The Role and Impact of Financial Sector Aid on Financial Development and Poverty Reduction

By

KIM, JI MI

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

MASTER OF DEVELOPMENT POLICY

2015

The Role and Impact of Financial Sector Aid on Financial Development and Poverty Reduction

By

KIM, JI MI

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

MASTER OF DEVELOPMENT POLICY

2015

Professor Kye-Woo Lee

The Role and Impact of Financial Sector Aid

on Financial Development and Poverty Reduction

By

KIM, JI MI

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

MASTER OF DEVELOPMENT POLICY

Committee in charge:

Professor Kye Woo LEE, Supervisor

Professor Wook SOHN

Professor Shu Chin LIN

Approval as of April, 2015

Abstract

The Role and Impact of Financial Sector Aid on Financial Development and Poverty Reduction

By

Ji-Mi Kim

The paper empirically considers the impact of financial aid on the financial development and poverty reduction, which is closely related to the quality of policy. I build a panel of 77 developing countries and study 1974 to 2011 using econometric methodology, including system-GMM. I find that financial sector aid can be a driver of poverty reduction with sound policy : Financial sector aid has a significantly positive impact on developing countries.

TABLE OF CONTENTS

List of Tables

I. Introduction

1.1 Purpose of the research

The main purpose of this study is to identify the role of financial sector aid in developing countries and to analyze its impact on reducing poverty of the developing countries between 1977 to 2011.

1.2 Background of the study

Many economists examine the relationship between financial development and economic growth (Gurley and Shaw, 1960; King and Levine, 1993; Levine, 2004; Apergis, Filippidis, and Economidou, 2007; Chea, 2011; and Chee, 2010), but the research on financial development and poverty reduction is scarce (except for Dollar and Kraay, 2002; Honohan, 2004; and Beck, Demirgüç-Kunt, and Levine, 2007).

Dallar and Kraay(2002) assessed the impact of economic growth on poverty reduction by using several determinants of growth, such as a good rule of law, openness to international trade, and developed financial markets. Honohan(2004) found financial depth is negative with headcount poverty rates, even after accounting for the average income and the share going to the top income groups. He emphasized finance-intensive growth is pro-poor. Beck, Demirgüç-Kunt, and Levine(2007) analytically explained the impact of financial development on the distribution of income and changes in both relative and absolute poverty. They found the impact of the financial development on the poor is due to the effect of financial development on accumulated economic growth.

1.3 Statement of the problem

It is no wonder that financial sector aid affects financial development, because goals and targeted financial sector development priorities are aligned. But research on the relationship between financial sector aid and poverty reduction is lacking. To analyze this

issue, I researched two approaches. First, the direct channel to poverty reduction, i.e. poor people's access to financial services. Second, the indirect channel to poverty reduction, i.e. financial development affects economic growth, which in turn results in poverty reduction.

Methodologically speaking, previous empirical studies use the panel data analysis with a lot of financial development variables. But they have highly correlated and overlapped variables (Table 2). In this paper, I conducted dimensionality reduction, using principal component analysis, then I implemented Oridinary Least Square (OLS) and instrumental variable (IV) regressions. This paper's results contribute to poverty reduction literature by inquiring the possible impact of financial sector foreign aid on poverty reduction over a longer duration.

1.4 Research question

This study will address two research questions:

- Does aid contribute to enhancing financial development and poverty eradication in developing countries? If so, how large is the impact?
- Does the effectiveness of financial sector aid on poverty reduction depend only on sound legal environment or geographical region (latitude-wise)?

1.5 Hypothesis of the Study

This paper advances the following hypothesis as the research question "*Aid improves growth by relaxing financing constraint, which allows the government to finance investment in physical and human capital that promotes growth*." (Morrissey, 2002)

I assume that financial development helps alleviate poverty indirectly by encouraging growth and directly by promoting transactions and enabling the poor to benefit from financial services that increase their income, reduce transaction costs and enhance their capacity to engage in beneficial investments.

1.6 Importance of the Study

The core goal of the Millennium Development Goals (MDGs) is world poverty eradication by half between 1990 and 2015. Sachs (2012) expressed widespread poverty, health, hunger, disease, gender inequality, and environmental degradation can be eliminated. At the Rio+20 summit in 2012, UN general assembly issued a report recommending that the world adopt Sustainable-Development Goals (SDGs). The 17 goals of the SDGs include development finance. Inclusive financial systems provide savings, credit, payment, and risk management (Ryou, Joo and Han, 2012). It will lead to improvement of income distribution and economic growth. Therefore, it is important that financial sector aid must be directed to improvements in financial sector development in developing countries.

The result of this study is found to be robust for different models and statistical tests. Thus, Policy makers can utilize the information generated in this study to design appropriate policies towards official development assistance (ODA) for developing countries. It can also serve as a reference to subsequent research works in the area of financial sector aid and poverty reduction in the context of developing countries. More importantly, it confirms or verifies the results, arguments, and policies based on the Panel data studies.

