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CROSS COUNTRY EVIDENCE ON FINANCIAL DEVELOPMENT- INCOME INEQUALITY LINK

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

CEREN AKBIYIK

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF ECONOMICS

SEPTEMBER 2012

Approval of the Graduate School of Social Sciences

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ABSTRACT

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September 2012, 93 pages

This study analyzes the relationship between financial development and income inequality by using panel data of 60 developing and developed countries for the period 2000-2010. We find evidence for the linear negative relationship between financial development and income inequality which asserts that financial development reduces income inequality. We also find evidence supporting Kuznets inverted u-shaped hypothesis on development-income inequality link, except that for the developed countries where we find evidence for u-shaped hypothesis. It is also concluded that the panel is stationary without unit root, indicating that shocks on income inequality is not persistent.

Keywords: Financial Development, Income Inequality, Kuznets curve, Arellano-Bond estimator

ÖZ

FİNANSAL GELİŞMİŞLİK-GELİR EŞİTSİZLİĞİ İLİŞKİSİ ÜZERİNE ÜLKELER DÜZEYİNDE KANIT

Akbıyık, Ceren
Master, İktisat Bölümü
Tez Yöneticisi : Yrd. Doç. Dr. Esma Gaygısız Lajunen

Eylül 2012, 93 sayfa

Bu çalışma 60 gelişmiş ve gelişmekte olan ülkeden oluşan panel veri kullanarak 2000-2010 yılları arasında finansal gelişmişlik ve gelir eşitsizliği arasındaki ilişkiyi analiz etmektedir. Finansal gelişmişlik ve gelir eşitsizliği arasında negatif doğrusal bir ilişki bulunmuştur, bu finansal gelişmişliğin gelir eşitsiziğini azalttığını göstermektedir. Ayrıca, gelişmiş ülkeler hariç, Kuznets'in kalkınma-gelir eşitsizliği arasındaki ters u-şeklindeki ilişkiyi savunan hipotezine dair kanıt bulunmuştur. Gelişmiş ülkelerde u-şeklindeki ilişkiye dair kanıt bulunmuştur. Panelin birim kök olmaksızın durağan olduğu ve bunun da gelir eşitsizliği üzerindeki şokların kalıcı olmadığına işaret ettiği görülmüştür.

Anahtar Kelimeler: Finansal Gelişmişlik, Gelir Eşitsizliği, Kuznets eğrisi, Arellano-Bond tahmin edicisi

To My Fiancé

ACKNOWLEDGMENTS

I would like to thank my thesis supervisor Assist.Prof.Dr. Esma Gaygısız Lajunen for her close supervision, contributions, and academic support throughout this study. I am also grateful to the examining committee members, Prof. Dr. Erdal Özmen and Assist.Prof.Dr. Serdal Bahçe for their valuable contributions and criticisms.

I also thank my colleague from Middle East Technical University, Department of Economics, research assistant Osman Değer for his valuable support, company and sincerity.

I express my deepest gratitude to my fiancé Engin Öztürk, and to my parents Songül and Selami Akbıyık for their kindliness, encouragement and moral support throughout this study.

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ATM	Automatic teller machine
FD-IV	First Differences with Instrumental Variables
FDRs	Financial Development Reports
FE-IV	Fixed Effects with Instrumental Variables
FiDI	Financial Development Index
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
HT	Harris–Tzavalis unit root test
NBFIs	Non-bank financial intermediaries
PPP	Purchasing power parity
VIF	Variance inflation factors
WEF	World Economic Forum

CHAPTER 1

INTRODUCTION

The global economic environment continues to encounter significant uncertainty in the face of subsequent economic crises. Policy responses of counties need to address not only the immediate symptoms of the crises but also the underlying causes. These responses need to recover the system and the economic environment but at the same time, it is still possible to unintentionally hamper economic development and deteriorate distribution of income. Financial systems play a crucial role in economic development and income distribution considering the aggravating effect of crises on income distribution. Therefore, countries must follow a path that would use the financial sector as an instrument to reshape income distribution in order to be successful in the longer term. This approach is supported by many empirical studies which have found that cross-country differences in levels of financial development explain a considerable portion of the cross-country differences in income inequalities between economies.

Economists have been concerned about the distribution of income for a long time. Kuznets (1955), which is considered as the landmark study on economic development and distribution of income, argued that economic development is associated first with an increase and then a decrease in income inequality, resulting in an inverted u-shaped relationship between these two variables. In the 1990s, economists started to develop hypotheses on the link between financial development and income inequality built on the Kuznets' hypothesis.

The relation between financial development and income distribution is particularly important for policy makers in the current environment of economic crises. Policy makers want to know how policies affect inequality as well as how they affect development. Making this relationship perceptible to policy makers will allow them assess whether financial development will improve inequality. Because different theoretical models give different predictions about the distributional impact of

financial development on inequality, empirical investigation is needed to distinguish between the competing conjectures.

There are two mainstream approaches to the link between financial development and income inequality: the first is the inverted u-shaped hypothesis by Greenwood and Jovanovic (1990) which shows how the interaction of financial and economic development can give rise to an inverted u-shaped relationship between income inequality and financial development. And the second is the negative linear relationship by Banerjee and Newman (1993) and Galor and Zeira (1993) which have shown that financial market imperfections can perpetuate the initial distribution of wealth in the presence of indivisible investments.

In addition to theoretical studies, there exists a broad empirical literature on financial development and income inequality. Li, Squire and Zou (1998), Clarke *et al*. (2006), Beck, Demirguc-Kunt and Levine (2007) and Kappel (2010) examine the relationship between financial development and income inequality using cross country data. On the other hand, studies such as Liang(2006), Law and Tan (2009), Batuo *et al.* (2010), Bittencourt (2010) and Shahbaz and Islam (2011) use cross-regional data, mostly focusing on a single country or countries within a particular region. However only a few studies examine both linear and inverted u-shaped hypotheses at the same time such as Clarke *et al.*(2006), Liang(2006), Batuo *et al.* (2010) and Shahbaz and Islam (2011) and none finds evidence supporting inverted u-shaped hypothesis.

The present study analyzes the relation between financial development and income inequality using panel data from developing and developed countries for the period between 2000 and 2010. We examine the two mainstream approaches to finance-inequality link by the help of dynamic panel analysis. We test for the relevance of inverted u-shaped hypothesis as well the negative linear hypothesis both for developing and developed countries and investigate potential disparities. We also test for the relevance of Kuznets curve by examining the economic development and income inequality relation. Effects of other determinants on inequality are also examined. The relevance of findings are validated through a set of specification tests. We also complement our analysis with unit root test and make a prudential

conclusion on the persistence of shocks on income inequality. We carried out statistical analyses by using Stata version 11[1].

This study contributes to the literature in four dimensions. Firstly, studies up to now have examined only one or two aspect of finance-inequality link at the same time, such as the negative linear relationship only without testing for the inverted u-shaped hypothesis or Kuznets curve. Moreover, bulk of the literature does not analyze results separately for developed and developing countries. We carry out a cross-country analysis to test the validity of many hypotheses that have ever been suggested by the literature on development-finance-inequality nexus, including linear and inverted u-shaped hypotheses and the Kuznets curve.

Secondly, recent studies, including the very recent ones either focus on one single country or region or include a time period which is short or long but certainly not very recent. The most recent cross-country empirical analysis on this area is Kappel (2010) which includes a time period between 1960-2006. For this reason, the present study provides the most recent cross-country analysis of financial development-income inequality link. We apply such analyses for three panels each time: the whole panel including 60 developing and developed countries, the panel for 24 developing countries and the panel for 36 developed countries. Such division makes it possible to track diversity of results in developing and developed countries.

Thirdly, according to our knowledge this is the first study that uses wide scope of WEF Financial Development Index in an empirical analysis. By following the methodology of World Economic Forum's (WEF) Financial Development Reports (FDRs), we construct a unique financial development measure –financial development index (FiDI) used in panel estimations.

Traditional financial development measures used in recent studies capture only one particular area of financial development such as private credit or stock market development etc. They generally use one or two measures seperately in empirical analysis while few studies construct a simple composite index using such measures.

[1] StataCorp. 2009. *Stata Statistical Software: Release 11*. College Station, TX: StataCorp LP.

Batuo *et al.* (2010) construct a financial sector development index by using liquid liabilities to GDP, broad money to GDP and domestic private sector lending by banks as a share of GDP. Similarly, Kappel (2010) uses a composite index which equals the value of private credit plus market capitalization relative to GDP. Unlike recent studies, we construct and use a very comprehensive composite index including a wide range of measures of financial development and access to finance. Therefore, we capture not only one aspect but a spectrum of many aspects by using a comprehensive and reputable overall measure of financial development as also validated by WEF's FDRs.

The available indexes reported by FDRs for available years included a very short time span –from 2008 to 2011. Since our panel covers a period between 2000 to 2010, and not all countries in our panel is covered by FDRs, we needed to construct similar indexes for years before 2008 for each country in the panel. Therefore we calculated our own indexes of financial development between the years 2000 to 2010. Self constructed indexes and WEF's indexes are pretty much in a similar vein, which validates the accuracy of the self consturcted indexes.

One last contribution of the current study is complementing the analysis by investigating the persistence of shocks on income inequality through unit root tests. Unit root tests clarify the non-existence of unit roots in panel series as well as persistence of shocks.

The remainder of this study is as follows: Chapter 2 presents a review of the literature in three parts. Firstly within the context of the inverted u-shaped hypothesis, secondly negative linear hypothesis and thirdly within the framework of empirical studies. Chapter 3 defines the concept of financial development and the pillars constructing it and reports and compares financial development indexes over years. We also represent the calculation methodology of financial development indexes. In Chapter 4 we present the extent of income inequality in the world and then define other determinants of income inequality –control variables used in regressions in detail. Chapter 5 explains the econometric techniques used and presents the methodology. Chapter 6 represents the findings of empirical results and Chapter 7 provides a review of the findings and restates important conclusions.

CHAPTER 2

LITERATURE REVIEW ON FINANCIAL DEVELOPMENT AND INCOME INEQUALITY LINK

The literature on financial development and income inequality is concentrated around two basic hypothesis: Greenwood and Jovanovic (1990) “inverted u-shaped hypothesis” and Galor and Zeira (1993) and Banerjee and Newman (1993) “negative linear hypothesis”. In this chapter, both theories are explained in detail with the empirical findings of several studies investigating the link between financial development and income inequality.

2.1 The Inverted U-Shaped Hypothesis

Kuznets (1955) suggests a potential link between the sectoral structure of the economy, financial sector development and income inequality. During the transition from agriculture to industry, Kuznets (1955) suggests that there might be an inverted u-shaped relationship between income inequality and economic development. In the early stages of development, an economy's financial markets are hardly existent and the markets grow at a very slow pace. In the intermediate stage of development cycle, the society moves from low-income agricultural sector to high-income industrial sector, income inequality initially increases since only a small share of the population initially benefits from higher income possibilities in the new modern sector as the saving rates increase. However, as the agricultural sector shrinks and wages increase, the increasing inequality tends to decrease in the final stage of development. As more people adopt the new technology, and as new entrants catch up with those who started earlier, saving rates fall, the trend reverses and income inequality starts to fall. Kuznets (1955) also suggests that, in case the entry to modern sector is made easier, it will be easier to gain access to finance and inequality will be greater in economies with large modern sectors.

Greenwood and Jovanovic (1990) develop a model predicting a non-linear, inverted u-shaped relationship between financial development, income inequality and economic development building on Kuznets hypothesis. During all maturity stages of economic development, financial development helps the poor by improving capital allocation and promotes aggregate development. However, the extent to which financial development affects income distribution depends on the maturity of the economic development. At early stages of financial development, only the rich access and benefit from better financial markets but at higher levels, more people have access to financial markets, so it helps a larger share of population. The inverted u-shaped hypothesis practically suggests that financial development might widen income inequality at the early period, but then tends to lower it when average income increases and more households gain access to financial market.

Greenwood and Jovanovic (1990) investigate the finance-inequality relationship within the context of a dynamic model. Considering an economy populated by agents on the interval [0,1], at the period t the agents own wealth k_t which is allocated between consumption and investment, meaning $k_t = c_i + i_t$. The maximization of expected lifetime utility for an agent is given by:

$Max\ E \quad \sum_{t=0}^{\infty} \beta^t u(c_t)$ with the discount rate $\beta \in (0,1)$.

There exists two kinds of production technologies available in the economy. First is relatively safer but low return: δ for per unit capital and the other is more risky but yields higher rate of return expressed by a composite technology shock of $\theta_t + \varepsilon_t$, where $\theta_t \in \underline{\theta}, \overline{\theta}$ denotes the aggregate shock and $\varepsilon_t \in -\underline{\varepsilon}, \overline{\varepsilon}$ denotes idiosyncratic shock with $E\ \varepsilon_t = 0$, and the lower bound is assumed to be positive.

The development of financial intermediations might overcome the information friction on risky investments through collecting and analyzing information of a large number of projects to discover the true aggregate shock θ_t. The risk diversification, trading and pooling helps smoothing away the idiosyncratic shock ε_t.

The entry to the financial markets is costly; therefore not every agent will join the financial market immediately, so the entry will be restricted to agents with the

amount of wealth higher than a certain threshold level. Hence, the agents can be categorized into two groups as the participants who are already in the financial market and the non-participants who are not currently in the financial market.

If the non-participant invests in fraction ϕ_t of his portfolio into the high-risk technology at period t, then the investment output at the beginning of period $t+1$ will be:

$$k_{t+1} = i_t \ \phi_t \ \theta_t + \varepsilon_t \ + \ 1 - \phi_t \ \delta \ .$$

It implies that the wealth of the non-participant is greatly influenced by the uncertainty of the idiosyncratic shock. As for the case of the agent already participates the financial system, he gets a promised rate of return $r \ \theta_t$ per unit of capital invested in the financial system, and the financial intermediaries will make the decision on project investments and fund allocation based on their advanced information collection and analyses. Therefore, for the amount of capital i_t invested into the financial market at period t, the wealth of the participant is $k_{t+1} = i_t r \ \theta_t$ since the idiosyncratic shock ε_t is smoothed away by financial intermediaries.

Greenwood and Jovanovic (1990) defined the value function of an agent as $w \ k$ which is outside the financial market, and $v \ k$ as the value function of the financial participant. $F \ \theta$ and $G \ \varepsilon$ denote the cumulative distribution functions of θ and ε respectively.

In the period t, the investment decision of a non-participant agent will depend on the maximization of the following function:

$$w \ k_t \ = max \ u \ k_t - i_t \ + \beta \quad max \ w \ k_{t+1} \ , v \ k_{t+1} - q \quad dF \ \theta_{t+1} \ dG \ \varepsilon_{t+1}$$

Subject to:

$$k_{t+1} = i_t \ \phi_t \ \theta_t + \varepsilon_t \ + \ 1 - \phi_t \ \delta$$

For the financial market participant, the corresponding equations will be as follows:

$$v\ k_t\ = max\ \ v\ k_t - i_t\ + \beta\quad max\ v\ k_{t+1}\ \ dF\ \theta_{t+1}$$

Subject to:

$$k_{t+1} = i_t r\ \theta_t$$

For any given endowment of capital k, we have $v\ k_t\ > w\ k_t$ which indicates that k is worth to an individual within the financial system than to one outside of it, so an individual will never exit the system once he entered it.

The model of Greenwood and Jovanovic (1990) yields a dynamic solution to the relationship between finance and inequality: in the early stages of development when financial intermediaries are less developed, the economy develops slowly; in the intermediate stage of development, widening income inequality coincides with faster economic development and more deepening financial development; by maturity, when extensive financial structure is fully developed with more agents gaining access to the financial intermediary sector, the degree of income inequality will decline and ultimately become stable.

2.2 The Negative Linear Hypothesis

In contrast to the theory suggested by Greenwood and Jovanovic (1990), some theories predict a linear and negative relationship between financial development and income inequality. The theory by Galor and Zeira (1993) and Banerjee and Newman (1993) suggest that financial development promotes economic development and hence reduces inequality.

Banerjee and Newman (1993) and Galor and Zeira (1993) suggest that long-run convergence in the income levels of the rich and the poor will not necessarily happen in economies with capital market imperfections and indivisibilities in

investment in human or physical capital. Depending on the initial wealth distribution, income inequality might persist.

Galor and Zeira (1993) model the dynamic pattern of income distribution in an economy with investment indivisibility, where agents live for two periods, and generations are linked through the bequests. Agents can either work as unskilled labors for both periods, or make an indivisible investment in human capital in the first period and then work as skilled labors in the second period. However, given capital market imperfections, only individuals with bequests larger than the investment amount or who can borrow will be able to make this investment. This results in income inequality that is perpetuated through bequests to the next generation.

Consider now an economy with a single consumption good that can be produced with either the skilled-intensive technology or the unskilled-intensive one. The wage of skilled and unskilled workers are w_s and w_u respectively, with $w_s \gg w_u$. An agent with wealth y that lives for two-periods will consume c only in the second period, and will bequeath the capital amount b to his children, with $b = y - c$. The fund required for investment in human capital is h. Individuals who borrow will pay an interest rate i, which is greater than the rate r that they earn when they lend.

Assume that the utility function of an agent is $U = c^{\alpha} b^{1-\alpha}$, thus the solution to the utility maximization subject to $y = c + b$ is given by $b^* = (1-\alpha)\, y$ and $U^* = \theta y$ with $\theta = \alpha^{\alpha} (1-\alpha)^{1-\alpha}$. Therefore, for an agent who inherits x but chooses not to invest in human capital, his utility $U_u^*(x)$ can be written as follows:

$$U_u^*(x) = \theta (x + w_u)(1 + r) + w_u$$

If an agent with inheritance greater than the capital required for education investment (i.e., $x \geq h$) chooses to invest in human capital, his utility U_{sl}^* is given by:

$$U_{sl}^*(x) = \theta (x - h)(1 + r) + w_s$$

Based on these two equations, we find that people will choose to invest in education if and only if $U_{sl}^{*} \geq U_{u}^{*}$. This condition can also be written as:

$$w_s - h\ 1 + r\ \geq\ w_u\ 2 + r\ .$$

Moreover, as for the agent with inheritance $x < h$ who chooses to borrow for investment in human capital, his utility U_{sb}^{*} is given by

$$U_{sb}^{*}\ x\ =\ \theta\ \ x - h\ \ 1 + i\ + w_s$$

Note that for those who have to borrow for education, they choose to invest in human capital if and only. Based on these equations, this critical condition can be written as:

$$x \geq f \equiv \frac{wu\ \ 2{+}r\ - ws{+}h(1{+}i)}{i{-}r}$$

It indicates that only agents with sufficiently large inheritance will invest in human capital and then become the skilled labors, while the other agents will remain unskilled. Let x denote the inheritance received by the agent born at time t. The bequest that he leaves for his children (i.e. $b\ x_t$) can be given by:

$$b\ x_i\ =\ \begin{array}{ll} 1-a\ \ x_t + w_u\ \ 1 + r\ + w_u & if x_t < f \\ 1-a\ \ x_t - h\ \ 1 + i\ + w_s & if\ f \leq x_t < h \\ 1-a\ \ x_t - h\ \ 1 + r\ + w_s & if\ x_t > h \end{array}$$

In their model, an economy with capital market imperfections and an initially unequal distribution of wealth will maintain this inequality and grow more slowly than a similar economy with a more equitable initial distribution of wealth. However, the development of financial market will provide broader and easier credit access for poor households: as financial market develops, the credit constraints faced by low-income agents will be alleviated, which will in turn help to reduce income inequality. Similar predictions can also be found in the model of Banerjee and Newman (1993).

In sum, both of these theoretical models predict a negative and linear relationship between finance and inequality, in which the development of financial market and financial intermediation, by eliminating capital market imperfections and providing more opportunities for the poor to borrow and invest in human capital or high-return projects, contributes to the improvement in income distribution.

