, & Park, 2013; Van den Berg, 2016; Schmukler & Abraham, 2017), where globalisation in the financial sector has improved the integration of the world economy, leading to and overall economic growth in most countries around the world.

Nonetheless the income distributional effects are rather debatable (Greenwood & Jovanovic, 1990). Some argue that global financial integration would be in benefit of low income group as it stimulates new business activities resulting in rise of employment opportunities, lowering income inequality (Reuveny & Li, 2003; Lim & McNelis, 2014; Li & Yu, 2014; Shahbaz, Loganathan, Tiwari, & Sherafatian-Jahromi, 2015). While others argue that financial globalization promotes inward foreign business investments that often bring new technologies, leading towards the rise of skill biased employment increasing the gap between skilled and unskilled employment opportunities, which in turn leads to higher income inequality (Te Velde 2003; Figini & Gorg, 2011; Jaumotte, et al., 2013; Furceri & Loungani, 2013). Thus, the thesis contends that there is exist mixed results in the literature regarding the relationship between financial globalisation and inequality. Thus, further research aids to identify the causes of this diversion.

Consequently, chapter 3 of the thesis contributes to the literature by re-examining the effects of financial globalisation on income inequality through disaggregating between the de

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[3] Chinese economic reform in 1978, and Russia's shift to globally integrated market economy following the collapse of the Soviet Union in 1991 are the main examples of the rise of global financial integration of the developing nations in recent decades.

jure- capital account openness (Chinn and Ito, 2008), and de facto- foreign direct investment (Kose et al., 2009) measures of financial globalisation to see whether they have opposing effects on inequality. To the best of our knowledge, this route has not been taken in previous studies.

1.2.3. Income inequality and financial development

According to Levine (1999) and Cihak, Demirgüç-Kunt, Feyen, & Levine (2012) financial development can be interpreted in various ways. Although financial development was traditionally incorporates with financial globalisation and liberalisation (McKinnon, 1973; Shaw, 1973; King & Levine, 1993) the majority of the most recent mainstream literature regard it as the growth of domestic credit to private sector by banks[4]. It is crucial not to incorporate the term with financial globalisation or liberalisation, as this can lead to misrepresentations in interpretation of the empirical findings. Following the same manner as most recent mainstream literature, this thesis regards financial development as the rise of domestic credit to private sector by banks.

Financial development is viewed as a facilitator for recent economic growth (De Gregorio & Guidotti, 1995; Levine, 1999; Acemoglu, 2008; Valickova, Havranek, & Horvath, 2015; Cecchetti & Kharroubi, 2015), where the expansion of credit provision to the private sector rises the scope and extent of business activities, leading to economic growth. While

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[4] As for noteworthy: Jalilian and Kirkpatrick (2005), Clarke, et al. (2006), Liang (2006) Motonishi (2006) Beck, et al. (2007), Rodríguez-Pose and Tselios (2009), Roine et al. (2009), Ang (2010), Enowbi Batuo et al. (2010),Gimet and Lagoarde-Segot (2011), Shahbaz and Islam(2011).

financial development is influential for the recent economic growth, the effects on income distribution is not entirely clear. For example, Greenwood and Jovanovic (1990) provides a framework suggesting that the rise of financial development is mostly in benefit of the high income group in initial stages of financial development, but the benefitt spreads to all income segments of the population in the long-run, i.e., they propose a model in which the relationship between financial development and income inequality follows and inverted U-shaped pattern. In line with the predictions of Greenwood and Jovanovic (1990); Jalilian and Kirkpatrick (2005), Clarke, Xu, & Zou (2006), Beck et al. (2007), Jeong and Townsend (2008), Ang (2010), and Shahbaz et al. (2015) provide evidences that financial development is negatively associated with income inequality.

In contrast, others such as Motonishi (2006), Rodríguez-Pose and Tselios (2009), Gimet and Lagoarde-Segot (2011), and Jauch and Watzka (2016) argue that financial development aggravates income inequality. The main rationale behind this argument is that banks prefer to issue loans to the high income group as they traditionally have a better credit score and lower credit default risk in compare to the lower income segments of the population. In this case, the high income group can accumulate wealth via utilizing the borrowed funds, for example through investment in entrepreneurship (Cagetti & De Nardi, 2006; Parker, 2018) or human capital (Castelló-Climent & Doménech, 2008; Cuaresma et al., 2018), while the lower income segments do not have such opportunities, i.e., the income gap between the high and low income groups would be aggravated.

The above discussion shows that there exists opposing viewpoints on the effects of financial development on income inequality, however, both school of thoughts agree on one point: 'financial development can result in reduction of income inequality, if more equal access

to credit was in place'. A gap in the literature, to the best of our knowledge, is that a plausible empirical link between financial development, more equal access to credit, and reduction of inequality does not exists.

Thus the thesis provides original contribution to knowledge by introducing a new conceptual framework in which 'robust banking supervision' is viewed as a facilitator for more equal distribution of credit, leading to more equal opportunities to invest and generate wealth, reducing income inequality. Essentially, banking supervision monitors the performance of the banks in order to maintain a higher quality of banking standards (Abiad et al., 2010). With higher quality of banking standards one may assume that banks would be more profitable. Higher profits would increase banks capital, i.e., more security against credit default risks, leading to expansion of the credit supply to wider income segments of the society that carry higher loan default risks. In this case, the fruits of financial development would more equally shared as all income segments of the population would have equal opportunities to utilize borrowed funds and generate wealth, resulting in reduction of income inequality.

1.2.4. Financial liberalisation and income inequality

Positive effects of financial liberalisation on economic growth is acknowledged among scholars (for example in: Quinn & Toyoda, 2008; Hermes & Lensink, 2008; Valickova et al., 2015), however, the distributional consequences is not systematically investigated in the literature. Although we noticed lack of thorough explorations, some recent interest came to existence investigating the association between the two (see for example: Shahbaz & Islam,

2011; Agnello et al., 2012; Li & Yu, 2014). Among the recent studies, it has been argued that financial liberalisation in form of removal of credit controls tends to reduce inequality. Specifically, the current literature point out that financial liberalisation would reduce inequality by forming an easier pathway for the low-income to get access to financial services (Demirgüç-Kunt, Honohan, & Beck, 2008). However, the thesis considers that there exist a gap in the literature where better access to credit does not solely improve individuals' income level, i.e., it needs to be supplemented with efficient utilization of the borrowed funds.

According to the large body of research (for example: Galor & Zeira, 1993; Castelló & Doménech, 2002; Black, Devereux, & Salvanes, 2005; Erosa, Koreshkova, & Restuccia, 2010; Philippon & Reshef ,2012; Murphy & Topel, 2016) human capital investment in form of tertiary education enrolment is seen as an efficient utilization of funds. The notion behind this is that an individual increases his/her opportunity to accumulate wealth through acquiring skilled-jobs made available as a result of tertiary education attainment.

If all individuals across the society had the same access to tertiary education enrolment, then income inequality would be greatly lower as all people had the same opportunity to invest in human capital and later generate wealth. In fact, countries that provide free tertiary education enrolment experience lower levels of inequality in compare to countries that charge fees[5] . In educational regimes where tertiary education enrolment fees are charged, taking the costs of human capital investment would be highly challenging, or even unconceivable, for the low income group. In this case, higher income segments of the society continue to invest in human

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[5] See chapter 2 section 2.6 for discussions and stylised facts.

capital and get high-paid skilled jobs while low-income people remain as unskilled, causing a rise in inequality.

An alternative for the low income group is to invest in human capital from the borrowed funds. By accessing to loans and investing them in human capital, people within the low income segment of the society would get higher-paid skilled jobs alongside the high income group, thus tighten the income gaps.

The key point here is that financial liberalisation, removal of credit controls in particular, has surged in recent past (Abiad, Detragiache, & Tressel, 2010). This allows banks to issue loans with less restriction. This could increase the provision of loans to wider income segments of the society including the previously marginalised low income group. In other words, the low income group would have higher chance to get loans as a result of rise of financial liberalisation.

Thus, the chapter 4 of the thesis intends to make original contribution to knowledge by introducing a new conceptual framework in which financial liberalisation reduces income inequality through promotion of human capital investment for the previously marginalised low income group. To the best of our knowledge this link has not been investigated in the current literature.

1.3 Research questions and key empirical findings

The main motivation of the thesis derives from the fact that the empirical findings in the literature recognise income inequality as a major socio-economic issue, but potential channels in which it could be tackled is not thoroughly addressed. In other words, empirical findings and

conceptual frameworks on channels that inequality could be abbreviated is rather limited. Before investigating for a plausible channels abbreviating income inequality, it is essential to recognise the key causes of income inequality. Literature provides a variety of roots causing the rise of income inequality[6]. Simultaneous investigation on large number of causes not only adds to the complexity of the issue, but makes the question even larger and inquires further examinations in various branches of social science. Hence it would be logical to analyse each cause one at the time. Therefore, the thesis focuses on the most recent and widespread element affecting income inequality, which according to the large body of literature appears to be the cause of financial evolution. Thus the very main questions of the thesis are:

1- What appears to be the key factor affecting income inequality in recent past?

2- What are the key components of this cause?

Consequently, chapter 2 of the thesis addresses the first two questions by the following approaches:

- *A comprehensive review of the literature investigating the most influential causes of income inequality*: based on an extensive review of the literature, financial evolution

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[6] For example, skill biased employment, trade liberalisation, reforms in labour market institutions, changes in redistributive policies, education inequality, financial globalisation, financial deepening, and financial liberalisation are among the most well-known causes of income inequality.

seem to have a large and significant association on income inequality in most regions around the world in the past few decades.

- *Determining the key components of the cause*: we provide a new framework in which financial evolution is categorised into three components that are: financial globalisation measured as capital account openness and foreign direct investment, financial development measured as domestic credit to private sector by banks, and financial liberalisations measured as pro-liberalisation financial policy reforms.

- *Creating a new set of stylised facts reviewing associations between financial evolution and income inequality*: although the extensive review of the literature provides adequate evidence on the associations between financial evolution and income inequality, we intend to reassure the existence of this association by creating a new set of stylised facts demonstrating the relationship between the two for a panel of 46 countries (25 developing and 21 advanced) between 1980 and 2005. The outcomes of the stylised facts closely resemble the findings of the literature, i.e., confirming that financial evolution is closely associated with the rise of income inequality.

Overall, chapter 2 of the thesis demonstrate that financial evolution- namely financial globalisation, financial development, and financial liberalisation- are among the key factors affecting inequality in recent past. Consequently, chapter 2 provides a robust and clear context for carrying the empirical investigations that follows in chapters 3 and 4, where the former analysis the association between financial globalisation and development on income inequality, and the latter investigates for links between financial liberalisation and income inequality.

Moving on to chapter 3 of the thesis, the effects of financial development and financial globalisation on income inequality are analysed separately. The motive behind this notion is to provide a more clear understanding on individual effects of financial globalisation and financial development on income inequality. Regarding the effects of financial globalisation, current findings provide mixed results, i.e., some argue that financial globalisation reduces income inequality, while others insist that it leads to aggravation of inequality. This indicates a potential contrasting effects of different measures of financial globalisation on income inequality, thus the first question in chapter 3 is that:

3- Does de jure and de facto measures of financial globalisation affect inequality differently?

Chapter 3 of the thesis addresses this question by running an empirical investigation consisting of 36 countries between 1980 and 2005. The results show that while the de jure measure of financial globalisation (capital account openness) has a negative association with income inequality, the de facto measure (Foreign direct investment) tends to aggravate income inequality. Implying a set of control variables, as well as the use of Pooled Ordinary Least Squares (POLS) including year and country dummies, Within Fixed Effects estimator (WFE) accounting for country heterogeneity, and Generalised Method of Moments (GMM) controlling for potential endogeneity problem, the validity of our results are confirmed.

Regarding the effects of financial development, a school of thought argues that higher provision of credit could increase inequality in short-term due to credit market imperfections, though it leads to reduction of income inequality in the long-term. While other argues that it

aggravates it as the high income group benefit the most form the rise of credit provision. Although the two school of thoughts have opposing viewpoints, both agree on one agenda: if credit was fairly distributes among all income segments of the society, financial development would reduce income inequality. Thus, empirical links between financial development, fairer distribution of income, and reduction of income inequality is the central motive of chapter 3. Thus we ask:

4- What could be a conceptual link between financial development and lowering income inequality?

Chapter 3 addresses this question by providing a new conceptual framework in which 'robust banking supervision' is seen as a facilitator to extend the benefits of financial development to wider income segments of the population, leading to lower inequality. Consequently, this leads to a central question of chapter 3:

5- Does financial development reduce income inequality if robust banking supervision is in place?

Addressing this question, Chapter 3 of the thesis runs an empirical investigation consisting of 36 countries between 1980 to 2005. In line with the conceptual notion, the results show that financial development reduces income inequality if robust banking supervision is in place, making an original contribution to knowledge. Implying the same econometric techniques used for financial globalisation estimation, the validity of our results are confirmed.

Moving on to chapter 4 of the thesis, the relationship between financial liberalisation, removal of credit controls in particular, and income inequality is investigated. Although some recent studies analyse the effects of financial liberalisation on inequality, large gaps exists on evaluating the links associating the two. Thus the thesis asks:

6- What could be a potential link between financial liberalisation and lowering income inequality?

To address this, the chapter 4 investigates for a plausible link between financial liberalisation and reduction of income inequality. Initially, the thesis assumes that financial liberalisation creates a more convenient path for the low income group to get access to funds, invest the borrowed funds in human capital, get better paid skilled jobs, resulting in lower income inequality. specifically, the thesis provides a new conceptual framework in which financial liberalisation is seen as a facilitator for the low income group to generate wealth by investing in human capital from the borrowed funds made available as a result of the rise of financial liberalisation. Consequently, the central question in chapter 4 is that:

7- Does financial liberalisation reduce income inequality through promotion of human capital investment by the low income group?

Addressing this question, Chapter 4 of the thesis runs an empirical investigation consisting same countries and time span as chapter 3. Confirming the conceptual framework, the results show that financial liberalisation, removal of credit control in particular, reduces income inequality by creating a more convenient path for the low income group to invest in human

capital and get skilled jobs. With the use of POLS, WFE, and GMM estimators, potential problems associated with the econometric specification is controlled, providing reliable empirical results, making an original contribution to knowledge.

1.4. Reasons for choosing cross-country examinations and obstacles associated with it

A large portion of empirical studies investigating the elements affecting income inequality are based on regional or within-country analysis. This thesis, however, investigates on a large panel of countries both in developed and developing world for different reasons. As such, there are several features that make the cross-country investigations advantageous compared to the within-country studies in this research field. The cross-country investigations are considering a large number of countries, whereas regional studies only focus on a specific region or a single country. Although this difference does not prove superiority, empirical results based on a broader geographical location can provide more comprehensive information (Hakim, 2000).

This point is further apparent in today's global economic climate where the intense progress of international economic integrations links countries' economies together (Stiglitz, 2002). Besides, in income inequality context, data sources for larger number of countries have become more available in recent years. For this reason, empirical studies face less obstacles to carry cross-country investigations, motivating the rise of recent research interest in cross-country contexts, including this thesis.

In addition to the rise of global economic integration and data accessibility, there exist other motives making cross-country analysis popular among economic researchers. As such, development of new indexes that includes large panel of countries would motivate the researchers to carry cross-country analysis. For example, Financial Reforms Index (Abiad et a., 2008), and Chinn-Ito Index (Chinn & Ito, 2008) are among these new indexes. Adding further to this notion, the World Development Indicators (WDI), which perhaps is the most consistent and reliable global development database, has continued to progress the extent of indicators in the recent past (World Bank, 2016). In addition, the number of locations under this database have progressively increased. In sum, global financial integration, rise of global data availability, the creation of new cross-country databases, and the rapid development of the existing cross-country data sources motivates this thesis to undertake a cross-country investigation.

Moreover, while regional economic studies mainly focus on indigenous data analysis, cross-country examinations can be more comprehensive as:

1- *Within-country studies often employ domestic data bases for their research, while cross-country investigations should refer to international databases:* The empirical results for the latter would be more reliable as international databases are typically globally recognised databases that gather data from internationally recognised sources and provide their final indexes based on universally approved and robust statistical standards (World Bank, 2016), while national data sources may not carry such merits.

2- *Rapid rise of globalisation and integration of the world economy inevitably associates countries with each other*: Although the scope and extent of this association largely varies between countries, this link exist for most nations (Giddens, 2018). As a result, findings of within-country economic studies may be less informative due to missing the potential influences caused by changes in cross-border economies. On the other hand, cross-country investigations solves for this issue by recognising the fact of global economic integration.

The above points highlight the potential advantages of cross-country studies in compare to regional or within-country examinations in this research field. For these aspects, the thesis considers that outcomes derived from studies based on cross-country examinations would be more informative in compare to regional and within-country studies.[7] Thus, the empirical analysis of the thesis will be based on 36 countries for a time span spinning 26 years between 1980 to 2005. Initially, the thesis intended to use as many countries as possible in order to be highly informative. However, the number of countries was reduced to 36 for a number of reasons:

1- Lack of data availability: although the international databases have improved their data availability and accessibility, data unavailability is still seen as an obstacle for studies intending to employ large number of countries for their empirical analysis.

2- Omitted countries: is regression analysis that consist of a number of variables pooled from different data sources the problem of 'omitting countries' could rise. Even if the

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[7] This thesis does not imply that cross-country studies have a categorical superiority in compare to within country ones, and acknowledge that different studies use different data sources based on the nature of their research. Thus, the points mentioned are indications of potential advantages a cross-country investigation may have in this research field.

country is missing the values for one variable, this can lead to its omission from the regression analysis.

3- Large missing values: data for some countries come with large amounts of missing values. Interpolation, that is the act of filling the missing gaps between values, could be a solution for this problem, however interpolation is not recommended where the gaps between values are large (Meijering, 2002). The thesis intends to use minimal interpolations in order to avoid providing inaccurate results. This results in omission of some countries.

4- Unbalanced dataset: some countries within the dataset did not have any data before/after a certain point. Including such countries in the dataset makes it highly unbalanced, which can lead to biased empirical results (Chawla, Japkowicz, & Kotcz, 2004).

Chapter 2: Income Inequality and Financial Evolution: Literature Review and Stylized Facts

Abstract

This chapter demonstrates a comprehensive literature review as well as a set of stylised facts regarding the relationship between income inequality, and financial evolution. Contextualising for the impending empirical chapters, this chapter demonstrates that the evolution of financial aspects of the economy are greatly associated with income inequality. The overall impact of this chapter documents that high income inequality is evidently perceived, coinciding with conspicuous progression of financial globalisation, financial development, and liberalisation in financial markets, establishing coherent motivations to investigate the relationship between income inequality and financial evolution in the upcoming empirical chapters.

2.1. Introduction

The main economic causes of income inequality are widely recognised (Greenwood & Jovanovic ,1990; Acemoglu, 1998), Feenstra & Hanson, 2001; Card & DiNardo, 2002; Claessens & Perotti, 2007), Freeman, 2010; Philippon & Reshef, 2012)[8] with global financial evolution to be among the most acknowledged drivers (Dabla-Norris, Kochhar, Suphaphiphat, Ricka, & Tsounta, 2015)[9].

Over the past few decades, a well-documented process of global financial evolution has been observed (Abiad et al., 2010; Beck, Demirguc-Kunt, & Levine, 2010; Cihak, Demirguc-Kunt, Feyen, & Levine, 2013; Claessens & Van Horen, 2014). Although the overall effect of global financial evolution on income inequality is acknowledged, we know very little on how each individual component of financial evolution impact on income inequality. Most of the current studies provide a broad narrative describing financial advancements. Some regard financial advancements as global financial integration (Furceri & Loungani, 2013), while others regard it as financial deepening (Calderón & Liu, 2003) or financial reforms (Abiad, et al. 2010).

The main aim of this chapter is to identify and outline the main components of global financial evolution, review the literature on the relationship between each individual aspect and income inequality, complementing with new set of stylised illustrations. Based on an extensive literature review instrumenting with a new set of stylised illustrations, the chapter identifies a

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[8] Technological change, trade globalisation, changes in labour market institutions, redistributive policies, education, financial globalisation, financial deepening, financial liberalisation are among the main documented factors affecting income inequality.

plausible context in which global financial evolution is distinguished into three main categories: (a) financial globalisation, (b) financial development, (c) financial liberalisation. Each of these categories are seen as independent factors, as financial globalisation is defined as capital account openness and foreign direct investment, financial development as domestic credit to private sector, and financial liberalisation as reforms in financial sector.

The rest of this chapter is structured as follows. Section 2.2 describes the measurement tool of income inequality (Gini Index) as well as set of stylised facts presenting intensities and trends of income inequality for a sample of countries[10]. In section 2.3 the relationship between de jure and de facto measures of financial globalisation and income inequality has been reviewed. Section 2.4 describes the relationship between financial development and income inequality. In section 2.5 association of financial liberalisation and income inequality is reviewed. Section 2.6 presents some additional factors known to be significant in affecting inequality. Section 2.7 concludes the chapter.

2.2 Income Inequality

2.2.1 Measuring Income Inequality: Gini Index

The Gini index is a measurement tool for income inequality created by Gini (1921), which takes values between 0 and 100. Values closer to the upper bound indicate higher income inequality, while values closer to the lower bound show more equal distribution of income. The

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[10] The stylized facts are built based on a pooled sample of 46 countries.

Gini index is the most frequently used income inequality index[11]. A reason for its popularity is the straightforwardness of the method (Jenkins, 2015). Gini coefficient uses the Lorenz curve (Gastwirth, 1971) to calculate income equality. The Lorenz curve represents the difference between perfectly equal distribution of income and the actual estimated distribution of income. A 45-degree line represents the perfect income distribution, meaning that 50% of people hold 50% of overall wealth. However, this case is far from reality, where in some cases 1% of people hold disproportionately higher share of wealth in compare to the other 99% (Piketty, 2015). The Lorenz curve shows the real distribution of wealth, which will be the curve taking place below the 45-degree perfect equality line. The greater the distance from the Lorenz curve and perfect equality line, the more unequal the distribution of wealth.

Moreover, the Gini coefficient is typically interpreted based on two measurement methods: (a) gross Gini coefficient; and (b) net Gini coefficient, where the former is measured based on pre-tax and transfer incomes, also known as the 'market income', while the latter represents income inequality based on post-tax and transfer incomes; known as 'net disposable income' (Solt, 2009, 2016). Although, undertaking gross or net Gini index as a measure of inequality depends on the nature of research, a vast majority of cross-country inequality studies prefer the net Gini index as it captures a more factual measure of inequality due to the tax and transfer adjustments (Jenkins, 2015). In fact, Figure 2.1 compares the difference between gross and net Gini coefficients for a sample of 46 countries in year 2005, showing a significant divergence between the two.

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[11] A vast majority of the income inequality literature use Gini Index as their measurement tool for income inequality (As for noteworthy: Greenwood & Jovanovic, 1990; Aghion et al., 1999; Barro, 2000; Dollar & Kraay, 2002; Firebaugh, 2009; Cowell, 2011; Ostry et al., 2014; Acemoglu et al., 2015; Lindert & Williamson, 2016).