II. Literature review

There are two channels through which financial sector development can impact poverty reduction: One works indirectly through growth, and another directly through the poor benefiting from accessing financial services. (Claessens and Feijen, 2006).

2.1 Review of Theoretical literature

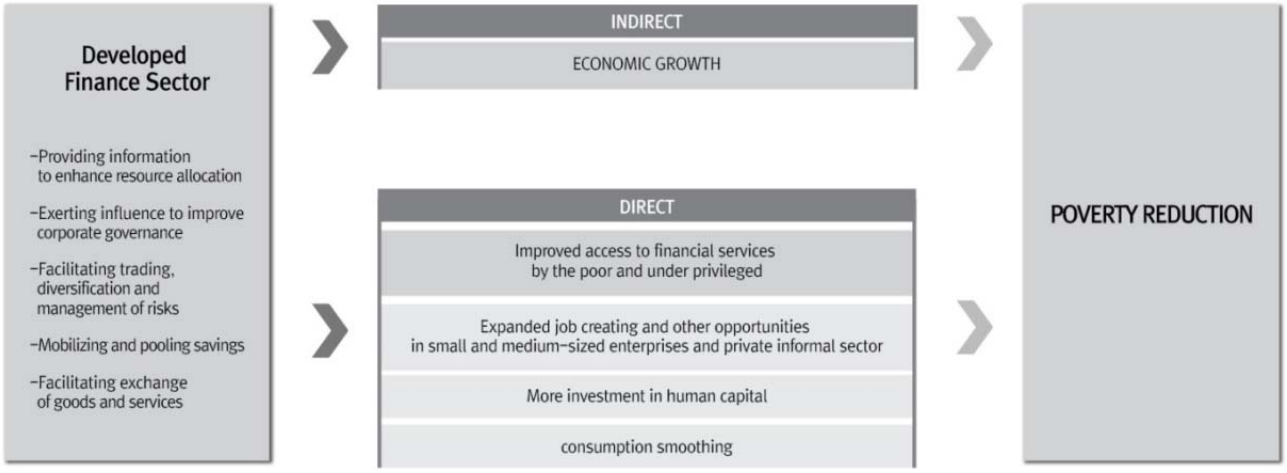


Figure 1 Source: Adapted from Claessens and Feijen(2006)

2.1.1 The direct channel to poverty reduction: access to financial services

Many people believe that financial sector development can directly contribute to alleviating poverty by expanding poor people's opportunity to use financial services. Aghion and Bolton(1997) argued that most economists presume that financial sector development will have an unfairly small beneficial impact on the poor. Because informational asymmetries make credit constraints that are unusually impinging on the poor, they are excluded from access to capital for their own business, or to access bank credit.

These credit constraints limit the poor from utilizing investment opportunities, thus slowing growth by constraining capital from available means on time. A deficient financial system might also exacerbate income inequality by disproportionately preventing capital from "wealth-deficient" entrepreneurs. Financial development decreases information asymmetry and transaction costs, so (i) allows more market participants—especially those destitute—to access external finance, (ii) boosts the allocation of capital, and (iii) expends particularly large impact on the poor. As a consequence of improved access to credit, the poor have the opportunity to take part in more productive ventures, which in turn grow their

incomes. Giving credit access chance to the poor has a particularly important impact on poverty alleviation. Access to financial services also empower the poor to better respond to economic or social confusion, diminishing the likelihood of falling into poverty when such confusion occurs.

However, there are also suspicious views on whether financial development can lead to an expanded access to finance by the poor, specially at entry stages. Haver (2008) argue that it is the rich and politically connected who would benefit from financial development. In this way, it is debatable whether financial sector development will enlarge or diminish income disparities even if it boosts accumulated growth. Some economists insist on a nonlinear relationship between finance and income distribution. Greenwood and Jovanovic (1990) show how the interaction of economic development can give rise to an inverted U-shaped curve of income inequality (building on the Kuznets' hypothesis) and financial intermediary development. At the entry stages of financial sector development, only the few wealthy entrepreneurs enter the financial markets, and therefore monopolizing higher-return projects. However, with cumulative economic growth, more people can afford to enter the orderly financial system, with positive consequence on economic growth. With economic success, everyone can take part in the financial system.

2.1.2 The Indirect Channel to poverty reduction through Economic Growth

A major indirect channel by which financial development encourages poverty reduction is by means of economic growth. It is common that economic growth diminishes absolute poverty. The growth impact on poverty alleviation manifests itself through a number of possible channels. (i) economic growth could provide more jobs to the poor. (ii) it has been proposed that a higher rate of growth could lower the wage distinctions between trained and untrained labor at a later stage of development (Galor and Tsiddon ,1996) which helps the

poor. (iii) high economic growth rate could lead to higher tax revenues, allowing the government to assign more monetary resources on social spendings such as public health, education, and social protection, therefore helping the poor, and the poor could also contribute more to human capital (Perroti, 1993). (iv) accumulation of capital increases with high economic growth (Aghion and Bolton 1997), thus increasing their wages. However, there exists different views on the economic growth and poverty alleviation nexus in the previous literatures. Kuznets (1955, 1963) suggests that economic growth might raise income inequality at the initial stage of development, but lower it at the developed stage of industrialization (It is called Kuznets's inverted-U hypothesis). The rich people who have easy access to finance would drive the early industrialization and thus reap a larger share of the economic pie, leaving the poor underprivileged. On the other hand, the "trickle down" theory figured that economic growth might either "trickle down" to the poor by job creation and other economic lucky coincidences or build the fundamental conditions for the broad distribution of the economic and social benefits of growth (Todaro, 1997).