Furthermore, these credit constraints reduce the efficiency of capital allocation and intensify income inequality by impeding the flow of capital to poor individuals with high expected return investments (Galor and Zeira (1993); Aghion and Bolton (1997); Galor and Moav (2004)). From this perspective, financial development helps the poor both by improving the efficiency of capital allocation, which accelerates aggregate growth, and by relaxing credit constraints that more extensively restrain the poor, which reduces income inequality.

2.3 Empirical Studies on Finance-Inequality Nexus

Many empirical studies have been performed to test alternative theories, however the greater part of the literature was produced between years between 2006-2011.

Empirical studies on finance-inequality nexus start with Li, Squire and Zou (1998). By employing data for 40 developed and developing countries from 1947 to 1994 and using pooled Ordinary Least Squares (OLS) estimator, they find that better-functioning financial markets are strongly associated with lower income. Dependent variable is the Gini coefficient while independent variables include initial mean years of secondary schooling, civil liberty index, and the initial Gini coefficient for the distribution of land and the measure of financial development which is defined as the ratio of financial aggregate M2 to GDP. They find that better functioning financial markets are strongly associated with lower income inequality. They find that a more equal distribution of land benefits the poor but not the rich thus lead to improvements in inequality. Also, the expansion of political liberties and secondary education and greater financial depth affect income growth for both the rich and the poor in the same direction, but in a way it reduces inequality.

Clarke *et al*. (2006) examine the impact of financial development on income distribution by employing panel data from both developing and developed countries between 1960 and 1995. Clarke *et al*. (2006) analyze whether financial intermediary development has an impact on income inequality and whether this impact depends on the extent of financial intermediary development or the structure of the economy. The inverted u-shaped relationship and linear negative relationship hypotheses are both tested. The inverted u-shaped relationship as proposed by Kuznets is identified by regressing the logarithm of the Gini coefficient on the log of real per capita GDP and its squared term.

The recent literature on the relationship between financial intermediary development and economic development has developed several indicators to proxy for the ability of the financial system. Clarke *et al*. (2006) concentrate on credit to private sector by financial intermediaries over GDP, which is claimed to be a good proxy for the extent to which private sector agents have access to financial intermediation. As an alternative measure of financial intermediary development, claims on the non-financial domestic sector by deposit money banks divided by GDP is used. The finance variable is either private credit or bank assets. They also include a number of control variables, specifically linear and squared terms of the log of (initial) per capita GDP to control for the relevance of Kuznets curve. They also include inflation rate, government consumption, ethno-linguistic fractionalization and the risk of expropriation as a measure of protection of property rights and ethnic fractionalization.

Clarke *et al*. (2006) find that inequality is lower in countries with better-developed financial sector, and that income inequality decreases along with the development in financial markets and financial intermediaries. Therefore, their empirical results provide strong evidence to the linear hypothesis suggested by Banerjee and Newman (1993) and Galor and Zeira (1993), yet they find no evidence of an inverted u-shaped relationship between finance and inequality.

Liang (2006) examines the relationship between financial deepening and income inequality, using Chinese provincial data over the period of 1991-2000. In their model, Gini coefficient is the dependent variable while a vector of three measures of

financial development are included in the model namely: share of financial sector in GDP; ratio of total credits to gross fixed capital formation and the share of credits allocated to private sector. The linear and squared terms of financial development and real urban per capita disposable income are included in the model. The share of population with educational attainment, ratio of employment in urban state-owned units to the total urban employment, trade openness and urban unemployment rate are the remaining independent variables. The empirical results based on the generalized method of moment (GMM) techniques demonstrate that financial development significantly contributes to the reduction of rural income inequality in China in terms of three financial development indicators. Control variables namely unemployment and educational attainment has positive and significant impact on urban inequality while state owned employment decreases inequality. Linear and squared terms of disposable income suggest an inverted u-shaped relationship between development and inequality consistent with the findings of Kuznets (1955). However they find no evidence to the Greenwood-Jovanovic hypothesis that there is an inverted u-shaped relationship between finance and inequality.

In a more recent work, Beck, Demirguc-Kunt and Levine (2007) use a broad cross-country sample of 72 developing and developed countries between 1960 and 2005 to investigate the relationship between financial intermediary development and changes in income distribution. They examine three dependent variables to assess the impact of financial development on the poor: the growth of the Gini coefficient, the growth of the income share of the lowest quintile and the growth of percentage of the population living on less than $1 (and 2$) dollars per day. Financial development is measured by private credit which is equal to the value of credit by financial intermediaries to the private sector divided by GDP. The control variables are GDP per capita growth, logarithm of the average years of school attainment, the growth rate of the GDP deflator (inflation), trade openness and for the headcount growth regressions, population growth and the age dependency ratio are also included. The empirical results show that there is a negative relationship between financial development and the growth of Gini.

Controlling for initial schooling, trade openness and inflation, it is found that while inflation is positively associated with the growth of income inequality, the negative

relationship between private credit and growth and Gini still holds and initial schooling and trade openness are found to be insignificant in the model. Conditioning on GDP per capita growth, the financial development may influence income inequality by affecting development since the result on private credit does not change and GDP per capita growth does not enter the model significantly. Controlling for the interaction term between initial income inequality and GDP per capita growth shows that aggregate economic growth might vary with the initial degree of income inequality and it is insignificant in the model. An alternative measure of financial intermediary development namely commercial-central bank has a negative and significant effect on income inequality.

Beck, Demirguc-Kunt and Levine (2007) conclude that financial intermediary development has an unequally positive impact on the poor and reduces income inequality. The model for growth of lowest income share shows that the lowest quintile is more likely to enjoy greater income gains than average in countries where the initial income share of the poor is very low. It is also found that financial development positively and significantly boosts the share of income received by the poorest quintile. Also, financial development is associated with poverty alleviation.

Law and Tan (2009) investigate the role of financial development on income inequality in Malaysia for allowing policy makers to assess whether financial development will improve inequality as well as how they affect economic growth over the period 1980-2000. If financial development could reduce income inequality, policy makers should focus on creating and promoting modern financial institutions to gain long-term benefits. They test the role of financial development with a range of indicators including banking sector, stock market and finance. These indicators are namely the private sector credit, stock market capitalization and domestic credit as shares of GDP, finance size and finance activity. They control for a number of variables namely institutional quality, per capita income, inflation and the dummy variable to measure the effect of New Economic Policy between the years 1980-1990 on income disparity. Following the Autoregressive Distributed Lag (ARDL) bounds test, they find that financial development indicator is not statistically significant determinant of income inequality. The evidence remains valid for a variety of financial development indicators, including two indicators of banking system

development, two indicators of stock market development, as well as two finance aggregate variables. The institutions and real GDP per capita variables, however, are negatively correlated with income inequality and statistically significant; while inflation is a positive and significant determinant of income inequality as well. Among these determinants, it seems that real GDP per capita has greatest impact on income distribution, followed by inflation and institutions based on long-run elasticities.

Kappel (2010) aims at empirically investigating the effects of financial development on inequality and poverty by using a panel containing 78 developing and developed countries for the period 1960-2006. In order to better understand how and to what extent financial development affects income inequality and poverty, they not only include measures of the banking sector's development, but also control for stock market development. Using several measures of the financial and the stock market development to examine the robustness of the effect of financial development on income inequality and poverty, they have shown that stock market development – compared to credit market development has a lower, yet significant effect on income inequality and poverty. They also showed that the link between financial development and inequality particularly for developing countries is rather weak.

Batuo *et al.* (2010) seek empirical evidence on how financial development is related to income distribution in a panel data set covering 22 African countries for the period 1990 to 2004 by employing a dynamic panel estimation technique (GMM) as well as inverted u-shaped hypothesis of Greenwood and Jovanovic (1990). They use Gini coefficient as the dependent variable in line with the bulk of finance-inequality literature. They measure financial development by a set of indicators: liquid liabilities, domestic credit to the private sector and monetary aggregate M2 over GDP. They also construct a composite financial development index from these three indicators. The results are controlled for inflation, primary school enrollment rate, GDP per capita, development of modern sector (sum of the added value manufacture and service sectors as a share of GDP). The linear and squared terms of both financial development indexes and the GDP per capita are included in the model to test for the inverted u-shaped hypothesis and Kuznets hypothesis. The empirical results show that the coefficients on Gini and financial development index

are significantly negative. Results for individual financial variables show that all of them have negative signs and are statistically significant. Whatever measure of financial development variable used, the marginal impact of financial development on income inequality is such that when the level of financial development is high, the level of inequality tends to reduce, thus, confirming the existence of negative and linear relationship as proposed by Galor and Zeira (1993) and Banerjee and Newman (1993). They find no evidence in favor of the inverted u-shaped hypothesis and Kuznets curve hypothesis.

Bittencourt (2010) investigates the link between financial development and inequality in the case of Brazil over the period 1985-1994. The dependent variable in their model is Gini coefficient calculated from the individual earnings of people between 15-60 years of age by regions. The measures of financial development are financial domestic product which accounts for the gross domestic products of the financial sector in each region. The monetary aggregates M2, M3 and credit to the private sector and personal credit are calculated at market prices and deflated by the GDP by region to measure the overall size and financial depth of an economy and how active the financial intermediates are in actually channeling credit from savers to borrowers. Rate of inflation and regional unemployment rates are the macroeconomic control variables.

The equations are estimated by using Pooled ordinary Least Squares (POLS) and then the one-way Fixed Effects estimators (FE). The empirical evidence shows that more broad access to financial and credit markets had a significant and robust effect in reducing income inequality. Both POLS and FE estimates show that all financial development measures present positive and significant effects on Gini while unemployment rate has negative sign. Inflation rate is regressive in POLS estimator while it is insignificant in FE estimator. The FD-IV and FE-IV estimators deliver similar results. Most of the financial development measures have significant and positive effects on the Gini while inflation has significant and regressive effect and unemployment has no significant effect for FD-IV estimator. All financial development measures have significantly reducing effect on Gini for FE-IV estimator and the unemployment and inflation have negative and significant effects.

Shahbaz and Islam (2011) explore the existence of long run relationship between financial development and income inequality in Pakistan. They test the –inverted u-shaped relationship between financial development and income inequality by employing data from 1971 to 2005 in Pakistan. They use the Gini coefficient in the model as the dependent variable. The financial development measure is selected as private sector credit as a share of GDP and this variable enters the model both in linear and squared terms to test whether the relationship between inequality and financial development fits best in either inequality narrowing, widening or u-shaped, inverted u-shaped hypothesis. The control variables are inflation, initial GDP per capita, government spending as a share of GDP, manufacturing value added as a share of GDP and openness to trade. The findings suggest that financial development reduces income inequality while financial instability aggravates it. While this is true for many nations, however, for Pakistan, economic growth has led to deterioration of income distribution as it is also true for trade openness. The results support negative linear hypothesis that financial development is narrowing inequality in Pakistan. Economic growth, government size and trade openness have increased income inequality. However, the results from nonlinear specification do not lend support for inverted u-shaped hypothesis proposed by Greenwood and Jovanovic (1990).

CHAPTER 3

FINANCIAL DEVELOPMENT

3.1 Determinants Of Financial Development

The determinant of income inequality which is of major interest in this study is financial development. There are two basic ways that finance can affect inequality: directly or indirectly the poor gets involved in the economy. As the number and scale of financial agents increases, the lower income quintiles can directly access to finance therefore, get directly involved in the economy. On the other hand, through investment such as employment opportunities or better economic development, the poor will be indirectly involved in the economy. In developing countries, where saving and lending is the key business in financial intermediation, one single measure of financial development such as the ratio of private credit to GDP can measure direct access, however in emerging markets and industrialized countries, financial intermediation is more sophisticated and therefore requires taking into account other dimensions of ”finance”(Kappel, 2010).

Despite the fact that development of financial systems is a key factor in economic development and income distribution, there is still surprisingly little argument about how to define and measure financial system development. World Economic Forum (WEF) undertakes this research initiative aimed at providing business leaders and policymakers with a common framework to identify and discuss the key factors in the development of global financial systems and markets. WEF’s Financial Development Reports (FDRs) is being published annually since 2008 and is used as a tool with which countries can benchmark themselves and establish priorities for their financial system weaknesses. FDRs provide Financial Development Indexes (FiDI) for over 50 countries’ financial systems.

WEF's FDRs define financial development as "*the factors, policies, and institutions that lead to effective financial intermediation and markets, as well as deep and broad access to capital and financial services*". In accordance with this definition, measures of financial development are captured across seven pillars:

1. Institutional environment
2. Business environment
3. Financial stability
4. Banking financial services
5. Non-banking financial services
6. Financial markets
7. Financial access

The structural framework of FiDI which is also adopted in this study relies upon academic research in selecting the factors that affect financial development. Therefore it is desired to capture different dimensions of financial development, emphasizing on the leading factors of the current crisis. Financial development is measured by factors such as size, depth, access, and the efficiency and stability of a financial system, which includes its markets, intermediaries, and range of assets, institutions, and regulations.

The various aspects of development can be seen as seven "pillars" grouped into three broad categories as given in Figure 1:

1. Factors, policies, and institutions: the "inputs" that allow the development of financial intermediaries, markets, instruments and services

2. Financial intermediation: the variety, size, depth, and efficiency of the financial intermediaries and markets that provide financial services

3. Capital availability and access: the "outputs" of financial intermediation as manifested in the size and depth of the financial sectors and the availability of, and access to, financial services. This combination of "inputs," financial intermediaries and markets, and "outputs" provides an organic measure of the degree of financial development.

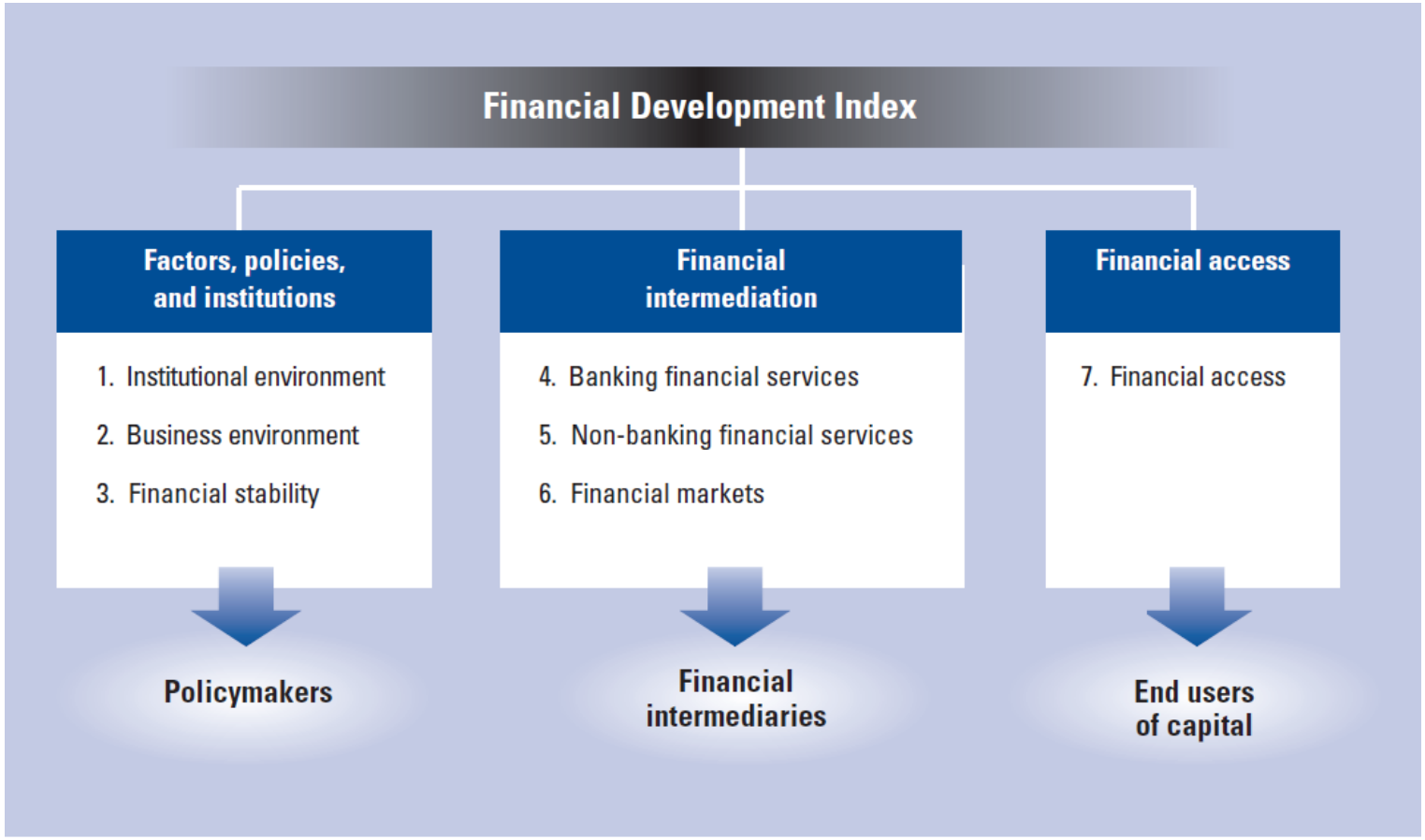

Figure 3.1: Composition of the Financial Development Index

Source: World Economic Forum Financial Development Report, 2010.

The pillars are organized and described below according to these three categories.

3.1.1 Factors, policies, and institutions

This first category covers the inputs supporting financial intermediation and the optimal provision of financial services and includes the first three of the seven pillars: the institutional environment, the business environment, and the degree of financial stability.

First pillar: Institutional environment

The institutional environment includes the overall laws, regulations and supervision of the financial sector, as well as the quality of corporate governance. There are four sub-pillars within the first pillar with equal weighing: financial sector liberalization (capital account liberalization), legal and regulatory issues and contract enforcement.

We use *capital account liberalization index* to represent financial sector liberalization sub-pillar. This index measures the degree of capital account liberalization within a country, standardized on a 1–7 (most liberalized) scale. Data is obtained from Chinn and Ito (2008). According to McKinnon (1973), liberalization of financial markets allows financial deepening which reflects an increasing use of financial intermediation by savers and investors and the monetization of the economy, and allows efficient flow of resources among people and institutions over time. This encourages savings and reduces constraint on capital accumulation and improves allocative efficiency of investment by transferring capital from less productive to more productive sectors. The efficiency as well as the level of investment is thus expected to rise with the financial development that liberalization promotes. Research of Grilli and Milesi-Ferretti (1995) and Edison *et al*. (2002a) finds evidence for the positive relationship between liberalization and development. Empirically, however, the impact of capital account liberalization delivers controversial evidence, Edison *et al*. (2002b); Chandra (2003); and Arteta *et al*. (2003) asserts that the relationship is undetermined.

However, within the context of financial development index, it is a known fact that the better a country's legal environment, the greater benefits from capital account openness. The presence of both a robust legal system and capital account openness provide a positive indication of the financial development of a country.

S*trength of legal rights index* and *corruption perception index* are used to represent legal and regulatory issues. Strength of legal rights index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The index ranges from 0 to 10, with higher scores indicating that collateral and bankruptcy laws are better designed to expand access to credit.

The most powerful indirect tool to undermine access to finance is weak enforcement of private contracting, such as poor creditor and equity rights protection. As suggested by De Soto (2000) in cross-country regressions, poor legal enforcement and unclear property rights limit individuals' ability to commit contractually, secure assets and thus to raise funding. The literature on law and finance (La Porta *et al*., 1998a, 2006) has established that in countries with larger capital markets and better protection of investors, markets are wider, ownership more diffused, with more listed firms and more public offerings. Djankov *et al*. (2006) show how both creditor protection through the legal system and information sharing institutions are associated with higher ratios of private credit to GDP, but that the former is relatively more important in the richer countries, therefore the quality of property rights can be a function of the distribution of wealth.