Figure 2. 1: Net Gini vs Gross Gini (Year 2005)
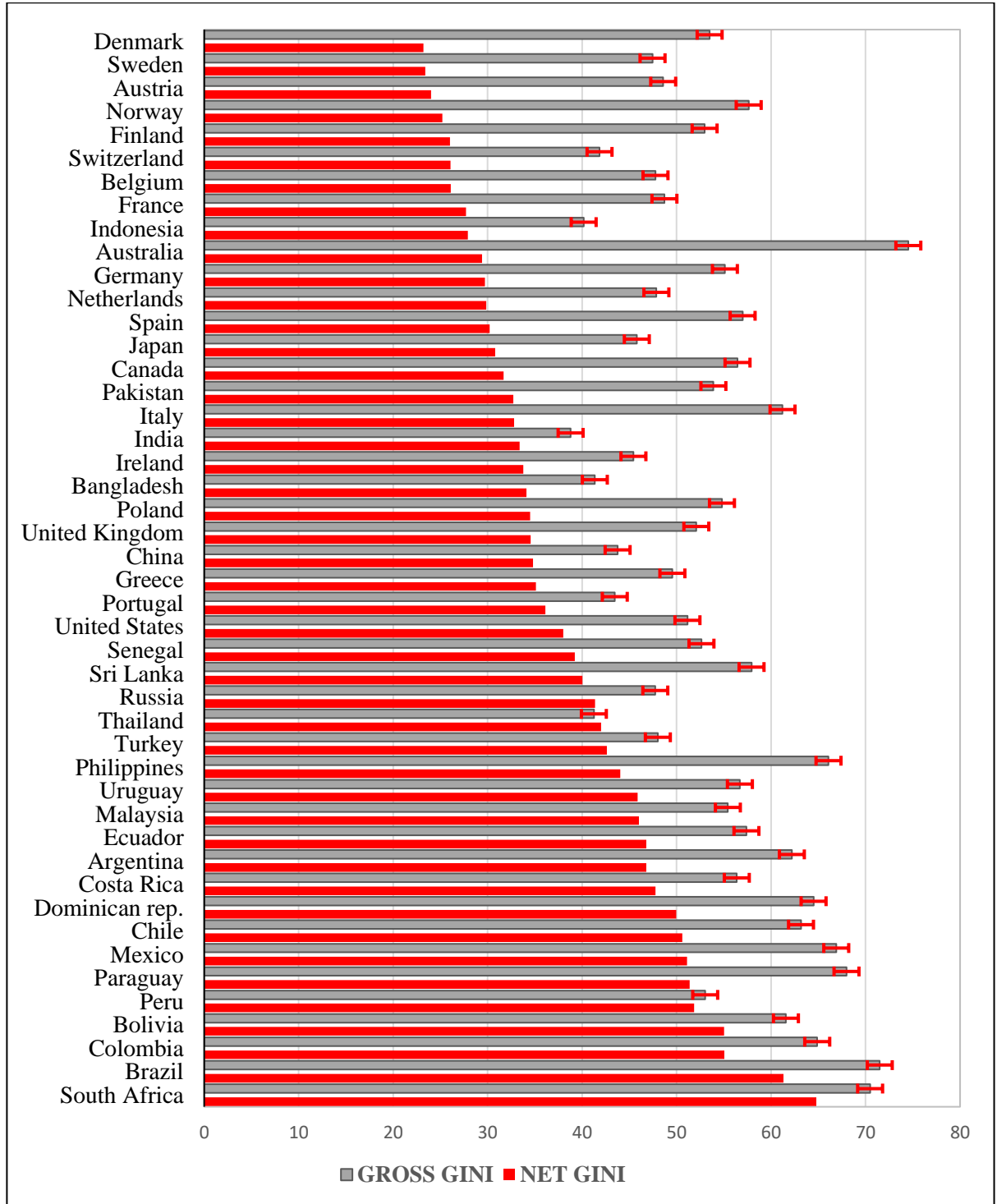
Notes: The horizontal line represents the values of Gini coefficients. Data Source: Standardised World Income Inequality Database (Solt, 2009,2016).

2.2.2 Advantages of the Gini index in compare to alternative inequality measures

Gini index appears to be the most appropriate measure of income inequality for the context of the thesis for two main reasons:

1- Comparable and reliable data for many countries and years: as the inquiry of the thesis is based on cross-country analysis, access to a unit of inequality measurement that is reliable, comparable, and available for many countries and years is essential. According to Bergh and Nilsson (2010) and Jenkins (2017), Gini index appears to be the most widely used and reliable measure of income inequality in cross-country analysis, thus it would be an appropriate approach to use the Gini index as the measurement unit of income inequality.

2- Forthrightness of the method: Gini index uses a single summary statistic of the income distribution within the society as a whole, providing a straightforward answer for studies seeking for the overall level of income inequality within a nation (De Maio, 2007). Many researches, including this thesis, look for the level of income inequality as a whole within a nation, thus Gini index is an applicable measurement tool for income inequality in this particular context of analysis.

Other than the Gini index, there exist additional inequality measurement tools. For example Coefficient of variation (CV) method divides the standard deviation of the income distribution by its means. According to De Maio (2007) this method has some shortcomings in compare to the Gini index as "it does not have an upper bound, unlike the Gini coefficient, making

interpretation and comparison somewhat more difficult; and the two components of the CV (the mean and the standard deviation) may be exceedingly influenced by anomalously low or high income values" (p.849). Moreover, comparison of the income ratios is another approach for measuring inequality. Here the calculations are done by comparing, for example, the income earned by the richest 10% to the income earned by the poorest 10% of the households. The most acknowledged income ratio analysis are the 20:20 ratio (constructed by the United Nations' Human Development Indicators (HDI)) and the Palma ratio (Palma, 2011), where the former compares the wealth held by the top 20% of income earners to the lowest 20% of income earners and the latter compares the income of the richest 10% to the poorest 40%.

According to Cowell (2011) the rationality of inequality measurement tool is largely related to the nature of the research. For example, ratio analysis would be useful in research fields focusing on particular income percentiles. Though, a large portion of macroeconomic studies, including this thesis, focus primarily on the overall level of income inequality within a nation. Hence the Gini index appear to be among the most commonly used measurement tool for income inequality in macroeconomic-related studies (Bergh & Nilsson, 2010). As the context of the thesis is based on investigating the overall level of income distribution within a country, the Gini index is the preferred measurement tool in compare to income percentile and ratio analysis.

2.2.3 Income inequality trends in recent past

Over the past few decades, Income inequality measured by the Gini coefficient had an upward trend in many regions around the world among both developed and developing nations (Brandolini & Smeeding, 2009; Ravallion, 2014). Moreover, the income share of high income

37

group has been dramatically increased among many nations around the globe (Atkinson et al., 2011).

There exist an extensive number of studies confirming the rise of within-country income inequality. For example, Smeeding (2002) show that income inequality followed an upward trend for three decades from 1970s to 1990s in a sample of OECD countries, while Székely (2003) demonstrate that inequality follows a similar pattern in Latin America after the mid-1970s. Riskin (2003) shows that there is an increase in income inequality in China from 1978–1985, with this increase being sharpened after this period. Moreover, Cornia (2005) by taking 70% of the countries with inequality data (i.e., 80% of the world population and global GDP) between 1980 and 2005, estimates overall increase of income inequality worldwide. In a similar line of study, in a sample of 51 countries (20 developed and 31 developing) from 1981–2003, Jaumotte, Lall, and Papageorgiou (2013) show that inequality has risen in the majority of areas throughout the world. Moreover, Cingano (2014) illustrates that "In most OECD countries, the gap between rich and poor is at its highest level since 30 years. Today, the richest 10 per cent of the population in the OECD area earn 9.5 times the income of the poorest 10 percent; in the 1980s this ratio stood at 7:1 and has been rising continuously ever since" (p.6).

The above studies provide a clear message: income inequality has increased in many countries around the world in the past few decades. In conjunction with the existing findings, we create a new set of stylised facts assessing the trends and intensities of income inequality in a pooled dataset consisting of a diverse panel of 46 countries within different income groups and in all regions around the world between 1980 to 2005. See Tables 2.1 for countries being used to create the stylized facts throughout the chapter, and see table 2.2 for their income group classification.

Table 2. 1 Countries used to create the stylized facts

Advanced Countries		Developing Countries	
Australia	Poland	Argentina	Mexico
Austria	Portugal	Bangladesh	Peru
Belgium	Spain	Bolivia	Paraguay
Canada	Sweden	Brazil	Pakistan
Denmark	Switzerland	Chile	Philippines
Finland	United Kingdom	China	Russia
France	United States	Colombia	China
Germany		Costa Rica	South Africa
Greece		Dominican Republic	Sri Lanka
Ireland		Ecuador	Tanzania
Italy		India	Thailand
Japan		Indonesia	Turkey
Netherlands		Madagascar	Uganda
Norway		Malaysia	Uruguay

Note: According to the World Bank (2016) a high income (advanced) country had a GNI per capita of $10725 or more in year 2005. Any country with GNI per capita below this figure is categorized as low and middle income (developing) country. Data source: World Bank.

Table 2. 2 Countries by income group

Low Income	Lower-Middle Income	Upper-Middle Income	High Income	
Bangladesh	Bolivia	Argentina	Australia	Japan
India	China	Brazil	Austria	Netherlands
Madagascar	Colombia	Chile	Belgium	
Pakistan	Dominican	Costa Rica	Canada	Norway
Tanzania	Republic	Malaysia	Denmark	Poland
Uganda	Ecuador	Mexico	Finland	Portugal
	Indonesia	Russia	Finland	Spain
	Peru	South Africa	Germany	Sweden
	Paraguay	Turkey	Greece	Switzerland
	Philippines	Uruguay	Ireland	United Kingdom
	Sri Lanka		Italy	United States
	Thailand			

Note: According to the World Bank (2016), in year 2005 low income countries had GNI per capita $825 or less, lower-middle countries between $876-3465, upper-middle countries between $3466-10725, and high income countries above $10725.

Figure 2. 2: Income Shares by Quintile
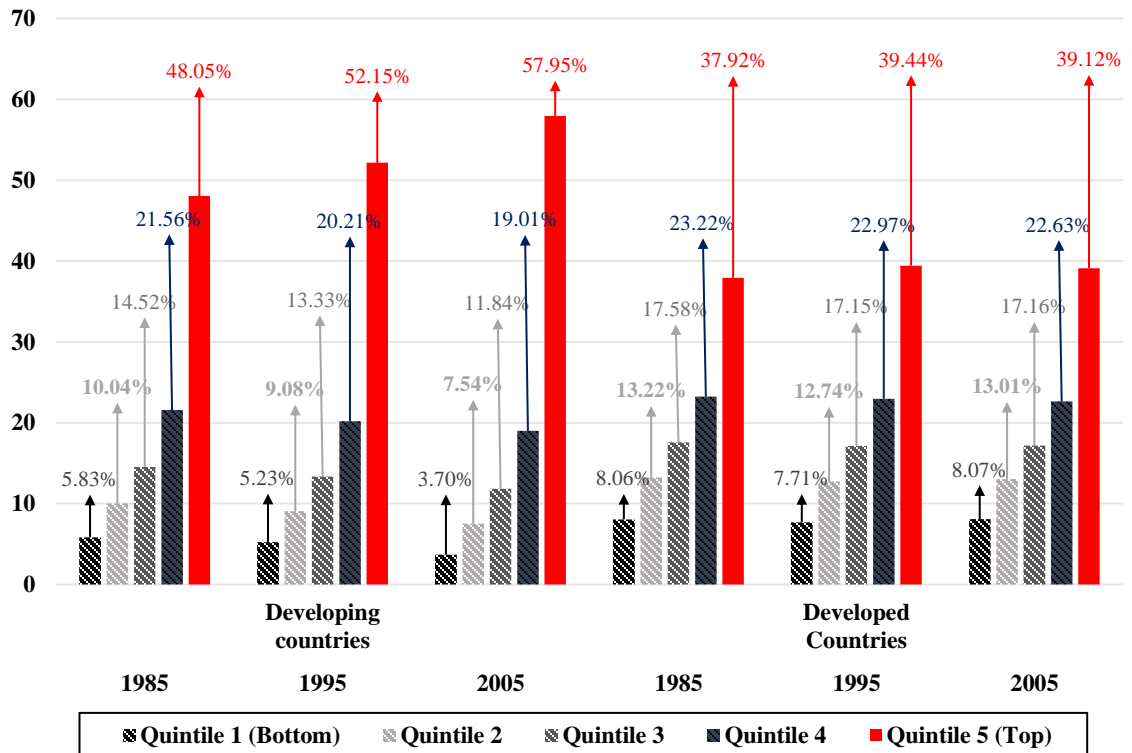
Note: The vertical line is the percentage of net income share. Q1 is the low income group, Q2 is lower-middle income group, Q3 is middle income group, Q4 is upper-middle income, and Q5 is high income group. Data source: UNU-WIDER WIID.

Figure 2.2 shows the trends of income share by quintiles for 25 developing and 21 developed countries shown in Table 2.1. Developing countries have experienced a rise of 4.1% for the highest income quantile in a 20 year period from 1985 to 2005. Simultaneously, the income share of the lowest quantile has decreased by 2.13% during the same period. This leaves us with an alarming gap between the high income and low income groups in the developing countries where the share of the former is almost 16 times as the latter in year 2005. Moreover, the income share of the top quantile is almost 8% more than the sum of all other income quantiles, i.e., a sign of high income inequality for developing nations in year 2005.

The distribution of income appears to be slightly more equal in advanced nations, though a considerable level of income inequality is still visible. The share of the top income quantile has increased by 1.2%, while the income share of the bottom quintile remain almost the same at approximately 8.07%. A large gap of 31.05% exists between the top and bottom income quintiles, plus, the top income quintile holds around 40% of the income share, indicating a high level of income inequality in advanced nations.

Moreover, Figure 2.3 shows the trends of income inequality within income country groups and selected developed and developing nations. Income inequality appears to have an increasing trend for the mean of all countries shown in Table 2.1, between 1980 and 2005. The income gap has been remarkably increased for low and lower-middle income countries where we observe a rise of approximately 10% and 15% respectively. Interestingly, the Gini coefficient for the mean sample of upper-middle-income countries sits above all the other countries. As expected, the income gap in the high income countries seem to be the most stable and lowest among all income groups, although a slightly upward trend is visible from mid-1980s. A general conclusion would be that income inequality has risen among countries with different income groups.

For a more detailed observation, Gini coefficient trends for a selected developed and developing countries is demonstrated in Figure 2.3. Among the selected developed nations United States, United Kingdom, japan and Germany experienced an upward trend in income inequality. In France and Australia inequality has generally decreased, however periods in which Gini has risen is observable. On the other hand, inequality has increased in developing countries particularly in Russia, China, and India. Brazil, South Africa, and Mexico experienced

Figure 2. 3: Income Inequality Within Income Country Groups and Selected Developed and Developing Countries
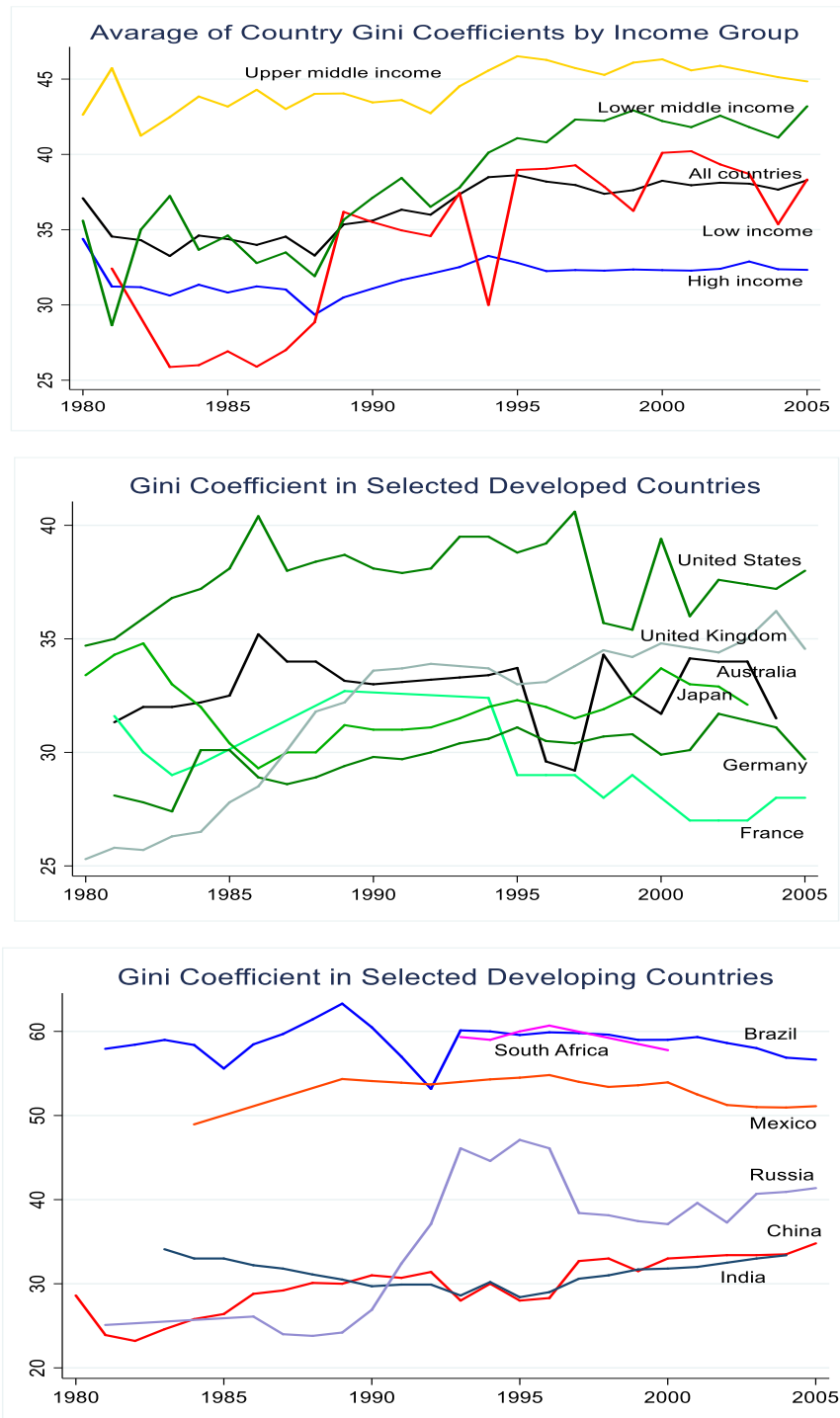
Notes: The horizontal line is the net Gini coefficient, and the vertical line is the year. Data source: UNU-WIDER WIID.

steady trends, however inequality remained at the highest levels. In fact, figure 2.1 shows that these countries had the highest levels of inequality among nations in the selected sample in year 2005.

Overall, the illustrations from Figures 2.1, 2.2 and 2.3 gives us a clear message: there exists high levels of income inequality across the world, with trends following and upward movement for most nations in different regions and within various income groups. This validates the global rise of income inequality.

2.3 Financial factors that affect income inequality: the choice of empirical proxies

Among the large body of literature investigating the effect of financial factors on income inequality, the majority of the studies point out to the importance of at least one of the following three factors: (a) financial globalisation (Chinn & Ito, 2008; Kose et al., 2009; Freeman, 2010; Figini & Gorg, 2011; Wu & Hsu, 2012; Philippon & Reshef, 2012; Jaumotte et al., 2013; Furceri & Loungani, 2013); (b) financial development (Greenwood & Jovanovic, 1990; Clarke et al., 2006; Motonishi, 2006; Rodríguez-Pose & Tselios, 2009; Ang, 2010; Shahbaz & Islam, 2011; Jauch & Watzka, 2016); (c) financial liberalisation (Chigumira & Masiyandima, 2003; Arestis & Caner, 2005; Dobson & Ramlogan-Dobson, 2010; Agnello et al., 2012; Li & Yu, 2014; Uddin et al., 2014; Christopoulos & McAdam, 2017).

Although in overall perspective all of the above three factors can jointly be labelled as financial aspects of the economy, the empirical proxies used for each element are completely independent from each other and they do not overlap:

- Financial globalisation: The traditional approach to measuring financial globalisation is to use procedures to estimate restrictions on capital account openness (see for example:

Grilli & Milesi-Ferretti, 1995; Quinn, 1997; Rodrik, 1998), where less restrictions resembles higher financial globalisation. This approach is also known as the de jure measure of financial globalisation, and the Chinn-Ito Financial Openness Index (*KAOPEN*) created by Chinn and Ito (2008) is the most recent and most commonly used empirical proxy for de jure financial globalisation. However, Kose et al. (2009) suggest that de jure measure of financial globalisation may face some shortcomings as "they do not accurately reflect the degree of openness of the capital account because they are partially based on various restrictions associated with foreign exchange transactions that may not necessarily impede capital flows" (p.8). Thus, the de jure measure of financial globalisation may not always reflect the actual degree of global financial integrations of an economy. Consequently, as Kose et al. (2009) suggests, using de facto measures of financial globalisation (such as the levels of foreign direct investments) may reflect a more factual level of financial globalisation. As a result financial globalisation is usually measured based on two empirical proxies: (1) Chinn-Ito Financial Openness Index- that is the traditionally used de jure measure; and (2) foreign direct investments- that is an additional supplementary de facto measure[12].

- Financial development: the majority of inequality literature has applied the rise of credit provision to private sector by financial institutions as the main empirical proxy for financial development (see for example: Jalilian & Kirkpatrick, 2005; Liang, 2006; Clarke et al., 2006; Motonishi, 2006; Beck et al., 2007; Rodríguez-Pose & Tselios, 2009; Roine, Vlachos, & Waldenström, 2009; Ang, 2010; Enowbi Batuo, Guidi, & Mlambo, 2010; Gimet & Lagoarde-Segot, 2011; Shahbaz & Islam, 2011; Jauch & Watzka, 2016). This approach is derived from one of the most acknowledged theories on the relationship between the evolution of finance and income inequality, that is the Greenwood and Jovanovic (GJ) theory (Greenwood & Jovanovic, 1990). This theory implies that financial development (measured by the rise of credit to private sector),

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[12] The majority of the mainstream inequality literature regard FDI as the main de facto measure of financial globalisation (for example: Sylwester, 2005; Choi, 2006; Jensen & Rosas, 2007; Figini & Gorg, 2011).

could mostly benefit the high income group in the short-term mainly because of the existence of capital market imperfections. However, if the access becomes less restricted overtime the benefits becomes more broadly shared leading to improving the allocation of capital and reducing income inequality.

- Financial liberalisation: financial liberalisation can be interpreted in a variety of ways, however, the majority of the finance-inequality literature define financial liberalisation as financial policy reforms that promote liberalisation in the financial markets (see for example: Williamson and Mahar ,1998; Bandiera, Caprio, Honohan, & Schiantarelli, 2000; Laeven, 2003; Giné and Townsend, 2004; Crotty and Lee, 2006; Iacoviello, 2008; Schindler, 2009; Abiad et al., 2010; Ang, 2010; Li and Yu, 2014; Osorio, 2015; Christopoulos and McAdam, 2017). According to Abiad et al (2010), the traditional approach to measuring financial liberalisation is to use at least one of the following empirical proxies; (1) credit controls; (2) interest rate controls; (3) entry barriers; (4) state ownership in the banking sector; (5) financial account restrictions; (6) prudential regulations and supervision of the banking sector; (7) securities market policy.

2.4 Financial Globalisation and income inequality

The term 'financial globalisation' is broadly defined as the rise of international financial integration (Obstfeld, 2015). Capital account openness and foreign direct investment are commonly used as the de jure and de facto[13] measures of financial globalisation respectively (Chinn & Ito, 2008; Kose et al., 2009).

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[13] Equity Foreign Portfolio Investment (EFPI) is also a form of de facto financial globalisation (Jaumotte, et al., 2013), however, the majority of the mainstream inequality literature regard FDI as the main de facto measure of financial globalisation (for example: Sylwester, 2005; Choi, 2006; Jensen & Rosas, 2007; Figini & Gorg, 2011).

Although there exist little systematic empirical literature on the direct association between financial globalisation and income inequality, some studies investigated the effects of financial globalisation on income inequality, most of which are focused on the effects of foreign direct investment. For example, Pang-Long (1995) examined the relationship between FDI and income inequality and obtained results that FDI increased income inequality in Less Developed Countries (LCDs) in Asia/South East Asia during the 1970s.

Moreover, using a time series-cross sectional dataset containing 26 countries (15 developed and 11 developing) for a time span of 25 year between 1970 and 1995, Gopinath and Chen (2003) provides evidence that inward FDI flows are associated with higher income inequality in developing nations. In a similar line of study, studying the effects of FDI on income inequality in 18 Latin American countries during 1980s and 1990s, Te Velde (2003) demonstrates that the rise of inward FDI results in skill-biased technological change that results in higher wages for the high-skilled labour leading to widening the wage gap between the low-skilled and high-skilled labour resulting in rise of income inequality.

On a further note, examining the relationship between income inequality and FDI for a large panel of 119 countries between 1993 to 2002, Choi (2006) finds that income inequality measured as the Gini coefficient, is positively associated with the rise of FDI. Similarly, Basu and Guariglia (2007) studying the relationship between FDI and income inequality for a large panel of 119 countries between 1970 to1999 finds a positive association between income inequality and the rise of FDI. On the other hand, Jensen and Rosas (2007) in a country specific study find that the rise of FDI is associated with a decrease of income inequality in Mexico between 1990 to 2000.

More recently, Figini and Gorg (2011) analysed the relationship between FDI and wage inequality for more than 100 developing and developed countries for the period of 1980–2002, finding that wage inequality increases with inward FDI in developing countries. Freeman (2010) also argues that the rise of international financial flows, particularly FDI has a positive association with the rise of income inequality both in the developed and emerging market economies. As for more evidence, in a cross-sectional dataset consisting of 54 countries over the 26 period between 1980 to 2005 Wu and Hsu (2012), find that the inward FDI can increase income inequality if it instigates skill-biased technological shifts.