2.2 Review of Empirical literature

Many studies use cross sectional analysis for estimating growth regression (Barro et al., 1995). However, the restrictive assumption of uncorrelated individual effects in standard cross sectional specification does not hold in dynamic specification of growth model (Caselli et al., 1996). Moreover, according to Rodrik(2005) the cross sectional regression analysis assumes the reforms as exogenous, which can not be justified econometrically or theoretically. Another issue with the cross sectional regression is its inability to control country-specific effects, as all countries in the group are at different stages of the policy variables.

To control the country specific effect, many studies have used the fixed effect regression models. However, both cross sectional and fixed effect models do not take into account the issue of endogeneity present in the growth equations (Caselli et al., 1996).

To deal with the problem of country-specific effects and the problem of endogeneity, I conduct generalized method of moments (GMM) introduced by Holtz-Eakin et al. (1988); Arellano and Bond (1991) and Arellano and Bover (1995) and popularized by Caselli et al. (1996), Levine et al. (2000) and Beck and Levine (2004) in the growth finance literature. We use one-step and two-step versions of system GMM. The system GMM deals with the endogenous components by using lag of the variables as instruments. The one-step estimators assume error term $\epsilon_{i,t}$ to be iid, whereas the two-step estimators allow the error term $\epsilon_{i,t}$ to be heteroscedastic. The two-step procedure in the first step assumes independent error terms, and the second step relaxes the assumption by establishing variance covariance matrix using error terms from the first step. This methodology is also in line with the methodology used by Rousseau and Wachtel (2000) to study relationship between stock market, banks and economic growth.

The equation 1 uses the regression equation of growth for our cross country model used by Beck and Levine (2004)

$$y_{i,t} - y_{i,t-1} = \alpha y_{i,t-1} + \beta \; X_{i,t} + u_i + \epsilon_{i,t} \quad (1)$$

Where, $y_{i,t}$ is poverty indicator; $X_{i,t}$ is a vector of explanatory variables except the initial level of per capita GDP, including our indicators of financial sector development; u_i represents country-specific fixed effects and; $\epsilon_{i,t}$ represents idiosyncratic error, and the subscripts i and t show the country and time period, respectively. To measure the time specific effects, I also include time dummies.

According to Arellano and Bond (1991) differencing equation (1) yields,

$$\left(y_{i,t} - y_{i,t-1}\right) - (y_{i,t-1} - y_{i,t-2}) = \alpha y_{i,t-1} - y_{i,t-2} + \beta \; (X_{i,t} - X_{i,t-1}) + (\epsilon_{i,t} - \epsilon_{i,t-2}) \quad (2)$$

The model explained in equation (2) removes the country-specific effects. Arellano and Bond(1991) show that this specification introduces another bias due to correlation between new error term and lagged dependent variable. With the following two assumptions explained by Arellano and Bond (1991) we can overcome this new bias.

$$E\left[y_{i,t-s}\left(\epsilon_{i,t} - \epsilon_{i,t-1}\right)\right] = 0 \text{ for } s \geq 2; t = 3, \cdots, T \quad (3)$$

$$E\left[X_{i,t-s}\left(\epsilon_{i,t} - \epsilon_{i,t-1}\right)\right] = 0 \text{ for } s \geq 2; t = 3, \cdots, T \quad (4)$$

Bond et al. (2001) argue that the first difference GMM estimators can be misleading in presence of persistent variables, as lagged levels of the series provide weak instruments for subsequent first differences. Therefore, we use system GMM that deals with this problem more effectively. Use of the lagged differences of the instruments, therefore, ensures no correlation between differenced explanatory variables and the error term. We have the following stationary conditions.

$$E[y_{i,t+p}u_t] = E[y_{i,t+q}u_t] \text{ and } E[X_{i,t+p}u_t] = E[X_{i,t+q}u_t] \text{ for all p and q} \quad (5)$$

The further moment conditions are as under,

$$E[(y_{i,t-s} - y_{i,t-s-1})(u_t + \epsilon_{i,t})] = 0 \text{ for } s = 1 \quad (6)$$

$$E[(X_{i,t-s} - X_{i,t-s-1})(u_t + \epsilon_{i,t})] = 0 \text{ for } s = 1 \quad (7)$$

We use moment conditions given in equation (3), (4), (6) and (7) to get GMM system estimators. To check the consistency of the estimators derived from GMM we validate the assumption that the error terms do not show serial correlation and further validate the instruments. For this purpose we use specification tests suggested by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). The first is the Sargan test of over-identifying restriction and the second test is to check if the error term $\epsilon_{i,t}$ is not serially correlated.