Corruption captures another dimension of law and finance and we use *corruption perceptions index* as a composite index measuring the perceived levels of corruption in a given country as determined by expert assessments and opinion surveys. Higher scores indicate less extensive corruption. Data for both indexes is accessed from the World Bank Doing Business database.

The last of three sub-pillars, contract enforcement is represented by four measures, namely *strength of investor protection index, time, cost and number of procedures to enforce a contract.* Investor protection index is the average of the extent of disclosure index, the extent of director liability index, and the ease of shareholder

suits index. The index ranges from 0 to 10, with higher values indicating more investor protection. High ranking on the strength of investor protection index shows that an economy's regulations offer strong investor protections against self-dealing. However, the indicator is not a measure of the dynamism of capital markets or of protections for foreign investors.

Time to enforce a contract is defined as the time in days to resolve a dispute related to a contract. Time is counted from the moment the plaintiff files the lawsuit in court until payment. This includes both the days when actions take place and the waiting periods between. Cost to enforce a contract is defined as the cost of enforcing contracts as a percentage of legal claim while procedures to enforce a contract is defined as the number of procedures from the moment the plaintiff files a lawsuit in court until the moment of payment. A procedure is defined as any interaction between the parties, or between them and the judge or court officer. This includes steps to file the case, steps for trial and judgment, and steps necessary to enforce the judgment. Data and definitions of all four measures are accessed from the World Bank Doing Business database.

Companies need capital to be able to grow and expand. For companies seeking access to finance through equity markets, the strength of investor protections is particularly important. The current crisis has made access to equity markets more challenging. In times of uncertainty, investors become even more concerned about corporate governance risks and look for legal protections. Investors typically look for transparency in such corporate dealings, accountability from company directors for improper corporate practices and ability to take part in the major decisions of the company. If a country's laws do not provide these, investors may be reluctant to invest, except to become the controlling shareholder.

Enforcing a contract is defined as resolving a commercial dispute through the courts. The ability to enforce contracts is a fundamental characteristic of properly functioning markets as reducing uncertainty by assuring that contractual rights will be enforceable by the courts and therefore is a necessary precondition to creditors' investment decision. When the procedures for enforcing contracts are high in number due to bureaucratic burdens, disagreements in contractual arrangements

cannot be resolved timely and cost efficiently. As a result, investors need to rely on less efficient practices or even desist from the investment. In particular, financial intermediates are likely to reduce the amount of lending if the ability to collect on debts is no longer given or obtaining control over property as collateral to secure loans is denied. Such limitations restrict business expansion and investment opportunities, and hamper economic development in developing as well as in industrialized countries. Nunn (2007) shows that a country's ability to enforce contracts is an important determinant of its comparative advantage in the global economy: among comparable economies, those with good contract enforcement tend to produce and export more customized products than those with poor contract enforcement.

Second pillar: Institutional environment

The second pillar focuses on the business environment and considers:

- The availability of human capital—that is, skilled workers who can be employed by the financial sector and thus provide efficient financial services;
- Infrastructure which defines the state of physical capital—that is, the physical and technological infrastructure;
- Taxation policy, and
- The costs of doing business for financial intermediaries

The creation and improvement of human capital have been found to assist the process of economic development (Levine, 1997). Empirical evidence supports this observation and shows positive correlations between human capital and the degree of financial development (Outreville, 1999). Our proxies for the quality of human capital are related to the enrollment levels of tertiary education –*percentage share of tertiary school enrollment*. We also include a measure that reflects the quality of human capital, namely *percentage share of labor force with tertiary education*. Data are retrieved from the World Bank, World Development Indicators & Global Development Finance database.

Another key area is infrastructure. We capture a basic measure of the quality of physical infrastructure, which is important given its role in enhancing the process of

private capital accumulation and financial depth in countries by increasing the profitability of investment (Barro, 1991). Our analysis of infrastructure emphasizes measures of information and communication technologies, which are particularly important to those firms operating within a financial context because of their data-intensive nature. We use four measures of infrastructure: *mobile cellular subscriptions, telephone lines, fixed broadband internet subscribers* and *internet users,* all measured per 100 people. Data for this sub-pillar is accessed from the World Bank, World Development Indicators & Global Development Finance database.

Cost of doing business in a country is also an integral aspect of business environment. Specifically, research has shown that the cost of doing business is a vital feature of the efficiency of financial institutions. The different costs of doing business are fundamental to assessing a country's business environment as well as the type of constraints that businesses may be facing (Beck, 2006). As such, the better the business environment, the better the performance of financial institutions and the higher the degree of financial development. Variables that capture such costs include *cost of starting a business* and the *cost of registering property*. Indirect or transaction costs are captured in variables such as *time to start a business* and *time to register property* from the World Bank Doing Business database.

Our analysis also considers taxes as another key constraint that businesses in the financial sector can face. We use *time to pay taxes* to represent the burden of taxes on businesses. However, we could not access data to focus on issues related to distortionary and burdensome tax policies, and high marginal tax rates. Therefore we have not included measures related to such aspects but represent this sub-pillar with time to pay taxes from the World Bank, Doing Business database.

Third pillar: Financial stability

The third pillar addresses the stability of the financial system which can lead to significant losses to investors. This pillar encompasses the risk of currency crises and systemic banking crises. For the risk of currency crises, we include *the change*

in real effective exchange rate and the current account balance from the World Bank, World Development Indicators & Global Development Finance database.

The systemic banking crises sub-pillar combines measures of historic banking system instability which is represented by *the frequency of banking crisis* since 1970s. Loayza and Ranciere (2006) show that the positive link between long run economic development and financial deepening is smaller in countries which suffered from banking crisis in the past and such countries are more susceptible to profound short-term negative impacts on the degree of financial intermediation. We also capture the degree of economic *output loss associated with crises* (weighting output loss from more recent crises more heavily). Data for both measures is obtained from Resolution of Banking Crisis database.

Risk of crisis might bring about potential harms to different processes of financial development. On the other hand, strict supervision of financial system from the risk of crisis brings along a hampered financial development, therefore decreases returns, restrains diversification of risks and leads to misallocation of risks to high return investments. However a financial system which is free and loosely regulated may be unstable and susceptible to credit booms and asset bubbles and better allocates resources to the highest-return investments, it may eventually become unstable and trigger credit booms and asset bubbles that can severely affect development, returns, and welfare. Although there is some tradeoff between the stability of the financial system and its degree of innovation and freedom, financial stability remains as an important input in the process of financial development.

3.1.2 Financial intermediaries and markets

The second category of pillars measures the degree of development of the financial sector as seen in the different types of intermediaries. These three pillars are banking financial services, non-banking financial services (e.g., investment banks and insurance firms), and financial markets.

Fourth pillar: Banking financial services

This pillar concentrates on the crucial role of banking system in supporting financial development. The role of bank-based financial systems is to improve access to financial information and to lower transaction costs as well as to allocate credit more efficiently. This role is especially influential for developing countries (WEF FDR 2011). Fourth pillar consists of three sub-pillars, namely size index, efficiency index and financial information disclosure.

One of the key measures of the banking system captured in this pillar is size. The larger the banking system, the more capital can be channeled from savers to investors. This enhances the process of financial development, which in turn leads to greater economic development. These measures of size include *deposit money bank assets to GDP, liquid liabilities to GDP, private credit by deposit money banks and other financial institutions to GDP, bank deposits to GDP and financial system deposits to GDP*. Data for all measures is accessed from Financial Structure Database[2]. Beck, Demirguc-Kunt and Levine (2000) categorize size indicators as relative and absolute size indicators. The relative size indicators measure the importance of the three financial sectors relative to each other, namely, central banks, deposit money banks and other financial institutions. Absolute size indicators measure their size relative to GDP. The measures we use are among absolute size measures such as deposit money bank assets to GDP or other financial institutions assets to GDP. These measures give evidence of the importance of the financial services performed by the three financial sectors relative to the size of the economy. Private credit by deposit money banks to GDP and private credit by deposit money banks and other financial institutions to GDP are defined as measures of activity of financial intermediaries by Beck, Demirguc-Kunt and Levine (2000). Both measures isolate credit issued to the private sector as opposed to credit issued to governments and public enterprises. Furthermore, they concentrate on credit issued by intermediaries other than the central bank. They are considered as measures of the activity of financial intermediaries for channeling savings to investors. Focusing on the liability size of the balance sheet, Beck, Demirguc-Kunt and Levine (2000)

[2] http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20696167~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html, accessed September, 2012.

also include a measure of absolute size based on liabilities. Liquid Liabilities to GDP equals currency plus demand and interest-bearing liabilities of banks and other financial intermediaries divided by GDP. They consider liquid liabilities to GDP as the broadest available indicator of financial intermediation, since it includes all three financial sectors. They also suggest that liquid liabilities is a typical measure of financial depth and thus of the overall size of the financial sector, without distinguishing between the financial sectors or between the use of liabilities.

Another key aspect of the banking system is its efficiency. Direct measures of efficiency captured in the financial development index are *net interest margin, bank return on assets (ROA), bank return on equities (ROE), bank overhead costs to total assets* and *the ratio of nonperforming loans to total loans*. Beck, Demirguc-Kunt and Levine (2000) also construct net interest margin and overhead costs to measure the efficiency of commercial banks. Net interest margin equals the accounting value of a bank's net interest revenue as a share of its total assets while overhead cost equals the accounting value of a bank's overhead costs as share of its total assets.

A third key aspect of the efficacy of the banking system captured by this pillar is the role of financial information disclosure within the operation of banks. We use public credit registry coverage and private credit bureau coverage as proxies for the scope, quality and accessibility of credit information available through public credit registries and private credit bureaus. Data for both measures are retrieved from the World Bank Doing Business database. Credit bureaus in countries track the loans and defaults of individuals and firms and facilitate lending by banks and financial institutions. Larger credit bureau coverage indicates better financial development because it implies that it is easier for financial intermediaries to make loans when credit information of borrowers is available (Arellano, Bai and Zhang 2009).

Fifth pillar: Non-banking financial services

Bank and non-bank financial services are key to facilitate savings mobilization by offering additional instruments for high returns than available only on bank deposits. Non-bank financial intermediaries (NBFIs) complement functions of banks in their role to fill any vacuum created by commercial banks and compete with banks

operate more efficiently in market needs. Non-bank financial institutions complement the services provided by banking institutions and also represent a competitive environment to force other financial intermediaries to be more efficient.

NBFIs provide a strong stimulus to the development of the capital markets, by generating large amounts of long-term financial resources, and creating new sources of supply and demand for marketable securities. While banks dominate the financial systems in most countries, activities of non-bank financial intermediaries include their participation in securities markets as well as the mobilization and allocation of financial resources of a longer-term nature such as insurance activities and offering a range of financial products to meet financial needs. The degree of development of non-bank financial intermediaries in general has been found to be a good proxy of a country's overall level of financial development (Vittas, 1998).

There are three main areas of nonbank financing activity that we capture in the Index: initial public offering (IPO), merger and acquisitions (M&A) activity, and securitization activity. However, these areas could not be included in the fifth pillar due to lack of access to data. We included a number of variables to represent the insurance sector, which can facilitate trade and commerce by providing ample liability coverage. *Non-life and life insurance density and non-life and life insurance coverage* are used as proxies for insurance and the data is accessed from Swiss Re, World Insurance Reports for all years available.

Insurance markets play a crucial role for the development and efficacy of the financial sector since insurance companies are financial intermediaries that reduce transaction costs and mobilize and channel significant amount of savings to investments, corporate and government bonds, commercial mortgages and equity. A healthy insurance is key for financial system since it reduces the amount of risk and unexpected loss, increases the quality of life while decreasing the spending of government on social protection.

Sixth pillar: Financial markets

There are four major types of financial markets: bond markets (both for government and corporate bonds), stock markets where equities are traded, foreign exchange markets, and derivatives markets.

The growing body of literature has neglected the significance of the bond markets despite their role as an essential source of external finance. Studies including Levine and Zervos (1998), Beck and Levine (2004), and Rousseau and Wachtel (2000) find that both stock market development and bank development help predict economic development. Fink *et al.* (2003) also suggest that bond markets play an important role in financial development and the effective allocation of capital. As indicators of the size of the domestic bond market we use the *private and public bond market capitalization to GDP*, which equals the total amount of outstanding domestic debt securities issued by private or public domestic entities divided by GDP. Data is from Financial Structure Database.

Diamond (1984), Greenwood and Jovanovic (1990) and Williamson (1986) contribute to the theoretical literature with the assertion that stock markets might encourage long run development of the economy by promoting specialization and acquisition and diffusion of information. Greenwood and Smith (1997) also suggest that stock markets minimize cost of mobilizing savings thus, facilitate investment opportunities. Levine and Zervos (1998) assert a positive and significant relationship between stock market liquidity and banking development and correlated with higher capital accumulation, productivity growth and long run economic development. They also find that there is a strong and positive link between financial development and economic development and the result suggests that financial debtors are an integral part of the development process.

We use *stock market capitalization to GDP* as a measure of size of the stock market which equals the value of listed shares divided by GDP, *stock market value traded to GDP* to measure the activity or liquidity of the stock market which is defined as total shares traded on the stock market exchange divided by GDP. Last of all we use*, stock market turnover ratio* and *number of listed companies per 10.000 people*

to represent this sub-pillar. Stock market turnover ratio is an efficiency indicator of stock markets and defined as the ratio of the value of total shares traded and market capitalization. It measures the activity or liquidity of a stock market relative to its size. A small but active stock market will have a high turnover ratio whereas a large, while a less liquid stock market will have a low turnover ratio (Beck, A Demirgüç-Kunt, 2000)

We also include three measures of foreign exchange markets, namely *spot foreign exchange turnover, outright forward foreign exchange turnover* and *foreign exchange swap turnover*. Data is from Triennial Central Bank Survey's Foreign Exchange and Derivatives Market Activity Reports for years available.

3.1.3 Financial access

This third and final category is comprised of one pillar that represents measures of access to capital and financial services.

Seventh pillar: Financial access

The measures represented in this last pillar measures access to capital through commercial and retail access. Commercial access includes measures such as access to venture capital, commercial loans, and the local equity markets. We use *foreign direct investment net inflows (% of GDP)* as the measure of commercial access. Data is from the World Development Indicators & Global Development Finance database. Retail access includes measures such as the penetration of bank accounts and ATMs and access to microfinance and we use *number of commercial bank branches per 100.000 adults* and *number of ATMs per 100.000 adults* as measures of retail access. Data is provided by IMF Financial Access database.

Performance in the other pillars contributes to performance in this pillar and to the extent of access to financial services by end users. Accessibility, along with the size and depth of the financial system as a whole captured in the previous pillars, has a

significant effect on a country's real activity, economic development, and overall welfare.

3.2 Financial Development Index

This section explains the methodology followed in calculating the financial development index (FiDI) in detail. A summary table of the weights of all pillars and sub-pillars and the measures used are given in Table 3.1. The computation of the FiDI is based on successive aggregations of scores, from the variable level (i.e., the lowest level) all the way up to the overall FiDI score (i.e., the highest level), using the weights reported in Table 3.1. The percentages next to each pillar in Table 3.1 represent the category's weight and all of the seven pillars are equally weighted with 14.29%. However sub-pillars are not assigned with equal weight within the Index to signify relatively greater importance to particular sub-pillars.

The indicators from different sources are normalized on a 1-to-7 scale. The standard formula for converting hard data is the following:

$$6*\frac{(\text{country score-sample minimum})}{(\text{sample maximum-sample minimum})}+1$$

The sample minimum and sample maximum are, respectively, the lowest and highest country scores in the sample of countries covered by the FiDI. In some instances, adjustments were made to account for extreme outliers. For those hard data variables for which a higher value indicates a worse outcome, we rely on a normalization formula. In addition to converting the series to a 1-to-7 scale, the formula also reverses it so that 1 and 7 still corresponds to the worst and best possible outcomes, respectively. The formula is given by:

$$-6*\frac{(\text{country score-sample minimum})}{(\text{sample maximum-sample minimum})}+7$$

Table 3.1: Structure of the Financial Development Index: weighting and scaling of variables

1st pillar: institutional environment	**14.29%**
A. Financial sector liberalization	33.3%
1.01 Capital account liberalization	
B. Legal and regulatory issues	33.3%
1.02 Strength of legal rights index	
1.03 Corruption perceptions index	
C. Contract enforcement	33.3%
1.04 Strength of investor protection index	
1.05 Time to enforce a contract	
1.06 Cost to enforce a contract	
1.07 Number of procedures to enforce a contact	
2nd pillar: Business environment	**14.29%**
A. Human capital	25%
2.01 Labor force with tertiary education	
2.02 Tertiary school enrollment	
B. Taxes	25%
2.03 Time to pay taxes	
C. Infrastructure	25%
2.04 Mobile cellular phone subscriptions	
2.05 Telephone lines	
2.06 Fixed broadband internet users	
2.07 Internet users	
D. Cost of doing business	25%
2.08 Time to start a business	
2.09 Cost of starting a business	
2.10 Time to register a property	
2.11 Cost of registering property	
3rd pillar: Financial stability	**14.29%**
A. Currency stability	50%
3.01 Change in real effective exchange rate (REER)	
3.02 Current account balance	
B. Banking system stability	50%
3.03 Frequency of banking crisis	
3.04 Output loss during financial crisis	

Table 3.1 continued

4th pillar: Banking financial services	**14.29%**
A. Size index	33.3%
4.01 Liquid liabilities to GDP	
4.02 Central bank assets to GDP	
4.03 Deposit money bank assets to GDP	
4.04 Private credit by deposit money banks and other financial institutions to GDP	
4.05 Bank deposits to GDP	
4.06 Financial system deposits to GDP	
B. Efficiency index	33.3%
4.07 Net interest margin	
4.08 Bank return on assets	
4.09 Bank return on equities	
4.10 Bank overhead costs to total assets	
4.11 Bank nonperforming loans to total gross loans	
C. Financial information disclosure	33.3%
4.12 Public credit registry coverage (% of adults)	
4.13 Private credit bureau coverage (% of adults)	
5th pillar: Non-banking financial services	**14.29%**
A. Insurance	100%
5.01 Non-life insurance density	
5.02 Life insurance density	
5.03 Non-life insurance coverage	
5.04 Life insurance coverage	
6th pillar: Financial markets	**14.29%**
A. Foreign exchange markets	33.3%
6.01 Spot foreign exchange turnover	
6.02 Outright forward foreign exchange turnover	
6.03 Foreign exchange swap turnover	
B. Equity market development	33.3%
6.04 Stock market capitalization to GDP	
6.05 Stock market value traded to GDP	
6.06 Stock market turnover ratio	
6.07 Number of listed companies per 10,000 people	
C. Bond market development	33.3%
6.08 Private domestic bond market capitalization to GDP	
6.09 Public domestic bond market capitalization to GDP	
7th pillar: Financial markets	**14.29%**
A. Commercial Access	50%
7.01 Foreign direct investment, net inflows (% of GDP)	
B. Retail Access	50%
7.02 Number Of Commercial Bank Branches Per 100,000 Adults	
7.03 Number Of ATMs Per 100,000 Adults	

The composite financial development measure used in this study is also called *financial development index* and is measured similarly with the Financial Development Index reported by WEF Financial Development Report for years 2008-2011. Since our sample contains data of 60 developing and developed countries for the period 2000-2010, we needed to calculate FiDI for years between 2000-2008 and the calculations are made in a similar, almost identical fashion with the Financial Development Index reported by WEF's Financial Development Report.

We observe from Table 3.2 that, ranking of countries with respect to scores of financial development index have slightly changed over ten years. On the other hand, scores in general increased over the period, especially for the countries with initially lower scores.