So far we observed that the focus appears to be on the effects of de facto measure of financial globalisation income inequality. Though in a broader perspective Jaumotte et al. (2013) indicates that the rise of financial globalisation, associated with higher income inequality. They distinguished financial globalisation into de facto (foreign direct investment) and de jure (capital account openness index) measures for different income country groups between 1981 and 2003. Both de facto and de jure measures indicate rise of financial globalisation across countries with different income levels, and the path correlates with the rise of income inequality.

Similarly, Studying 17 advanced economies, Furceri and Loungani (2013) demonstrate a highly positive correlation between the rise of financial globalisation and income inequality. They show that the upward trend of capital account openness is closely associated with the rise of income inequality for a 30 year period between 1985 and 2005. Furthermore, Philippon and Reshef (2012) studying the US finance industry between 1990 and 2006 find that with the evolution of financial globalisation the finance industry has substantially grown resulting in

Figure 2. 4: De jure financial globalisation (Chinn-Ito capita account oppenness Index)
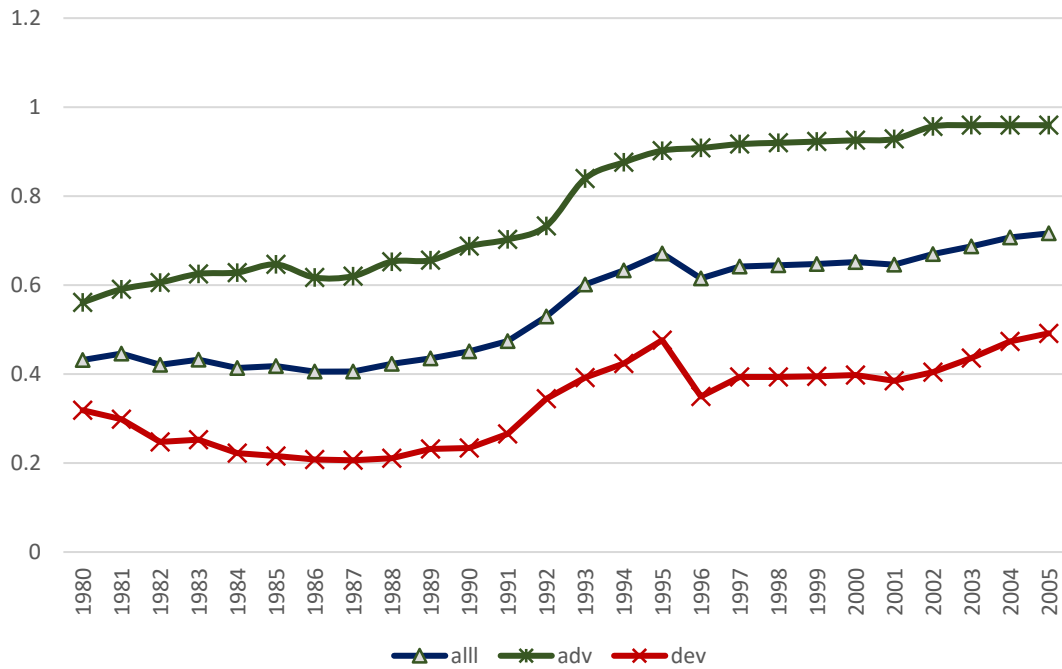
Notes: The vertical line is the Chinn-Ito Capital Account Openness Index that is further normalised between 0 and 1. All is the mean sample of 46 countries, adv is the mean sample of 21 developed countries, dev is the mean sample of 25 developing countries. Higher figure resembles a more liberalised capital account regime. Data Source: Chin and Ito (2008).

disproportionate rise of the salaries of the finance employees in compare to workers in other sectors, i.e., rise of income inequality.

In conjunction with the limited empirical findings on the relationship between financial globalisation and income inequality, we create stylised facts for de jure measure (capital account openness) and de facto measure (FDI) of financial globalisation to observe whether the trends correlate with the rise of income inequality. Differentiating between developed and

Figure 2. 5: De Facto financial globalisation (Foreign direct investment)
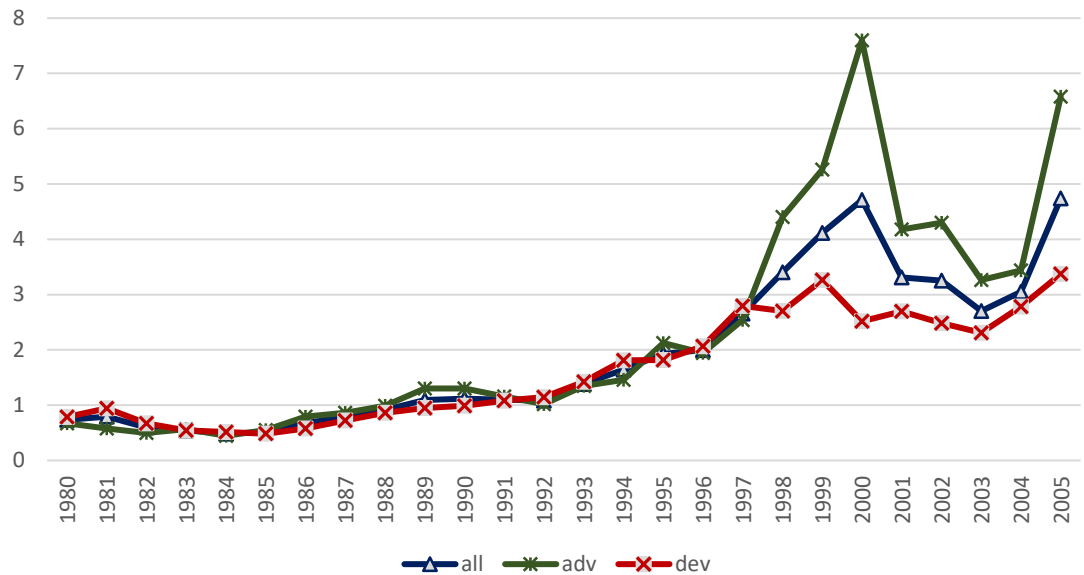
Notes: The vertical line in the net foreign direct investment as percentage of GDP. All is the mean sample of 46 countries, adv is the mean sample of 21 developed countries, dev is the mean sample of 25 developing countries. Higher figure resembles more FDI as GDP%. Data Source: WDI.

developing countries is a set of 46 nations, Figure 2.4 shows that capital account openness had an upward trend for both set of countries between 1980 and 2005. Advanced nations tend to have a more open capital account regime than developing countries (nearly double in year 2005), though the overall trends follows an upward movement for all 46 countries. Moving on to de facto measure of financial globalisation (Foreign direct investment), Figure 2.5 shows that all countries tend to have a slight upward movement from 1980 to 1996. From this point there exist a substantial upward shift for advanced nations resembling a shift toward foreign business ownership.

Overall, the increasing trends from figures 2.4 and 2.5 seem to be in the same direction as rise of income inequality in Figures 2.2 and 2.3. This is in line with many findings of the existing literature, i.e., higher financial globalisation- and in particular FDI- correlates with higher income inequality.

2.5 Financial development and income inequality

Financial development is a broad term that can be interpreted in different ways (Levine, 1999; Cihak et al., 2012) though the majority of the mainstream inequality literature regard financial development as growth of domestic credit to private sector by financial institutions (Jalilian & Kirkpatrick, 2005; Clarke et al., 2006; Liang, 2006; Motonishi, 2006; Beck et al., 2007; Rodríguez-Pose & Tselios, 2009; Roine, Vlachos, & Waldenström, 2009; Ang, 2010; Enowbi Batuo, Guidi, & Mlambo, 2010; Gimet & Lagoarde-Segot, 2011; Shahbaz & Islam, 2011).

One of the most acknowledged theories on the relationship between financial development and income inequality is the Greenwood and Jovanovic (GJ) theory (Greenwood & Jovanovic, 1990). This theory implies that financial development, could mostly benefit the high income group in the initial stages of development mainly because of the existence of capital market imperfections, however, the access becomes less restricted in the long-run and benefits becoming more broadly shared leading to improving the allocation of capital and reducing income inequality. In other words, this theory indicates that income inequality could increase in the short-run, but decrease in the long-run during the course of financial development. In similar line with the GJ theory, Aghion and Bolton (1992, 1997) Piketty (1997) Matsuyama (2000) Mookherjee and Ray (2006) Jeong and Townsend (2008), argue that financial development would result in better allocation of resources leading to alleviating inequality.

In line with the GJ prediction, Focusing on a panel of 42 developing countries between 1960 to 1995, Jalilian and Kirkpatrick (2005) confirms that inequality initially escalates during the first stages of financial development and decreases in the long-run, i.e., in an inverted U-

shaped fashion. Moreover, Clarke, Xu, and Zou (2006) have examined the relationship between financial development and income inequality for 83 countries between 1960 and 1995. With the use of cross-sectional regressions and implementing endogeneity controls for growth, law, and finance, results suggest that in the long-run inequality is less when financial development is greater, but inequality increases in the first stages of financial development. The results also reject the hypothesis that financial development benefits only the rich.

Furthermore, Beck et al. (2007) assessed the impact of financial development on income distribution and the poor in a cross-country study based on a sample of 72 nations for 1960-2005. With the use of dynamic panel instrumental variables regressions and generalized-methods-of-moments panel estimator, they have found that financial development disproportionately helps the poor. Greater financial development induces the incomes of the poor to grow faster than average per capita GDP growth. The results indicate that financial development helps the poorest quintile beyond finance's effect on aggregate growth.

There also exists country-specific studies confirming the GJ predictions. For example, Liang (2006) using Chinese provincial data over the period of 1986-2000 and with the use of GMM estimator find that financial development significantly reduces income inequality in urban areas of post-reform China. Similarly, with the use of a time-series data for India for a period of 53 year between 1951 and 2004, Ang (2010) finds that financial development is negatively associated with income inequality.

Moreover, Shahbaz and Islam (2011) have examined the relationship between financial development and income inequality for Pakistan between 1971 to 2005. They implemented the Auto Regressive Distributed Lag (ARDL) bounds testing approach to cointegration to examine the existence of long run; and the error correction model (ECM) for the short run relationships

51

between financial development (measured as a ratio of private credit to GDP) and income inequality. With the use of inflation, size of the government, GDP growth, and trade as control variables the findings indicate that financial development reduces income inequality. As for further evidence, in a regional study of 22 African nations for a time span of 14 year between 1990 to 2004, Enowbi Batuo et al. (2010) presents empirical evidence with the use of dynamic panel estimation technique (GMM) that financial development is negatively related to income inequality.

However, some studies have rejected the GJ predictions. For example, Motonishi (2006) analysing Thailand for the period 1975 to 1998 finds a positive association between financial development and income inequality. Similarly, Rodríguez-Pose and Tselios (2009) find that financial development increases income inequality across most regions of the European Union between 1995 and 2000. Moreover, Roine et al. (2009) studied the effect of financial development on the top income percentile (P90-100) and the rest of the income groups (P0-90) for a panel of 16 OECD nations over the entire twentieth century. They find that the "rich" (P99-100, i.e., top 1% of income earners) and the high income group (P90-99, i.e., top percentile of income earners) benefited the most from financial development resulting in rise of income inequality.

As for more evidence, Studying 49 countries for a period of 8 year between 1994 to 2004 Gimet and Lagoarde-Segot (2011) find that financial development is positively associated with income inequality. They estimated the determinants of income inequality using a panel Bayesian structural vector autoregressive model (SVAR) and uncovered significantly positive impact of financial development on rising income inequality. Also in a more recent study, Analysing the link between financial development and income inequality for a large panel of

52

Figure 2. 6: Figure 2.6. Domestic credit to private sector by banks (%GDP)
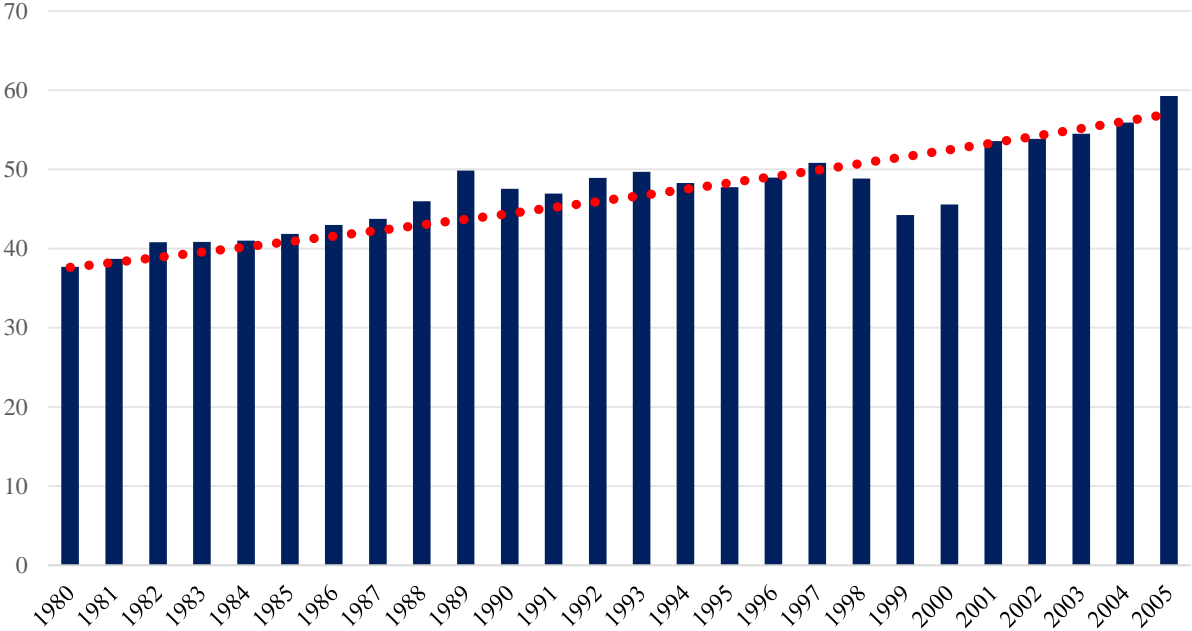
Notes: Vertical line is the domestic credit to private sector by banks as GDP% for mean sample of 46 countries. Data source: WDI.

138 countries between 1960 and 2008 and controlling for country-fixed effects and GDP per capita, Jauch and Watzka (2016) reject the GJ theory, i.e., they find that financial development has a positive association with income inequality.

The empirical findings on the relationship between financial development and income inequality appear to be rather mixed. This could be due the differences in time periods, locations, econometric techniques, control variables and many other factors. However, what is common among all of the above studies is that they acknowledge that financial development and income inequality had coinciding upward trends. In conjunction with the existing literature, we create a new stylised fact in which the trend of financial development measured as domestic credit to private sector by banks for the mean sample of 46 countries between 198 to 2005 is demonstrated. Figure 2.6 shows that financial development had an upward trend during the

same course of the rise of income inequality shown in Figures 2.2 and 2.3. Hence we acknowledge a positive correlation between the trends of financial development and income inequality, contextualising for further empirical investigations.

2.6 Financial liberalisation and income inequality

2.6.1 Measurement of financial liberalisation

Financial liberalisation is a broad term that can often be misrepresented[14]. Though, the majority of the finance-inequality literature describe financial liberalisation as 'pro-liberalisation financial policy reforms'. There exist a number of databases measuring financial liberalisation, for example, Williamson and Mahar (1998), Bandiera, Caprio, Honohan, & Schiantarelli (2000), Edison and Warnock (2003), Kaminsky and Schmukler (2003), Laeven (2003), Schindler (2009). However, the most recent and most reliable measurement tool for financial liberalisation appear to be the 'New Database of Financial Reforms' created by Abiad et al. (2010)[15]. They measure financial liberalisation based on seven different dimensions of financial sector policy:

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[14] Financial liberalisation, financial openness, and financial globalisation have been often generally described as the surge of global financial integration (Freeman, 2010; Philippon and Reshef, 2012; Furceri and Loungani, 2013; Jaumotte et al. 2013, etc). In order to avoid misrepresentation, we should cautiously and clearly identify the meaning of the term.

[15] In terms of country coverage, time span, and measurement units, the Abiad et al. (2010) database in aggregate provides a more complete and more detailed data set in compare to others.

1- Credit controls and excessively high reserve requirements: They analyse this dimension based on the minimum amounts of credit that must be channelled to certain sectors, the existence of credit ceilings to non-priority[16] sectors, subsidized rates to preferred sectors, and restrictions on the expansion of credit supply.

2- Interest rate controls: They measure deposit and lending rates separately, analysing whether interest rates are governmentally set, direct intervention of government on controlling interest rates, degree of restrictions on imposing floors, ceilings and interest rate bands.

3- Entry barriers: they evaluate the imposed barriers on the participation of overseas banks; boundaries on the range of banking operations; tightening the geographical area where banks can operate; high restrictions on licensing requirements.

4- State ownership in the banking sector: assesses the level of privatization in the banking sector.

5- Financial account restrictions: They analyse restrictions on international financial flows of credit within the country, and the restrictive controls over the exchange rates. These restrictions includes multiple exchange rates for various transactions, high transactions taxes and high boundaries on financial credit flows.

6- Prudential regulations and supervision of the banking sector: they investigate whether a country implement Basel I capital accord[17], the banking supervisory agency is an

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[16] Priority sectors refer to the ones that have crucial importance for country's economy (for example agricultural sector, or certain manufacturing sectors).

[17] That is the Risk-based capital adequacy ratios set by Basel Committee on Bank Supervision (BCBS) with the goal of minimizing credit risk.

independent body without any association to the administrators, preferential and favoured supervision for certain financial institutions linked to bureaucrats, effective and robust supervision through on-site and off-site examinations.

7- Securities market policy: They consider the incentives of a country to develop securities markets, and openness of the equity market to foreign investors.

In dimensions 1 to 5, and 7, a greater deregulation and lower restrictions implies higher financial liberalisation. Reversely, higher monitoring in dimension 6 represents greater financial liberalisation.

2.6.2 Relationship between financial liberalisation and income inequality

The empirical evidence on the systematic relationship between financial liberalisation and income inequality remains very thin, hence we review the literature focusing on the relationship between financial liberalisation components of Abiad et al. (2010) and income inequality. Current literature provides mixed results on the relationship between the two.

As for positive impacts of financial liberalisation on income distribution, Chigumira and Masiyandima (2003) report estimates that establish a positive effect between financial sector reforms and availability of loans to the poor in Zimbabwe from 1977 to 2001. More specifically, liberalisation on credit control and interest rate controls alongside with removal of entry barriers promoted financial deepening ensuing wider range of financial services for the majority of people within the society. In the same line, Arestis and Caner (2005) argue that financial liberalisation in the form of removal of entry barriers escalates competition among

financial intermediaries which extends financial services to a greater numbers societal segments.

Moreover, Studying causes of income inequality in 19 Latin American countries between 1984-2003 Dobson and Ramlogan-Dobson (2010) provide indications that financial liberalisation in the form of privatization in the banking sector tend to have an adverse effect on income inequality. Shahbaz and Islam (2011) reveal a similar effect for Pakistan over 1971-2005, showing that liberalisation in the financial market- in the form of reducing credit controls- offers to low income segments of the society easier access to credit, which reduces poverty and income inequality.

Furthermore, Agnello et al. (2012) assessed the impact of financial liberalisation on income inequality taking a panel of 62 countries over 1973 to 2005. They find that financial liberalisation in the forms of removals of directed credit, excessively high reserve requirements, and promoting security market development has a negative impact on income inequality. Following the same path, Investigating the effect of financial liberalisation on income inequality for 18 countries in Asia between 1996 to 2005, Li and Yu (2014) find that financial liberalisation- particularly eliminating credit controls, improved banking supervision and security market expansion- reduces income inequality.

Likewise, Uddin, Shahbaz, Arouri, & Teulon (2014) investigate the relationship between financial liberalisation and poverty in Bangladesh between 1975 and 2011 finding a negative relationship, which is attributed to easier access to institutional credit as a result of less credit controls. In one of the most recent studies, Christopoulos and McAdam (2017) examine the channel between financial liberalisation- being the seven components of Abiad et al. (2010) dataset- and the and the stabilization of income inequality using panel unit root tests extended

to allow for the presence of some covariates. They find that removal of entry barriers and promoting security market developments tend to stabilize income inequality.

On the other hand, there exist a number of studies indicating that benefits of financial liberalisation is not equally distributed among all societal segments. Bandiera et al. (2000) shows minor impact of financial liberalisation- less credit control restrictions particularly- on the rise of loan availability to low income customers in a number of developing countries[18]. Similarly, Amonoo, Acquah, & Asmah (2003) investigate the link between interest rate liberalisation and demand of credit by low income groups in Ghana's rural regions. The results suggest interest rate liberalisation promotes credit access in general without necessarily making the low income group better off.

Moreover, Giné and Townsend (2004) studied the distributional consequences of financial liberalisation in Thailand from 1976 to 1996. Focusing on liberalization of credit controls and financial account restrictions, they suggest that the former can improve the income for talented entrepreneurs who lack credit and cannot otherwise go into business, and the latter does not affect the income distribution. The overall message of this study would be that the benefits of financial liberalisation, credit controls in particular, would not be equally shared among all segments of the population. Undertaking similar aspects of financial liberalisation, Crotty and Lee (2006) show that after neoliberal reforms, financial liberalisation in South Korea increased income inequality in the post-reform period.

In similar line of findings, Studying the trends of income inequality in the US between 1963 to 2003, Iacoviello (2008) finds that financial liberalisation in the form of less restrictions

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[18] Chile, Ghana, Indonesia, Korea, Malaysia, Mexico, Turkey and Zimbabwe.

on credit supply, disproportionately increases the ratio of debt to income for the low income group, resulting in widening inequality. Likewise, Examining the effect of financial sector reforms- in the forms of reducing interest rate controls, lower reserve requirements, liberalising security markets, and removal of entry barriers- on income inequality in India, Ang (2010) find that "both domestic and international financial sector reforms do not seem to reduce unequal access to finance, but rather tend to aggravate income inequality" (p.757). similarly, Jaumotte and Osorio (2015) studying a sample of 18 advanced countries between 1980 to 2010, find that financial liberalisation- measured as the mean of the seven components in Abiad et al. (2010) dataset- tend to increase income inequality.

2.6.3 Distributional effects of financial liberalisation through development of the informal financial markets

Most of the recent empirical literature solely concentrate on the formal financial markets when studying the distributional effects of financial liberalisation, while in many developing countries informal financial markets could have great influences. Historically, financial liberalisation shown to have positive effects on the provision of loans to the low income group through expansion of the informal financial markets (Timberg & Aiyar, 1984; Floro & Yotopoulos, 1991; Steel, Aryeetey, Hettige, & Nissanke, 1997; Sagrario Floro & Ray, 1997; Mohieldin & Wright, 2000)[19].

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[19] Informal financial market refers to organisations that are not licenced by central bank (such as credit unions, microfinance NGOs, savings and credit associations, and moneylenders), whereas the formal market refers to banks that are licensed by central bank (such as commercial banks).

Commonly, there are two directions in which the informal financial market develops after financial liberalisation: A primary approach is that the low income group first try the formal market that is expanded as a result of financial liberalisation, when unsuccessful to obtain loans due to market imperfections, they turn to the informal market, hence the demand for the informal market rises resulting in expansion of the informal market. Another way is that informal providers of financial services have more access to credit from the formal sector that is expanded due to financial liberalisation; from the obtained funds they invest in the informal market leading to informal market expansion.

Hence, financial liberalisation can grow the informal market through the development of the formal market. This can be in benefit of the low income group as the informal market usually provides easier and more cost efficient access to credit in compare to the formal sector. Moreover, the Informal sector may have important influences, especially in rural and underdeveloped areas, where they have traditionally provided credit to the low income who were not able to reach access to credit via the formal sector.

Thus, the growth of informal sector as a part of financial liberalisation process would help the poor to get access to loans. In fact, Steel et al. (1997) find that the informal sector in African countries has grown as a result of financial liberalisation with banks to withdraw their branches from rural areas, focusing on expansion in urban areas. In this case, financial liberalisation facilitated the poor to get access to loans through expansion of the informal credit market.

Another reason for the low income group to shift from the formal to the informal sector, as Sagrario Floro and Ray (1997) suggest, is that the former may have deficiency of knowledge

about the characteristics of borrowers in the rural areas, while the informal sector generally have better community acquaintance since they operate in their native towns or villages.