To test the impact of financial development on the poverty reduction, I reform the regression as follows. Equation (8) shows the exact specification for this model.

$$Pov_{i,t} = \beta_1 FD_{i,t-1} + \beta_2 FD_{i,t-1} + u_i + \epsilon_{i,t}$$

I conduct instrumental variables (IV) regressions to remove deleted variables and reverse causation biases in the Ordinary Least Squared (OLS) regressions. Although financial development may bring in great rates of poverty reduction, financial sector development might be discouraged by the poverty. There could also be deleted variables that are driving both financial sector development and poverty reduction. Additionally, it is possible that lowered poverty or inequality by developing financial sector development may increase the demand for financial services. In order to choose relevant instruments for the IV regression, it is required to detect variables that are not correlated with the error term of the OLS regression, yet are correlated with financial development. As previous literature successfully

implemented IV regresions, I use the legal origins and latitude variables for IV regressions (Beck, Demirguc-Kunt, and Levine, 2004).

III. Data and Methodology

3.1 Data

This paper compiled data for a sample of 77 developing countries between 1974 - 2011. Developing countries are defined as those classified by the World Bank as low- or middle-income. Excluding developed countries from the sample reduces sample heterogeneity. The sample size and the period of study are limited by the availability of data about poverty and stock market indicators.

3.1.1 Financial Sector Aid

To measure financial sector aid I used OECD CRS data, the CRS (Creditor Reporting System) contains statistics on individual aid activities. Since 1967, this system covers the activities of most OECD DAC(Development Assistance Committee) members as well as multilateral development banks and some UN agencies, in addition to to non-DAC emerging donors. CRS data enables analysis about aid flows, their goals, and targeted policies priorities. The CRS enables tracking of aid commitments and disbursements, and supports establishment of comparable panel data. In particular I assembled data of DAC code 240, which means Banking and Financial Services (OECD/DAC the list of CRS purpose codes, 2011) for financial sector aid.

DAC 5 CODE	CRS CODE	DESCRIPTION	Clarifications / Additional notes on coverage
240		**BANKING AND FINANCIAL SERVICES**	
	24010	Financial policy and administrative management	Finance sector policy, planning and programmes; institution capacity building and advice; financial markets and systems.

	24020	Monetary institutions	Central banks.
	24030	Formal sector financial intermediaries	All formal sector financial intermediaries; credit lines; insurance, leasing, venture capital, etc. (except when focused on only one sector).
	24040	Informal/semi-formal financial intermediaries	Micro credit, savings and credit co-operatives etc.
	24081	Education/training in banking and financial services	

3.1.2 Financial Development

The variables considered as a proxy of the financial development are as follow.

Bank private credit to GDP (%) is the ratio of the financial resources provided to the private sector by domestic money banks as a share of GDP. Domestic money banks are comprised of commercial banks and other financial institutions that accept transferable deposits, such as demand deposits (IMF Financial structure database 2013). *Liquid liabilities to GDP (%)* is the ratio of liquid liabilities to GDP. This ratio is an indicator of the liquidity provision in the economy. It captures the depth of the financial sector as it captures the total size of the financial sector as a percentage of GDP (Beck et al. 1999). The shortcoming of the liquid liabilities is that it does not include the savings allocation, thus that not all activities of financial channel can be precisely accounted for. *Private credit by deposit money banks to GDP (%)* is the financial resources extended to the private sector by domestic money banks as a share of GDP. *Deposit money banks' assets to GDP (%)* is the total assets held by deposit money banks as a share of GDP. Assets include claims on domestic real nonfinancial sector which includes central, state and local governments, nonfinancial public enterprises and private sector. Deposit money banks are comprised of commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. *Private credit by deposit money banks and other financial institutions to GDP(%)* is the percentage of private

credit by deposit money banks and other financial institutions to GDP. This proxy indicates the credit issued on merit and also the promotion of innovation and research and development in an economy. *Bank net interest margin (%)* is the accounting value of bank's net interest revenue as a share of its average interest-bearing (total earning) assets. This indicator measures the efficiency of banking sector. *Bank overhead costs to total assets(%)* is the operating expenses of a bank as a share of the value of all assets held. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax assets, discontinued operations and other assets. *Stock market capitalization to GDP(%)* is the total value of all listed shares in a stock market as a percentage of GDP. It measures the size of the stock market. *Stock market total value traded to GDP (%)* is the total value of all traded shares in a stock market exchange as a percentage of GDP. It measures the activity of the stock market.

3.1.3 Poverty variables

Measuring Poverty is complicated, for it has many dynamic and unstable aspects. Nevertheless, it is often defined in terms of deficient resources or income like insufficience of basic human requirements such as food, clothing, housing, hygienic water and health services. Many literatures mainly use four common indicators of poverty: income share held by the lowest 20%, headcount poverty index, poverty gap and the Gini coefficient.