We compare calculated indexes with the Financial Development Report's indexes for years between 2008 and 2010 in Table 3.3 below. The calculated and reported Financial Development indexes were similar, however slightly different due to lack of access to data originally used in calculations of WEF's Financial Development Index. As obvious from Table 3.3, relative comparison of reported and calculated indexes show that however slight differences, indexes go hand in hand.

We can visually judge from Table 3.3 that the calculated and the original datasets for Financial Development Index move in similar directions. However, we need to run tests for comparing two matched samples to validate the accuracy of calculated financial development indexes.

We need to determine some sample properties of samples for years 2008, 2009 and 2010 to decide on the most appropriate test for comparing samples. These properties are normality and equality of variances of two samples since comparable data is available only for these years. We do not need to test for independence of samples since the samples are paired and naturally correlated. This assumption is also validated by Spearman's correlation test of independence which is reported here, and samples for all years are found to be statistically significantly correlated.

Table 3.2: Financial development index, 2000-2010.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
United States	5,23	5,16	5,19	5,06	5,09	5,17	5,09	4,92	5,00	4,93	5,11
United Kingdom	4,74	4,50	4,59	4,65	4,82	4,84	4,80	4,75	4,63	4,56	4,75
Belgium	4,48	4,62	4,43	4,67	4,60	4,53	4,51	4,37	4,48	4,25	4,54
Switzerland	4,41	4,33	4,49	4,62	4,54	4,55	4,66	4,33	4,38	4,41	4,51
Netherlands	4,34	4,59	4,49	4,55	4,58	4,65	4,49	4,65	4,56	4,57	4,64
Korea Republic	4,31	4,28	4,31	4,27	4,31	4,36	4,25	4,18	4,27	4,28	4,31
New Zealand	4,29	4,18	4,32	4,32	4,40	4,39	4,27	4,24	4,19	4,13	4,38
Spain	4,20	4,13	4,29	4,21	4,29	4,32	4,31	4,23	4,33	4,24	4,47
Germany	4,29	4,25	4,37	4,32	4,38	4,40	4,34	4,22	4,23	4,17	4,36
Denmark	4,30	4,34	4,40	4,41	4,42	4,58	4,49	4,41	4,44	4,41	4,54
Japan	4,29	3,99	4,19	4,28	4,37	4,38	4,22	4,15	4,32	4,15	4,12
Portugal	4,16	3,93	3,96	4,11	4,05	4,14	4,16	4,06	4,14	4,08	4,37
Ireland	4,14	4,10	4,51	4,59	4,14	4,08	4,19	4,30	4,14	4,34	4,42
Australia	4,15	4,10	4,29	4,34	4,46	4,30	4,36	4,33	4,39	4,40	4,75
Italy	4,10	3,94	4,03	4,04	4,10	4,14	4,07	4,03	4,10	4,17	4,32
France	4,04	4,06	4,13	4,18	4,24	4,30	4,36	4,28	4,30	4,26	4,47
Finland	4,05	4,12	4,27	4,18	4,23	4,25	4,18	4,14	4,15	4,10	4,17
Norway	4,05	4,09	4,15	4,13	4,17	4,26	4,17	4,08	4,14	4,12	4,32
Austria	4,01	4,00	4,02	4,08	4,08	4,41	4,08	4,08	4,02	3,97	4,02
Singapore	3,99	4,20	4,20	4,57	4,55	4,40	4,51	4,32	4,24	4,29	4,45
Sweden	3,89	3,95	4,14	4,16	4,17	4,17	4,21	4,20	4,21	4,17	4,22
Malaysia	3,81	3,91	3,96	3,95	3,94	3,96	3,92	3,83	4,00	3,86	4,06
Israel	3,79	3,72	3,83	3,89	3,86	3,97	4,09	3,89	4,02	3,94	4,18
Slovenia	3,59	3,49	3,67	3,59	3,71	3,75	3,71	3,63	3,70	3,63	3,86
Greece	3,60	3,54	3,68	3,66	3,71	3,76	3,72	3,69	3,77	3,67	3,96
Latvia	3,51	3,41	3,51	3,53	3,56	3,66	3,68	3,57	3,63	3,66	3,87
Bulgaria	3,58	3,33	3,41	3,57	3,58	3,62	4,05	3,80	3,67	3,59	3,72
Slovak Republic	3,45	3,39	3,57	3,54	3,69	3,63	3,67	3,61	3,60	3,48	3,71
South Africa	3,44	3,51	3,59	3,80	3,82	3,85	3,73	3,58	3,68	3,72	4,02
Hungary	3,38	3,59	3,62	3,60	3,75	3,83	3,97	4,23	4,16	3,79	3,80
Poland	3,43	3,42	3,45	3,39	3,51	3,62	3,59	3,48	3,60	3,50	3,83
Czech Republic	3,44	3,59	3,81	3,65	3,75	3,92	3,82	3,72	3,80	3,64	3,93
Estonia	3,48	3,43	3,41	3,60	3,53	3,69	3,68	3,54	3,58	3,72	3,84
Russian Federation	3,43	3,32	3,36	3,37	3,59	3,58	3,63	3,50	3,58	3,53	3,91
Brazil	3,31	3,31	3,42	3,37	3,45	3,53	3,54	3,46	3,54	3,53	3,80
Lithuania	3,36	3,38	3,53	3,40	3,49	3,57	3,59	3,47	3,51	3,52	3,69
Argentina	3,32	3,16	3,35	3,27	3,30	3,38	3,32	3,19	3,28	3,25	3,46
Romania	3,31	3,25	3,39	3,42	3,67	3,80	3,74	3,67	3,68	3,65	3,88
China	3,32	3,34	3,37	3,39	3,40	3,43	3,40	3,54	3,73	3,67	3,85
Mexico	3,26	3,26	3,24	3,17	3,27	3,41	3,28	3,25	3,34	3,26	3,57
Uruguay	3,28	3,27	3,41	3,31	3,37	3,51	3,45	3,29	3,39	3,34	3,63
Croatia	3,16	3,23	3,21	3,40	3,36	3,44	3,44	3,40	3,59	3,53	3,71
India	3,13	3,29	3,34	3,32	3,37	3,41	3,44	3,40	3,48	3,55	3,73
Thailand	3,19	3,29	3,30	3,35	3,39	3,35	3,30	3,11	3,22	3,20	3,42
Venezuela, RB	3,14	3,04	2,89	3,00	2,93	2,90	3,03	2,96	3,06	3,07	3,02
Peru	3,08	3,07	3,24	3,21	3,22	3,30	3,42	3,34	3,43	3,45	3,68
Chile	3,15	3,34	3,49	3,55	3,67	3,64	3,59	3,43	3,52	3,51	3,70
Jordan	3,06	3,11	3,27	3,36	3,36	3,40	3,55	3,18	3,28	3,29	3,38
Ukraine	3,03	3,08	3,09	3,12	3,22	3,41	3,32	3,14	3,26	3,12	3,39
Turkey	2,99	3,25	3,27	3,11	3,21	3,28	3,25	3,14	3,27	3,22	3,43
Indonesia	2,79	2,78	3,08	2,78	2,84	2,94	2,85	2,83	2,91	2,92	3,18
Panama	3,03	3,13	3,24	3,37	3,32	3,33	3,45	3,22	3,28	3,32	3,41
Philippines	2,91	3,02	3,15	3,04	3,06	3,18	3,18	3,10	3,10	3,07	3,24
Egypt	2,88	2,87	3,01	2,87	2,94	2,90	3,00	2,95	3,01	2,96	2,95
Pakistan	2,92	2,94	3,10	3,02	3,00	3,11	3,07	2,88	2,92	2,89	3,15
Colombia	2,84	2,86	2,98	2,90	3,09	3,11	3,03	3,11	3,15	3,01	3,17
Kazakhstan	2,84	2,93	2,99	3,01	3,00	2,95	2,97	2,90	3,03	3,12	3,27
Macedonia, FYR	2,82	2,92	2,98	3,03	3,02	3,01	3,07	3,01	3,09	3,05	3,30
Morocco	2,76	2,80	2,87	2,94	2,84	2,85	2,90	2,79	2,83	2,81	2,96
Bangladesh	2,48	2,43	2,58	2,61	2,64	2,68	2,69	2,54	2,61	2,61	2,79

Table 3.3: Comparison of calculated and reported financial development index

	2008		2009		2010	
	FDI	WEF- FDI	FDI	WEF- FDI	FDI	WEF- FDI
Argentina	3,28	3,04	3,25	2,77	3,46	2,78
Australia	4,39	4,98	4,40	5,13	4,75	5,01
Austria	4,02	4,55	3,97	4,28	4,02	4,20
Bangladesh	2,61		2,61	2,57	2,79	2,55
Belgium	4,48	4,56	4,25	4,50	4,54	4,65
Brazil	3,54	3,28	3,53	3,46	3,80	3,53
Bulgaria	3,67		3,59		3,72	
Chile	3,52	3,79	3,51	3,60	3,70	3,53
China	3,73	4,09	3,67	3,87	3,85	4,03
Colombia	3,15	3,21	3,01	2,94	3,17	3,02
Croatia	3,59		3,53		3,71	
Czech Republic	3,80	3,43	3,64	3,48	3,93	3,46
Denmark	4,44		4,41	4,64	4,54	4,3
Egypt	3,01	3,32	2,96	3,33	2,95	3,24
Estonia	3,58		3,72		3,84	
Finland	4,15	4,45	4,10	4,24	4,17	4,12
France	4,30	5,25	4,26	4,57	4,47	4,65
Germany	4,23	5,28	4,17	4,54	4,36	4,49
Greece	3,77		3,67		3,96	
Hungary	4,16	3,53	3,79	3,08	3,80	3,04
India	3,48	3,63	3,55	3,30	3,73	3,24
Indonesia	2,91	3,31	2,92	2,90	3,18	2,90
Ireland	4,14	4,72	4,34	4,39	4,42	4,20
Israel	4,02	4,14	3,94	3,69	4,18	3,85
Italy	4,10	4,38	4,17	3,98	4,32	3,95
Japan	4,32	5,28	4,15	4,64	4,12	4,67
Jordan	3,28		3,29	3,89	3,38	3,65
Kazakhstan	3,03	3,13	3,12	2,93	3,27	2,98
Korea Rep	4,27	4,55	4,28	3,91	4,31	4,00
Latvia	3,63		3,66		3,87	
Lithuania	3,51		3,52		3,69	
Macedonia, FYR	3,09		3,05		3,30	
Malaysia	4,00	4,48	3,86	3,97	4,06	4,20
Mexico	3,34	3,21	3,26	3,06	3,57	3,07
Morocco	2,83		2,81		2,96	3,2
Netherlands	4,56	5,22	4,57	4,85	4,64	4,73
New Zealand	4,19		4,13		4,38	
Norway	4,14	4,66	4,12	4,38	4,32	4,31
Pakistan	2,92	3,46	2,89	2,85	3,15	2,62
Panama	3,28	3,61	3,32	3,63	3,41	3,22
Peru	3,43	3,06	3,45	3,07	3,68	3,01
Philippines	3,10	3,03	3,07	2,84	3,24	2,97
Poland	3,60	3,27	3,50	3,27	3,83	3,33
Portugal	4,14		4,08		4,37	
Romania	3,68		3,65		3,88	3,05
Russian Fed.	3,58	3,40	3,53	3,16	3,91	3,21
Singapore	4,24	5,15	4,29	5,03	4,45	5,03
Slovak Republic	3,60	3,25	3,48	3,30	3,71	3,30
Slovenia	3,70		3,63		3,86	
South Africa	3,68	4,00	3,72	3,48	4,02	3,53
Spain	4,33	4,90	4,24	4,40	4,47	4,42
Sweden	4,21	4,75	4,17	4,48	4,22	4,60
Switzerland	4,38	5,23	4,41	4,91	4,51	4,71
Thailand	3,22	3,82	3,20	3,35	3,42	3,37
Turkey	3,27	3,30	3,22	3,03	3,43	3,18
Ukraine	3,26	2,73	3,12	2,71	3,39	2,76
United Kingdom	4,63	5,83	4,56	5,28	4,75	5,06
United States	5,00	5,85	4,93	5,12	5,11	5,12
Uruguay	3,39		3,34		3,63	
Venezuela, RB	3,06	2,71	3,07	2,52	3,02	2,55

First of all, we test for normality by using Shapiro-Wilk considering the small sample sizes around 50. We test for normality under the null hypothesis that calculated and original samples come from a normally distributed population. Test results are reported in Table 3.4.

Table 3.4: Shapiro-Wilk normality tests for matched samples, 2008-2010.[3]

Variable	Obs	W	V	z	Prob>z
2008 calculated	44	0.95325	1.989	1.456	**0.07274**
2008 WEF	44	0.93519	2758	2147	0.01589
2009 calculated	47	0.96440	1.595	0.992	**0.16067**
2009 WEF	47	0.94951	2.262	1.734	0.04143
2010 calculated	49	0.98072	0.892	-0.242	**0.59579**
2010 WEF	49	0.93915	2.817	2.206	0.01370

Recalling that the null hypothesis is that the population is normally distributed, the p-values are less than the chosen alpha level of 0.05 for the FiDIs reported by WEF, then the null hypothesis is rejected (i.e. the data are not from a normally distributed population). On the other hand p-values are greater than 0.05 for all calculated FiDIs, so we fail to reject the null hypothesis and conclude that the data came from a normally distributed population.

Next we test for the heterogeneity of variances between calculated and original FiDIs by using Pitman's test of difference in variance for paired samples. Test results are reported in Table 3.5 below.

According to variance ratio tests, the null hypothesis is ratio of variances is equal to 1 and the alternative hypothesis is the ratio of variances is not equal to one. 2*Pr(F<f) values given in Table 3.5 represents two-sided test and since p-values are less than 0.05 for all pairs, we reject the null hypothesis that variance ratio is equal to 1, i.e. variances are found to be statistically unequal with a significance level of 5%.

[3] Number of observations varies over years since WEF does not report FiDIs for some countries and some years in our sample.

Table 3.5: Pitman's test of difference in variances results, 2008-2010.

Variable	Obs	Mean	Std.Err.	Std.Dev.	[95% Conf.	Interval]	2* Pr(F<f)
2008 calculated	44	3.792	0.0815	0.5406	3.627	3.956	0.0019
2008 WEF	44	4.064	0.1324	0.8786	3.796	4.331	
2009 calculated	47	3.729	0.0811	0.5563	3.565	3.892	0.0217
2009 WEF	47	3.772	0.1144	0.7845	3.542	4.003	
20010 calculated	49	3.884	0.0795	0.5570	3.724	4.044	0.0367
2010 WEF	49	3.726	0.1079	0.7559	3.509	3.943	

We have non-normally distributed samples of FiDI reported by WEF against normally distributed samples of calculated FiDI. So, the normality property is not satisfies, moreover the variances are unequal. Since we have paired and non-normal variates, Wilcoxon Signed rank test is the most appropriate test for comparing two samples. It is an alternative of paired Student's t-test but for non-normally distributed samples.

We compare the calculated and the original FiDIs under the null hypothesis that the median difference between two samples is zero, against the alternative hypothesis that median difference is not zero. P-values for 2009 and 2010 are greater than 0.05 which means we fail to reject null hypothesis, in other words, there is no statistically significant difference between the calculated and the reported FiDIs in 5% significance level. However since the p-value for the year 2008 is not greater than 0.05, we fail to reject the null hypothesis that there is no difference between the means of reported and calculated FiDIs.

Table 3.6: Wilcoxon signed-rank test results, 2008-2010

Pairs	Obs.	Sum ranks	Adjusted variance	z	Prob> |z|
2008	44	741	4754.25	-2.320	0.0203
2009	47	1128	8927.63	-0.773	0.4398
2010	49	946	6857	1.769	0.0769

However results of 2009 and 2010 show that there is no significant difference between samples, result for 2008 indicate significant differences. We had difficulty in accessing some data which is originally used in construction of FiDI. Dominance of the missing data might cause some significant deviations. On the other hand, some of the missing data was reported for years 2009 and 2010 only. So, the effect of new data might be different for the calculated and reported FiDIs. The new data added in calculations might have balanced the calculated FiDIs and narrow the differences with the WEF's FiDIs in 2009 and 2010.

CHAPTER 4

INCOME INEQUALITY AND ITS DETERMINANTS

4.1 The Extent of Income Inequality in the World

Income inequality is basically defined as the unequal distribution of household or individual income across the various participants in an economy or how material resources are distributed across society. We examine the extent of income inequality in the world within the context of four questions: 1) Is there a worldwide income inequality? 2) Is worldwide income gap increasing over time? and 3) How does income inequality change in countries over time? and lastly which constitutes the basic hypothesis of the present study 4) What is the relationship between financial development and income inequality.

The first question to answer is whether income inequality exists in the world. To answer this question, we use the average income of high-income countries and compare it with the average income of low-income countries. The difference between the two is called the “income gap” and is tracked over time.

In Figure 4.1 we have GDP per capita, PPP (constant 2005 international $) on y-axis and years on x-axis as illustrated, income per capita among high-income countries has always been higher than income per capita in countries from other income groups over the period between 1980 and 2010. Over time, the two high and upper-middle income countries began to get richer more quickly which can be traced from the blue and purple lines begin to trend upwards in the 2000s in Figure 4.1. So, the answer to the first question is yes, there is income inequality.

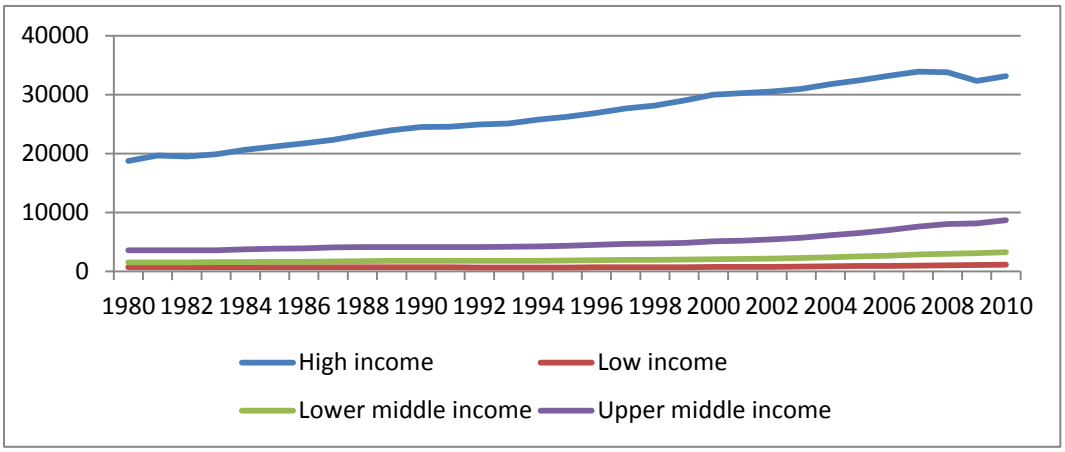

Figure 4.1: Income per capita by income groups (constant 2005 international $)

Secondly one may question whether the income gap has been widening over time. As shown in Figure 4.2, gaps between higher and lower income countries increase over time. It grew in the 1980s, the 1990s, and the first part of the 2000s, but declined slightly between 2007 and 2010. Hence, the answer to the second question is yes, income gap has been widening over time.