Although in general the rise of informal financial markets in the course in financial liberalisation appear to benefit the low income group, the characteristics and effects of the informal markets might differ between countries. For example, Floro and Yotopoulos (1991) point out that in the Philippines, rice millers have the highest rank in the country's informal credit market, which they have non-competitive incentives amongst each other, nonetheless entry to this market is extremely difficult. This implies that the financial liberalisation may not result in rise of competition and growth in the informal financial market of Philippines, being ineffective in credit access for the low income group.

Whereas in India, Timberg and Aiyar (1984) studied the manifestation of legal informal financial intermediaries in most regions of the country, and summarized that with the liberalised interest rates and methods of lending the informal financial sector was imperative for the low income group that could not get access to credit through the formal sector.

Moreover, in Latin America, Guirkinger (2008) points out to the vitality of informal credit markets for farm households in a region of Peru- that are typically among the low income group- where lower risks and transaction costs motivate households to borrow from informal credit markets- that tend to grow as a result of financial liberalisation- in the last decade of 20th century and beginnings of the 2000s. Approximately in same period, Egypt experienced a rise in the informal financial sector in compare to the formal sector in the course of liberalisation. As Mohieldin and Wright (2000) suggest, this is due to a large increase of short-term small loans offered by the informal sector, which aided the low income group.

Based on the above documentation, financial liberalisation may promote the rise of informal credit markets that have a significant positive effects on the low income group in some regions of the world. Though, lack of systematic research on these links provides a very limited findings.

2.6.4 Evolution of Financial Liberalisation: A stylised fact

In a historical context, the process towards financial liberalisation began in the early 1970s with the liberalisation of security markets in developed countries Kaminsky and Schmukler (2003). The liberalisation process of the domestic financial sector- namely the liberalisation in security markets- has continued in mid-1980s. This if followed by removal of financial account restrictions a decade later in the beginning of the 1990s. By then, all developed countries have implemented policies towards liberalising financial accounts, security markets and promoting privatization in the banking sector with less restriction on credit and interest rate controls (Kose et al. 2009).

Developing countries followed a similar path as advanced economies, starting a liberalisation process of the financial account restrictions alongside with liberalising domestic financial sector through less restrictions on credit and interest rate controls in the late 1970s (Prasad, Rogoff, Wei, & Kose, 2005). During the same period, though, the security markets was underdeveloped. A few years after, Asia and Latin America, adopted substantial movements towards liberalising most dimensions of financial sector policy after financial crises

Figure 2. 7: Evolution of Financial Liberalisation
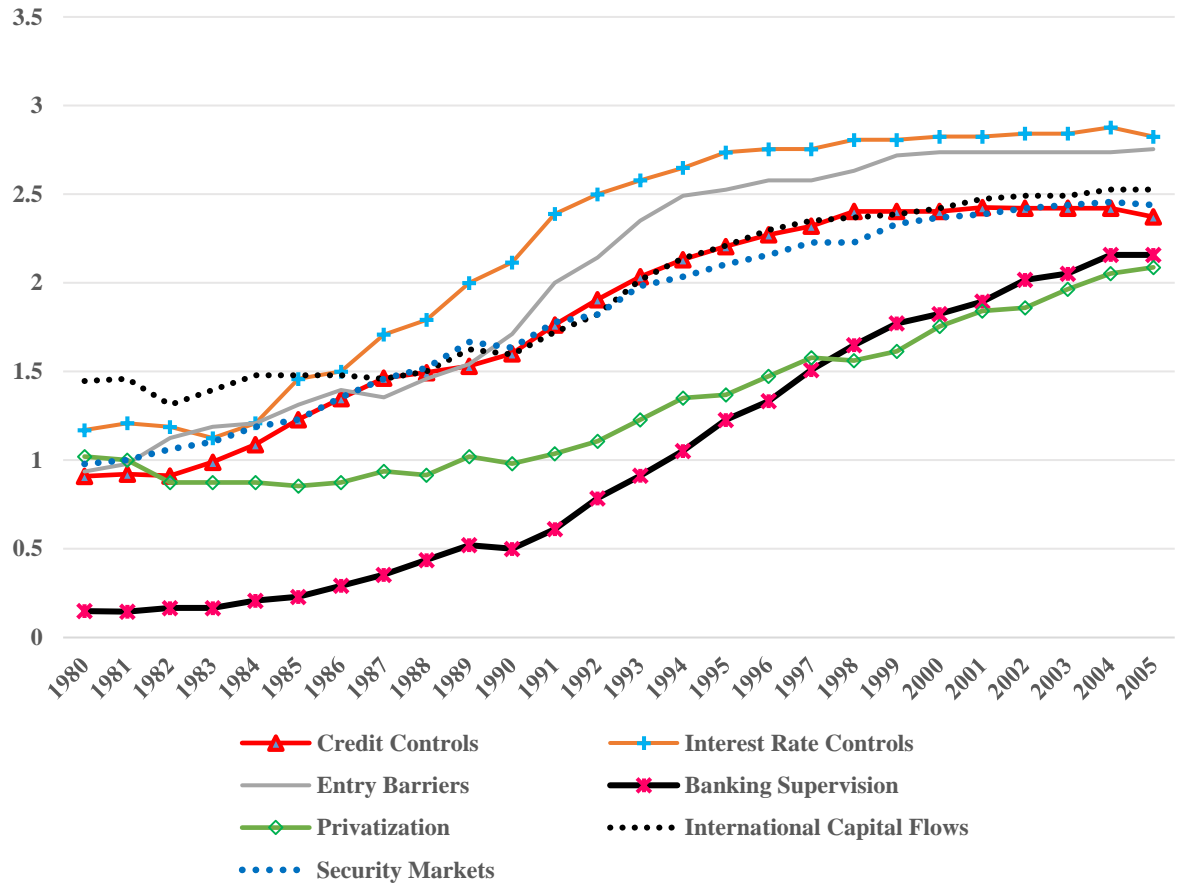
Notes: All components are coded between 0 and 3, where the lower bound resembles a fully restrict financial policy, and the upper bound is fully liberalised financial policy. Data source: Abiad et al. (2010) Financial Reforms Database (FRD).

in the 1980s[20]. Following that, most of the developing countries have implemented policies

towards removing restrictions on financial accounts, developing security markets and

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[20]The Latin American debt crisis in the early 1980s, Crisis of 1982 in Chile, Black Monday stock market crash beginning in Hong Kong in 1987, and the Bank Stock Crisis in Israel in 1983, are among the main financial crises in 1980s.

privatization in the banking sector alongside less constraint on credit and interest rate controls by the early 1990s (Lane & Milesi-Ferretti, 2017). By mid-1990s most of the countries around the world had implemented movements towards financial liberalisation in all aspects of financial sector policy defined in Abiad et al. (2010). Settling this perception, we demonstrate some trends on the evolution of financial liberalisation based on seven components of 'New Database of Financial Reforms' (Abiad et al., 2010) for the mean sample of 46 countries[21] between 1980 and 2005. Figure 2.7 shows a perspicuous increase in all of the components, confirming the surge of global financial liberalisation. These perspicuous upward trends could potentially affect income distribution. Based on estimations of Abiad et al. (2010), higher liberalisation of credit controls includes lower reserve requirements and directed credit. Conceptually, lower reserve requirements and directed credit would allow banks to provide more loans to the private sector as well as the households.

This notion leans to be encouraging by observing the trends in Figure 2.6, where credit to private sector by banks has considerably increased for the same sample of countries during the same timeframe of financial liberalisation growth shown in figure 2.7. Similarly, *National Accounts of OECD Countries* (OECD, 2017) indicate that loans to households are considerably increased for most OECD countries during the course of financial liberalisation in the past decades. If the provision of loans are fairly distributed it could promote more equal distribution of income.

Moreover, liberalisation of lending interest rates allow banks to offer credit products with lower rates. In fact, lending interest rates have considerably decreased in many regions

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[21] This is in reference to 25 developing and 21 advanced nations.

around the world during the course of financial liberalisation. For example, according to the World Bank (2016), Australia's average lending rates reduced from 15% in 1987 to 6.61% in 2003. During similar timeframes, in NA there exists a reduction of 14.25% to 4% and 15% to 6% for Canada and the United States respectively. Moving on to South America, rates reduced from 47.14% to 6.67% in Chile. As for more evidence, in Europe rates decreased from approximately 17% to 7% in Denmark; in France and Germany from 12% to 4%; in United Kingdom from 16% to 4%; and in Spain from 16% to 7%. Furthermore in Asia, Japan's rates reduced from 8% to 1%; in Thailand from 16% to 5%.

Meanwhile, some developing countries that did not experience prodigious financial liberalisation carry higher lending rates: India at 10%; Indonesia at 14%; Russia at 10%; South Africa at 10%; Tanzania at 16% (all figures are for year 2005). Interestingly, some of these nations sit among the high Gini index rankings, motivating the notion that countries with lower financial liberalisation experience higher inequality.

Moreover, with removal of entry barriers for new domestic and international financial institutions, the number of banks are likely to increase in the country. Higher the number of banks rises the competition in the banking industry, leading to credit market expansion. Although empirically unconfirmed, credit market growth may result in inclusion of previously marginalised poor in the financial market.

Moving on to banking supervision, higher figures demonstrate stricter banking supervision. Independence and firmness of supervisory agencies results in reduction of related lending, which are lending in executives and/or owners interest. Less related lending may result in more loans to other segments of the society, increasing the chance of the poor to get access to loans. The above viewpoints indicate that financial liberalisation may increase credit

65

availability for the poor, however better access to credit 'by itself' does not necessarily increase individuals wealth.

In fact, efficient utilization of the borrowed funds is the key to success. One of the main instruments of efficient utilization of the borrowed funds tend to be investment in human capital (Galor & Zeira, 1993). In the next section we review the rationality of this notion.

2.7 Human Capital Investment and Income Inequality

Human capital is an economic term propagated by Mincer (1958), and Becker (1962), that is defined as the stock of knowledge gained through educational achievements. It is widely believed that higher human capital attainment increases ones wealth through acquiring better-paid skilled jobs, thus an unequal access to human tend to aggravate income inequality, and vice versa (Schultz ,1961; Becker & Tomes,1986; Kawachi et al., 1997; Castelló & Doménech, 2002; Black et al., 2005; Erosa et all., 2010; Philippon & Reshef ,2012; Murphy & Topel, 2016).

In fact, figure 2.8 shows that countries with lowest level of income inequality[22] have high levels of human capital stock. This is in line with findings of Durlauf (1996), who constructed a model showing that income inequality is lower in regions with higher rates of human capital. Reversely, figure 2.9 shows that countries with higher levels of income inequality[23] experience lowers levels of human capital. This is in line with Gupta, Davoodi, &

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[22] Based on 46 countries in year 2005, Denmark with GINI index of 23.2 has the lowest level of income inequality. Finland with GINI of 26, Sweden with 23.4, Australia with 29.4, and Norway with 25.2, stand among the top countries with lowest levels of income inequality.
[23] South Africa with GINI of 64.8 has the highest level of income inequality in year 2005 based on a sample of 46 nations. This is followed by Brazil with GINI index of 61.3, Colombia with 55.04, Paraguay with 51.37, and Mexico with 51.11, making among the top 5 countries with highest level of income inequality.

Figure 2. 8: Countries with Lowest Levels of Inequality
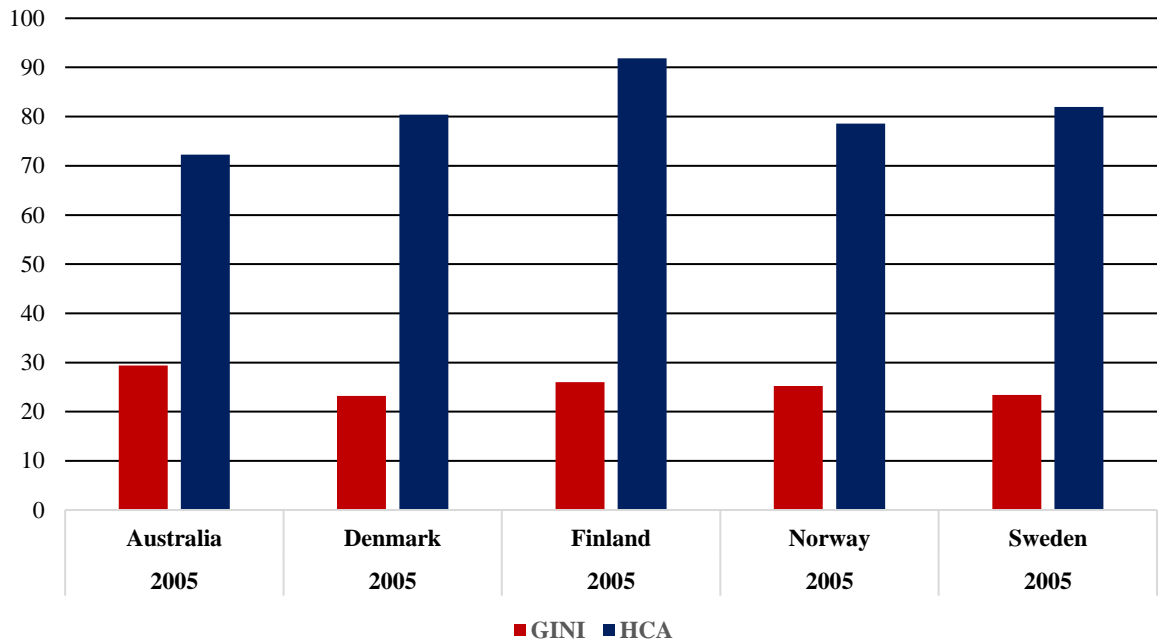
Figure 2. 9: Countries with Highest Levels of Inequality
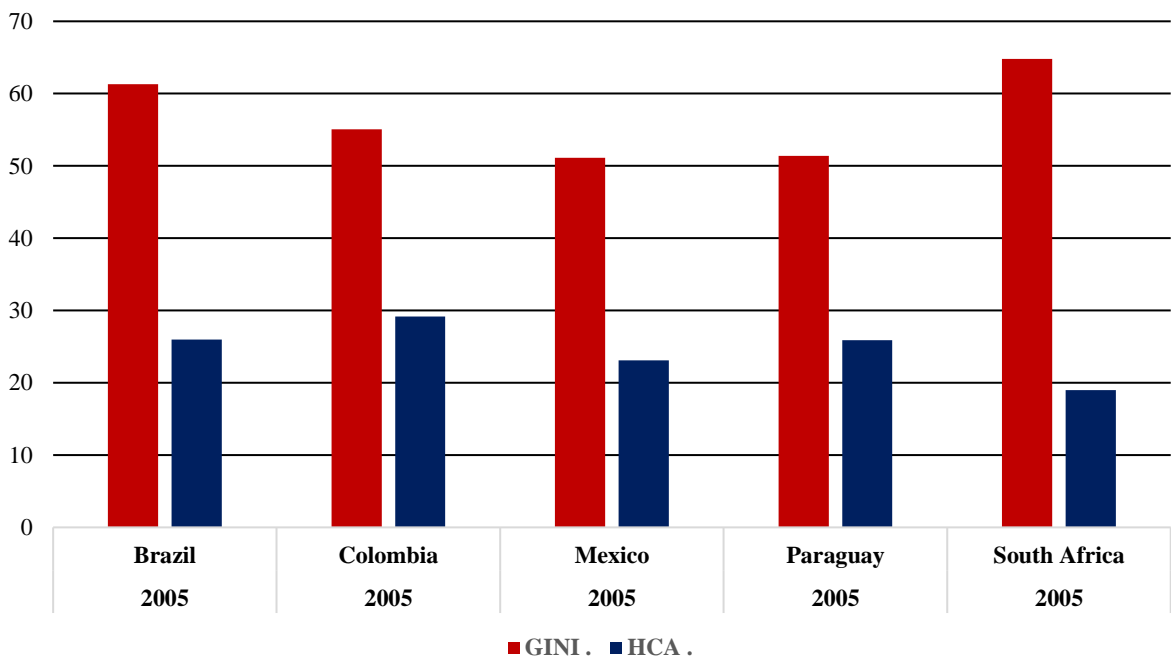
Notes: GINI is the net Gini coefficient, HCA (abbreviation of human capital attainment) is tertiary school enrolment as percentage of the population of the age group that officially corresponds to tertiary education. Data source: SWIID, WDI.

Figure 2. 10: Income Inequality and Human Capital
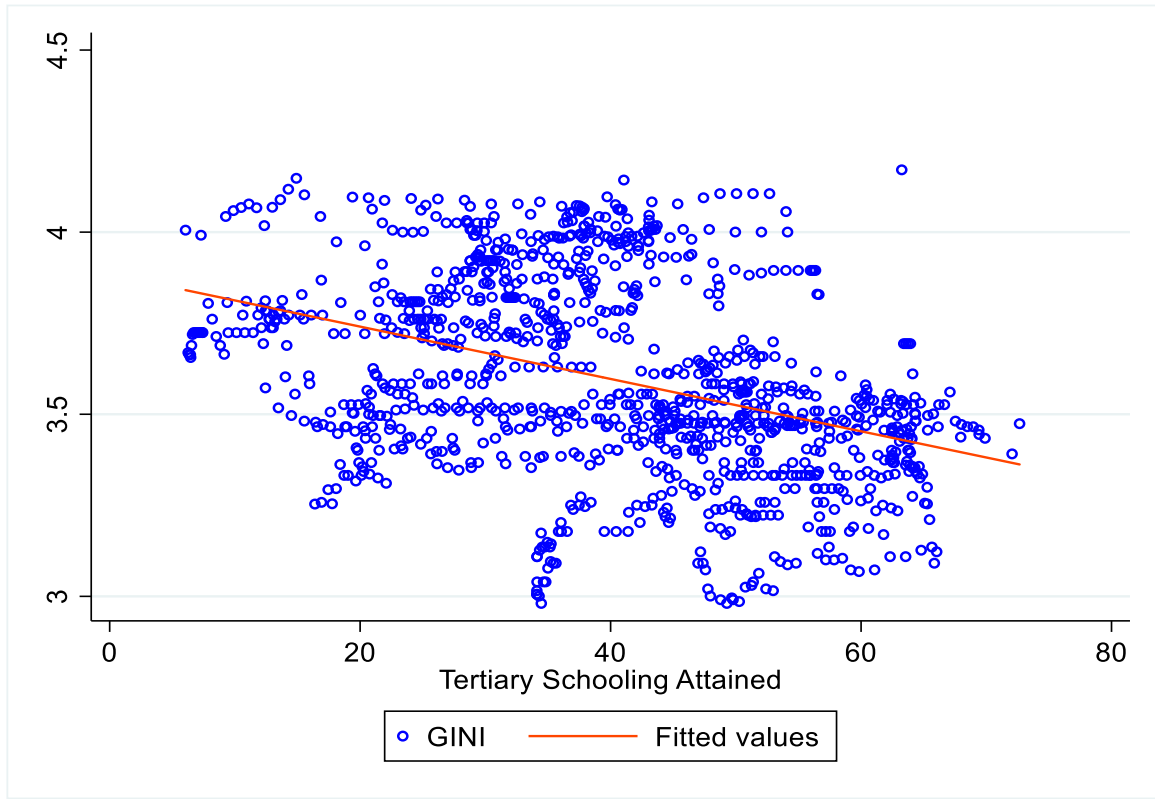
Notes: GINI is the natural logarithm of net Gini index. Data source: SWIID, Barro-Lee dataset.

Alonso-Terme (2002) who found that inadequate distribution of human capital can increase income inequality. Moreover, figure 2.10 shows the relationship between income inequality and human capital for the mean sample of 46 countries indicating that lower income inequality associates with higher human capital. This is in line with Castelló and Doménech (2002) who found a strong negative relationship between income inequality and stock of human capital in a large cross-country study.

Figure 2. 11: Employability by Education Level
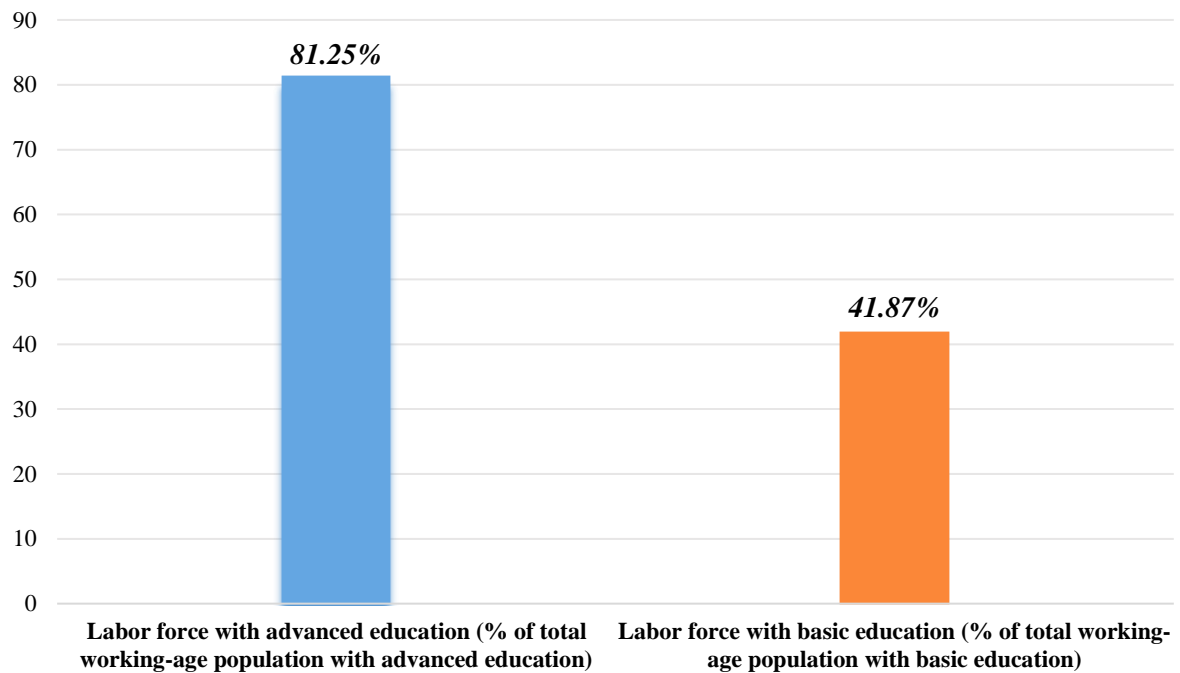
Notes: Based on estimations of World Bank's World Development Indicators (WDI), advanced and basic education are defined as tertiary school attainment, and primary school attainment respectively.

In addition, figure 2.11 shows that employment rate with advanced education is much higher compared to employment rate with basic education for the mean sample of 46 countries in year 2005. This indicates that individuals with higher human capital stock have a better employability rate in compare to labour force with basic education.

In fact, the employment percentage of the former group is nearly double as the latter, where labour force with advanced education experienced employment rate of 81.25%, in compare to 41.87% of labour force with basic education.

Above indication provides a clear messages: higher human capital investment tend to have a negative relationship with income inequality. However, the empirical literature on the links between the two is rather limited and thorough investigation on how the two are linked is an area of further investigation. Thus, we further investigate this association in this thesis[24].

2.8 Concluding remarks

This chapter provides an extensive literature review on the relationship between financial aspects of the economy and income inequality. Although a number of acknowledged theoretical frameworks as well as empirical findings exists on the association between the two, the literature has rooms for development in the following areas:

1- Provision of a framework in which financial aspects of the economy are clearly and coherently defined: the terms financial development, financial globalisation, financial liberalisation, financial openness, and financial reforms carry mixed interpretations across the literature. This can cause misunderstandings and misperceptions for future

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[24] Chapter 4 provides an empirical investigation on the relationship between finance, human capital, and income inequality.

research. Hence a framework in which all aspects of financial markets are clearly defined and interpreted can be supportive for future researches.

2- The amount of empirical research on the relationship between the de jure and de facto measure of financial globalisation and income inequality remains very thin.

3- Although there exists empirical findings on the relationship between financial development and income inequality, plausible empirical links between the two have not been systematically investigated.

4- The relationship between financial liberalisation and income inequality is an area in which generous gaps exists for further research. In other words, we know very little on the distributional effects of financial liberalisation.

This chapter provides a new context in which financial aspects of the economy are clearly distinguished into three aspects: (a) financial globalisation, defined as capital account openness (de jure measure) and foreign direct investment (de facto measure); (b) financial development, defined as provision of credit to private sector by banks; (c) financial liberalisation, defined as reforms in seven financial sector dimensions based on Abiad et al. (2010).