To examine the impact of financial development on the poor, I examine both income inequality and levels of poverty. I examine levels of poverty to determine if the poor directly benefit from financial services. I examine income inequality to determine if financial services disproportionately benefit one group in society over another. If financial development reduces poverty and income inequality, then the poor disproportionately benefit from improved financial services. If financial development reduces poverty yet increases income

inequality, then there is a trade-off for the poor. The poor benefit from greater absolute levels of consumption, yet they are worse-off compared to the rest of the society.

To measure *income share held by the lowest 20%* we first use the average per capita income of the poorest 20 percent of the population in 1985 constant dollars (logarithmic). The Dollar and Kraay database 8 is relatively rich and contains at least two spaced observations of mean income of the poor in 92 countries (observations within countries are separated by at least five years over the period 1950–1999, the median interval being six years). From this database we select 75 developing countries and 187 observations between 1974 and 2011, though the sample size varies across specifications depending on the availability of data on covariates. *Headcount poverty index* is the percentage of the population living with per capita consumption or income below the poverty line of $1.25 a day. This is the most popular measure of poverty because it represents a measurable metric of people living in improper conditions. *Poverty gap* considers the distance between the poverty line and the average consumption or income per capita for the population living below the poverty line, expressed as a percentage of the total population up to the poverty line. It is a measure of the poverty intensity. Poverty is more severe for countries with larger poverty gaps. The database includes developing countries only, and each country has data reported for years within the range of 1974-2011.

The *Gini index* extracts two alternative specifications of the Lorenz curve in order to arrive at a better representation of the level of inequality. The Gini coefficient of 0 indicates complete equality and a coefficient of 1 indicates a state of total inequality where one person receives all of the income in theory. The data for the income share held by the lowest 20%, the headcount rate, the poverty gap and the Gini index come from the World Bank's PovcalNet Database.

3.1.4 Control variables

I include control variables in attempt to isolate the impact of financial development on the income inequality and poverty measures. *Growth of GDP* equals the annual growth of GDP per capita. Financial development may indirectly reduce poverty by promoting economic growth. I control for Growth of GDP, to be able to investigate the direct effects of financial development on changes in poverty only. *Inflation* equals the annual growth of the Consumer Price Index. I use this variable to control for the economic environment in countries. *Sum of exports and imports as a share of GDP* captures the degree of international openness (Trade openness). *Mobile Cell phone population* is used as a proxy for the extent of economic freedom, as mobile technology helps to promote economic freedom by making financial services accessible to the poor and long term asset accumulation (Diga, 2008). *Population growth* is often used as a proxy for the rate of growth of labor input in the production process. For this reason, the sign of the population growth rate coefficient is unpredicted prior to our empirical investigation. *Government consumption* is the ratio of general governmental final consumption expenditure to GDP. *Education* equals the average growth rate of secondary education enrollment rate and is taken from the World Development Indicators. *Health* is indicator for total health expenditure of GDP(%). Social development (i.e. enhancement in education and health) is one of the core strategic area for sustainable economic growth (ADB, 2001)

3.1.5 Institutional indicator

During the recent years, indicators of *Institutional quality and governance* have flourished, but many of them suffer from limited country and time coverage. Here, to opt for the widely used indicator of institutions—also called CPIA—compiled by Country Policy and Institutional Assessment(CPIA), which rates countries by a set of 16 criteria categorized

in four clusters: economic management, structural policies, policies for social inclusion and equity, and public sector management and institutions. The indicators range from 1(low) to 6(high), with higher figure indicating a better quality and enforcement of the policy and institution (World Bank databank).

3.1.6 Instrument variables

The first instrument is the *Legal Origin* of countries. In a previous literature, it has been shown that legal protection of investors is generally the strongest for English common law countries,with German and Scandinavian civil law countries located in the middle, and French civil law countries being the weakest (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1997), because concentration of ownership of shares in the public companies is adversely related to investor protection. In this paper I use four dummy variables as instruments.

English equals one for countries with English common law legal systems and zero otherwise. German equals one for countries with German common law legal systems and zero otherwise. Scandinavian equals one for countries with Scandinavian common law legal systems and zero otherwise. Likewise, French equals one for countries with French civil law systems and zero otherwise. The legal origin data comes from the Foreign Law Encyclopedia Commercial Laws of the World (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 2008).

The second instrument is *the Latitude*, which equals the absolute value of the latitude of the capital city, nominalized between 0 and 1, for each country. (Beck and Levine, 2005; Beck et al, 2003; Easterly and Levine, 2003; and Levine, 2006). The latitude is used as an estimate for natural resource endowment, which helps explain the development of financial institutions.

3.2 Descriptive Statistics, Correlation, and Scatter Plots

Table 1 displays descriptive statistics and correlation for the 1974-2011 samples. In Table 2, which contains correlations/covariance matrix for principal component analysis, highly correlated explanatory variables need to be reduced in terms of dimensionality.