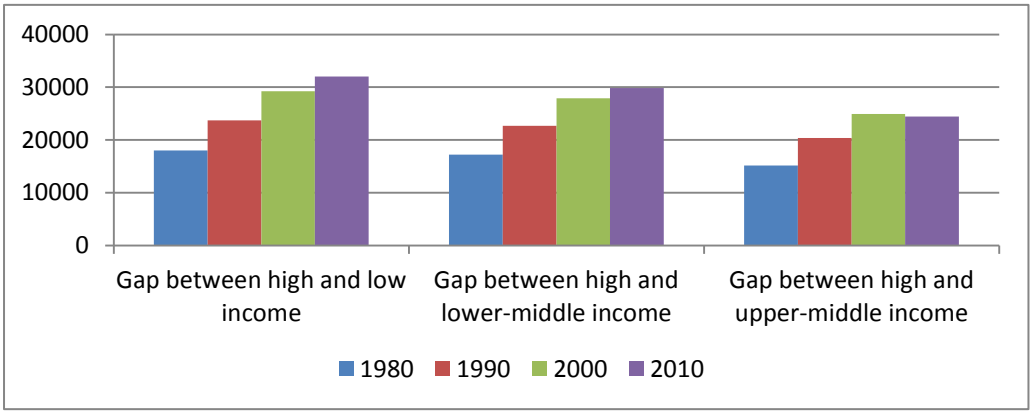

Figure 4.2: Income gap between high-income countries and other country groups

The third question is what is happening to income inequality in the world. We use Gini index as the measure of income inequality when the task is to compare income inequality among many countries. The index is calculated as the area between a

Lorenz curve and the line of absolute equality, expressed as a percentage of the triangle under the line.

The Gini index can theoretically range from 0 to 100 or expressed as percentages. In the case of perfect equality, the area between Lorenz curve and the diagonal line conflicts, making the area between them 0. Therefore, lower Gini index indicates a more equal distribution with 0 corresponding to complete equality. On the contrary, higher values of Gini index indicate more unequal distribution, with 100 corresponding to complete inequality.

As given in Figure 4.3, the deeper a country's Lorenz curve, the greater the area between Lorenz curve and the diagonal line. Hence, income distribution becomes the less equal as in the case of South Africa. On the contrary, the shallower a country's Lorenz curve, the smaller the area between Lorenz curve and the diagonal line. Hence, income distribution becomes more equal as in the case of Sweden.

Data for Gini coefficient is obtained from World Income Inequality Database V2.0c May 2008[4]. In some cases, the database reports multiple Gini values for the same year. In such cases we run a selection method to ensure maximum coverage of area, population and age group available for all countries. In cases of large data gaps, missing data is replaced with previous observations or if available, complemented by the data reported by the World Bank, especially for years after 2008 since World Income Inequality Database covers data until 2008. Figure 4.4 reports data for Gini index for selected countries in our sample for 2000, 2004 and 2008, respectively.

In our sample of 60 countries, the gap between the rich and the poor has narrowed in most countries over years. Between the early 2000s and the late 2000s, 20 countries, including United States and China, experienced rising income inequality while 12 countries had stable inequality, and 28 countries saw income inequality decline.

[4] http://www.wider.unu.edu/research/Database/en_GB/wiid/

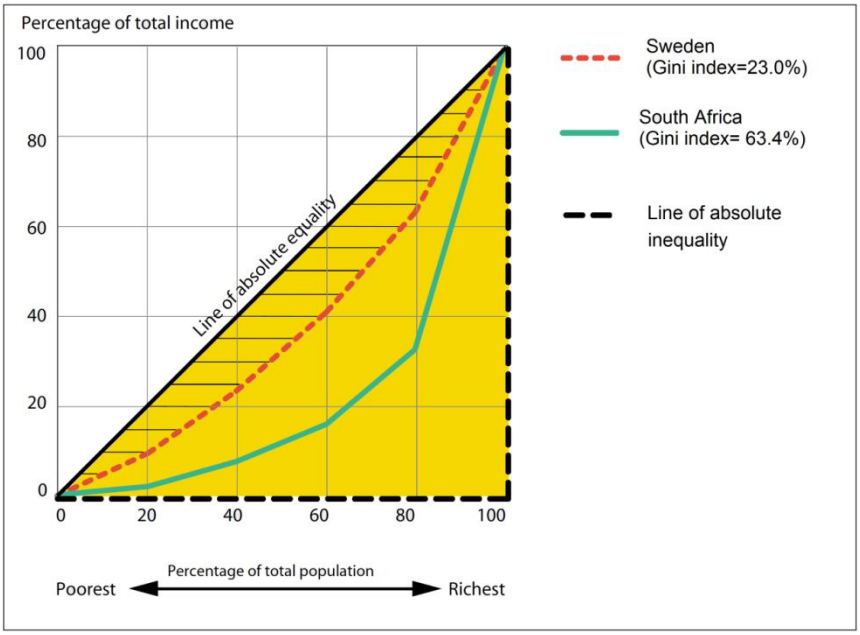

Figure 4.3: Lorenz curve and Gini index for Sweden and South Africa, averaged over 2004-2010.

As obvious from Figure 4.4, we observe traditionally low income inequality in particular countries including Austria, Belgium, Czech Republic, Finland, Germany, France, Norway, Slovak Republic, Slovenia and Sweden with Gini indexes around 25%. On the other hand, traditionally high income inequality is observed in countries such as Argentina, Brazil, Chile, Colombia, Mexico, Panama, Peru, Philippines, South Africa, Venezuela and Uruguay with Gini indexes higher than 45% over the years. [5]

We observe rising income inequality in high income countries mostly. As also obvious from Figure 4.4 the rise in income inequality was largest in Croatia which traditionally had low inequality. Macedonia FYR, Indonesia and South Africa follows Croatia. Even though income inequality is higher in the United States around 45%, growth in inequality had almost been the same as Croatia around 6%.

[5] See Milanovic (2009a, 2009b) on global income inequality.

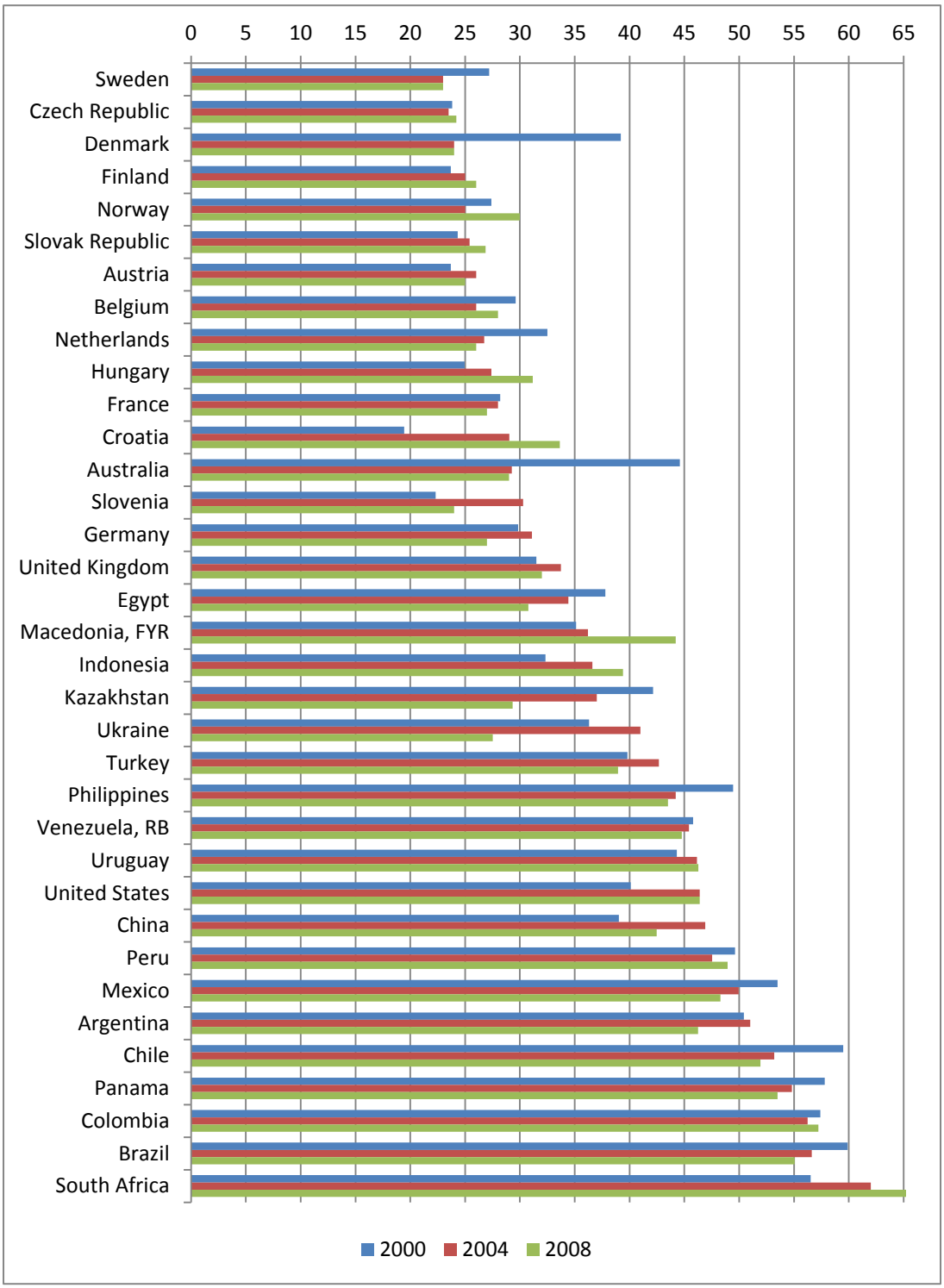

Figure 4.4: Gini indexes for selected countries, 2000, 2004 and 2008.

Countries that have been most successful in reducing inequality were Australia, Denmark and Kazakhstan by 14%. Despite the traditionally high income inequality over years, Latin American countries have been successful in reducing inequality by around 6% on average over the period between 2000-2008.

Plotting the logarithm of the Gini coefficient and its fitted value (from the regression of the logarithm of the Gini coefficient on the logarithm of financial development index) against the logarithm of financial development index, Figure 4.5 suggests a negative, and possibly linear, relation between the two as also validated by the findings of Clarke et al. (2006).

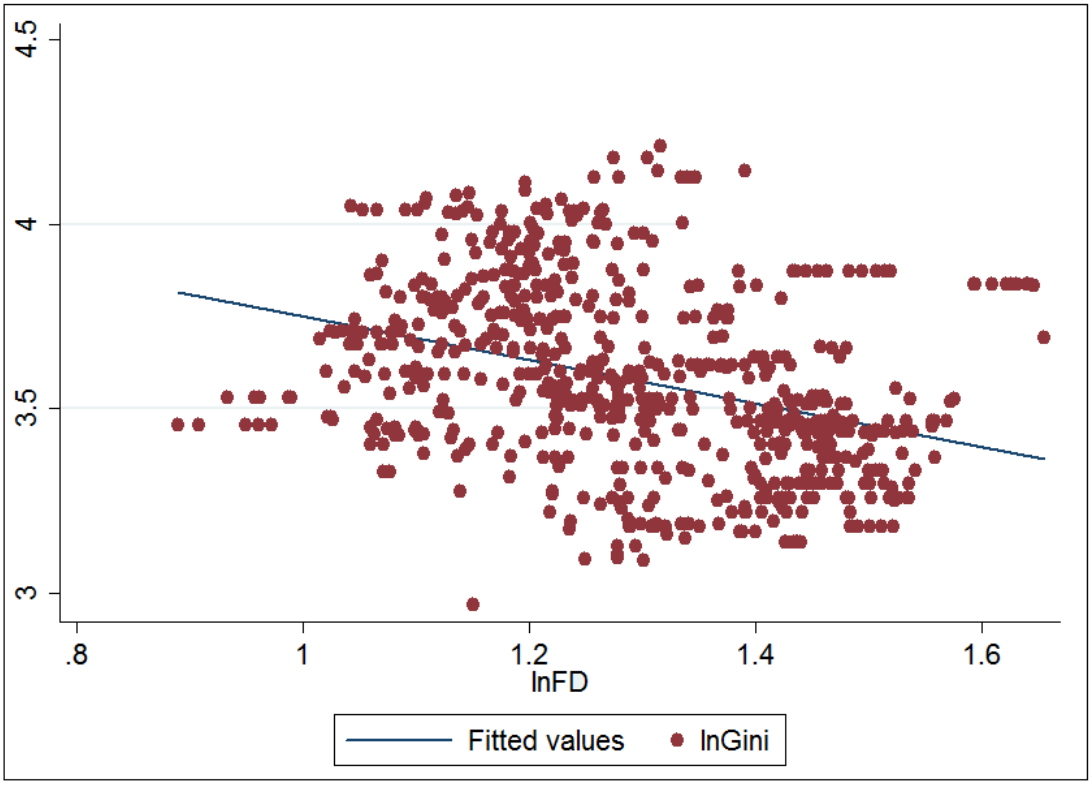

Figure 4.5: Scatterplot showing the relationship between Gini index and Financial Development Index

The negative relation between Gini index and financial development index is also suppoted by the results shown in Figure 4.6. A group of countries which succeeded

in alleviating income inequality progressively over time is presented. These countries commonly start with high values of Gini and gradually and sharply reduce values of Gini over time. It is noteworthy that there is a mirror-like relationship between income inequality and financial development index. They move in opposite directions, intersect at one or two points and then continue to move in opposite directions for all country examples given in Figure 4.6. It illustrates that a decrease in the value of Gini is associated with an increase in financial development, or vice versa. Such findings is also applicable for other countries, however results are more outstanding for countries with sharp decline in Gini index over the years. Such results give us an intuition about the possible negative relationship between financial development and income inequality. This relationship is further examined in Chapter 6 through panel data analysis to gain a better insight.

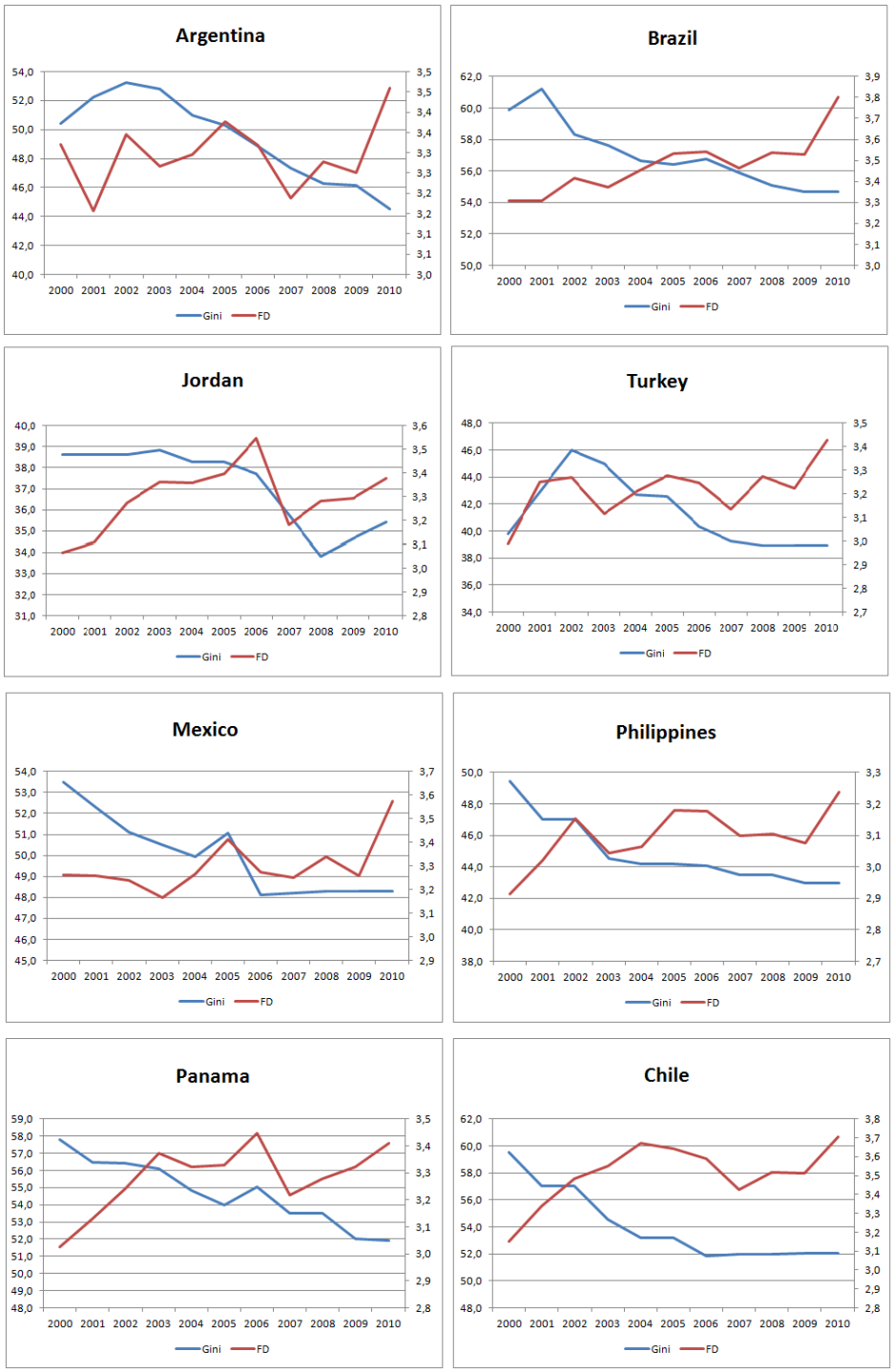

Figure 4.6: Financial development index and income inequality link for selected countries over 2000-2010

4.2 Other Determinants of Income Inequality

Financial development is considered as the major determinant of inequality within the scope of this study. However it is also obvious that inequality is not only determined by financial development and there is a set of control variables motivated by the literature. The set of control variables consists of macroeconomic variables, i.e. GDP per capita, unemployment, tax revenues, trade openness and foreign direct investment. In addition to these variables we control for arable land, tertiary school enrollment and corruption. Data for all control variables except corruption perceptions index is obtained from World Bank, World Development Indicators & Global Development Finance database covers the years between 2000 and 2010. Data for corruption perceptions index is obtained from Doing Business database.

Cornia and Court (2001) suggested that one has to separate between so called "traditional" causes of inequality and "new" causes. Traditional causes are factors such as arable land area, urban bias and inequality in education and income distribution consequences of economic development while new causes are said to be linked to the liberal economic regimes and policies implemented in large scale in developing countries in the 1980s and 1990s such as new technology, trade liberalization, financial liberalization, privatization and distribution of industrial assets, changes in labor market institutions etc. The traditional causes are explained to be responsible for the initial level of inequality in different countries, but the recent increase in inequality in some countries is said to be due to the new causes corresponding to the rapidly changing liberalizing economic regimes. Therefore, traditional causes are claimed not to be responsible for the worsening situation but new causes are rather crucial.

The present study classifies other determinants of income inequality as traditional and new causes as in Cornia and Court (2001) classification. We will also test either traditional or new causes of inequality are significant in explaining inequality.

4.2.1 Traditional Causes of Inequality

4.2.1.1 Economic Development

Relationship between development and income inequality has been a focus of research for several decades. Kuznets (1955) explored the historical evolution of income distribution and output. His study demonstrates that income inequality widens in the early phase of economic development and narrows in the later stage of development. Kuznets inverted u-shaped hypothesis has been debated in the last few decades and confirmed by a number of empirical studies.

Galor and Zeira (1993) have demonstrated that, in the presence of capital market imperfections, distribution of wealth affects aggregate economic activity. Furthermore, in the presence of indivisibilities in investment in human capital, these effects are carried to the long run, as well. In the long run, there will be a polarization of wealth between high-income skilled labors and low-income unskilled ones: the rich and better-educated families will converge to the high-income steady state, whereas the poor and less-educated ones will converge to the low-income steady state. Hence, development is affected by the initial distribution of wealth, or more specifically by the percentage of individuals who inherit a large enough wealth to enable them to invest in human capital. However, the development of financial market will provide broader and easier credit access for poor households: as financial market develops, the credit constraints faced by low-income agents will be alleviated, which will in turn help to reduce income inequality.