Moreover, we demonstrated a new set of stylised facts showing the trends of income inequality measured as the Gini coefficient and the three financial aspects for 46 countries around the world between 1980 to 2005. Income inequality in aggregate had an upward trend during the course of financial globalisation, financial development and financial liberalisation. In fact, Figure 12 shows a summary of this association in which the net Gini index, and the three financial factors have all followed a similar path.

Overall, this chapter sheds more light on the association between the evolution of financial markets and distribution of income. With an extensive review on the literature combined with a new set of stylised facts, we conclude that further research needs to be done on three dimensions: (i) effects of de facto and de jure measures of financial globalisation on income inequality; (ii) empirical links between financial development and income inequality; (iii) linkage of financial liberalisation and income distribution with a particular emphasis on the role of human capital.

Figure 2. 12: Financial Evolution and Income Inequality
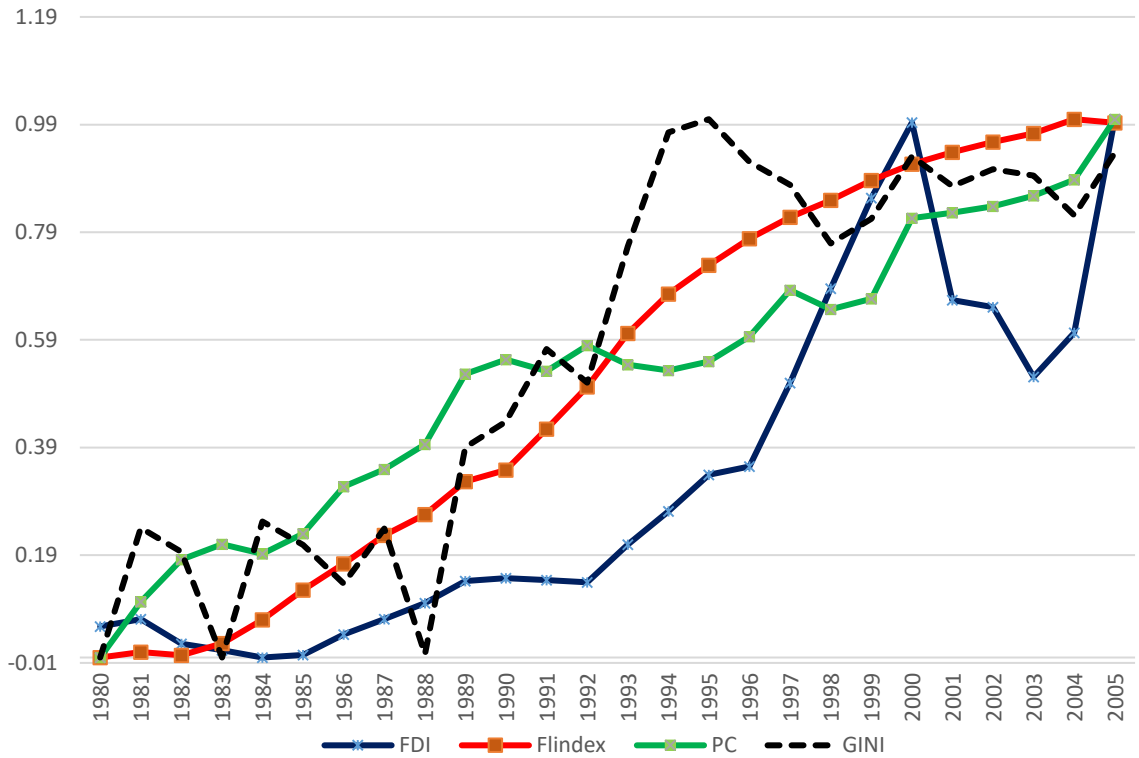
Notes: GINI in net Gini index, FDI in net foreign direct investment, Flindex is summary index of seven financial liberalisation components defined in Abiad et al. (2010), PC is domestic credit to private sector by banks. All variables are normalised to the range between 0 and 1. Data source: SWIID, WDI, FRD.

Chapter 3: Rising Income Inequality: The Role of Financial Globalisation and Development

Abstract

The chapter examines the effects of financial development, and financial globalisation on income inequality. Using a compiled panel of 36 countries over a 26-year period from 1980 to 2005, the chapter makes original contribution to knowledge reporting estimates that financial development can reduce income inequality if robust banking supervision was in place. The impact of financial globalisation reflects two opposing results: whereas higher capital account openness (the de jure measure of financial globalisation) reduces income inequality, foreign direct investment (the de facto measure of financial globalisation) increases income inequality.

3.1 Introduction

The role of financial development and globalisation on growth has been recently investigated in the literature (De Gregorio & Guidotti, 1995; Levine, 1999; Honohan, 2004; Hassan, Sanchez, & Yu, 2011; Cecchetti & Kharroubi, 2012; Valickova, Havranek, & Horvath, 2015; Shahbaz, Khraief, Rehman, & Zaman, 2016; Rousseau & Wachtel, 2017), nonetheless what is less clear and more debatable are the income distributional effects. The trend of increasing income inequality in many regions around the world[25] poses a great challenge to economic policymakers calling for further and more systematic research of the factors that drive it. Financial globalisation and development is seen as one on the key factors affecting income inequality is the past few decades (Greenwood & Jovanovic, 1990; Li & Zou, 1998; Clarke, Xu, & Zou, 2006; Dabla-Norris, Kochhar, Suphaphiphat, Ricka, & Tsounta, 2015; De Haan & Sturm, 2017).

Among the limited number of studies investigating the effects of financial development and globalisation on income inequality, Beck, Demirgüç-Kunt, and Levine (2007) show that financial development and globalisation disproportionately helps the low income group where it "induces the incomes of the poor to grow faster than average per capita GDP growth, which lowers income inequality" (p.46). They also suggest that "financial development improves capital allocation, boots aggregate growth, and helps the poor" (p.28). Supporting this notion,

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[25] For example we observed in our dataset an increase of 5.03 percent for the Gini coefficient for a mean sample of 36 countries from 1980 to 2005. Similar trends is observed in Caminada & Goudswaard (2001), Atkinson (2002), Cornia (2005), Jaumotte et al. (2013), Cingano (2014).

Kim and Lin (2011), Law, Tan, and Azman-Saini (2014), and Park and Shin (2017) show that financial development could be effective in reducing income inequality.

However, counter-arguments (such as Forster, Chen, & Llenanozal, 2011; Jaumotte et al., 2013; Piketty, 2015) suggest that The benefits from global financial integration, expanding financial services as well as allowing for further financial deepening may not be shared equally across all income segments of the population. In fact many studies suggest that financial globalisation results in skill-biased technological shifts and rise of income inequality[26], with some others mentioning that financial development is mostly in benefit of the high income segments of the society resulting in rise on the income inequality.[27]

There exists little systematic research as well as limited number of studies providing mixed findings on the relationship between financial development and globalisation, and income inequality. Thus, this chapter investigates the effect of financial development, and financial globalisation on income inequality in a panel of 36 countries over a 26-year period from 1980 to 2005. Financial development and globalisation are seen as two different concepts, where financial development is regarded as 'domestic' credit to private sector by banks (De Gregorio & Guidotti, 1995), and financial globalisation is treated as 'international' financial integration; capital account openness (Chinn & Ito, 2008) and foreign direct investment (Prasad et al., 2005), representing the de jure and the facto[28] measures respectively.

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[26] See Chapter 2 (section 2.3) for a literature review on the positive association between financial globalisation and income inequality.
[27] See Chapter 2 (section 2.4) for recent findings on the relationship between financial development and income inequality.
[28] Equity Foreign Portfolio Investment (EFPI) is also a form of de facto financial globalisation (Jaumotte, et al. 2013), however, the majority of the mainstream inequality literature regard FDI as the main de facto measure of financial globalisation (for example: Sylwester, 2005; Choi, 2006; Jensen & Rosas, 2007; Figini & Gorg, 2011), as linking EFPI to inequality in rather complex. Hence, we undertake FDI as the key de facto measure of financial globalisation.

Financial development can affect income inequality in different ways. First, some argue that the high income group benefit the most from financial development as they have better access to credit (Macintyre, Macdonald, & Ellaway, 2008; Hudon, 2009; Jauch & Watzka, 2016), thus more opportunities to invest and accumulate wealth, resulting in rise of inequality. However, if the credit was fairly distributes among all segments of the population, individuals in different income groups would have the same opportunity to use the borrowed funds to invest and generate wealth, for example through investment in entrepreneurship (Banerjee & Newman, 1993; Parker, 2018) or human capital (Galor & Zeira, 1993; Cuaresma, Doppelhofer, Huber, & Piribauer,.2018), leading to reduction of income inequality.

Equal distribution of credit for all income segments of the population is almost unattainable, as banks are profit maximising institutions preferring costumers with low credit default risk, that are generally among the high income segments of the society (Chatterjee, 2007; Verbraken, Bravo, Weber, & Baesens, 2014). Though, potential channels may exist promoting a more equal distribution of credit. Hypothetically, a robust 'banking supervision'[29] may be seen as a potential channel, where it can lead to a fairer distribution of credit through, for example, implying regulations that prevents the 'related-lending' (Li & Yu, 2014), that is preferential credit supply to certain parties[30].

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[29] Baking sector supervision refers to monitoring the banks performance and operational activities, mainly through imposing rules and regulations that monitor the bank's capital adequacy ratio and their lending methods, to pursue a safe and sound banking (Santos, 2001; Levine and Barth, 2001; Abiad, et al. 2008).

[30] The term 'related lending' signifies the loans issued in accordance to the bank owners and executives interest (La Porta et al., 2003).

Moreover, in the past few decades, Flannery (1989) and Blum (1999) argued that banking supervision through imposing capital adequacy requirements[31] would protect banks against loan defaults, promoting them to involve in riskier operations including issuing loans to wider income segments of the society, i.e., a more equal distribution of credit. In a same spirit with this notion, we can observe some recent empirical studies such as in Laeven and Levine (2009), Agoraki, Delis, and Pasiouras (2011), and Jiménez, Lopez, and Saurina (2013) in which capital adequacy requirements is seen as a motivator for banks to issue loans more freely and to the wider income segments of the society.

Hence we assume that robust banking supervision through implementation of capital adequacy requirements would generate a more widespread distribution of credit. In this case, we assume that financial development alongside with robust banking supervision would lead to higher credit issuance with more widespread distribution to all income segments of the population, leading to more equal opportunities to invest and generate wealth, reducing income inequality.

Moving on to the effects of financial globalisation on income inequality, current literature provides mixed findings. Generally, global financial integration promotes openness of financial markets (Mendoza, Quadrini, & Rios-Rull, 2009). More transparent financial markets reduces uncertainly for foreign investors, stimulating capital inflows and economic growth (Bekaert, Harvey, & Lundblad, 2011), leading to lower income inequality[32]. However,

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[31] Capital adequacy requirements refers to regulations imposing a minimum amount of capital reserves a bank must hold (Moyer, 1990).

[32] Substantial body of literature points at negative association between economic growth and income inequality. As for noteworthy, Kuznets inverted U-shaped curve (Kuznets, 1995) argues that income inequality initially rises and then deescalates through the course of economic growth. In the same line of study, Greenwood and Jovanovic (1990) Alesina and Rodrik (1994). Dollar and Kraay (2002), among many others pointed at significance of economic growth on income distribution.

when disaggregating between de jure measure of financial globalisation (capital account openness) and the de facto measure (foreign direct investment), the effects can be varied. Initially, the empirical literature on the effects of de jure measure of financial globalisation (capital account openness) on income inequality is very limited (with exceptions of recent interest including: Jaumotte et al., 2013; Larrain, 2014; Furceri, 2015; Bumann & Lensink, 2016), leaving a great room for further research on the relationship between the two. Among the limited studies, the direct effect of capital account openness on inequality appear not to be thoroughly inspected, though some signal inequality abbreviating effects.

Unlike the de jure measure, there exist a number of studies investigating the effect of de facto measure of financial globalisation (foreign direct investment) on income inequality. Foreign direct investments (FDI) can flourish as a result of financial openness. According to a large body of literature (as for noteworthy: Borensztein, De Gregorio, & Lee, 1998; Alfaro, Chanda, Kalemli-Ozcan, & Sayek, 2004; Carkovic & Levine, 2005; Buckley, Clegg, Cross, Liu, Voss, & Zheng, 2010; Audretsch, Lehmann, & Wright, 2014; Iwasaki & Tokunaga, 2016) FDI brings new technologies in the receiving country, resulting in skill-biased technological shifts (Berman & Machin, 2000; Conte & Vivarelli, 2007; Antonelli & Fassio, 2014), leading to lower job prospects for the unskilled, increasing income inequality.

Based on the current state of the literature, financial globalisation may have varying impacts on income inequality, where the effects of de jure and de facto measures may be contrasting. To the best of our knowledge, this divergence is not thoroughly investigated in the literature, hence room for further research exists in this area.

This chapter makes a contribution among several dimensions: First, the cross-country evidence on links between financial development and globalisation, and income inequality is

very limited, plus, existing literature largely address within-country analysis for the specific country being studied (see for example: Chen & Fleisher, 1996; Piketty & Saez, 2003; Förster, Jesuit, & Smeeding, 2005; Esquivel & Cruces, 2011; Shahbaz & Islam, 2011; Florida & Mellander, 2016). This study aims to enrich the literature by investigating the links based on a panel data set across both developed and developing countries.

Second, making original contribution to knowledge this study proposes a new conceptual framework in which 'robust banking supervision' is seen as the link between financial development and income distribution. To best of our knowledge, not any other paper has investigated this link.

Third, previous studies analysing the effect of financial globalisation on income inequality have not differentiated the effects of financial globalisation components on income inequality. This chapter extends the literature by providing a new conceptual idea in which de jure and de facto measures of financial globalisation have opposing effects on income inequality.

The main findings are as follows. Financial development measured as domestic credit to private sector abbreviates income inequality if robust banking supervision is in place. De jure (capital account openness) and de facto (foreign direct investment) measures of financial globalisation have opposing effects on income inequality where the former abbreviate and the latter increase income inequality.

The rest of the paper is organized as follows. Section 3.2 demonstrates the analytical framework, where the potential channels though which financial development and globalisation can affect income inequality are explained. Section 3.3 is empirical analysis, where data

definitions and sources, as well as empirical specifications and results are shown. Section 3.4 concludes.

3.2 Analytical Framework

3.2.1 Channels through which financial development affects income inequality

This part demonstrates the channels through which financial development, measured as increase in domestic credit to private sector by banks, affects income inequality. Assuming that banks are profit maximising institutions, they would prefer to issue loans to costumers with less credit default risk (Crook, Edelman, & Thomas, 2007; Agarwal, Chomsisengphet, Liu, Song, & Souleles, 2018). The high income group carry less credit default risk in compare to the low income group, as they traditionally have superior credit score (Hand & Henley, 1997; Thomas, Crook, & Edelman, 2017). In this case, it would seem rational if banks prefer to issue loans to the high income group. If more loans are provided to the high income group, income inequality can increase through:

-More opportunity for the high income group to invest in entrepreneurship, and potentially increase their wealth, widening the income gap between the high income group and the low income group (Cagetti & De Nardi, 2006; Parker, 2018).

-Greater prospect for the high income group to continue investing in higher education, accelerate human capital attainment followed by acquirement of skilled jobs that are

traditionally better-paid in compare to the unskilled jobs, resulting in rise of income inequality (Castelló-Climent & Doménech, 2008; Cuaresma et al. 2018).

Hence, we propose a general hypothesis that financial development, measured as higher credit to private sector by banks would result in accumulation of wealth for the high income group, ceteris paribus, increasing income inequality.

On the other hand, if credit was more fairly distributed among all segments of the society, higher credit supply would have an adverse effect on income inequality, as all segments of the population had the same opportunity to utilize those funds, which would lead towards a more equal distribution of income (Beck et al., 2007; Immergluck, 2016). One of the conceptual links in which credit could be more fairly distributed among all segments of the society is that if banks had incentives to treat all income segments of the population as potential credit consumers. If banks had higher capability to cover the losses caused by credit defaults, then they would more spontaneously widen the credit supply to all income segments of the population intending to increase their profits from additional loan repayments. We assume that banks would have higher ability and incentives to issue loans to wider income segments of the society if 'robust supervision on banks' was instigated through:

-Implementation of capital adequacy requirements by government supervisory agencies: capital adequacy requirements resembles that banks must have substantial amount of capital to cover their losses (Demirguc-Kunt, et al., 2006; Barrell, Karim, & Ventouri, 2017). With more ability to cover their losses, banks would have higher incentives to widen the provision of loans to all income segments of the society, reducing income inequality. Traditionally

Flannery (1989) and Blum (1999), and more recently Cummings and Durrani (2016) show some evidence that banks increased their involvement in riskier projects, including widening their credit supply, after implementation of capital adequacy requirements.

-Enactment of unbiased and robust banking supervision by government supervisory agencies: an unbiased and robust supervision on banks performance and operations (such as on capital adequacy and banks liquid assets) by independent supervisory agencies that are non-aligned to bank owners and executives, would maintain a higher quality of banking standards (Naceur & Omran, 2011). Higher quality of banks' performance and operation would stimulate profits (Petria, Capraru, & Ihnatov 2015), which in turn accumulates capital. Higher availability of capital would increase the ability of the bank to expand their operations, such as extending credit provision to wider range of costumers that could result in providing loans to the previously marginalised low income groups, leading to reduction of income inequality.

Hence, we propose a hypothesis that if robust banking supervision is in place, credit would be more fairly distributed among all segments of the society, leading to reduction of income inequality. Overall, our empirical analysis on the relationship between financial development and income inequality tests the following hypothesis:

(H.1) Whether financial development, measured as credit to private sector by banks, increases income inequality

(H.2) Whether banking supervision affects income inequality

(H.3) As an attempt to make original contribution to knowledge; whether financial development interacted with robust banking supervision reduces income inequality.

3.2.2 Channels through which financial globalisation affects income inequality

This part demonstrates the channels through which financial globalisation affects income inequality. Financial globalisation is typically measured in two ways; de jure and de facto measures, where the former represents 'capital account openness' and the latter is 'foreign direct investment (FDI)' (Quinn, Schindler, & Toyoda, 2011). Considering the effects of de jure measure of financial globalisation on income inequality, we assume that capital account openness would affect inequality by the following channels:

- Capital account openness promotes cross-border trade in financial assets, leading to higher international financial integration (Stulz, 2005; Karcher & Steinberg, 2013). Higher international financial integration result in more transparent financial markets (Kose, et al., 2009; Furceri & Loungani, 2018); reducing the uncertainty in financial markets that were previously restricted and non-transparent for international investors. More transparency in the financial market would promotes more business investments, resulting in higher job opportunities and reduction of inequality.

Hence we propose that the de jure factor of financial globalisation (capital account openness) reduces income inequality. Moving on to the de facto measure of financial globalisation, FDI would affect income inequality by the following channel:

- Foreign direct investments are often in the form of building new production plants and facilities by a foreign entity in the host country. These new facilities habitually come with modern technology (Carkovic & Levine, 2005; Alfaro & Johnson, 2012) that needs to be operated by high-skilled labour. Thus, FDI could result in rise of demand for high-skilled labour in the host country. Moreover, what seems to be skill-intensive inward FDI for the host country may seem low skill-intensive outward FDI for the exporting country (Jaumotte et al., 2013). This results in reduction of low-skilled jobs in the exporting country, leading to higher ratio of skilled jobs to unskilled ones. As a result, an increase in FDI from exporting country to receiving economy could increase the demand for skilled labour in both countries, increasing inequality in both the exporting and the receiving country.

Hence, we propose that the de facto measure of financial globalisation, foreign direct investment, results in rise of inequality both in exporting and receiving countries. Overall, the empirical analysis on the relationship between financial globalisation and income inequality tests the following hypothesis:

(H.4) Whether de jure factor of financial globalisation, measured as capital account openness, reduces income inequality.

(H.5) Whether de facto factor of financial globalisation, measured as foreign direct investment, increases income inequality.

(H.6) As an attempt to make an original contribution to knowledge; whether de jure and de facto measures of financial globalisation have opposing effects on income inequality.

3.3. Empirical Analysis

3.3.1. Data and Empirical Model

Based on annual data, our sample covers the time period 1980-2005[33] for a diverse panel of 36 countries (see table 3.1)[34], the specifications used to estimate the effects of financial development and financial globalisation on income inequality are:

$$Gini_{i,t} = \beta_0 + \beta_1 FinDev_{i,t} + \beta_2 BSN_{i,t} + \beta_3 FinDev * RBS_{i,t} + \beta_4 X_{i,t} + \eta_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

$$Gini_{i,t} = \beta_0 + \beta_1 FDI_{i,t} + \beta_2 KAOP_{i,t} + \beta_3 X_{i,t} + \eta_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

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[33] This time span is constrained by data availability of the key independent variables, BS (banking supervision), and KAOP (capital account openness).
[34] The number of countries are constrained to 36 due to the following factors: 1- our pooled dataset consists of four different data sources, limiting the number of available countries under our specification; 2- many countries had large missing values being inconsistent with our specification; 3- the available time span of many countries was limited/capped to just a few years making the dataset highly unbalanced. Appendix shows the full set of countries.

where equation (1) specifies the relationship between financial development and income inequality, and equation (2) represents the effects of financial globalisation on income inequality. $Gini_{i,t}$ represents the Gini coefficient, the measure of income inequality. Considering equation (1), $FinDev_{i,t}$ is the proxy of financial development, that is credit to private sector by banks. $BS_{i,t}$ is the index of banking supervision, $RBS_{i,t}$ represents robust banking supervision, $FinDev * RBS_{i,t}$ is the interaction term of financial development and robust banking supervision. Under equation (2), $FDI_{i,t}$ is the proxy of de facto financial globalisation, that is foreign direct investment, whereas $KAOP_{i,t}$ is the proxy of de jure financial globalisation, that is capital account openness. $X_{i,t}$ indicates other control variables that are identical in both equations. The model is augmented with a set of country dummies η_i and a set of year dummies δ_t. Finally, $\varepsilon_{i,t}$ denotes an error term. Below demonstrates variables measurement and definition:

- Gini Index ($Gini_{i,t}$): The Gini index is the most wide spread measurement tool for income inequality (Deininger & Squire, 1996; Silber, 2012) created by Corrado Gini (Gini, 1921), which takes values between 0 and 100. Values closer to the upper bound indicate higher income inequality, while values closer to the lower bound show more equal distribution of income. The dependant variable measures upon post-tax and transfer income of the households, based on Luxembourg Income Study (LIS) data

Table 3. 1 List of countries used for empirical analysis

Countries	Income groups	Geographical regions	OECD Member	GINI World rank
Australia	H	EAP	Yes	103
Austria	H	ECA	Yes	138
Bangladesh	L	SA	No	125
Belgium	H	ECA	Yes	144
Bolivia	LM	LAC	No	32
Brazil	UM	LAC	No	11
Canada	H	NA	Yes	108
Chile	UM	LAC	No	22
China	LM	EAP	No	54
Colombia	LM	LAC	No	12
Denmark	H	ECA	Yes	143
Ecuador	LM	LAC	No	38
Finland	H	ECA	Yes	149
France	H	ECA	Yes	120
Greece	H	ECA	Yes	92
India	L	SA	No	101
Indonesia	LM	EAP	No	71
Ireland	H	ECA	Yes	126
Italy	H	ECA	Yes	104
Japan	H	EAP	Yes	123
Malaysia	UM	EAP	No	29
Mexico	UM	LAC	Yes	43
Netherlands	H	ECA	Yes	142
Norway	H	ECA	Yes	150
Pakistan	L	SA	No	137
Peru	LM	LAC	No	42
Portugal	H	ECA	Yes	94
Russia	UM	ECA	No	80
Spain	H	ECA	Yes	87
Sri Lanka	LM	SA	No	69
Sweden	H	ECA	Yes	148
Switzerland	H	ECA	Yes	117
Thailand	LM	EAP	No	88
Turkey	UM	ECA	Yes	56
United Kingdom	H	ECA	Yes	106
United States	H	NA	Yes	58

Notes: H is High Income, UM is upper-middle income, LM is lower-middle income, L is low income. EAP is East Asia and Pacific, ECA is Europe and Central Asia, SA is South Asia, LAC is Latin America & the Caribbean, NA is North America. Data source : World Bank.

created in early 1980s. Solt (2009) extends the LIS data creating a Standardized World Income Inequality Database (SWIID)[35]. This study uses the latest version of SWIID

- Domestic Credit to Private sector by Banks ($FinDev_{i,t}$): stands the fraction of domestic credit to private sector by banks to GDP. It denotes financial services provided to the private sector by financial organisations, mainly deposit money banks. The services are mainly through loans, that establish a claim for repayment. The data is taken from the financial organisations survey of the International Monetary Fund's (IMF) *International Financial Statistics*.