3.3 Econometric Methodologies

3.3.1 Principal Component Analysis

Principal Component Analysis is an effective tool for analyzing highly correlated multivariate data. The main purpose of principal component analysis is reducing dimensionality of the data set, and analyzing new meaningful variables. Methodologically, the Principal Component Analysis (PCA) is as follows:

Assume principal component PC_1 is composed of $x_1, x_2, \cdots, x_p$

$$PC_1 = a_{11}x_1 + a_{12}x_2 + \cdots + a_{1p}x_p = \sum_{i=1}^{p} a_{1i}x_i$$

Then Var(PC_1) is maximized given the constraint $\sum_{i=1}^{p} a_{1i}^2$=1. Where the eigen vector $a_1 = (a_{11}, a_{12}, \cdots, a_{1p})$ and the associated Var(PC_1)= λ_1. λ_1 is the largest eigenvalue of $(x_1, x_2, \cdots, x_p)$. The first PC_1 retains the greatest magnitude of variation in the sample. Thus for the second principal component PC_2, following the same approach of finding the first eigen vector, a second weight vector, $(a_{21}, a_{22}, \cdots, a_{2p})$ such that the variance of $PC_2 = a_{21}x_1 + a_{22}x_2 + \cdots + a_{2p}x_p = \sum_{i=1}^{p} a_{2i}x_i$ is maximized based on the constraints that it is not correlated with the first principal component and $\sum_{i=1}^{p} a_{2i} = 1$.

This demonstrates that PC_2 has the next largest sum of squared correlation with the initial variables (SAS Institute Inc. 1989). Bo and Woo (2008) attempted a new approach for calculating weight for individual measures used in the index by the subsequent formula: $w_j = \frac{\sum_{i=1}^{i=p} \lambda_i a_j^i}{\sum_{i=1}^{i=p} \lambda_i}$, where $\lambda_i (i = 1,2,\cdots,p)$ is the i^{th} eigenvalue, and $a_{p\times 1}^i (i = 1,2,\cdots,p)$ is the i^{th} eigen vector of the correlation matrix (SAS Institute Inc., 1989).

Assuming that $\lambda_1 > \lambda_2 > \cdots > \lambda_p$ and expressing the i^{th} principal component as PC_i, then: $PC_i = Xa^i$, where X is comprised of normalized transformations of the variables it includes and $\lambda_i = Var(PC_i)$. It means that the first principal component (PC_1) has the largest variance, and second largest variance, $Var(PC_2)$ is a linear combination of the index which is orthogonal to the PC_1. By that, the p^{th} principal component is a linear combination of the indicators and has the smallest variance (Bo and Woo, 2008).

Then the index constructed: $Index = \frac{\sum_{i=1}^{i=p} \lambda_i PC_i}{\sum_{i=1}^{i=p} \lambda_i} = \frac{\sum_{i=1}^{i=p} \sum_{j=1}^{p} \lambda_i a_j^i x_j}{\sum_{i=1}^{i=p} \lambda_i} = \sum_{j=1}^{j=p} w_j x_j$. In this formula, x_j is the j^{th} column of the matrix X and w_j is the final weight of the indicator j that is previously denoted.

As shown above, I consider some variables for financial development and institutional quality indicators. This approach makes use of the eigenvectors and enables use of weights depending on the eigenvectors and eigenvalues for each of these groups. This reduces bias by exploring the results using first score of the principal components (Özkök, 2010)

Atiq and Haque (2013) used Principal Component Analysis (PCA) for banking sector indicators and stock market indicators for financial development. PCA variables are used for the aggregate index of financial development (Huang, 2011). A sound financial

development indicator should include information about different aspects such as depth, access, efficiency and stability for both financial institutions and financial markets in the financial system (Martin and Asli, 2012). Moreover, a good indicator for financial development should also provide information about the ability of the financial system to channel funds from depositors to investors (Ang and McKibbin, 2007). Therefore, it is quite difficult to have a single indicator of financial development that could explain all the aspects of financial system (Huang, 2011). Explaining all the aspects of the financial system using a single indicator poses tremendous challenge.

I used Principal Component Analysis (PCA) on frequently used banking sector indicators of financial development to derive a new summary aggregate index. I chose the banking sector indicators for financial development due to the problem of data availability for security market indices. Studies covering the data from 1970s for financial development mainly use banking sector indicators (Tressel and Detragiache, 2008). The use of PCA for the aggregate index of financial development is gaining popularity in growth finance literature. Such efforts aim to construct a summary index of financial development and other dimensions of financial systems (Huang, 2011, Ang and McKibbin, 2007).

Table 6 shows that the variables of the financial development are extremely and meaninfully correlated. PCA works finest with diverse variables that are highly correlated. Table 7 provide results of PCA. I run the PCA for financial development(*FD*) and policy(*CPIA*)

Methodologically, the PCA produces an orthogonal summary index using N number of different indicators that are highly correlated. These principle components (PCs) explain the amount of variance among different indicators, capturing different dimensions of the dataset.