Aghion and Bolton (1997) suggests that Kuznets effect is reinforced by the existence of capital market imperfections. In the early phases of development, the lending terms are favorable to lenders, so the wealth of rich lenders grows faster. In later stages of development, lending terms become more favorable to borrowers so that wealth of the middle class tends to catch up with that of the rich. In other words, initial phases of development tend to increase inequalities while later stages tend to reduce them.

Banerjee and Newman (1993) have demonstrated that, in the presence of capital market imperfections, the interplay between individuals' occupational choice and the distribution of wealth may be consistent with the Kuznets hypothesis. Alessina and Perotti (1993) assert that income inequality creates an instable politico-economic environment which reduces investment. Considering investment as the main driver of economic development, income inequality harms economic development as a consequence.

We examine the role of economic development on income inequality and we use ***GDP per capita PPP (constant 2005 international $)*** as a proxy for the stage of development of a given economic system. PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. We also include the squared-term of GDP per capita PPP, to examine whether the data predict a linear or an inverted u-shaped relationship between economic development and income inequality as suggested by Kuznets (1955).

4.2.1.2 Education

Access to knowledge is a major component of well-being and is used as a measure of economic development and quality of life, which is a key factor determining whether a country is in the group of developed, developing, or underdeveloped countries. Inequality of income might restrain access of poor families to education, therefore risk of poverty is perpatuated through generations. On the other hand, better access to education means investment on human capital, therefore might incease earning opportunities of the lower income families, and eventually reduce income inequality.

Despite the fact that some theoretical models suggest an unclear relation between education and inequality, most empirical studies suggest that more education reduces income inequality. We hypothesize that countries with better and broader access to education in general have more equal distribution of income as also supported by the findings of De Georgio and Lee (2002). They suggest that educational factors, i.e. higher educational attainment and more equal distribution of education play a significant role in making income distribution more equal. We

control for the effect of education and income inequalities between countries and we expect education to have an alleviating effect on income inequality. We use ***gross tertiary enrollment ratio*** which is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of tertiary education shown. Tertiary education requires the minimum condition of successful completion of education at the secondary level.

4.2.1.3 Arable Land Endowment

Comparative advantage a country may have in agricultural production as measured by its relative endowment in arable land is and it is one of the very powerful explanatory factors of differences in income inequality. In addition to agricultural income, endowment of a country would also affect overall income inequality by enhancing the human capital accumulation of rural households and by increasing urban income.

In most developing countries arable land serves as collateral for financial services. Inequality in terms of land therefore prevents the poor from making productive investments such as education, and finally results in inequality of incomes. Deininger and Squire (1998) suggest that the effects of land inequality are transmitted through (imperfect) financial markets. Hence, we expect a more equal distribution of land to be associated with a broader access to the financial market and thus a more equal distribution of income.

Arable land in hectares is used as a proxy of endowment in arable land and includes land defined as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded.

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4.2.2 New Causes of Inequality

4.2.2.1 Unemployment

Labour markets have the role of improving allocative efficiency and dynamic efficiency as well as improving earnings equity and social justice among labour force participants (Cornia and Court, 2001). Therefore, increasing employment opportunities will also help more equal distribution of income by diminishing wage inequalities between individuals.

The relationship between unemployment and income distribution has given rise to numerous studies in recent years. The main hypothesis behind the relationship between income inequality and unemployment is that, unemployment increases wage inequality as suggested by Levy and Murnane (1992). Martinez *et al*. (2001), investigate the contribution of unemployment to income inequality and poverty in various OECD countries. They conclude that unemployment has only a limited effect on income distribution in most of the considered countries, however it is also stated that the unemployed are one of the high risk groups regarding the chances of suffering poverty. We control for the effect of unemployment under the hypothesis that income inequality will narrow as unemployment decreases. Unemployment refers to the share of the labor force that is without work but available for and seeking employment. So we use ***unemployment ratio*** which is defined as the share of the unemployed as a percentage of total labor force.

4.2.2.2 Health Expenditures

Health is an important source of human capital and it can be considered as an important factor to promote economic and human development. Since illness is more concentrated among the poor and they are more likely to ask for a public medical care, expenditure on health plays an important role in reducing inequality in living standards. Schultz (1962) discusses on the possibilities of including health as source of human capital, basing on Grossman (1972)'s work on government's investment on health. Ehrlich and Becker (1972) and Ehrlich (2000) present a

theoretical framework for the analysis of optimal insurance and self-protection, considering health as human capital. They found that the existence of private insurance (or insurance fully-funded by public expenditure) increases the likelihood that larger health endowments (lower mortality risks) raise the demand for life protection, reducing inequality in life expectancy.

We use ***total health expenditures as % of GDP*** to represent this area. Total health expenditure is the sum of public and private health expenditure. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation.

4.2.2.3 Trade Openness

Basic hypothesis behind the relationship between trade openness and income inequality suggests that greater openness of trade leads to increased inequality. The most popular measure for ***trade openness*** defines it as the value of its exports and imports divided by the GDP, in other words, trade to GDP ratio.

A number of hypotheses investigating the relationship between trade openness and income inequality reached to controversial results so that it is even possible to claim that the relationship between two is ambiguous. The hypothesis that trade openness by itself is associated with higher inequality is rejected by White and Anderson (2001), Dollar and Kraay (2002), Edwards (1997b) and Higgins and Williamson (1999). However Barro (2000) found support for it using the trade to GDP ratio. Edwards (1997b), Higgins and Williamson (1999), Calderón and Chong (2001) and Dollar and Kray (2002) also found no evidence for an alternative hypothesis that openness is associated with higher inequality in developed countries. On the other hand, Barro (2000) and Ravallion (2001) showed that openness itself appeared to be associated with increased inequality, while developed countries appeared to experience decreased inequality with openness.

4.2.2.4 Tax Revenues

Next we control for the effect of taxes, namely ***taxes on income, profits and capital gains (% of tax revenues).*** It is defined as the gains which are levied on the actual or presumptive net income of individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets.

Governments can influence income distribution through the system of collection of taxes. Taxes tend to be progressive, in the sense that people with higher incomes pay a higher proportion of their income in tax. The amount collected as tax can be targeted at the poor through government programmes so that they will tend to narrow the proportional difference between the incomes of the rich and the poor. Wu *et al*. (2006) find that taxes are effective in making income distribution more equal, emphasizing on the significant effect of the earned income tax which has a statististically significant and desirable effect on income inequality. A very recent research of OECD shows that OECD-wide inequality in income after taxes and transfers, as measured by the Gini index, was about 25% lower than for income before taxes and transfers in the late 2000s.[6] Therefore we expect taxes on income and profits to reduce income inequality in our estimations.

4.2.2.5 Foreign Direct Investment

Two different theories compete in explaining the effect of ***foreign direct investment net inflows (% of GDP)*** on income inequality: traditional and modernization theories. Foreign direct investment is defined as the net inflows of investment to acquire a lasting management interest in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments.

[6] OECD 2012, "Income inequality and growth: The role of taxes and transfers", OECD Economics Department Policy Notes, No. 9. January 2012.

The well-known traditional foreign direct investment theories suggest that impacts of FDI on economic development are numerous, such as increasing trade openness and economic activities, boosting exports, creating employment, increasing foreign capital investment etc. In contrast to the mentioned foreign direct investment theories, dependency and modernization theories viewed that more foreign direct investment in a country means more foreign control and as a consequence the greater the degree of income inequality (Bornschier and Chase-Dunn, 1985; Gowan, 1999). It is also argued that, foreign direct investment causes the unemployment rate to increase in the traditional sectors and income inequality becomes greater (Tsai, 1995).

Velde (2003) investigates the relationship between foreign direct investment and income inequality in Latin America and finds that, at a minimum, foreign direct investment is likely to perpetuate inequalities which are in contrast to what traditional trade and foreign direct investment theories would predict. A recent study Chintrakarn *et al*. 2010 explore the relationship between inward foreign direct investment and income inequality in the United States and they suggest that the short-run effects of foreign direct investment on income inequality are insignificant, or weakly significant and negative. In the long run, foreign direct investment exerts a significant and robust negative effect on income inequality in the United States. Tang and Selvanathan (2008) find that foreign direct investment inflows as one of the main factors have led to increasing regional income inequality at national level, as well as rural and urban regions of China.

4.2.2.6 Corruption

Corruption is defined as the use of authority by government officials for private gain in designing and implementing public policies by Tanzi (1997a). Corruption may result in enrichment these officials as well as private individuals who obtain a larger share of public benefits or bear a lower share of public costs. Many studies investigated the impact of corruption on investment, development and expenditure allocations and show that corruption lowers investment and therefore economic development (Mauro,1995; Knack and Keefer, 1996). Gupta *et al*. (1998)

demonstrate that high and rising corruption increases income inequality and poverty by reducing economic development, the progressivity of the tax system, the level of effectiveness of social spending and the formation of human capital, and by perpetuating an unequal distribution of asset ownership and unequal access to education. Corruption may also limit the effectiveness of taxes and transfers as redistributive instruments. Also, policies that reduce corruption will also lower income inequality and poverty.

We control for corruption by employing ***corruption perceptions index*** which ranks countries and territories according to their perceived levels of public sector corruption. A country's score indicates the perceived level of public sector corruption on a scale of 0 - 10, where 0 means that a country is perceived as highly corrupt and 10 means that a country is perceived as very clean. A country's rank indicates its position relative to the other countries included in the index. We expect the corruption perceptions index to have a positive effect on income inequality.

CHAPTER 5

DATA, MODEL AND THE METHODOLOGY

5.1 Data and Model

The following model examines the impact of financial development on income inequality utilizing a panel dataset of 60 countries over the period of 2000 – 2010:

$$Gini_{it} = \alpha + \beta_1 Gini_{i,t-1} + \beta_2 FiDI_{it} + \beta_3 GDPPC_{it} + \beta_4 Y_{it}^2 + \gamma X_{it} + \epsilon_{it}$$

We estimate the following equation:

$$Gini_{it} = \alpha + \beta_1 Gini_{i,t-1} + \beta_2 FiDI_{it} + \beta_3 GDPPC_{it} + \beta_4 GDPPC_{it}^2 + \gamma_1 SchoolEnroll_{it} + \gamma_2 HealthExp_{it} + \gamma_3 Unempl_{it} + \gamma_4 TradeOpen_{it} + \gamma_5 Tax_{it} + \gamma_6 ForeignDI_{it} + \gamma_7 Arable_{it} + \gamma_8 CorruptionPI_{it} + \epsilon_{it}$$

In equation above, all variables are in logarithmic forms where i denotes country and t stands for time. $Gini_{it}$ denotes the Gini index *and* $Gini_{i,t-1}$ is the one lagged Gini index. $FiDI_{it}$ is financial development index, $GDPPC_{it}$ is GDP per capita PPP (constant 2005 international $) and $GDPPC_{it}^2$ is the squared term of GDP per capita PPP (constant 2005 international $). X_{it} is a matrix of the following control variables: $SchoolEnroll_{it}$ is the gross tertiary school enrollment ratio, $HealthExp_{it}$ is total health expenditures as % of GDP, $Unempl_{it}$ is the unemployment ratio, $TradeOpen_{it}$ is trade to GDP ratio, Tax_{it} is taxes on income, profits and capital gains (% of revenue), $ForeignDI_{it}$ is the ratio of foreign direct investment net inflows to GDP, $Arable_{it}$ is arable land in hectares and finally $CorruptionPI_{it}$ is corruption perceptions index. Definitions of the control variables are presented in detail in Chapter 4.

Table 5.1 presents descriptive statistics for the key variables. It becomes evident that there are large variations in the data. Regarding income inequality, the sample contains countries with Gini coefficients ranging from around 20% to over 60%. We observe large variations in the control variables. Large discrepancies in values of GDP per capita, school enrollment, trade openness and arable land are spectacular. Negative values for foreign direct investment net inflows for a particular year show that the value of disinvestment by foreign investors was more than the value of capital newly invested in the reporting economy.

Table 5.1: Descriptive statistics

	Obs	Mean	Std. Dev.	Min	Max
Gini	659	36.78	9.48	19.45	67.4
FiDI	670	3.71	0.56	2.43	5.23
GDPPC	671	17789.93	12302.83	969.78	51969.47
SchoolEnroll	533	49.92	21.81	2.55	103.87
HealthExp	670	7.16	2.53	1.97	16.21
Unemp	670	8.57	5.50	1.2	37.3
TradeOpen	659	87.89	57.44	20.48	445.91
Tax	523	27.13	14.42	0.01	67.76
ForeignDI	653	4.27	6.58	-32.64	92.38
Arable	606	1.33e+07	2.79e+07	0	1.75e+08
CorruptionPI	662	5.37	2.20	1.2	9.7

We run multicollinearity test for any possible multicollinearity between independent variables. Results are reported in Table 5.2. We find no evidence for multicollinearity since all variance inflation factor (VIF) values are lower than 10 and 1/VIF tolerance values are greater than 0.05.

Correlation matrix is given below in Table 5.3. Correlations between independent variables are low in general, however we observe slightly high correlations between health expenditures and tertiary school enrollment. Such results are assumed to be natural since education and health are also key indicators for financial development. We also observe a substantially positive and significant correlation between tertiary

school enrollment and health expenditure, for this reason we did not include both variables in one single model and examined the effects of each variable separately.

Table 5.2: Results for test of multicollinearity

	VIF	1/VIF
FiDI	2.73	0.366135
GDPPC	1.83	0.545327
SchoolEnroll	2.61	0.383753
HealthExp	1.75	0.571762
Unemp	1.43	0.699139
TradeOpen	1.22	0.822616
Tax	1.23	0.816151
ForeignDI	1.22	0.817339
Arable	1.13	0.884891
CorruptionPI	1.23	0.814165
Mean VIF	**1.64**	

Table 5.3: Correlations between independent variables

	FiDI	GDPPC	SchoolEnroll	HealthExp	Unemp	TradeOpen	Tax	ForeignDI	Arable	CorruptionPI
FiDI	1.0000									
GDPPC	0.5536	1.0000								
SchoolEnroll	0.5920	0.3866	1.0000							
HealthExp	0.4928	0.3592	0.4136	1.0000						
Unemp	-0.3819	-0.1798	-0.0611	-0.0899	1.0000					
TradeOpen	0.0883	-0.0340	0.1113	0.0139	-0.0788	1.0000				
Tax	0.2923	0.2205	-0.1070	-0.0193	-0.2261	0.0192	1.0000			
ForeignDI	-0.1980	-0.1950	-0.1573	-0.0377	-0.0668	-0.0991	-0.1131	1.0000		
Arable	0.3027	0.2383	0.2920	0.0994	-0.0445	-0.1861	0.1665	-0.1222	1.0000	
CorruptionPI	-0.0036	0.1509	0.0479	-0.1175	-0.2043	0.1415	0.0259	0.0865	0.0053	1.0000

5.2 Panels

The panel study investigates the relationship between financial development and income inequality for 60 developing and developed countries over the period of 2000 and 2010. List of countries are given in Table 5.4 below. We divide the panel into two groups to compare the results for both developed and developing countries. Therefore, we run the regressions for the whole panel in the first stage and then in the second stage, for developed and developing country panels, separately. Table 5.5 shows the list of countries included in each group.

We make the distinction between developed and developing countries by looking at the income index scores reported by United Nations Development Programme (UNDP) Human Development Report. The income index is expressed in terms of Gross National Income per capita, 2005 PPP International $ using natural logarithm. It ranges from 0 to 1 and countries with higher scores are regarded as higher income or developed countries. We consider 0.650 as the threshold level for development of countries, so that countries with scores equal and lower than 0.650 are included in the group of developing countries while countries with scores higher than 0.650 are included in the group of developed countries. We have 24 countries in the group of developing countries and 36 countries in the group of developed countries.

We also analyze how the effect of other determinants of income inequality differs in developing and developed countries. The effect of health expenditures and school enrollment on income inequality is particularly of interest since we might observe gaps between developing and developed countries considering the fact that such variables depend heavily on the income level of a country.

Table 5.4: List of developing and developed countries[7]

	Developing Countries		Developed Countries
1.	Bangladesh	1.	Argentina
2.	Brazil	2.	Australia
3.	Bulgaria	3.	Austria
4.	Chile	4.	Belgium
5.	China	5.	Croatia
6.	Colombia	6.	Czech Republic
7.	Egypt	7.	Denmark
8.	India	8.	Estonia
9.	Indonesia	9.	Finland
10.	Jordan	10.	France
11.	Kazakhstan	11.	Germany
12.	Macedonia, FYR	12.	Greece
13.	Malaysia	13.	Hungary
14.	Morocco	14.	Ireland
15.	Nigeria	15.	Israel
16.	Pakistan	16.	Italy
17.	Panama	17.	Japan
18.	Peru	18.	Korea (Republic of)
19.	Philippines	19.	Latvia
20.	Romania	20.	Lithuania
21.	South Africa	21.	Mexico
22.	Thailand	22.	Netherlands
23.	Turkey	23.	New Zealand
24.	Ukraine	24.	Norway
25.	Uruguay	25.	Poland
		26.	Portugal
		27.	Russian Federation
		28.	Singapore
		29.	Slovakia
		30.	Slovenia
		31.	Spain
		32.	Sweden
		33.	Switzerland
		34.	United Kingdom
		35.	United States
		36.	Venezuela

[7] Note: Countries with scores equal and lower than 0.650 are included in the group of developing countries while countries with scores higher than 0.650 are included in the group of developed countries

5.3 Arellano-Bond Estimator

We use Arellano-Bond (1991) and Arellano-Bover (1995)/Blundell-Bond (1998) linear generalized models while estimating the parameters of the form:

$$y_{it} = y_{i,t-1}\gamma + x_{it}\beta + u_i + \in_{it}$$

for i = {1, . . . ,N} and t = {1, . . . ,T} using panels with large N and small T, meaning fewer time periods and many groups, i.e. countries. By construction, $y_{i,t-1}$ is correlated with the unobserved individual-level effect u_i which means that independent variables are correlated with past and current realizations of the error, with fixed effects; and with heteroskedasticity and autocorrelation within groups.

Arellano-Bond estimation uses the Generalized Method of Moments and starts usually by differencing, for this reason it is called Difference GMM. The Arellano-Bover/Blundell-Bond estimator makes an additional assumption, that first differences of instrument variables are uncorrelated with the fixed effects. This allows for the introduction of more instruments and improves efficiency. It builds a system of two equations: the original equation as well as the transformed one, and is known as System GMM. (Roodman, 2009)

The Difference and System GMM estimators are designed for panel analysis, and embody the following assumptions about the data-generating process:

1. The process may be dynamic, with current realizations of the dependent variable influenced by past ones.
2. There may be arbitrarily distributed fixed individual effects. This argues against cross-section regressions, which must essentially assume fixed effects away, and in favor of a panel set-up, where variation over time can be used to identify parameters.
3. Some regressors may be endogenous.
4. The idiosyncratic disturbances (those apart from the fixed effects) may have individual-specific patterns of heteroskedasticity and serial correlation.
5. The idiosyncratic disturbances are uncorrelated across individuals.

In addition, some secondary concerns shape the design:

6. Some regressors may be predetermined but not strictly exogenous: independent of current disturbances, they may be influenced by past ones. The lagged dependent variable is an example.
7. The number of time periods of available data, T, may be small and the panel, N, is large.

Finally, since the estimators are designed for general use, they do not assume that good instruments are available outside the immediate data set. In effect, it is assumed that:

8. The only available instruments are “internal”-based on lags of the instrumented variables. However, the estimators do allow inclusion of external instruments.