- Banking Supervision Index($BSN_{i,t}$): demonstrates the banking supervision index of Abiad et al. (2010), which captures four components:

  (i)   adoption of capital adequacy ratio of the Basel standard (CAR)[36]

  (ii)   independence of supervisory agencies from executives' influence

  (iii)   effective supervision through on-site and off-site examinations

  (iv)   supervision on all financial institutions without exception

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[35] According to Bergh and Nilsson (2010), SWIID is the leading data source for cross-country inequality examinations.

[36] Basel standard, that is, the 1988 Basel Accord, is focused on credit risk and appropriate risk-weighting of assets. Assets of banks were classified and grouped in five categories according to credit risk, carrying risk weights of 0% ,20%, 50% , and 100%. Banks with an international presence are required to hold capital equal to 8% of their risk-weighted assets (RWA).

each of these components are scored as 0,1, or 2, where the lower bound denotes 'not regulated', and the upper bound denotes 'highly regulated'. The final index is the sum of the scores of all components, that is further normalised between 0 to 3.

- Robust Banking Supervision dummy ($RBS_{i,t}$): denotes the dummy variable for robust banking supervision. We created this variable by taking 0 if the banking supervision index is 0 or 1, and taking 1 if banking supervision index is 2 or 3.

- Foreign Direct Investment ($FDI_{i,t}$): is foreign direct investment as percentage of GDP. It denotes investment made by an organisation or individual in one country into corporate interests situated in another country. FDI takes place when an investor launches business operations, or acquires business assets in a foreign country, including ownership and controlling of the operations and assets. The data is sourced from International Monetary Fund's *International Financial Statistics* and *Balance of Payments* databases, as well as World Bank's *International Debt Statistics*, and *OECD GDP* estimates.

- Capital account Openness ($KAOP_{i,t}$): is capital account openness index (also known as Chinn-Ito Index) of Chinn and Ito (2008). This index denotes the extent of the openness in cross-border financial transactions in a country. Capital account openness index (often abbreviated as KAOPEN) is measured based on principal components extracted from disaggregated capital and current account restriction measures in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. The index is

further normalised between 0 and 1, where the lower bound denotes a restrict capital account regime, while the upper bound denotes a fully liberalised capital account regime.

- Vector of Other Control Variables ($X_{i,t}$):

(1) Population Growth ($POPG_{i,t}$): is the annual population growth rate. Providing the fact that the population of different income groups grow at different rates, measuring the effect of aggregate population growth rate on income inequality is rather complex. Yet, it is generally believed that the aggregate population growth limits resource availability, resulting in rise of poverty and inequality (Birdsall, Kelley, Sinding, & Sinding, 2001; Ahlburg, Kelley, & Mason, 2013).

(2) General Government Final Consumption Expenditure to GDP ($GOV_{i,t}$): stands the fraction of general government final consumption expenditure to GDP. The government expenditure comprises all the non-military current spending for purchases of goods and services. Government expenditure captures government's role to increase welfare in the society including redistribution of income (Adam, Brewer, & Shephard, 2006; Mankiw & Weinzierl, 2010; Joumard, Pisu, & Bloch, 2012).

Table 3. 2 Data Definition and Sources

Notation	Definition	Data source
GINI	Gini coefficient	Standardised World Income Inequality Database (SWIID)
BSN	Banking supervision: Basil CAR, independence of supervisory agencies, robust supervision	Financial Reforms Database (FRD)
FinDev	Domestic credit to private sector as percentage of GDP	World Development Indicators (WDI)
TRADE	Ratio of exports and imports to GDP	WDI
KAOP	Chinn-Ito capital account openness index	Chinn and Ito (2008)
FDI	Foreign direct investment: SQRT(FDI as % GDP^2)	WDI
GOV	Government expenditure as percentage of GDP	WDI
INF	Inflation : Ln(100 + consumer price inflation annual rate%*100)	WDI
GDPC	GDP per capita growth by annual percentage	WDI
POPG	Population Growth annual rate percentage	WDI

(3) Inflation ($INF_{i,t}$): it is the consumer price index (CPI). According to Albanesi (2007), higher inflation disproportionately hurt the low income group. As they are in a more vulnerable financial situation, increase in prices of goods and services has a more deteriorating effect on their aggregate wealth.

(4) GDP Growth Rate per capita ($GDPC_{i,t}$): represents the percentage growth of real GDP per capita. Alesina and Rodrik (1994) and Dollar and Kraay (2002) show that income inequality can be declined when real GDP per capita increases.

(5) Trade ($TRADE_{i,t}$): is the sum of exports and imports of goods and services measured as a share of GDP. A large body of literature have investigated the effects of trade liberalisation on income inequality, many of which suggest a positive relationship between the two (for example in: Savvides, 1998; Lundberg & Squire, 1999; Meschi & Vivarelli, 2009; Bergh & Nilsson, 2010) with particular emphasis that higher trade associates with higher skill-biased technological shifts, resulting in higher income inequality.

For detailed information for each variable, Table 3.2 demonstrates data definition and source[37].

3.3.2. Potential problems with the econometric specification

To obtain consistent econometric estimates for equations (1) and (2), a number of issues should be addressed. First, our specification accounts for country heterogeneity (η_i) , which estimates (1) and (2) use a within fixed effect (WFE) estimator that expresses all regressors as deviations from their group means. Second, equation (1) and (2) might suffer from feedback effects, that is the evolution of *Gini* coefficient drives right hand-side variables, i.e., the problem of endogeneity could exist. According to Wooldridge (2010), the endogeneity issue rises if one or more of the following problem exists:

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[37] Summary statistics of all variables are shown in appendix 1.

- Reverse causality (simultaneity): Reverse causality appears when one or more of the right hand-side variables simultaneously affecting the dependent variable.

- When any of the variables (dependant of independent) suffers from measurement error: this problem occurs typically when using proxy variables. It is highly common in many economics-related empirical studies to use a proxy variable describing an element that is quantitatively out of reach, or extremely difficult to capture. Sometimes employing a proxy variable may cause inconsistency in the econometric specification, where the proxy variable could misrepresent the actual variable, leading to biasedness if the empirical results, i.e., measurement error.

- Omitted variables: use of control variables is a common practice in most business-related econometric specifications. However, often it is problematic to include some of the intended control variables due to lack of sufficient data availability, or presumable variable of interest is not statistically measured. This leads to excluding a variable of interest, i.e., the problem of omitted variables.

According to discussion in Das and Mohapatra, (2003), Perotti and Volpin (2007), Demirgüç-Kunt and Levine (2009), and Mandel (2010), increased income inequality propagates policy changes necessary for tackling income differentials. These could include changes in financial sector policies in which it promotes wider income segments of the society to benefit from fruits of financial development (Perotti & Von Thadden, 2006; Haber, North, & Weingast, 2008; Haber & Perotti, 2008). Trade policies could also be affected when rise of inequality is associated with trade openness (Dalgin, Mitra, & Trindade, 2004; Mitra & Trindade, 2005).

Moreover, according to Lupu and Pontusson (2011) rise of inequality intuitively affects redistributive policies, where higher inequality propagates policy changes towards higher income redistribution. There exists also some evidence that Income inequality can affect GDP growth rate (Ravallion, 1998; Ehrhart, 2009), population growth (Cantarero, Pascual, & María Sarabia, 2005) and inflation (Beetsma, 1996; Jäntti & Jenkins, 2010).

Hence we assume that endogeneity could exist between our dependant variable (Gini) and all the right hand-side variables. In this case, OLS estimates produce biased results as the exogeneity assumption is violated: $E(\varepsilon_i Z_{i,t}) \neq 0$, where Z is the vector of all explanatory variables shown in equation (1) and (2):

$$\ln(Gini)_{i,t} = \beta Z_{i,t} + \eta_i + \delta_t + \varepsilon_{i,t} \tag{3}$$

To address endogeneity, a GMM (Generalised Method of Moments) estimator is used. According to Baum, Schaffer, & Stillman (2003), the GMM estimator uses instruments for the endogenous variables in order to control for the potential simultaneity problem. Moreover, Bond and Meghir (1994), provides that the use of GMM requires valid instruments that need to fulfil two criteria:

1- They must be strongly linked with endogenous variables

2- They must be uncorrelated with the error term.

According to Bound, Jaeger, & Baker (1995) and Stock, Wright, & Yogo (2002) instrument variables that realise both conditions is highly challenging to find, and if not cautions it can lead to employing weak instruments resulting in model misspecification. Though, they

suggest an alternative approach that is the use of lagged values of endogenous variables as instruments. Thus in order to avoid employing weak instruments higher order lags of the endogenous variables, $Z_{i,t}$, can be used.

Though, by referring to Baum, Schaffer, & Stillman (2007) the legitimacy of higher order lags as instruments depends on whether the econometric specifications in (1) and (2) have a white noise error term. Hence, the Arellano and Bond (1991) test for autocorrelation (AR) is used for both equations to test whether error terms are subject to first order (AR1) and higher order (AR2) serial correlation. The null hypothesis of the AR tests is that there is no autocorrelation. If the null hypothesis cannot be rejected the error term in (1) and (2) does not suffer from serial correlation. This means that the lagged values of endogenous variables can be used as valid instruments. So far we established that lagged values may be used as appropriate instruments for endogenous variables, however we must address the appropriate number of lags to be used in order to avoid weak identification problems in form of under-identification (Stock & Yogo, 2002; Kleibergen & Paap, 2006), and over-identification (Hansen, 1982).

In order to test for potential under-identification problem, the Kleibergen-Paap test can be used. If the Kleibergen-Paap first stage F-statistics is higher that the critical values set by Stock and Yogo (2002) then we can reject the instrumental variable relative bias assuring that our instruments do not suffer from under-identification.

Moreover, according to Donald and Newey (2001) we should take precautionary steps before choosing the number of higher order lags as the problem of over-identification could occur when using many instruments in GMM estimations. Thus, Hansen's over-identification test can be used to check for potential over-identification problem. The joint null hypothesis of

the Hansen test is that the all over-identifying restrictions are jointly valid. If the null hypothesis cannot be rejected, then we can reassure the joint validity of the specified instruments.

As Baum and Christopher (2006) suggest, the Hansen test of over-identification assesses the full set of over-identifying restrictions, however, to confirm the validity of a subset of instruments, the Sargan-Hansen exogeneity test (Sargan, 1958; Hansen, 1982) can be implemented. The null hypothesis of Sargan-Hansen exogeneity test is that the instruments are exogenous; if the null hypothesis cannot be rejected, then we can confirm the exogeneity of the subsets, further reassuring that the instruments are valid (Baum, Schaffer, & Stillman, 2003). The next section shows the empirical findings, controlling for the potential problems associated with our econometric specifications in (1) and (2).

3.3.3 Empirical Results

Gini coefficient is the dependent variable in all estimations. Table 3.3 demonstrates the results of the three estimation techniques. Models 1 and 4 shows the results of the Pooled Ordinary Least Squared (POLS) estimation, Models 2 and 5 presents estimates of a within country fixed effects estimator (WFE), and Models 3 and 6 shows GMM estimates. Models 1 to 3 estimates the effects of financial development (FD), and Models 4 to 6 estimates the effects of financial globalisation (FG).

Credit to private sector (FinDev), appears to be positively related to income inequality, significant at 1% level in POLS while at 10% level in GMM. Confirming the first hypothesis of the analytical framework (H.1), we see evidence that the high income group disproportionately benefit from fruits of financial development, increasing income inequality.

This is in line with findings of Jauch and Watzka, (2016), where more developed financial markets; rises the credit provision for the high income group increasing their opportunity to utilize the borrowed funds and accumulate wealth, leading to higher income inequality.

Testing the second hypothesis of the conceptual framework (H.2), banking supervision (BSN) does not seem to have a direct effect on income inequality. However, when robust banking supervision is interacted with financial development (FinDev* RBS), the effects are negative and significant at 1% level in POLS while at 5% level in GMM. This is consistent with the third hypothesis of the analytical framework (P.3), where banks would have higher ability and incentives to issue loans to all segments of the society if robust supervision on banks was instigated, resulting in wider distribution of credit, more equal opportunities to generate wealth, leading to lower inequality.

Moving on to the effects of financial globalisation on income inequality, the de jure measure of financial globalisation, capital account openness, appears to be negatively related to income inequality, significant at 5% level in POLS and 10% GMM. This confirms the fourth hypothesis of the conceptual framework (H.4) where capital account openness reduces the uncertainty in the financial markets, which attracts and stimulates business investments potentially leading to creation of new job prospects for the low income group, which in turn leads to reduction of inequality.

Table 3. 3 Income Inequality Panel Regressions (Dependant Variable: Gini)

Variables	(1) POLS-FD	(2) WFE-FD	(3) GMM-FD	(4) POLS-FG	(5) WFE-FG	(6) GMM-FG
FinDev	0.028***	0.024	0.013*			
	(0.007)	(0.024)	(0.008)			
BSN	-0.442	-0.234	-0.173			
	(0.400)	(0.494)	(0.229)			
FinDev* RBS	-0.031***	-0.006	-0.010**			
	(0.008)	(0.009)	(0.004)			
FDI				0.174***	0.103**	0.126*
				(0.052)	(0.038)	(0.073)
KAOPEN				-1.579**	-0.744	-0.395*
				(0.266)	(0.358)	(0.341)
POPG	0.698	0.259	0.128	0.201	0.190	0.143
	(0.417)	(0.579)	(0.305)	(0.413)	(0.549)	(0.338)
INF	0.415	0.015	0.064	0.081	0.068	0.113
	(0.299)	(0.253)	(0.154)	(0.318)	(0.257)	(0.162)
GOV	-0.042	-0.083	-0.090*	-0.046	-0.109	-0.115*
	(0.079)	(0.145)	(0.049)	(0.086)	(0.157)	(0.054)
GDPC	0.148	0.080	0.091	0.111	0.068	0.073
	(0.213)	(0.356)	(0.040)	(0.106)	(0.367)	(0.043)
TRADE	0.008*	0.014	0.020**	0.022*	0.016	0.021**
	(0.008)	(0.012)	(0.007)	(0.009)	(0.016)	(0.008)
Country Dummies	NO	NO	NO	NO	NO	NO
Year Dummies	YES	YES	YES	YES	YES	YES
Observations	874	874	850	817	817	812
R-squared	0.459	0.383	0.343	0.492	0.338	0.336
Diagnostic tests						
Arellano-Bond AR(1)			-0.31			-1.94
[p-values]			[0.760]			[0.521]
Arellano-Bond AR(2)			-1.08			-0.88
[p-values]			[0.281]			[0.378]
Hansen			0.754			1.767
Overidentification test [p-values]			[0.36]			[0.18]
Kleibergen-Paap			18.01			23.58
Underidentification test [p-values]			[0.00]			[0.00]
Sargan-Hansen			0.274			0.285
Exogeneity test [p-values]			[0.47]			[0.28]

Notes: FD is financial development, FG is financial globalisation. *denotes significance at the 10 percent level, **denotes significance at the 5 percent level, ***denotes significance at the 1 percent level. Standard errors are in parentheses. All estimates are produced with standard errors robust for cluster heteroscedasticity. POLS is the pooled ordinary least squared estimator, WFE is the country fixed effects estimator, GMM in the generalised method of moments estimator. The endogenous variables in the GMM estimation instrumented using their lagged values in years (t-1), (t-2) and (t-3). AR is the Arrelano-Bond test (Arrelano and Bond, 1991) for autocorrelation at first order AR(1), and second order AR(2).

In terms of the de facto measure of financial globalisation, foreign direct investment appears to be positively related to income inequality, significant at 1% level in POLS while at 5% level in WFE and 10% GMM. This is in line with the fifth expectation of the conceptual framework (P.5), where foreign direct investment raises skill-biased employment in the exporting and receiving country, leading to the rise of income inequality. This in turn confirms the sixth hypothesis of the conceptual framework (H.6) where is it expected that the de jure and de facto measures of financial globalisation have opposing effects on income inequality.

Trade openness (TRADE) appear to have a positive association with income inequality in all estimates, significant at 10% level under POLS-FD and POLS-FG, while at 5% under GMM-FD and GMM-FG. This is in line with a bulk of empirical findings (for example: Savvides, 1998; Lundberg & Squire, 1999; Meschi & Vivarelli, 2009; Bergh & Nilsson, 2010), where trade openness can result in shift towards skill-biased technological change, resulting in rise of income inequality.

In line with many empirical findings (for example Simpson, 1990; Nielsen, 1994; Deaton and Paxson, 1997; Bucci and La Torre, 2009; Heerink, 2012), Population growth rate (POPG), seem to have a positive association with income inequality, although not statistically significant. This association signals that the aggregate level of population growth may restraint resource availability leading to the rise of poverty and inequality.

Moving on to the effects of Inflation (INF), the results indicate a positive association with income inequality under all estimates, although not statistically significant. This signals that inflation may disproportunately hurts the low income group.

Government expenditure (GOV) appear to be negatively associated with income inequality under all estimations, statistically significant at 10% under GMM-FD, POLS-FG,

GMM-FG. This provides evidence that higher government expenditure more likely through transfer payments redistribute income and wealth from rich segments towards low income segments of the society.

GDP growth per capita (GDPC) does not seem to have a significant effect on income inequality under all estimations. This indicates that we do not see adequate evidence on the economic benefits of GDP growth for the low income group. This is in contrast with the findings of Valickova et al. (2015), and Rousseau and Wachtel (2017) where they show evidence negative association between economic growth and income inequality.

Further diagnostic tests have been implemented to reassure the validity of our specifications. First, controlling for the potential problem of endogeneity, GMM estimators in models 3 and 6 have implemented first and higher order lags as instruments of the endogenous variables for financial development and financial globalisation estimators respectively. Validity of the instruments needs to be tested, thus (Arrelano and Bond, 1991) test for autocorrelation at first order AR(1), and second order AR(2) has been implemented. The P-values for both instruments shows values above 10% for both GMM estimators confirming the validity of instruments. Reassuring the validity of our instrument, we checked for potential weak identification problems, i.e., the problem of under and over-identification. First, with the use of Kleibergen-Paap test we confirm that our instruments are not subject to under-identification as their F-statistics are above 10, exceeding the critical value set by Stock and Yogo (2002) under both GMM models (models 3 and 6).

Moreover, when using instruments in GMM the problem of over-identification could occur. Thus, Hansen's over-identification test is demonstrated in Table 3.3, with a P-value of J statistics above 10% in the GMM estimators, validating that the null cannot be rejected

reassuring the joint validity of the specified instruments. As Baum and Christopher (2006) suggests, the Hansen test of over-identification assesses the full set of over-identifying restrictions. Yet, to confirm the validity of a subset of instruments, the Sargan-Hansen exogeneity test can be implemented. Outcome of this test presented under the GMM estimators in Table 3.3, showing the value for the subset of instruments of the endogeneous variables. The test validates the exogeneity of the subsets as the P-value exceed 10% (that is 47% and 28% for FD and FG models respectively) and the null hypothesis cannot be rejected. The diagnostic tests of autocorrelation, under and over-identification and exogeneity of the subset instruments confirm the validly of instruments, which in turn enhances the reliability of our econometric specifications.

3.4 Concluding remarks

In this chapter, the relationships between financial development and globalisation, and income inequality is examined. Previous studies assessing the effect of financial development on income inequality do not consider the role of banking supervision. This chapter contributes to income inequality literature by examining whether financial development, measured as rise of credit to private sector, can reduce income inequality when robust banking supervision is in place.

Besides, the potential opposing effects of de jure (capital account openness) and de facto (foreign direct investment) measures of financial globalisation on income inequality has not been previously examined. This chapter makes contribution to the literature by analysing whether de jure and de facto measures of financial globalisation affect inequality differently.

The examinations are based on a compiled dataset consisting of 36 countries all over the world for a period of 26 years between 1980 and 2005; providing a widespread cross-country study. The hypothetical framework creates two separate hypothesis. First, financial development reduces income inequality when it is accompanied with robust banking supervision. In other words, higher banking supervision results in improvement of banks performance leading to expansion of banking operations which could include broadening credit provision to wider income segments of the society. Thus, rise of credit provision (financial development) accompanied with wider credit distribution (due to robust banking supervision), leads to acceleration of more equal opportunities to utilize funds and generate wealth, leading to the reduction of income inequality.

Second, the key components of financial globalisation; capital account openness (de jure measure) and foreign direct investment (de facto measure) affect income inequality in opposite directions. De jure measure reduces income inequality through reducing the unpredictability of financial markets, improving business incentives and creating jobs. While de facto measure increases income inequality through rise of skill-biased employment.

In the same direction as hypotheses in the conceptual framework, it is confirmed that financial development reduces income inequality if robust banking supervision is in place. The results further confirm that the de jure and de facto measures of financial globalisation have opposing effects on income inequality where the former abbreviate inequality and the latter aggravates it. With the use of POLS, WFE, and GMM estimators controlling for potential econometric problems, the empirical results confirm the hypotheses of the conceptual framework.

Chapter 4: Financial liberalisation and income inequality: the role of human capital investment

Abstract

This chapter investigates whether financial liberalisation can reduce income inequality, with particular emphasis on the role of human capital. Contributing to income inequality literature, this chapter proposes a new conceptual framework where financial liberalisation, removal of credit controls in particular, is effective in reducing income inequality through promotion of human capital investment for the low income group. Using the data for 36 countries for a time span of 26 years between 1980 and 2005, the conceptual framework is confirmed.

4.1. Introduction

The positive role of financial liberalisation on economic growth is widely established (King & Levine, 1993; Levine & Zervos, 1998; Quinn & Toyoda, 2008; Hermes & Lensink, 2008; Valickova et al., 2015) with the most acknowledged effect to be that the rise of bank credit stimulates the expansion of the private sector as entrepreneurs are provided the credit required to finance the purchase of new capital assets that lead to the expansion of business operations (De Gregorio & Guidotti, 1995; Christiansen, Schindler, & Tressel, 2013)[38].

Over the last 30 years, a well-documented process of financial liberalisation has been observed (Abiad et al., 2010). Although the effect of financial liberalisation on economic growth is indisputable, we know very little on how more liberalised financial markets impact on income inequality as the literature on this topic is very limited (exceptions include Chigumira & Masiyandima, 2003; Arestis & Caner, 2005; Dobson & Ramlogan-Dobson, 2010; Shahbaz & Islam, 2011; Agnello et al., 2012; Li & Yu, 2014).

The main aim of this chapter is to identify the channels through which financial liberalisation in particular the abolishment of credit controls, affects the distribution of income. As for a prospective channel, financial liberalisation would abbreviate income inequality by removing credit controls creating a more convenient path for the low income group to get admittance to loans, and use the borrowed funds for productive investments. To the best of our

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[38] Financial liberalisation also contributes to a better allocation of the resources by facilitating financial intermediating activities and promoting economic development (Levine, 2001; Galindo et al., 2007; Bekaert, et al., 2011).

knowledge, a plausible empirical specification assessing the liability of this notion is non-existent.

The chapter specifies a plausible link through which financial liberalisation reduces income inequality. As banks allow for an easier access to funding the low income group has two options: (a) to undertake investment for implementing new entrepreneurial projects[39] (Banerjee & Newman, 1993) and (b) to increase investment in accumulating higher levels of human capital[40] (Galor & Zeira, 1993). These two options are seen as substitutional, as the individual decides whether to invest in entrepreneurship or in human capital. Regarding option two, a positive relationship between individuals' human capital stock and income is expected, where higher levels of educational attainments provides ground for acquiring higher-paid skilled occupations (Schultz ,1961; Kawachi et al., 1997; Philippon & Reshef, 2012). Consequently, easier access to credit benefits the accumulation of human capital, which is the vehicle for higher earnings that would eventually reduce income inequality.

We studied the effects of financial liberalisation on income inequality with particular emphasis on the role of human capital investment for 36 countries over a 26-year period from 1980 to 2005. We make a contribution along three key dimensions: First, we introduced a new conceptual framework in which financial liberalisation abbreviates income inequality through the promotion of human capital investment for the low income group.

Second, in order to capture the association of financial liberalisation with human capital investment in countries that tertiary education tuition fees are paid privately, we introduce 'no

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[39] Entrepreneurship refers to establishing a new organisation, consisting the process of planning, launching and running a new business.
[40] Human capital resembles stock of knowledge that is gained through investment in education.

free tertiary education dummy' in which countries with a systematic free (or very low fee) tertiary education policy are distinguished form the 'non-free' regimes. This has been done using a set of coding guides and country-specific data sources to capture the higher education accessibility, particularly for the low income group.