Based on the different measures of financial structure presented above, in this paper I will use consistent indicator of financial development. Three composite indicators of financial development are: first, banking sector development (BSD), second, stock market development (SD), and third (FD) a combination of (BSD) and (SD) variables. Specifically:

$$\text{BSD} = \text{pcf}\left(\frac{\text{Bank private credit}}{\text{GDP}}, \frac{\text{Liquid liabilities}}{\text{GDP}}, \frac{\text{private credit}}{\text{GDP}}, \frac{\text{bank assets}}{\text{GDP}}, \frac{\text{bank loans}}{\text{bank deposits}}, \frac{\text{overhead cost}}{\text{assets}}, \text{net interest margin},\right)$$

$$SD = pcf\left(\frac{stock\ market\ capitalization}{GDP}, \frac{stock\ market\ total\ value\ traded}{GDP}\right)$$

$$\text{overall measure of financial developpement } (FD) = \text{pcf}(BSD, SD)$$

where pcf stands for principal component factor

Second, I conducted the principal component analysis (PCA) through applying Country Policy and Institutional Assessment (CPIA) in conjunction.

The overall measure of financial institution and policy: $CPIA = pcf(CPIA1, CPIA2, CPIA3, CPIA4, CPIA5, CPIA6, CPIA7)$

where pcf stands for principal component factor.

I used Principal Component Analysis (PCA) on CPIA indicators of financial development to get new summary aggregate index. Based on the different measures of CPIA presented above, I derived consistent measures of financial development. Seven composite indicators of financial development policy and environment were constructed: Fiscal policy

(CPIA1), Business Regulatory Environment (CPIA2), Financial Sector indicator (CPIA3), Quality of budgetary and Financial management (CPIA4), Debt Policy (CPIA5), Trade(CPIA6), and Macroeconomic management(CPIA7) a combination of the Principal Component Factor.

3.3.2 Panel Data Analysis

To examine the relationship between financial development and poverty reduction, this paper uses both Ordinary Least Square (OLS) and system GMM.

First, by modeling using Ordinary Least Square(OLS) fixed-effects model, I recomposed the following equation(1), of Beck, Demirgüç-Kunt, and Levine (2004).

$$(1) Pov_{i,t} = \beta_0 + \beta_1 * FD_{i,t} + \beta_2 * Pov_{i,t-1} + \sum_{j=3}^{n} \beta_j Control_{i,t}^{j} + u_i + \epsilon_{i,t}$$

Equation (2) attempts to answer the question: "Does Financial sector Aid affect poverty reduction?", where dependent variables $Pov_{i,t}$ is the poverty indicator (income share held by lowest 20%, headcount poverty index, poverty gap and the Gini index) and $FD_{i,t}$ is financial development indicator in country *i,* in year *t.* Control variable is the growth of GDP per capita because financial development might indirectly alleviate poverty due to economic growth. Instead of FD, Total Aid variable ($TODA_{i,t}$) and Financial Sector Aid variable($FODA_{i,t}$) are included in the model. The country fixed-effects (FE) will control for time-invariant factors and reduce a potential omitted variable bias.

$$(2)\ Pov_{i,t} = \beta_0 + \beta_1 * TODA_{i,t} + \beta_2 * FODA_{i,t} + \sum_{j=3}^{n} \beta_j Control_{i,t}^{j} + u_i + \epsilon_{i,t}$$

Residual versus fitted plot (Figure 2) shows heteroscedasticity: the scatter in the residuals from small values of poverty indicator (Income share held by lowest 20% ,

Headcount poverty index, Poverty gap and the Gini index) is a little larger than that of larger values of poverty indicator.

Otherwise, with the exception of the control variables, financial sector aid (FODA), total aid (TODA) and instrument variables (legal origins and latitude) are apt to be endogenous. So these independent variables have an impact on changes in Financial Development (FD) but they are influenced by poverty indicators (POV), too. This calls for a proper instrumental variable approach. As the second estimator, I conduct the two-step system-GMM estimator (Roodman, 2006). The two-step system-GMM estimator deals effectively with reverse causality by using lagged levels and differences as a set of instruments for the endogenous variables. I set the lagged dependent variable (TODA and FODA) and instrumental variables (legal origins and latitude) as endogenous. La Porta et al. (1997), Beck, Demirgüç-Kunt, and Levine (2003) and Stulz and Williamson (2003) assess the robustness of the results using legal tradition, initial endowment and dominant religion, after Beck, Demirgüç-Kunt, and Levine (2004) used the legal origin of countries and absolute value of the latitude of the capital city and added religious composition of the population as instrumental variables. But I include as the instrumental variables: legal origins and latitude (La Porta et al, 1997), for dimensionality reduction (excluding religious composition and ethnic fractionalization because the results were very similar).

$$(3)\ FD_{i,t} = \beta_0 + \beta_1 FODA_{i,t-1} + \beta_2 TODA_{i,t-1} + \beta_3 Latitude + \sum_{j=4}^{n} \beta_j Legal\ Origins_i^j + u_i + \epsilon_{i,t}$$

In equation (3) $FD_{i,t}$ stands for the financial development (as it figure out principal component analysis) in country *i* during period *t,* β_0 is the country fixed effect, *FODA* represents the financial sector aid (disbursement) variable, *TODA* is the total aid (disbursement) variable, *Latitude* denotes value of the latitude of the capital city, standardized between 0 and 1, in country *i. Legal*

Origins is the law system of each country. u_i is a set of time dummies which accounts for period-specific effect, and $\epsilon_{i,t}$ denotes the error term. I use lagged observations for aid(*FODA* and *TODA)* as it expect time lags between aid and financial sector development(*FD*). If a developing country accepts additional aid in a particular year, changes in financial sector development are more likely to start to be valid in the following year, as it takes time to implement changes financial development.