The general model of the data-generating process is as follows:

y_{it}= δ$y_{i,t-1}$ + υ_{it} for $i = 1, \dots, N \quad t = 1, \dots, N$ (1)

where $u_{it} = \mu_i + \upsilon_{it}$ with μ_i~ IID(0, σ_μ^2) and υ_{it}~ IID(0, σ_υ^2), independent of each other and among themselves. In order to get a consistent estimate of δ as N → ∞ with T fixed, we first difference (1) to eliminate the individual effects

$$y_{it} - y_{i,t-1} = \delta \ y_{i,t-1} - y_{i,t-2} + \upsilon_{it} - \upsilon_{i,t-1} \quad (2)$$

And note that $\upsilon_{it} - \upsilon_{i,t-1}$ is MA(1) with unit root. For $t = 3$, equation (2) is rewritten as follows:

$$y_{i3} - y_{i2} = \delta \ y_{i2} - y_{i1} + \upsilon_{i3} - \upsilon_{i2}$$

In this case, y_{i1} can be used as a valid instrument since y_{i1} is highly correlated with $y_{i2} - y_{i1}$ and uncorrelated with $\upsilon_{i3} - \upsilon_{i2}$ as long as υ_{it} does not suffer from serial correlation. For $t = 4$, equation (2) can be written as:

$$y_{i4} - y_{i3} = \delta \ y_{i3} - y_{i2} + \upsilon_{i4} - \upsilon_{i3}$$

Similarly, y_{i2} and y_{i1} can be used as valid instruments for $y_{i3} - y_{i2}$ since both y_{i2} and y_{i1} are uncorrelated with $v_{i4} - v_{i3}$.

Henceforth, if we continue to add new valid instrument variables for each next term, the set of valid instrumental variables at T is as follows:

$$(y_{i1}, y_{i2}, \dots\dots\dots, y_{i,T-2}) .$$

This instrumental variable procedure still does not account for the differenced error term in (2).

$$E \quad \Delta vi \, \Delta v_i' \quad = \sigma_v^2 G \tag{3}$$

where $\Delta v_i' = (v_{i1}, v_{i2}, \dots\dots\dots v_{iT}, v_{i,T-1})$ and

$$G = \begin{matrix} 2 & -1 & 0 & . & . & . & 0 & 0 & 0 \\ -1 & 2 & -1 & . & . & . & 0 & 0 & 0 \\ 0 & -1 & 2 & . & . & . & 0 & 0 & 0 \\ . & . & . & . & & & . & . & . \\ . & . & . & & . & & . & . & . \\ . & . & . & & & . & . & . & . \\ 0 & 0 & 0 & . & . & . & 2 & -1 & 0 \\ 0 & 0 & 0 & . & . & . & -1 & 2 & -1 \\ 0 & 0 & 0 & . & . & . & 0 & -1 & 2 \end{matrix}$$

is *(T- 2) x (T- 2)* since $v_{i,T-1}$ is a MA(1) with unit root. Define

$$W_i = \begin{matrix} y_{i1} & 0 & 0 & 0 & 0 & 0 \\ 0 & y_{i1}, y_{i2} & 0 & 0 & 0 & 0 \\ 0 & 0 & y_{i1}, y_{i2}, y_{i3} & 0 & 0 & 0 \\ 0 & 0 & 0 & . & . & . \\ . & . & . & . & . & . \\ . & . & . & . & . & y_{i1}, \dots\dots\dots, y_{i,T-2} \end{matrix} \tag{4}$$

Then the matrix of instruments is $W = [W_1', \dots\dots\dots W_N']'$ and the moment equations described above are given by $E(W_i' \, \Delta v_i) = 0$. Pre-multiplying the differenced equation (2) in vector form by W', one gets

$$W' \Delta y = W' \, \Delta y_{-1} \, \delta + W' \Delta_v \tag{5}$$

Performing GLS on (5) one gets the Arellano-Bond and Bond (1991) preliminary one-step estimator

$$\delta_1 = \Delta y_{-1}{}' W \; W' \; I_N \otimes G \; W^{-1} W' \; \Delta y_{-1}{}^{-1} \times \Delta y_{-1}{}' W \; W' \; I_N \otimes G \; W^{-1} W' \; \Delta y \quad (6)$$

The Generalized method of moments (GMM) estimator δ_1 for N → ∞ and T fixed using only the above moment restrictions yields the same expression as in (5) except that

$$W' \; I_N \otimes G \; W = \sum_{i=1}^{N} W_i' G W_i$$

is replaced by

$$V_N = \sum_{i=1}^{N} W_i' \; \Delta vi \quad \Delta vi \;' W_i$$

This GMM estimator requires no knowledge concerning the initial conditions or the distributions of V_i and μ_i. To operatationalize this estimator, ΔV is replaced by differenced residuals obtained from the preliminary consistent estimator δ_1. The resulting estimator is the two-step Arellano-Bond (1991) estimator:

$$\delta_2 = \Delta y_{-1}{}' W V_N^{-1} W' \; \Delta y_{-1}{}^{-1} \quad \Delta \mathrm{y}_{-1}{}' \mathrm{W} \mathrm{V}_\mathrm{N}^{-1} \mathrm{W}' \; \Delta \mathrm{y} \quad (7)$$

A consistent estimate of the asymptotic var(δ_2) is given by the first term in (7),

$$var \; \delta_2 = \Delta_{y-1}{}' W V_N^{-1} W' \; \Delta_{y-1}{}^{-1} \quad (8)$$

where δ_1 and δ_2 are asymptotocally equivalent if the V_{it} are IID(0, σ_V^2).

5.4 Tests for Overidentifying Restrictions and Autocorrelation

We use Sargan/Hansen test to test for overidentifying restrictions and Arellano-Bond tests for autocorrelation: AR(1) and AR(2) tests in addition to panel estimations. A crucial assumption for the validity of GMM estimates is of course the exogeneity of instruments. The Sargan/Hansen test for joint validity of the instruments is standard

after GMM estimation. If the estimation is exactly identified, detection of invalid instruments will be impossible. But if the system is overidentified, a test statistic for the joint validity of the moment conditions (identifying restrictions) falls naturally out of the GMM framework. The Sargan test has a null hypothesis of “the instruments as a group are exogenous” or “overidentifying restrictions are valid”. Rejecting this null hypothesis implies that we need to reconsider our model or our instruments. Therefore, the higher the p-value of the Sargan statistic the better specified the model is. In robust estimation Stata reports the Hansen (1982) J statistic along with Sargan (1958) with the same null hypothesis.

In addition, Arellano and Bond (1991) develop a test for autocorrelation in the idiosyncratic disturbance term ε_{it}. The Arellano-Bond test for autocorrelation has a null hypothesis of “no autocorrelation and is applied to the differenced residuals”. Since $\Delta\upsilon_{it}$ is mathematically related to $\Delta\upsilon_{i,t-1}$ via the shared $\upsilon_{i,t-1}$ term, negative first-order serial correlation is expected in differences and evidence of it is uninformative. Thus, we look for second-order correlation in differences, on the idea that this will detect correlation between the $\upsilon_{i,t-1}$ in $\Delta\upsilon_{it}$ and the $\upsilon_{i,t-2}$ in $\Delta\upsilon_{i,t-2}$. Therefore the test for AR(2) in first differences is more important than the test for AR(1), because it will detect autocorrelation in levels.

CHAPTER 6

EMPIRICAL ANALYSIS

Alternative theories have made distinct predictions on the finance-inequality relationship, forming two broad schools of thought with two contrasting theoretical hypotheses: the inverted u-shaped hypothesis and the linear hypothesis.

Greenwood and Jovanovic (1990) predict an inverted u-shaped relationship between financial development and income distribution: in developing countries, at early stages of financial development only the rich access and benefit from better financial markets so income inequality widens, however as the average income increases and more households gain access to financial market, income inequality narrows.

In contrast to the inverted u-shaped hypothesis, Galor and Zeira (1993); Banerjee and Newman (1993) suggest a negative and linear relationship between financial development and income inequality which predicts a negative and linear relationship between finance and inequality. According to linear hypothesis, development of financial market and financial intermediation contribute to the improvement in income distribution by eliminating capital market imperfections and providing more opportunities for the poor to borrow and invest in human capital or high-return projects.

We run regressions for either hypothesis. In order to test for inverted u-shaped hypothesis we include financial development index and the squared term of the financial development index in the model. On the other hand, we include only the financial development index to test for negative and linear relationship.

We also test the relevance of inverted u-shaped relationship between economic development and income inequality following Kuznets (1955). It is suggested that in poor countries, economic development will increase the income disparity between

rich and poor people. In wealthier countries, economic development will narrow the gap. By noting patterns of income inequality in developed and underdeveloped countries, Kuznets (1955) proposed that as countries experienced economic development, the income inequality first increases and then decreases. Depending on this hypothesis, therefore we regress the logarithm of the Gini coefficient on the logarithm of per capita GDP and its square. We expect the linear term of per capita GDP to have positive sign and squared term to have negative sign, irrespective of the degree of development of countries.

We run the abovementioned regressions for three panels separately: panel for 60 developing and developed countries, panel for developing countries only and developed countries only. Also, we run three different specifications at the same time: regression (1) controls for the effect of schooling with other variables but expenditure on health, regression (2) controls for the effect of expenditure on health with other variables but schooling, regression (3) controls for variables except schooling and expenditure on health and regression (4) controls for GDP per capita without its squared term. We did not include schooling and health expenditures together in one model since there is relatively higher correlation between them.

We use one-step system GMM estimator. Gini index is assumed to be endogenous which is instrumented with GMM-style instruments, i.e. lagged values of the variables in levels. We use only the second lag of the endogenous variables as instruments for estimations for developed countries and no lag for other estimations. The second list of explanatory variables, in other words instrumental variables lists all strictly exogenous variables as well as the additional instrumental variables. In our model, other control variables and FiDI are assumed to be strictly exogenous. Although the set of strictly exogenous variables define system GMM, we also incorporate other instruments instead or in addition. For this reason, we add a set of instrumental variables including human development index, current per capita GDP, literacy rate, life expectancy, public spending on education, urban population growth etc. We do not include the constant term in our estimations.

6.1 Results for the Linear Hypothesis

The regression equation for the test of linear hypothesis suggested by Banerjee and Newman (1993) and Galor and Zeira (1993) is given as follows:

$$Gini_{it}=\alpha+\beta_1 Gini_{i,t-1}+\beta_2 FiDI_{it}+\beta_3 GDPPC_{it}+\beta_4 GDPPC_{it}^2+\gamma_1 SchoolEnroll_{it}+\gamma_2 HealthExp_{it}$$
$$+\gamma_3 Unempl_{it}+\gamma_4 TradeOpen_{it}+\gamma_5 Tax_{it}+\gamma_6 ForeignDI_{it}+\gamma_7 Arable_{it}+\gamma_8 CorruptionPI_{it}+\epsilon_{it}$$

The linear negative relationship hypothesis holds if the FiDI have negative sign, therefore we expect $\beta_2 < 0$ to justify this negative relationship.

Estimation results of the linear hypothesis are reported in Table 6.1. It is shown that, for the panel including all developing and developed countries, the financial development index is negative and significant at the 5% level in specification (1) and at the 10% level for specifications (2) and (3), which suggests that income inequality is lower in countries with better-developed financial sector.

We reach similar results with developing and developed countries. Panel estimations for developing countries show that coefficient for financial development index is negative and significant for all specifications and significant at the 10% level for all kinds of specifications. Developed country estimates justify these findings with negative and significant coefficients for financial development; at 10% significance level for specifications (1) and (2) and 5% level for specification (3). Therefore, our empirical results show that financial development can significantly reduce income inequality regardless of the degree of development, which provides strong support to the linear hypothesis.

Next we examine the existence of Kuznets curve for our model. We expect $\beta_3 > 0$ and $\beta_4 < 0$ to suggest Kuznets curve is relevant for the model. We find strong evidence for Kuznets inverted u-shaped relationship between development and inequality for the panel including all countries and the panel for developing countries. We find that the linear term of per capita GDP has positive sign and squared term has negative sign and statistically significant at 10% significance level.

However results for developed countries show that linear term for GDP per capita has negative sign and squared term has positive sign and statistically significant at 10% significance level. Such results imply a u-shaped relationship between financial development and income inequality. Hence it is possible to infer from this result that in developed countries higher GDP per capita values should indicate lower values of Gini, i.e. a more equal distribution of income. This result is also validated by Kuznets (1955) that in wealthier countries, economic development narrowed the disparity between the rich and the poor. It also suggest that a period of rising inequality is likely to reverse over the long-run as some of the countries that capture the minimum turning point in early years show evidence of improvement in income distribution in recent years (Angeles- Castro, 2006).

We examined for the Kuznets curve by including squared and linear terms of GDP per capita together. We exclude the squared term of GDP per capita in specification (4) to examine the effect of GDP per capita on income inequality. We find negative and insignificant effect of GDP per capita on income inequality for all panels. This result imply that in countries, irrespective of development levels, a relative measure such as the Gini coefficient might not be a telling measure of income inequality. An absolute measure of income inequality might have given significant results in explaining the link between GDP per capita and income inequality. This finding is not surprising since modern theories which try to explain the link between income inequality present ambiguous effects and are unable to predict a clear direction.

As for the control variables, a negative and statistically significant impact of trade openness on inequality is reported in estimation results, which indicates that the increase in trade openness has attenuated income inequality in all countries and developing countries. However trade openness seems to be significant only in specifications (2) and (3) for developing countries panel at 10% significance level. Moreover, empirical evidence also suggests that taxes on income have positive and significant effect on income inequality in specifications (2) and (3) of developing countries at 5% significance level. The results are not significant for the whole panel and developed countries.

Table 6.1: Estimation results and specification tests for the linear hypothesis[8]

	All countries				*Developing countries*				*Developed countries*			
Variables	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Gini (L1)	0.513	0.581	0.480	0.518	0.462	0.652	0.704	0.582	1.005	1.035	0.978	0.157
	(0.000)* **	**(0.000)*** **	**(0.001)*** **	**(0.028)** **	**(0.051)** **	**(0.000)*** **	**(0.000)*** **	**(0.074)* **	**(0.000)*** **	**(0.000)*** **	**(0.000)*** **	(0.876)
FiDI	-0.306	-0.428	-0.358	-0.175	-2.115	-0.979	-0.913	-1.104	-0.351	-0.178	-0.389	-1.394
	(0.053) **	**(0.109)* **	**(0.097)* **	(0.415)	**(0.104)* **	**(0.104)* **	**(0.109)* **	(0.631)	**(0.072)* **	**(0.081)* **	**(0.028)** **	(0.489)
GDPPC	1.232	1.995	1.861	-0.008	7.135	3.089	3.151	-0.066	-0.555	-0.463	-0.600	-0.078
	**(0.078)* **	**(0.101)* **	**(0.098)* **	(0.709)	**(0.058)* **	**(0.057)* **	**(0.062)* **	(0.643)	**(0.060)* **	**(0.023)** **	**(0.099)* **	(0.691)
Sq. GDPPC	-0.066	-0.109	-0.101		-0.364	-0.169	-0.173		0.031	0.025	0.033	
	**(0.078)* **	**(0.096)* **	**(0.096)* **		**(0.058)* **	**(0.058)* **	**(0.063)* **		**(0.058)* **	**(0.003)*** **	**(0.096)* **	
SchoolEnroll	-0.030				-0.202				-0.022			
	(0.396)				(0.121)				(0.475)			
HealthExp		0.041				0.053				-0.014		
		(0.362)				(0.430)				(0.568)		
Unemp	-0.059	0.003	-0.03	0.043	-0.048	-0.037	-0.031	0.393	0.005	0.007	-0.003	-0.257
	(0.238)	(0.976)	(0.471)	(0.441)	(0.612)	(0.400)	(0.343)	(0.416)	(0.913)	(0.764)	(0.856)	(0.582)
TradeOpen		-0.019	-0.092	-0.020		-0.198	-0.167	0.293		-0.006	-0.011	-0.066
		(0.894)	(0.111)	(0.819)		**(0.067)* **	**(0.097)* **	(0.521)		(0.831)	(0.672)	(0.820)
Tax	0.004	0.028	0.027	-0.007	0.154	0.187	0.162	0.026	0.000	-0.001	0.001	0.023
	(0.765)	(0.458)	(0.386)	(0.891)	(0.153)	**(0.027)** **	**(0.020)** **	(0.743)	(0.951)	(0.614)	(0.773)	(0.508)
ForeignDI	0.005	-0.008	-0.001	0.042	0.012	-0.000	0.005	0.002	-0.009	-0.002	-0.014	-0.075
	(0.854)	(0.373)	(0.854)	(0.969)	(0.661)	(0.946)	(0.722)	(0.946)	(0.405)	(0.866)	(0.208)	(0.677)
Arable	0.016	-0.004	0.007	0.004	-0.033	-0.003	-0.003	-0.032	-0.002	-0.004	0.002	0.006
	(0.458)	(0.837)	(0.529)	(0.857)	(0.268)	(0.873)	(0.849)	(0.568)	(0.723)	(0.438)	(0.659)	(0.911)
CorruptionPI	-0.167		-0.053	0.004	-0.013		0.006	-0.097	0.025		0.027	-0.221
	(0.038) **		(0.553)	(0.969)	(0.842)		(0.796)	(0.546)	(0.267)		(0.232)	(0.529)
AR(1)	-2.21	-2.75	-2.53	-2.07	-2.19	-1.87	-1.82	-1.56	-2.55	-2.96	-2.93	-0.83
	(0.027)	(0.006)	(0.011)	(0.038)	(0.028)	**(0.062)**	**(0.069)**	**(0.120)**	(0.011)	(0.003)	(0.003)	**(0.405)**
AR(2)	-0.04	0.29	0.36	0.26	-0.43	-0.55	-0.52	-0.09	-0.31	0.56	0.74	0.59
	(0.968)	**(0.772)**	**(0.716)**	**(0.792)**	**(0.767)**	**(0.585)**	**(0.604)**	**(0.926)**	**(0.759)**	**(0.576)**	**(0.457)**	**(0.556)**
Sargan test	12.19	15.08	4.13	19.99	11.68	21.14	23.72	11.63	2.98	3.34	11.22	1.13
	(0.352)	**(0.089)**	**(0.248)**	**(0.067)**	**(0.307)**	**(0.070)**	**(0.049)**	**(0.235)**	**(0.703)**	**(0.503)**	**(0.190)**	**(0.569)**
Hansen test	2.54	6.00	0.29	9.36	0.77	0.58	0.96	5.04	2.11	3.20	7.72	0.14
	(0.996)	**(0.740)**	**(0.962)**	**(0.672)**	**(1.000)**	**(1.000)**	**(1.000)**	**(0.831)**	**(0.834)**	**(0.525)**	**(0.461)**	**(0.932)**

[8] ***, **, and * show significance at the level 1%, 5%, and 10%, respectively.

Values reported in paranthesis are P> l t l

Specification (1) controls for the school enrollment and (2) controls for the health expenditures while (3) includes all other independent variables and (4) controls for GDPPC without its squared term.

Results for other control variables show only weak evidence on income inequality. The expected relationships with schooling and health expenditure seem to be insignificant for all panels. There is negative relationship between tertiary school enrollment and income inequality: increase in school enrollment decreases Gini coefficient resulting in a more equal distribution of income. However the results are insignificant for all panels. Similarly, one would expect increase in health expenditures to decrease inequality, however the panel results including all countries and the developing countries only shows a positive and insignificant relationship between health expenditures and income inequality. Panel for all developed countries shows negative and insignificant relationship.

Unemployment, foreign direct investment and arable land have insignificant effects on income inequality, however these results are not informative since we reached controversial results with coefficients; negative for some and positive for some specifications, however insignificant for all specifications. Corruption perceptions index is found to have negative and significant effect on income inequality only in the first regression of the panel with all developing and developed countries. However it is insignificant with controversial results for other specifications of all panels.

For each regression, we test the specification of equation with the Sargan/Hansen test of over identifying restrictions, and then with the Arellano-Bond test for the first and second order serial correlation. The test results represented in 6.1 show that all of the specifications satisfy the specification tests, which indicates that our instruments are valid and there exists no evidence of second order serial correlation in our regressions.