Third, we introduce a new interaction term of financial liberalisation and 'no free tertiary education dummy' to capture whether financial liberalisation reduces income inequality by creating a more convenient path for the low income group to get admittance to loans and invest in human capital.

Our main findings are as follows. Income inequality tend to increase in countries that higher education tuition fees are privately paid by the participants. In such regimes, the richer segments of the population have better access to higher education, leading to acquiring skilled jobs with higher incomes widening the income gap with the low income groups. However, we find that financial liberalisation helps to tighten the income gap between the high and low income segments of the society where it forms a pathway for the low income group to participate in human capital alongside higher income segments. In other words, we capture that financial liberalisation, particularly removal of credit controls creates a more convenient path for the low income group to get access loans and invest in human capital acquiring better-paid skilled jobs leading to reduction of income inequality. With the use of POLS taking into account country and year specific dummies, WFE controlling for country heterogeneity, and implementation of Generalised Method of Moments (GMM) estimator controlling for endogenetiy, our conceptual framework is confirmed.

The rest of this chapter is structured as follows. Section 4.2 presents the analytical framework describing the channels through which financial liberalisation affects income

inequality. In section 4.3 we instigate the empirical analysis by presenting the data description and the empirical specification followed by the potential problems associated with it and ways to overcome them. This is followed by the empirical results and diagnostic tests confirming the validity of our estimation. Section 4.4 concludes the chapter.

4.2. Analytical Framework: Channels through which financial liberalisation affects inequality

We now move into demonstrating the channels through which liberalisation in the financial sector affects income inequality. Our framework builds upon Galor and Zeira (1993) model assuming that financial liberalisation increases credit availability for the low income group; with funds to be invested in human capital that can potentially generate higher earnings for low income groups closing the gap of income inequality[41].

The Galor and Zeira (1993) model assumes two types of labour: skilled and unskilled.[42] First, individuals are assumed to be born with equal potential capabilities with desire to take skilled jobs as they usually offer higher salary rates compared to unskilled occupations. In fact, Card and DiNardo (2002) and Goldin and Katz (2018) shows that wages for skilled-jobs were typically greater than that of unskilled occupations with this wage gap being increased overtime, resulting in higher demand for skilled occupations. However, the individuals' choice

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[41] Voluminous studies such as: Schultz (1961); Glomm and Ravikumar (1992); Kawachi *et al* (1997); Becker, Murphy, and Tamura (1990); Heckman (2000); Philippon, and Reshef (2012) confirm the positive effects of human capital stock on individuals' income.
[42] Appendix 2 shows the full specifications of the Galor and Zeira (1993) model.

to work as unskilled or skilled is shaped by the amount that they inherit from their parents or their ability to borrow funds.

To get higher-paid skilled jobs, individuals need to invest in human capital, in the form of tertiary education enrolment. Strauss and De la Maisonneuve (2009) studying the return on human capital investment in form of tertiary education enrolment, show a great wage premium in favour of tertiary education participants as typically they acquired skilled occupations. If the amount that of individuals' bequests is higher than the cost of education, then they will invest in human capital and eventually get skilled jobs. This condition is more easily fulfilled by the richer segments of the society implying no financial constraints in funding education. On the other hand, if the amount of bequests is lower than the cost of education, which is more likely to be the case for low income groups, individuals that seek to invest in human capital should fund education mainly via credit.

In regimes with easier access to credit, low income groups would have higher chance to get access to loans. Financial liberalisation promotes easier access to credit as it allows lower reserve requirements thus issuing more loans. Banks would have higher incentives to issue more loans if the risk of default is low in the sense that repayment is secure given that individuals will get a highly-paid job enabling them to pay back (Chatterjee et al, 2007). If the intention of the individual is to invest the borrowed funds in human capital that surely leads to higher-paid jobs, then banks face less default risk allowing them to issue those loans.

In this case, financial liberalisation creates a more convenient path for the low income group to benefit for such type of loans that can be used for investment in human capital leading to skilled jobs and higher earnings. Thus, the general hypothesis of this chapter is that higher credit control liberalisation results is lower income inequality.

To understand the effect of easier access to credit in human capital investment, one needs to consider the cost of admission to higher education. In a system that offers enrolment to higher education without tuition fees, income criteria do not determine access to education and the potential of investment into human capital accumulation. On the other hand, in a system that charges fees for admission to higher education, financing human capital investment depends on income or alternatively on the ability of individuals to finance their education through credit. Thus, in such systems the high income households would have better access to education as they face less barriers to pay for the higher education fees. In this case the fraction of higher education enrolments by the high income group increases, leading to better-paid skilled-jobs prospects for the high income group, which increases the income inequality. Thus, the second hypothesis of this chapter is that in countries that do not offer free tertiary education, inequality would be higher.

A corollary of the above consideration is that credit control liberalisation can play an important role in reducing income inequality in countries that do not provide admission to higher education free of charge. Access to higher education funded with credit for low income groups increase opportunities of faster human capital accumulation for segments of the society that come from low income backgrounds. The third, and main hypothesis of this chapter is that higher credit control liberalisation in countries that do not free tertiary education, reduces income inequality.

In the following sections, the empirical study is carried out, investigating three hypotheses:

(H.1) whether credit controls liberalisation is effective in reducing income inequality;

(H.2) whether inequality is higher in countries that do not offer free tertiary education;

(H.3) whether credit control liberalisation is effective in reducing inequality in countries that do not offer free tertiary education.

4.3. Empirical Analysis

4.3.1. Data and Empirical Model

Based on annual data, our sample covers the time period 1980-2005[43] for 36 countries (see Table 4.1)[44], the specification used to estimate the effects of financial liberalisation on income inequality is:

$$\ln(Gini_{i,t}) = \beta_0 + \beta_1 CC_{i,t} + \beta_2 NOFRED_{i,t} + \beta_3 CC * NOFRED_{i,t} + \beta_3 X_{i,t} + \eta_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

$Gini_{i,t}$ represents the Gini coefficient, which is the measure of income inequality. $CC_{i,t}$ is the index of credit controls liberalisation, and $NOFRED_{i,t}$ is the dummy variable for 'no free tertiary education', $CC * NOFRED_{i,t}$ is the interaction term of credit control liberalisation and 'no free tertiary education', $X_{i,t}$ indicates other control variables. The model is augmented with

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[43] This time span is constrained by data availability of the key independent variable, CC (credit controls liberalisation).
[44] The number of countries are constrained to 36 due to the following factors: 1- our pooled dataset consists of four different data sources, limiting the number of available countries under our specification; 2- many countries had large missing values being inconsistent with our specification; 3- the available time span of many countries was limited/capped to just a few years making the dataset highly unbalanced.

a set of country dummies η_i and a set of year dummies δ_t. Finally, $\varepsilon_{i,t}$ denotes an error term. Below demonstrates variables measurement and definition:

- Gini Index ($Gini_{i,t}$): represents the net Gini coefficient measured upon post-tax and post-transfer income of the households, based on Luxembourg Income Study (LIS) data created in early 1980s. Solt (2009) extends the LIS data creating a Standardized World Income Inequality Database (SWIID)[45]. This study uses the latest version of SWIID.

- Credit Control Index ($CC_{i,t}$): demonstrates the credit control index of Abiad et al. (2010), which captures four components:

(1) Restrictions on reserve requirements: coded as 0, 1, or 2, where 0 represents high reserve requirement (more that 20 percent), 1 denotes reserve requirement reduced between 10 to 20 percent, and 2 is for lower reserve requirements (below 10 percent).

(2) Amounts of credit that must be channelled to certain sectors: coded as 0 in case of existence of mandatory credit allocation to certain sectors, i.e., directed credit, and coded as 1 if directed credit removed or does not exist.

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(3) Credit supplied to certain sectors at subsidised rates: coded as 0 if mandatory credit allocation to certain sectors with subsidized rates exist, and coded as 1 if this obligation is removed or financial institutions do not have to provide credit at subsidized rates.

(4) Credit ceilings: coded as 0 if ceilings on expansion of credit supply is imposed by the central bank, and coded as 1 if such ceilings does not exist.

The final index, ($CC_{i,t}$) is the weighted average of the sum of the first three components with the weight of ¾, and the last component with the weight of ¼. The index in further normalised between 0 and 3, where 0 represents a fully restrict credit control regime, 1 is partially restrict, 2 is largely liberalised, and 3 is fully liberalised.

- No Free Education Dummy ($NOFRED_{i,t}$): In our dataset, we distinguish countries between the ones that offer free tertiary education enrolment, and countries that do not offer it. Countries that offer free tertiary education are coded as 0, and 1 otherwise. The dimensions used to guide the coding are listed below (see Table 4.1 for more details):

Table 4. 1 Countries with and without free tertiary education

Countries Without Free Tertiary Education	Countries With Free Tertiary Education
Australia^^	Austria^
Bangladesh***	Belgium^
Bolivia***	Brazil**
Canada***	Denmark^
Chile***	Finland^
China***	France^
Colombia***	Greece^
Ecuador***	Ireland^
India***	Italy^
Indonesia***	Mexico**
Japan***	Norway^
Malaysia***	Netherlands^
Pakistan***	Portugal^
Peru***	Spain^
Russia**^	Sweden^
Sri Lanka^^^	Switzerland^
Thailand***	United Kingdom^^
Turkey***	
United States***	

Note: Countries with free tertiary education are the ones that offer free (or low) tuition fees for tertiary education enrolment. It does not take into account grants subsidies or loans that partially or fully offset the student's tuition fees. This research considers free tertiary education 'only based on the tuition fees' (Any other fees, expenses, or costs are not reflected).

^ Nordic countries of Denmark, Finland, Norway, Sweden, as well as France, Greece, and Spain offered free tertiary education, while Austria, Belgium, Ireland, Italy, Netherlands, Portugal, and Switzerland charged very low fees (Approximately $1000 per year).

^^Australia had free tertiary education system until mid-1980s, and the United Kingdom had free tertiary education system until 1998 where university fees were reintroduced at £1000 per year, followed by an increase to £3000 per year in 2004.

**Free Postsecondary Education in Brazil dates back to late 1960s (De Araujo, 2012). Also in Mexico tuition at public universities and technological universities and institutes is free to Mexican citizens (Rodríguez-Gómez & Casanova-Cardiel, 2005).

***Countries of Bangladesh, Bolivia, Canada, Chile, Colombia, Ecuador, India, Indonesia, Japan, Pakistan, Peru, Malaysia, China, Thailand, Turkey, and United States did not offer free tertiary education enrolments.

^^^Country of Sri Lanka has free-tuition state universities, however entry is extremely competitive and limited, where Sri Lanka's Centre for Poverty Analysis (CEPA, 2004) estimated that only around 15% of qualified students get admission to state universities, hence this research considers Sri Lanka under 'No Free Tertiary Education' category.

**^ Free tertiary education system existed in Russia when it was part of the former Union of Soviet Socialist Republics (USSR). Followed by dissolution of the USSR in year 1991, free tertiary education was removed in Russia, hence this study finds Russia under the category of 'no free tertiary education'.

- *Defining free tertiary education:* An established definition of 'free tertiary education' does not exist in the literature (McLaughlin, 2003; Yelland, 2011). Hence we assess whether a country offers free tertiary education based on the following factors:

(i) Distinguishing between tuition fees and all the other costs of education: According to Baum, Ma, Bell, & Elliott (2014) among the typical costs for tertiary education participation[46] tuition fees appear to be the central cost. Plus, all the non-tuition costs are varied for different participants, making the tuition the only common fixed cost for all participants within an educational establishment. Hence, we distinguish between 'free' and 'no-free' tertiary education solely focusing on tuition fees[47], disregarding any other type of cost caused as a result of tertiary education enrolment. In other words, we focus on the main fixed cost of tertiary education enrolment that is the tuition fees (Salmi & Hauptman, 2006).[48]

(ii) Distinguishing between Methods of payment: if tertiary education tuition fees is partially or fully funded by any form of grants, subsidies, or special government

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[46] That are distinguished into: tuition fees, charges for university services (Such as library loans, athletic facilities, specific membership fees, and any other non-tuition university charges), food and accommodation, learning material, personal and transportation expenses.

[47] Tuition payments refer to fees charged by education institutions for their instruction, and any other instruction-related services (Lemaitre, 2007).

[48] The other costs of tertiary education such as accommodation and expenses are not fixed for all participants. To avoid biased outcomes we only focus of tuition fees being a fixed costs for all participants within the same educational establishment.

student loans, we do not consider it as free[49], thus private funding is the only element for distinguishing between 'free' and 'non-free'.

(iii)   Existence of a systematic free tuition fees for tertiary education enrolment: It means that the country had a policy for establishing substantial number of public universities that do not charge a tuition fee. Some countries may have a number of public universities that do not charge for tuition fees, though if the access to those universities are extremely difficult (for example in Sri Lanka (CEPA, 2004)), or the number of private universities that charge tuition fees are much greater than tuition free public universities, then we do not consider it as free tertiary education system.

- *Defining very low tuition fees:* public universities in some countries charge very low amount of tertiary education tuition fees, closely resembling a tuition free system. Based on suggestions of a bulk of studies (Woodhall,1992; Hughes, 1994; Staniscia, 2012; Martin & Tremblay-Pepin, 2011; Post, 2000; Brunello Comi, & Lucifora., 2000; Jones, 2014; Dorling, 2016; Thompson & Bekhradnia, 2010; Brown, Ortiz-Nuñez, & Taylor, 2011; Wangenge-Ouma, 2012; Garritzmann, 2016;), tuition fees of approximately below $1000 per year appears to be among the lowest tuition fees been charged for the time period between 1980-2005.[50]

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[49] since not all participants are equally eligible to use those methods of payment (Schwarz and Rehburg,2004; Nora, et al., 2006), including any other method of payment other that 'private funding' can result is biased and misleading results.

[50] Although defining a 'low tuition fee' in a universal context is extremely difficult, we estimate based on the literature that fees below $1000 would seem liable as low tuition fees. An alternative approach would be to differentiate countries between the ones with zero tuition fees, and the ones that charged any amount of tuition fees. This approach would provide a highly biased results as some countries may charge very little tuition fees, and others with much higher amounts.

- *Defining no free tertiary education:* the tertiary education fees are defined as 'non-free' if the tuition fees being charged are approximately above $1000 per year with participants paying for their tuition fees via the main methods of private funding of education; savings, family money, or private loans (Heckman, 2005; Brouse et al., 2010; Bolton, 2017).

- *Time period and Specific country characteristics*: based on the time span of our dataset, the coding of the countries is grounded on the period of 1980-2005. In order to avoid misrepresentation, we cautiously take into account that references used for the coding are based on this time period[51]. Moreover, Education policy in each country is strongly linked to social and historical backgrounds, thus radical alterations in education policies are rather unlikely (Bell & Stevenson, 2006). However, this does not assure that education policies of a country remains unchanged, hence we take into account that during this period countries may have changed their education policies toward free tertiary education or vice versa, hence we observe for any potential shifts.

- *Exceptions in classification for some counties*: Studying the education system for each of the countries in our dataset for the period of 1980 to 2005, we found that some of the countries within the dataset have changed education policies, although marginally. As such, Australia had free tertiary education system until mid-1980s (ZAJDA, 2013), and

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[51] see appendix 3 for sources used for each individual country.

the United Kingdom had free tertiary education system until 1998 where university fees were reintroduced at £1000 per year, followed by an increase to £3000 per year in 2004 (Wilkins, Shams, & Huisman, 2013). Moreover, free tertiary education system existed in Russia when it was part of the former Union of Soviet Socialist Republics (USSR); followed by dissolution of the USSR in year 1991, free tertiary education was removed in Russia (Matthews, 2011).

- $X_{i,t}$ is a vector of the following control variables:

(1) Average Years of Tertirary Schooling ($HC_{i,t}$): is the average years of tertiary education completed among people over age of 15. More years of participation in tertiary schooling captures a productivity effect, while it also facilitates the notion that higher-salaried jobs results in lower inequality (Philippon & Reshef ,2012; Murphy & Topel, 2016).

(2) General Government Final Consumption Expenditure to GDP ($GOV_{i,t}$): is general government final consumption expenditure as percentage of GDP. The government expenditure comprises current spending for purchases of goods and services aimed at increasing the welfare of the society, including income redistribution (Adam, Brewer, & Shephard. 2006; Mankiw & Weinzierl, 2010; Joumard, et al., 2012).

(3) Inflation ($INF_{i,t}$): it is the consumer price index (CPI). The rise of consumer price inflation could be more deteriorating for the low income group compare to the high income, as they are more vulnerable to afford the higher prices. This would eventually lead the low income group to be more cautious in their spending, and reduce participations in business investments and generating wealth, leading to rise of income inequality (Albanesi, 2007)

(4) Population Growth ($POPG_{i,t}$): is the annual population growth rate. According to Birdsall, Kelley, Sinding, & Sinding (2001) and Ahlburg, Kelley, & Mason (2013) the aggregate population growth limits resource availability, resulting in rise of poverty and inequality.

(5) GDP Growth Rate per capita ($GDPC_{i,t}$): represents the percentage growth of real GDP per capita. Dollar and Kraay (2002) show that income inequality can be declined when real GDP per capita increases. This is due to the notion that economic growth results in stimulation of business activities, creating jobs and reduction of income inequality.

Table 4.2 demonstrates a summary of notation, definition, and data source for the dependant and each of the independent variables used under our estimation. Moreover, to observe the key statistical properties for each of the variables, a summery statistics of all of the variables are provided in appendix 1.

Table 4. 2 Data Definition and Sources

Notation	Definition	Data source
GINI	Gini coefficient	Standardised World Income Inequality Database (SWIID)
CC	Credit controls: Reserve requirements, directed credit, subsidized credit, credit ceilings	Financial Reforms Database FRD
HC	Years of tertiary schooling	Barro-Lee Dataset
GOV	Government expenditure as percentage of GDP	WDI
INF	Inflation : Ln(100 + consumer price inflation annual rate%*100)	WDI
GDPC	GDP per capita growth by annual percentage	WDI
POPG	Population Growth annual rate percentage	WDI

4.3.2. Potential problems with the econometric specification

To obtain consistent econometric estimates for (1), a number of issues should be addressed. First, our specification accounts for country heterogeneity (η_i) , which estimates (1) using a within fixed effect (WFE) estimator that expresses all regressors as deviations from their group means. Second, equation (1) might suffer from feedback effects, that is the evolution of *Gini* coefficient drives right hand-side variables. Intuitively, increased income inequality propagates policy changes necessary for tackling income differentials, see for instance discussion in Das and Mohapatra (2003), Perotti and Volpin (2007), Demirgüç- Kunt and Levine (2009) and Mandel (2010). In this case, OLS estimates produce biased results as the exogeneity assumption

is violated: $E(\varepsilon_i Z_{i,t}) \neq 0$, where Z is the vector of all explanatory variables shown in equation (1):

$$\ln(Gini)_{i,t} = \beta Z_{i,t} + \eta_i + \delta_t + \varepsilon_{i,t} \qquad (2)$$

To address endogeneity, a GMM (Generalised Method of Moments) estimator is used. The use of GMM requires valid instruments that need to fulfil two criteria. First, they must be strongly linked with endogenous variables and second, they must be uncorrelated with the error term. External instruments that fulfil both principles are highly difficult to find, therefore higher order lags of the endogenous variables, $Z_{i,t}$, can be used. The legitimacy of higher order lags as instruments depends on whether the econometric specification in (1) have a white noise error term. Hence, the Arellano and Bond (1991) test for autocorrelation (AR) is used to test whether error terms are subject to first and higher order serial correlation. The null hypothesis of the AR test is that there is no autocorrelation. If the null hypothesis cannot be rejected the error term in (1) does not suffer from serial correlation. This means that the lagged values of endogenous variables can be used as valid instruments. According to Baum et al. (2007), however, weak instruments problem could occur for two reasons: (a) when the correlation between endogenous regressors and the excluded instruments are above zero but very small, and (b) when dealing with a large sample, even if the correlation between the two are above zero and highly significant. Hence, we need to check whether the instruments being used are weak instruments, i.e. whether they suffer from under-identification. Thus, Kliebergen-Paap under-identification test (Kleibergen & Paap, 2006) can be used to check for potential under-identification.

121

Moreover, the problem of over-identification could also occur when using many instruments in GMM estimations (Stock, Wright, & Yogo, 2002). Thus, Hansen's over-identification test (Hansen, 1982) can be used to check for potential over-identification problem. The joint null hypothesis of the Hansen test is that the all over-identifying restrictions are jointly valid. If the null hypothesis cannot be rejected, then we can reassure the joint validity of the specified instruments. As Baum (2006) suggests, the Hansen test of over-identification assesses the full set of over-identifying restrictions, however, to confirm the validity of a subset of instruments, the Sargan-Hansen exogeneity test can be implemented (Sargan, 1988). The null hypothesis of Sargan-Hansen exogeneity test is that the instruments are exogenous. If the null hypothesis cannot be rejected, then we can confirm the exogeneity of the subsets, further reassuring that the instruments are valid. The next section shows the empirical findings, controlling for the potential problems associated with our econometric specification.

4.3.3 Empirical Results

Gini coefficient is the dependent variable in all estimations. Table 4.3 demonstrates the results of the three estimation techniques. Model 1 shows the results of the Pooled Ordinary Least Squared (POLS) estimation, Model 2 presents estimates of a within country fixed effects estimator (WFE), and Model 3 shows GMM estimates.

Credit control liberalisation index (CC), appears to be adversely related to income inequality, significantly at 1% level in all estimations. Confirming the first hypothesis of the analytical framework, we see strong evidence that the low income group benefit from credit control liberalisation, reducing income inequality. This outcome supports the findings of Haber

Table 4. 3 Income Inequality Panel Regressions
(Dependant Variable: Natural Logarithm of Gini)

Variables	(1) POLS	(2) WFE	(3) GMM
CC	-0.057***	-0.056***	-0.057***
	(0.005)	(0.012)	(0.006)
NOFRED	0.321***	0.345***	0.094***
	(0.030)	(0.046)	(0.031)
CC*NOFRED	-0.018**	-0.015**	-0.017*
	(0.013)	(0.020)	(0.008)
HC	-0.032***	-0.020**	-0.019**
	(0.012)	(0.019)	(0.010)
GOV	0.012*	-0.006*	-0.009*
	(0.025)	(0.029)	(0.017)
INF	0.074	0.005	0.005
	(0.006)	(0.006)	(0.004)
POPG	0.120	0.023	0.024
	(0.012)	(0.013)	(0.008)
GDPC	0.020	0.006	0.006
	(0.009)	(0.006)	(0.003)
Country Dummies	NO	NO	NO
Year Dummies	YES	YES	YES
N	862	862	860
R2	0.464	0.453	0.413
Diagnostic tests			
Arellano-Bond AR(1) [P-value]			-2.90
			(0.293)
Arellano-Bond AR(2) [P-value]			-0.98
			(0.859)
Hansen Overidentification test [P-value]			0.226 [0.64]
Kleibergen-Paap Underidentification test [P-value]			138.525 [0.00]
Sargan-Hansen Exogeneity test [P-value]			0.281 [0.77]

Notes: *denotes significance at the 10 percent level, **denotes significance at the 5 percent level, ***denotes significance at the 1 percent level. All estimates are produced with standard errors robust for cluster heteroscedasticity. All explanatory variables are in natural logarithm, except CC and NOFRED. POLS is the pooled ordinary least squared estimator, WFE is the country fixed effects estimator, GMM in the generalised method of moments estimator. The endogenous variable in the GMM estimation are instrumented using the values of endogenous variables in years (t-1), (t-2) and (t-3). AR is the Arrelano-Bond test (Arrelano and Bond, 1991) for autocorrelation at first order AR(1), and second order AR(2).

and Perotti (2007), and Rajan and Ramcharan (2011) who underline that access to credit can reduce income inequality. Moreover, our results are in line with findings of Agnello et al. (2012) where removal of policies towards directed credit and excessively high reserve requirements, i.e., credit control liberalisation, improve the distribution of income.

Consistent with the second hypothesis of the analytical framework, 'no free tertiary education dummy' (NOFRED), is positively associated with higher income inequality, significantly at 1% level in all estimations. This shows strong evidence that in countries with no free tertiary education, the high income group has easier access to education, which impacts negatively on income inequality. This is in same spirit with findings in Gregorio and Lee (2002) where more equal access to education is beneficial for a more equal distribution of income. It is also similar in spirit to the finding of Philippon and Reshef (2012), and Murphy and Topel (2016) who indicate that a more equal opportunities to invest in human capital can result in more equal distribution of income.