6.2 Results for the Inverted u-shaped Hypothesis

The Greenwood-Jovanovic hypothesis of an inverted U-shaped relationship between finance and inequality is tested by adding squared terms of financial variables and thus the regression model can be reconstructed as follows:

$$Gini_{it} = \alpha + \beta_1 Gini_{i,t-1} + \beta_2 FiDI_{it} + \beta_3 FiDI_{it}^2 + \beta_4 GDPPC_{it} + \beta_5 GDPPC_{it}^2 + \gamma_1 SchoolEnroll_{it} + \gamma_2 HealthExp_{it} + \gamma_3 Unempl_{it} + \gamma_4 TradeOpen_{it} + \gamma_5 Tax_{it} + \gamma_6 ForeignDI_{it} + \gamma_7 Arable_{it} + \gamma_8 CorruptionPI_{it} + \epsilon_{it}$$

Empirical results are presented in Table 6.2. In all specifications we find that the coefficients of both the financial development index and its squared terms are never statistically significant in all three panels. Therefore, our empirical results offer weak support to the inverted u-shaped hypothesis.

We expect $\beta_3 > 0$ and $\beta_4 < 0$ to suggest Kuznets curve is relevant for the model and it proves to be significant for developing countries, with positive sign of the linear term of GDP per capita and the negative sign of the squared term. The panel including all countries has the correct signs, results are not significant. We observe significant results for developed countries, however they do not indicate an inverted u-shaped hypothesis but as in the case of linear hypothesis, a u-shaped hypothesis with a negative linear term and a positive squared term of GDP per capita.

Testing for the effect of GDP per capita on income inequality, in specification (4), we find positive and insignificant effect. We reached negative and insignificant effect when testing for linear hypothesis. Such empirical findings may just reflect that in some countries the positive effects dominate the negative ones while in others the negative ones are stronger overall with no general trend.

Testing for other control variables yields almost similar results with the linear hypothesis. Trade openness have negative and significant effect on income inequality regarding regression (3) of developing country panel at 10% significance level, however insignificant in all other specifications. Similar to the findings of linear hypothesis, taxes on income has positive sign and statistically significant in regression (2) of developing country panel at 10% significance level. However, it is not significant in the rest of the specifications. School enrollment has negative and insignificant relationship with income inequality. Similar to results for the linear hypothesis, health expenditures have positive and insignificant effect on income inequality for the whole panel and developing countries, but a negative effect for developed countries.

Table 6.2: Estimation results and specification tests for the u-shaped hypothesis[9]

	All countries				*Developing countries*				*Developed countries*			
Variables	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Gini (L1)	0.527	0.567	0.672	0.530	0.754	0.555	0.561	0.597	1.016	0.979	0.978	1.042
	(0.000)* **	**(0.000)*** **	**(0.000)*** **	**(0.002)*** **	**(0.000)*** **	**(0.010)*** **	**(0.002)*** **	**(0.000)*** **	**(0.000)*** **	**(0.000)*** **	**(0.000)*** **	**(0.000)*** **
FiDI	-3.860	-7.327	-13.063	12.098	-19.161	-3.543	-6.047	2.581	0.499	-2.958	-0.368	1.138
	(0.757)	(0.465)	(0.328)	(0.263)	(0.292)	(0.725)	(0.451)	(0.803)	(0.926)	(0.266)	(0.917)	(0.828)
Sq. FiDI	1.411	2.727	5.055	-4.961	7.032	1.195	2.234	-1.205	-0.319	1.028	-0.008	-0.476
	(0.776)	(0.494)	(0.339)	(0.246)	(0.333)	(0.771)	(0.511)	(0.790)	(0.876)	(0.286)	(0.995)	(0.804)
GDPPC	1.743	2.462	3.206	0.041	8.928	3.841	4.053	0.027	-0.540	-0.382	-0.601	0.019
	(0.399)	(0.116)	(0.124)	(0.485)	**(0.103)***	**(0.098)***	**(0.097)***	(0.539)	**(0.098)***	**(0.095)***	**(0.058)***	(0.552)
Sq.GDPPC	-0.095	-0.136	-0.177		-0.495	-0.214	-0.225		0.030	0.020	0.033	
	(0.408)	(0.114)	(0.123)		**(0.106)***	**(0.104)***	**(0.099)***		**(0.089)***	**(0.103)***	**(0.054)***	
SchoolEnroll	-0.032				-0.026				-0.025			
	(0.331)				(0.129)				(0.425)			
HealthExp		0.043				0.029				-0.020		
		(0.355)				(0.780)				(0.459)		
Unemp	-0.028	0.0613	0.049	-0.075	-0.107	-0.010	-0.013	0.037	-0.000	0.009	-0.003	-0.007
	(0.620)	(0.692)	(0.674)	(0.759)	(0.361)	(0.792)	(0.787)	(0.400)	(0.995)	(0.653)	(0.894)	(0.809)
TradeOpen		0.015	0.019	-0.019		-0.179	-0.186	0.080		-0.001	-0.011	0.014
		(0.917)	(0.867)	(0.943)		**(0.056)***	(0.168)	(0.471)		(0.952)	(0.678)	(0.789)
Tax	-0.000	0.013	0.007	0.045	-0.071	0.160	0.146	-0.011	0.001	-0.004	0.001	-0.000
	(0.987)	(0.781)	(0.886)	(0.170)	(0.735)	**(0.039)** **	(0.161)	(0.829)	(0.905)	(0.380)	(0.798)	(0.998)
ForeignDI	0.004	-0.011	0.026	0.007	-0.025	-0.051	-0.047	0.019	-0.008	-0.005	-0.014	0.004
	(0.744)	(0.252)	(0.548)	(0.437)	(0.744)	(0.383)	(0.327)	(0.758)	(0.495)	(0.445)	(0.199)	(0.864)
Arable	0.004	-0.016	-0.018	0.023	-0.001	-0.021	-0.008	-0.006	-0.001	-0.004	-0.002	0.000
	(0.815)	(0.500)	(0.541)	(0.453)	(0.973)	(0.336)	(0.721)	(0.815)	(0.883)	(0.367)	(0.697)	(0.945)
CorruptionPI	-0.093		-0.004	-0.099	0.039		0.015	-0.058	0.024		0.027	-0.003
	(0.324)		(0.973)	(0.553)	(0.653)		(0.749)	(0.195)	(0.303)		(0.199)	(0.892)
AR(1)	-2.25	-2.65	-2.22	-2.63	-1.72	-2.07	-2.09	-1.65	-2.57	-2.96	-2.93	-2.87
	(0.024)	(0.008)	(0.026)	(0.009)	**(0.085)**	(0.038)	(0.037)	**(0.100)**	(0.010)	(0.003)	(0.003)	(0.004)
AR(2)	-0.04	0.09	0.20	0.22	-0.19	-0.88	-0.95	-0.26	-0.33	0.70	0.74	0.43
	(0.971)	**(0.929)**	**(0.845)**	**(0.827)**	**(0.853)**	**(0.378)**	**(0.343)**	**(0.793)**	**(0.740)**	**(0.485)**	**(0.458)**	**(0.665)**
Sargan test	11.27	12.54	11.93	13.72	16.34	14.26	14.62	12.90	3.01	0.035	11.22	12.13
	(0.337)	**(0.129)**	**(0.103)**	**(0.056)**	**(0.090)**	**(0.113)**	**(0.102)**	**(0.075)**	**(0.699)**	**(0.999)**	**(0.130)**	**(0.059)**
Hansen test	2.82	7.04	5.39	3.38	0.07	2.99	3.50	3.39	3.00	1.33	7.71	7.99
	(0.985)	**(0.533)**	**(0.613)**	**(0.848)**	**(1.000)**	**(0.965)**	**(0.941)**	**(0.846)**	**(0.699)**	**(0.970)**	**(0.359)**	**(0.239)**

[9] ***, **, and * show significance at the level 1%, 5%, and 10%, respectively.

Values reported in parantheses are P> l t l

Specification (1) controls for the school enrollment and (2) controls for the health expenditures while (3) includes all other independent variables and (4) controls for GDPPC without its squared term.

Results for unemployment, foreign direct investment and corruption perceptions index yield controversial and insignificant results and are not very informative. They all have negative and insignificant effect on income inequality for all three panels. Arable land have insignificant and negative effect on income inequality.

According to Sargan/Hansen tests and Arellano-Bond autocorrelation tests presented in Table 6.2, we observe that all specifications satisfy necessary conditions. It indicates that our instruments are valid and there exists no evidence of second order serial correlation in our regressions.

6.3 Persistence of Shocks and Existence of Unit Root

The linear negative hypothesis suggests that long-run convergence in the income levels of the rich and the poor will not necessarily happen in economies with capital market imperfections and indivisibilities in investment in human or physical capital. Depending on the initial wealth distribution, income inequality might persist. Since we found evidence supporting the linear negative relationship, we also need to control for the persistence of income inequality as suggested by this school.

We incorporate the human capital approach to inequality because parents maximize their profits by investing human and non-human capital of their children. The income of children increases as they receive more capital from their families. On the other hand, their income also raises by endowments such as abilities, family reputation and connections etc. which is called “inequality in luck” by Becker and Tomas (1979). So, the equilibrium income of children is determined by their market endowed luck, the own income and the endowment of parents, and the two parameters: the degree of inheritability and the propensity to invest in children (Becker and Tomes, 1979).

If these parameters were both less than unity, the distribution of income between families would approach a stationary distribution. As the inequality in the distribution of market and endowed luck and the degree of inheritability increases the stationary coefficient of variation would be greater. In particular, income inequality would

increase if the rate of growth in average income increased or if rates of return on investments decreased. We expect inheritance to raise inequality and make it more persistent in the long run.

Such findings are validated by the findings of Galor and Zeira (1993). They suggest that agents live for two periods and they can either work as unskilled labors for both periods, or make an indivisible investment in human capital in the first period and then work as skilled labors in the second period. However, given capital market imperfections, only individuals with bequests larger than the investment amount or who can borrow will be able to make this investment. This results in income inequality that is perpetuated through bequests to the next generation.

The coefficient of regression of the dependent variable on the lag of dependent variable might be informative about the existence of unit root. If the coefficient is near one, we might suspect unit root (Beck, 2001). To test this we included the lagged dependent variable, the first lag of Gini coefficient as an independent variable. Referring to regression results reported in Table 6.1 and Table 6.2, coefficients on lagged Gini are close to 1 for some specifications. So, we might suspect unit root and run tests for unit root for all three panels separately.

Given a fixed time span of data, the purpose of unit root testing is to describe the degree of persistence in a given sample (Volters and Hassler, 2006). Therefore we test for the existence of unit root in order to examine the persistence of shocks on income inequality over the years.

A variety of tests for unit roots (or stationarity) are available for panel datasets. The Levin– Lin–Chu (2002), Harris–Tzavalis (1999), Breitung (2000); Breitung and Das 2005), Im–Pesaran–Shin (2003), and Fisher-type (Choi 2001) tests have as the null hypothesis that “all the panels contain a unit root” and the alternative hypothesis that “all the panels are (trend) stationary”. The Hadri (2000) Lagrange multiplier (LM) test assumes the null hypothesis that all panels are stationary versus the alternative that at least some of the panels contain unit roots.

We consider a simple panel data model with a first-order autoregressive component:

$$y_{it} = p_i\, y_{i,t-1} + z_{it}\gamma_i + \epsilon_{it} \qquad (9)$$

where i = 1,…….N indexes panels; t = 1,……., T_i indexes time; y_{it} is the variable being tested; and ϵ_{it} is a stationary error term. The z_{it} term can represent panel-specific means and a time trend, or nothing. By default, $z_{it} = 1$, so that the term $z_{it}\gamma_i$ represents panel-specific means (fixed effects). The Im–Pesaran–Shin, Fisher-type and Hadri LM tests allow unbalanced panels, while the remaining tests require balanced panels so that $T_i = T$ for all i.

Panel unit-root tests are used to test the null hypothesis $H_0 : \rho_i = 1$ for all i versus the alternative $H_a : \rho_i < 1$. Depending on the test, H_a may hold, for one i, a fraction of all i or all i; the output of the respective test precisely states the alternative hypothesis. Equation (9) is often written as:

$$\Delta y_{it} = \phi_i\, y_{i,t-1} + z_{it}\gamma_i + \epsilon_{it}$$

so that the null hypothesis is $H_0 : \phi_i = 0$ for all i versus the alternative H_a: $\phi_i < 0$.

The various panel unit-root tests differ in several key aspects. First, the Levin–Lin–Chu, Harris–Tzavalis, and Breitung tests make the simplifying assumption that all panels share the same autoregressive parameter so that $\rho_i = \rho$ for all i. The other tests however, allow the autoregressive parameter to be panel specific. Imposing the restriction that $\rho_i = \rho$ for all i implies that the rate of convergence would be the same for all countries, an implication that is too restrictive in practice.

Second, the various tests make differing assumptions about the rates at which the number of panels, N, and the number of time periods, T tend to infinity or whether N or T is fixed. The size of the sample will determine which test is most appropriate in a given situation. If a dataset has a small number of panels and a large number of time periods, then a panel unit-root test that assumes that N is fixed or that N tends

to infinity at a slower rate than T will likely perform better than one that is designed for cases where N is large.

All three panels are strongly balanced and the panel including all countries have N=60 and T=11 while developing country panel have N=24 and T=11 and developed country panel have N=36 and T=11. We have large number of panels and small number of time periods, so tests whose asymptotic properties are established by assuming that T tends to infinity can lead to incorrect inference. Harris-Tsavalis (1999) derived a unit-root test that assumes that the time dimension, T, is fixed. Their simulation results suggest that the test has favorable size and power properties for N greater than 24, and they report that power improves faster as T increases for a given N than when N increases for a given T. The asymptotic distribution of the test statistic is justified as $N \rightarrow \infty$, so a relatively large number of panels is required when using this test. Considering the asymptotic properties of the test, the most appropriate unit root test is Harris–Tzavalis (HT) for all three panels.

We run the HT panel unit-root test to test the null hypothesis $H_0 : \rho_i = 1$ for all i versus the alternative $H_a : \rho_i < 1$. The null hypothesis H_0 is specified as "panels contain unit roots" against the alternative hypothesis H_a that "panels are stationary". As obvious from Table 6.3 below, we strongly reject the null hypothesis of a unit root and conclude that the series are stationary for all three panels. The point estimates of ρ are 0.4200 for the panel including all countries, 0.4266 for the developing country panel and 0.4113 for the developed country panel and the z statistics are -10. 0759, -6.2447 and -8.0103, respectively.

Table 6.3: Results for Harris–Tzavalis (HT) unit root test

AR parameter: common			Asymptotics: N-> Infinity
Panel means: included			T Fixed
Time trend: not included			Cross-sectional means removed
	z	***statistics***	***p-value***
Panel (N=60, T=11)	-10.0759	0.4200	**0.0000**
Developing (N=24, T=11)	-6.2447	0.4266	**0.0000**
Developed (N=36, T=11)	-8.0103	0.4113	**0.0000**

As far as persistence is measured by how much of the current innovation gets passed into the levels of the series, the basic idea is that for a random walk the innovation gets entirely passed (Bianchi, 1991). Cochrane (1988) proposes a measure of persistence derived from the unit root test results. He shows that any series with a unit root can be seen as a combination of a stationary component and a random walk (Libanio, 2005). However, not fully comprehensive about the extent and reasons of persistence, unit root tests are used as a simple measure of persistence of shocks. Since unit roots are thought of as generalizations of random walks, they indicate the persistence of shocks. Our series do not have a unit root it implies that shocks on income inequality do not persist.

CHAPTER 7

CONCLUSIONS

In the present study, we attempt to test alternative theoretical hypotheses on financial development-income inequality link with the help of a new panel dataset covering 60 developing and developed countries over the period of 2000-2010. We empirically investigate the impacts of financial development on income inequality. We find that financial development can significantly help to reduce income inequality for countries. In order to enhance the role of finance in reducing inequality which is further driven by the recent and current economic crises and to improve the condition of income distribution in countries, further steps have to be forwarded to accelerate countries' financial development, and effective policy measures should also be taken to strengthen financial systems.

Our empirical findings provide strong evidence for the linear hypothesis but not to the inverted u-shaped hypothesis. Such findings are also consistent with the findings of Liang (2006), Clarke *et al. (*2006), Batuo *et al.* (2010) and Shahbaz and Islam (2011). We find that, financial development can significantly reduce income inequality irrespective of the degree of development of countries.

We also find evidence for the relevance of Kuznets inverted u-shaped relationship between development and inequality testing for linear hypothesis. So we support the finding that as countries experience economic development, the income inequality first increases and then decreases. However, results are not significant while testing for inverted u-shaped hypothesis regressions. We also find a u-shaped relationship for developed countries only, rather than an inverted u-shaped relationship. It indicates that Kuznets curve is not relevant for developed countries. This finding is consistent with some other studies. Angeles- Castro (2006) suggests that a period of rising inequality is likely to reverse over the long-run as some of the countries that capture the minimum turning point in early years. It is also noted that the period of rising inequality starts earlier on average in countries which are associated with

macroeconomic stability, high governance, moderate expansion of trade and FDI compared to the rest of the countries. Such findings might help explain the u-shaped relationship between GDP per capita and income inequality for developed countries.

Testing for the effect of GDP per capita on income inequality without its squared term, we find negative and insignificant relation in estimation results testing for linear hypothesis. We find positive and insignificant relation in inverted u-shaped hypothesis. Such findings might imply that Gini coefficient is not the best measure of income inequality in reflecting the effect of GDP per capita on income inequality. It can also be argued that Gini index does not fully comprehensive measure of the income distribution since household level data used in measuring Gini index might not reflect the actual earned income. Modern theories cannot determine a clear link and present ambiguous effects. The conflicting signs also reflect that in some countries the positive effects dominate the negative while in others the negative ones are stronger overall with no general trend.

As of the control variables, almost all control variables proved to be insignificant in explaining income inequality. Some of the control variables are found to have significant effect on income inequality but only for some regressions. Despite controversial results of recent literature in explaining the relationship between trade openness and income inequality, our findings support the reducing effect of trade openness on income inequality. Our findings for taxes on income and corruption also support the recent literature that they reduce income inequality. Trade openness, taxes on income and corruption are found to be insignificant in other specifications. Control variables other than these variables yield conflicting and insignifiant results also and makes it hard to reach a conclusion. Nonetheless, these findings support Cornia and Court (2001)'s suggestion that traditional causes are not responsible of income inequality but rather "new" are crucial in developing countries where liberal economic regimes and policies implemented in large scale in the 1980s and 1990s such as new technology, trade liberalization, financial liberalization, privatization and distribution of industrial assets, changes in labor market institutions etc.

Last of all, we examined the persistence of shocks on income inequality since we found evidence for the linear negative hypothesis which suggests that depending on the initial wealth distribution, income inequality might persist. Unit root tests are used as a simple measure of persistence of shocks on inequality. Tests for unit root indicate that there is no unit root which implies that shocks on income inequality do not persist. Such a finding means that income inequality is stationary around its long run trend.

The present study does not fully analyze the reasons and the extent of persistence of shocks on inequality. Testing for the existence of unit root only helps gain an insight on persistence of shocks. On the other hand, it is of dispute whether a panel including only ten years of data is sufficient to reach broad conclusions about the existence and reasons of persistence of shocks on inequality.

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Appendix A: TEZ FOTOKOPİSİ İZİN FORMU

ENSTiTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☐

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : AKBIYIK

Adı : CEREN

Bölümü : İKTİSAT

TEZiN ADI (İngilizce) : CROSS COUNTRY EVIDENCE ON FINANCIAL DEVELOPMENT- INCOME INEQUALITY LINK

TEZiN TÜRÜ : Yüksek Lisans ☐ Doktora ☐

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. ☐

TEZiN KÜTÜPHANEYE TESLiM TARiHi: 05.10.2012