The coefficient of the interaction term between credit control liberalisation and 'no free tertiary education dummy' (CC*NOFRED), our main variable of interest, is negatively and significant at 5% level in POLS and FE while at 10% level in GMM. This result confirms the hypothesis of our conceptual framework; 'the removal of credit controls in an educational system that charges fees for admission to higher education tackles income inequality'.

The proxy of human capital investment, i.e., average years of tertiary schooling attained (HC), is negative and significant. This suggests that years of schooling is a path for low income groups to get skilled jobs with higher earnings. This is consistent with findings of Castelló and Doménech (2002) who show a negative association between income inequality and stock of

human capital in a large cross-country study. Lustig, Lopez-Calva, & Ortiz-Juarez (2012) also indicates that more years of schooling tend to decline income inequality.

In line with the predictions, government expenditure (GOV) reduces income inequality. This indicates that higher government expenditure more likely through transfer payments redistribute income and wealth from rich segments towards low income segments of the society. This is consistent with findings of a Goñi et al (2008), Rajkumar and Swaroop (2008), and Afonso, Schuknecht, and Tanzi (2010) where higher redistributive public spending are associated with more equal distribution of income. Population growth rate (POP), Inflation (INF), and per capita GDP growth (GDPC) does not seem to affect inequality significantly.

Further diagnostic tests have been implemented to reassure the validity of our specifications. First, controlling for the potential problem of endogeneity, GMM estimator has implemented first and higher order lags as instruments of the endogenous variables. Validity of the instruments needs to be tested, thus (Arrelano & Bond, 1991) test for autocorrelation at first order AR(1), and second order AR(2) has been implemented. The P-values for both instruments shows values above 10% (29% for AR(1), and 86% for AR(2)) confirming the validity of instruments. Testing for under-identification problem, we can reject the null hypothesis of weak instruments under Kleibergen-Paap test where the F-statistics is well above 10[52], assuring that our instruments are not under-identified. Moreover, when using many instruments in GMM the problem of over-identification could occur. Thus, Hansen's over-identification test is demonstrated in Table 4.3, with a P-value of J statistics above 10% in the GMM estimator, validating that the null cannot be rejected reassuring the joint validity of the specified

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[52] This is based on tabulations provided in Stock and Yogo (2002).

instruments. As Baum (2006) suggests, the Hansen test of over-identification assesses the full set of over-identifying restrictions. Yet, to confirm the validity of a subset of instruments, the Sargan-Hansen exogeneity test can be implemented. Outcome of this test presented under the GMM estimator in Table 4.3, showing the value for the subset of instruments of the endogeneous variables. The test validates the exogeneity of the subsets as the P-value exceed 10% (that is 77%) and the null hypothesis cannot be rejected. The diagnostic tests of autocorrelation, over-identification and exogeneity confirm the validly of instruments, which in turn enhances the reliability of our econometric specifications.

4.4. Concluding Remarks

In this chapter, the relationships between financial liberalisation, human capital investment and income inequality is examined. The literature pays little attention to the distributional effects of financial liberalisation. Moreover, among the limited number of studies assessing the effect of financial liberalisation on income inequality, the potential role of human capital participation, to the best of our knowledge, is not investigated. This chapter contributes to the income inequality literature by examining whether financial liberalisation, abolishment of credit controls in particular, can reduce income inequality through promotion of human capital investment for the low income group. The examinations are based on a compiled dataset consisting of a diverse panel of 36 countries for a period of 26 years between 1980 and 2005; providing a widespread cross-country study.

Credit controls is estimated based on the four components (reserve requirements; directed credit; subsidised credit; credit ceilings) in 'New Database of Financial Reforms'

(Abiad, et al., 2010). Moreover, following the Galor-Zeira model (Galor & Zeira, 1993), where more equal access to human capital reduces inequality, our conceptual framework propose that with liberalisation of credit controls, the low income group can utilize the funds made available to accelerate investment in human capital and get better-paid skilled jobs, resulting in reduction of income inequality. In other words, credit controls liberalisation would reduce the income gap between the rich and the poor, through creating a more equal path for human capital investment.

In the same direction as hypotheses in the conceptual framework, it is confirmed that credit controls liberalisation reduces income inequality for a diverse panel 36 countries. The results further confirm that in regimes where tertiary education enrolment is not free, income inequality is higher. Consequently, the key finding of this chapter show that with the rise of credit control liberalisation in nations that do not systematically offer free tertiary education enrolment, the low income group can accelerate investment in human capital from the funds made available for them, resulting in reduction of income inequality. With the use of POLS, WFE, and GMM estimators controlling for potential econometric problems, the empirical results confirm the hypotheses of the conceptual framework.

Chapter 5: Conclusion

Income inequality has been traditionally considered as one of the most critical socio-economic issues around the world. Its rapid rise in the modern calls for further research on the roots causing income inequality. Numerous studies investigated the causes of income inequality many of which are highly respected. Though, according to Piketty (2014) links to growing inequality could take several different forms and further exploration is needed to identify potential channels affecting inequality.

Driven by the significance of income inequality for socio-economic welfare, this thesis is motivated to investigate for the most influential factors affecting inequality in modern history, and potential routes in which inequality could be tackled. Although the literature provides that many different factors affect income inequality, the financial pathway appear to be among the most noteworthy in the past few decades. Thus the thesis focuses on the effects of financial aspects of the economy on income inequality.

To do so, the thesis provides three chapters investigating the association between financial evolution and income inequality. Initially, the thesis provides an extensive literature review as well as a new set of stylized facts in chapter 2, showing that the evolution of financial aspects of the economy is closely associated with income inequality, setting the context for the impeding empirical analysis. Chapter 2 further clarifies in a new framework that recent financial evolution consists of three elements: financial globalisation, financial development, and financial liberalisation. This creates a straightforward path for the thesis to analyse the association between financial evolution and income inequality through assessing the effects of each of these elements individually. Thus, chapter 3 of the thesis assessed the effects of financial globalisation, and financial development on income inequality, and chapter 4 analysed the associations between financial liberalisation and income inequality.

In terms of the effects of financial globalisation on income inequality, chapter 3 of the thesis provides that previous studies have signalled a mixed association between financial globalisation and income inequality. Some argue that financial globalisation promotes economic growth leading to rise of business activities and more job opportunities for all individuals among the society, leading to lower income inequality. While others argue that financial globalisation results in rise of international knowledge and technology transfers which could lead to skill-biased employment and rise of income gap between the skilled and unskilled labour, rising income inequality.

Addressing this divergence, the thesis undertakes that different measures of financial globalisation can have different effects on inequality, thus settles a notion that de jure (capital account openness) and the de facto (foreign direct investment) measures of financial globalisation could have opposing effects on income inequality. Consequently, the thesis makes contribution to the field by empirically investigating the opposing effects of de jure and de facto measures of financial globalisation on income inequality. Consistent with the notion, the empirical results confirm that while de jure measure of financial globalisation reduces income inequality, the de facto measure tends to aggravate it for a set of 36 countries between 1980 to 2005.

Regarding the effects of financial development on income inequality, chapter 3 of the thesis points out to divergence between two school of thoughts one of which argue that financial development leads to reduction of income inequality, and the other contend that financial development is mostly in benefit of the high income group, leading to the rise of income inequality. As a key point, both schools of thought agree that if credit was fairly distributed among all income segments of the society, financial development would reduce income

inequality. Thus, chapter 3 of the thesis is motivated to re-investigate the potential links between financial development, a more equal distribution of credit, and reduction of income inequality.

To do so, chapter 3 provides a new conceptual framework in which financial development would reduce income inequality when 'robust banking supervision' is in place. The idea behind this notion is that a robust banking supervision would increase the quality of banks performance and profitability, leading to expansion of banking operations including broadening the credit provision to wider income segments of the society, creating more equal opportunities to utilize loans and generate wealth, lowering income inequality. Making an original contribution to knowledge, chapter 3 empirically confirms that financial development reduces income inequality if robust banking supervision is in place for 36 countries between 1980 to 2005.

Moving on to the effects of financial liberalisation on income inequality, chapter 4 of the thesis contends that empirical evidences on the links between financial liberalisation and income inequality is very limited, thus further investigations are needed to explore the potential new channels. To do so, chapter 4 of the thesis provides a new conceptual framework in which financial liberalisation would reduce income inequality through promotion of 'human capital investment' for the low income group. Relaxing the fact that higher educational attainments results in acquiring better-paid skilled occupations, income differentials would be lower if all income segments of the society had equal access to higher education.

The idea behind the conceptual framework in chapter 4 derives from the notion that in educational regimes that charge tuition fees for tertiary education enrolment, the low income group would have difficulties accessing tertiary education due to the fact that paying for the

tuition fees could be challenging for them. However, financial liberalisation, through removal of credit controls, would create an easier path for the low income group to invest in tertiary education with the use of the borrowed funds made available. This would increase the participation of the low income group in tertiary education alongside the high income group, leading to more equal opportunities to attain better paid skilled-jobs, lowering income differentials. Making an original contribution to knowledge, chapter 4 empirically confirms that financial liberalisation reduces income inequality through promotion of human capital investment for the low income group for 36 countries between 1980 to 2005.

In terms of the econometric specifications used for empirical investigations in chapters 3 and 4, three different types of econometric methods are used for each specification to increase the reliability and validity of the results: (a) Pooled Ordinary Least Squares (POLS) accounting for year and country dummies, Within Fixed Effects estimator (WFE) accounting for country heterogeneity, and Generalised Method of Moments (GMM) controlling for potential endogeneity problems.

Although the thesis puts immense effort to provide robust outcomes, still areas for further developments exists. First, the dataset used in this thesis is based on macroeconomic indices that are collected on an annually basis for 36 countries between 1980 to 2005. Although the dataset used helps capturing the association between financial aspects of the economy and income inequality, undertaking larger number of countries and a more recent time span, as well as employing additional indicators would add to the value of research. The thesis contends that the used dataset is in accordance to data availability, however in future empirical investigations on the association between financial aspects of the economy and income inequality, employing

a modified dataset consisting novel macro-economic indices can further improve addressing the matters surrounding the financial causes of income inequality.

Second, income inequality measure of Gini index introduced first by Gini (1912) and later adjusted by Luxembourg Income Study (1983), Deininger, and Squire (1996) and Solt (2009), faces some criticisms by academic economists as to how effective this could be in capturing income inequality, especially that this index measures the total level of inequality instead of conscientious income comparison of different segments of the society. This notion is not entirely agreed among scholars as most recent inequality studies still employ the Gini index as measure of income inequality. However in future studies, the investigations could be modified by adding quantile income analysis which compares the income level of five segments of the society: low income, lower-middle income, middle income, upper-middle income, high income.

Third, the indexes capturing financial evolution are measured based on three different sources using diverse statistical techniques. For example, de jure financial globalisation is calculated based on binary coding statistical approaches under Chinn and Ito (2008), de facto financial globalisation and financial development are pooled from WDI and measured as percentage of GDP, financial liberalisation is measured based on a ranking approach in Abiad et al. (2010). Although this divergence is not necessarily a constraint, creating a new index comprising all of the above factor under single index may help future research to capture the effects of financial evolution on income inequality in a more straightforward pattern. Such methodology would be time consuming and complex, thus the thesis analysed each aspect of financial evolution separately, and views the creation of a single index as a potential future research ground.

133

In conclusion, the thesis identifies some gaps in the finance-inequality literature, thus makes original contribution to knowledge by proposing new conceptual frameworks followed by empirical confirmations on channels in which income inequality could be reduced. In addition, the thesis could widen the path for other research studies in economics and other branches of social science to further explore and develop methods in which income inequality could be tackled.

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Appendix 1

Summary statistics of all variables

Variable	Obs	Mean	SD	Min	Max
GINI	897	0.38	0.102	0.197	0.648
CC	923	0.188	0.109	0	3
BSN	923	0.145	1.198	0	3
RBS	923	0.493	0.501	0	1
NOFRED	936	0.472	0.501	0	1
FinDev	882	0.801	0.613	0.08	0.586
KAOPEN	903	0.594	0.356	0	1
FDI	837	0.178	0.401	0.047	0.47
TRADE	925	0.052	0.489	0.026	1.234
HC	936	0.427	0.291	0.02	1.49
GOV	927	0.157	0.051	0.043	0.277
INF	903	0.681	0.131	0.185	13.977
GDPC	925	0.02	0.035	-0.153	0.136
POPG	936	0.012	0.291	-0.004	0.035

Appendix 2

Galor-Zeira model specification

Below shows the full model specification of Galor-Zeira model, derived directly from Galor and Zeira (1993).

Production in the skilled labour sector is specified by:

$$Y_t^s = F(K_t, L_t^s), \tag{1}$$

where Y_t^s is output in this sector at time t, K is the amount of capital and L_t^s is labour input. F is a concave production function with constant returns to scale. Production in the unskilled labour sector is described by:

$$Y_t^n = w_n \cdot L_t^n, \tag{2}$$

where Y_t^n is the output, and L_t^n represents unskilled labour input. $W_n > 0$ represents the marginal productivity in this sector. Individuals in this economic model are assumed to live two periods each in coinciding generations. They can either take unskilled jobs in both phases of life or invest in human capital in the first phase leading to taking skilled jobs in the second phase. The volume of investment in human capital is represented by h > 0. Conceptually, they assume that

an individual utilises both from consumption in the second phase and from any inheritance to his/her descendants:

$$u = \alpha \log c + (1 - \alpha) \log b, \tag{3}$$

where c is consumption in second phse, b is bequest, and $0 < a < 1$. Meanwhile, the universal rate of interest is equal to $r > 0$ and is presumed to be persistent over time. Entities can lend any sum at this rate. They adopt that if creditors spend an amount z at monitoring a borrower, this borrower can still equivocate the creditors but only at a price of βz, where $\beta > 1$. Due to the non-existence of adjustment costs to investment, and to the notion that the quantity of skilled labours is recognised one period in advance, the aggregate of capital existing in the skilled labour subdivision is set each period so that:

$$F_K(K_t, L_t^s) = r. \tag{4}$$

Henceforth, there is a persistent ratio of capital to labour in this subdivision, which defines the salary of skilled labour W_s that is persistent as well. This wage W_s is contingent on r and on the level of technology solely. They initially inspect the capital market equilibrium for individual borrowers. It is vibrant that creditors to individuals must have positive costs of monitoring each borrower, or else all the borrowers would default. Hereafter, they must borrow at a rate greater than r, for lenders to cover these monitoring costs. Borrowers who get an

164

amount d afford an interest rate of id covering creditors' interest rate and creditors' costs z, as there could be an existence of a competitive financial intermediator operational on zero profits:

$$d \cdot i_d = d \cdot r + z.$$ (5)

Creditors select z to be substantial enough to make evasion disadvantageous:

$$d(1+i_d) = \beta z.$$ (6)

This is an incentive compatibility constraint. Above equations determine id:

$$i_d = i = \frac{1+\beta r}{\beta - 1} > r.$$ (7)

Consequently, The rate of interests for borrwongi- i - is independent of the quantity borrowed d, as monitoring costs increase with the quantity borrowed d. This outcome is rather instinctive: as the quantity borrowed rises, the inducement to default increases and therefore monitoring costs upsurges. They then turn to evaluate individual optimum decision making. Taking into account an individual who bequests an amount -x -in first phase of his/her life. If this individual chooses to take unskilled jobs and not invest in human capital, then utility of his/her lifetime is:

$$U_n(x) = \log\left[(x + w_n)(1 + r) + w_n\right] + \varepsilon, \tag{8}$$

where:

$$\varepsilon = \alpha \log \alpha + (1 - \alpha) \log (1 - \alpha). \tag{9}$$

This individual is a unskilled worker who leaves an inheritance amount of:

$$b_n(x) = (1 - \alpha)\left[(1 + r)(x + w_n) + w_n\right]. \tag{10}$$

An individual with bequest x > h, who capitalises in human capital, has a utility of:

$$U_s(x) = \log\left[w_s + (x - h)(1 + r)\right] + \varepsilon, \tag{11}$$

and a inheritance of:

$$b_s(x) = (1 - \alpha)\left[w_s + (x - h)(1 + r)\right]. \tag{12}$$

An individual who capitalises in human capital but has bequest -x -less than h, is a borrower, with utility of hi/her lifetime being:

$$U_s(x) = \log\left[w_s + (x - h)(1 + i)\right] + \varepsilon, \tag{13}$$

and a inheritance of:

$$b_s(x) = (1 - \alpha)\left[w_s + (x - h)(1 + i)\right]. \tag{14}$$

It is vibrant that if W_s - h(1 + r) < W_n (2 + r) all individuals would prefer to work as unskilled. Since this is a situation with limited interest we assume that:

$$w_s - h(1+r) \geqq w_n(2+r).$$

(15)

Therefore, the payback as a result of human capital investment is more than working as an unskilled, thus individuals prefer to invest in human capital, as is seen from equations (8) and (10). Borrowers would prefer to invest in human capital as long as $U_s(x) > U_n(x)$ that is:

$$x \geqq f = \frac{1}{i-r}[w_n(2+r) + h(1+i) - w_s].$$

(16)

Individuals who bequest an amount less than f would not wish to invest in human capital, rather they would be taking unskilled occupation. In this case, access to education is limited to individuals with substantial enough amount of initial wealth, due to a high interest rate. The amount an individual bequest in first phase of life, consequently, completely regulates his/her decisions to invest in human capital or work as unskilled, and how much to consume now, and how huck to leave for the next generation. Let D_t be the distribution of bequests by individuals born in time t. This distribution gratifies:

$$\int_0^\infty dD_t(x_t) = L.$$

(17)

Therefore, the distribution D_t, completely regulates financial performance in time t. It determines the quantity of skilled labour:

$$L_t^s = \int_f^\infty dD_t(x_t) \qquad (18)$$

and unskilled labour:

$$L_t^n = \int_0^f dD_t(x_t). \qquad (19)$$

Henceforward, the dissemination of capital governs aggregate output as well and it has a robust effect on the macroeconomic equilibrium. This effect is perhaps due to the existence of credit market imperfection. Though, they questioned the relevance of this result: the consequence of wealth distribution is applicable only if this distribution varies considerably from one nation to the other. This is not rational if the dynamic process is ergodic, specifically if all preliminary distributions resemble the similar distribution in the long-run, as in the mechanism introduced by Loury (1981) and Banerjee and Newman (1991). In the following section they display that the second supposition in their study, that is indivisibilities in human capital investment, directs to non-ergodic dynamics and to numerous routed of long-run wealth distributions. Therefore the notion becomes more plausible to inspect the effect of wealth distribution in the short-run too.

The circulation of wealth not only regulates equilibrium in time t, but similarly regulates next period distribution of bequests D_{t+1}:

$$x_{t+1} = \begin{cases} b_n(x_t) = (1-\alpha)[(x_t + w_n)(1+r) + w_n], & \text{if } x_t < f \\ b_s(x_t) = (1-\alpha)[w_s + (x_t - h)(1+i)], & \text{if } f \le x_t < h \\ b_s(x_t) = (1-\alpha)[w_s + (x_t - h)(1+r)], & \text{if } h \le x_t. \end{cases} \tag{20}$$

b_n and b_s define the dynamic associations between bequest of unskilled and inheritance fo skilled workers. Keep in mind that f is determined by the connexion of b_n and b_s.

Individuals who receive inheritance less than f take unskilled jobs and so are their offspring in all coming generations. Their bequests congregate to a long-run level $\bar{x}_n$:

$$\bar{x}_n = \frac{1-\alpha}{1-(1-\alpha)(1+r)} w_n(2+r). \tag{21}$$

Individuals who receive inheritance more than f take human capital investment but not all their offspring will continue in the skilled labour sector in forthcoming generations.

$$g = \frac{(1-\alpha)[h(1+i) - w_s]}{(1+i)(1-\alpha) - 1}. \tag{22}$$

Individuals who receive inheritance less than g in period t might invest in human capital, nonetheless after some generations their offspring become unskilled labours and their bequests congregate to $\bar{x}_n$ Individuals who bequest more than g invest in human capital as well as their offspring, generation after generation. Their inheritances congregate to $\bar{x}_s$:

$$\bar{x}_s = \frac{1-\alpha}{1-(1-\alpha)(1+r)}[w_s - h(1+r)]. \qquad (23)$$

Thus, households in this economic model are engaged in the long run in two clusters: high income households invest in human capital generation after generation, and low income group being unskilled workers generation after generation. Now they assume that α and r satisfy:

$$(1-\alpha)(1+r)<1. \qquad (24)$$

Appendix 3

Sources used in identifying 'free' or 'non-free' tertiary education enrolment

Country   **Source**

Australia: James et al. (2007), Marcucci and Johnstone (2007), McCaig (2011).Zadja (2013).

Austria: Maier, (2006), Marcucci and Johnstone (2007), McMartin, (2009)

Bangladesh: Ashraf et al. (2009), Monem and Muhammad (2010).

Belgium: Vandenberghe (2007), Vandenberghe and Debande (2007).

Bolivia: Bernasconi, (2007), Hauptman (2007), Rabossi (2009).

Brazil: De Mello and Hoppe (2005), Murakami and Blom (2008), McMartin, (2009)

Canada: Berger et al (2009), Oliveira Martins et al (2007), Marcucci and Johnstone (2007),

Chile: Bernasconi, (2005). Anand et al (2006), Arenas (2006), Espinoza (2008).

China :   ZHANG and MENG (2005), Li and Min (2001) Dong Wan (2012).

Colombia: Arenas (2006), Murakami and Blom (2008), Fernández (2010).

Denmark: Oliveira Martins et al (2007), McMartin, (2009), Woodfield (2009).

Ecuador: Wolff and de Moura Castro (2005), De Fanelli (2008), Jarrín (2008).

Finland: Davies et al. (2006), Oliveira Martins et al (2007), Barr, (2008) McMartin, (2009)

France: Oliveira Martins et al (2007), Courtioux, (2008), McMartin, (2009)

Greece: Psacharopoulos and Papakonstantinou (2005), Oliveira Martins et al (2007),

          McMartin, (2009)

India: Agarwal (2007), Marcucci and Johnstone (2007), McMartin (2009)

Indonesia: Kristiansen (2006), Tadjudin (2007), Welch (2007).

Ireland: Oliveira Martins et al (2007), Barr, (2008), McMartin, (2009)

Italy: Oliveira Martins et al (2007), McMartin, (2009), Minelli et al. (2012)

Japan: Marcucci and Johnstone (2007), Maruyama (2008), Johnstone (2008), McMartin
                (2009),

Malaysia: Lee (2004), Wan (2007), Marcucci and Usher (2012).

Mexico :   Marcucci and Johnstone (2007), Murakami and Blom (2008).

                McMartin, (2009), Gregorutti (2011).

Netherlands: Oosterbeek and Webbink (1995), Oliveira Martins et al (2007),

                Marcucci and Johnstone (2007), McMartin, (2009), Woodfield (2009).

Norway: Hämäläinen et al. (2001), Fägerlind and Strömqvist (2004), Barr (2008)

Pakistan: Khan (1991), Quddus and Rashid (2000), Anwar (2007).

Peru: Holm-Nielsen et al. (2005), De Wit et al. (2005), Murakami and Blom (2008).

Portugal: Oliveira Martins et al (2007), Barr, (2008), McMartin, (2009)

Russia: Hossler et al. (2007), Marcucci and Johnstone (2007), McMartin, (2009)

Spain: Marcos (2003), Oliveira Martins et al (2007), Barr, (2008), McMartin, (2009)

Sri Lanka: Chandrasiri (2003), Gamlath   (2013),   Randiwela and Herath (2008),
                Jayasundara, (2014).

Sweden: Oliveira Martins et al (2007), Barr, (2008), McMartin, (2009), Woodfield (2009).

Switzerland: Weber, (1994), Biffl and Issac (2002), Oliveira Martins et al (2007), McMartin,
                (2009)

Thailand: Suwanwela (1996), Chapman and Lounkaew (2009), Teerawut (2011), Ziderman (2015).

Turkey :   Erk (1989), Barr, (2008), Marcucci and Usher (2012),   Özoğlu et al. (2016)

United   Williams (1998), Williams, G. (2004), Oliveira Martins et al (2007),
Kingdom: Marcucci and Johnstone (2007), McMartin, (2009)

United   Hoxby (1997), Oliveira Martins et al (2007), Marcucci and Johnstone (2007),
States: McMartin, (2009), Snyder and Dillow (2012).