Then I deduct the lagged level of financial development(*FD*) from both sides, which yields:

$$(4)\ Pov_{i,t} = \beta_0 + \beta_1 \widehat{FD}_{i,t-1} + \sum_{j=2}^{n} \beta_j Control_{i,t}^{j} + u_i + \epsilon_{i,t}$$

In equation (5), the quality of institutions (in this paper I use indicator of CPIA) is included as part of an interaction variable with *FODA* and *TODA* since it might have an impact on poverty reduction through the interaction with aid.

$$(5) Pov_{i,t} = \beta_0 + \beta_1 FD_{i,t} + \beta_2 FODA * CPIA_{i,t} + \beta_3 TODA * CPIA_{i,t} + \sum_{j=4}^{n} \beta_j Control_{i,t}^{j} + u_i + \epsilon_{i,t}$$

A number of studies have presented that a sound growth policy is good for poverty reduction (Dollar and Karray, 2001). The recommended policy for distributing aid is clear: to boost poverty reduction, aid should be allocated to countries that have extreme poverty and good policy (Collier and Dollar, 2002).

III. Empirical Analysis Results

In all regressions, I include all of the previous introduced control variables but add each of the three poverty variables for $Pov_{i,t}$(*Income20* denotes *Income share held by the lowest 20%* , *Povgap* denotes *Poverty gap*, *Headcount* denotes *Headcount poverty index, and the Gini index)*

4.1 The Direct Channel : Financial Sector Aid and Poverty Reduction

From Equation (2), where I conduct an Ordinary Least Square(OLS) of fixed-effects to identify a direct relationship between poverty reduction and financial sector ODA, without controlling for financial development. The regression result in Table 1 indicates that financial sector aid makes positive contributions to poverty reduction. For income20, as reported in column 1 in Table 1, the FODA is positive but the coefficient is not siginificant. *Povgap* variable is not significant, but it has a negative coefficient. Concerning control variables, mobile cellular population is associated with poverty reduction. *Mobilecellular* is a significant variable and has a positive influence on Income20 and negative influence on *Povgap, Headcount* and *Gini.* This implies mobile technology motivates and brings economic freedom by making financial services easily accessible to the poor (Diga, 2008).

4.2 The Indirect Channel

In the previous regression, I examined the relation between financial sector aid and poverty reduction. But it is not significant. To evaluate the total impact of financial sector aid and financial development on poverty reduction, I need to estimate the indirect channel, using the System Generalized Method of Moment (GMM) estimator. System-GMM estimator well addresses the reverse causality as well as the concerns for an omitted variable bias at the same time. Still, the consistency of the System-GMM needs to be devoid of second-order serial correlation in the residuals. In Table 2, it indicates that there is no second-order serial correlation, so the null-hypothesis is rejected. To observe the fitting of the instruments used, I conduct the outcome of a Hansen test for over-identifying restrictions as well. The J-statstics check that is applied shows that instruments are effective. At this step, I use the collapse option in STATA to keep the number of instruments under the number of countries.

To facilitate the assessment with former consequences, I run the same model specification for the system GMM(Table 2). The performance of the control variables can be likened to comparing of the OLS FE results. *Mobilecellular* variable is statistically significant and more influential to poverty reduction, and in system-GMM estimator, openness to trade is positively associated with poverty reduction. While I control for endogeneity, trade has no influence on poverty reduction, which specifies that the relationship may run in the other direction. Therefore, good policy and institutions are conducive to international trade.

To test the proper instruments, I run the Hansen test for over-identifying restrictions, and it assesses whether the instrumental variables are related with the dependent variable beyond their capacity to describe cross-country variation in financial development (*FD*). The null hypothesis is that instrumental variables are not related with the error terms. When the *p*-value of Hansen J-test for over-identifying restrictions is high(1), we do not reject the null hypothesis. It implies a failure to reject the validity of the instrumental variables. Furthermore, appropriate instruments (*Legal Origins, Latitude, lag of TODA and lag of FODA*) explain cross-country variation in financial development(*FD*) well.

4.3 Robustness Checks

After the empirical analysis, I conduct the robustness checks to examine the positive influential effects of this model. I start with a reduction of the number of instruments. Before I use lagged levels and lagged differences, the number of instruments can be relatively large in system-GMM estimators. Many of the instruments can overfit endogenous variables and fail to remove their endogenous components, too. Also, it weakens the power of the Hansen test to discover over-identification. Despite that, I have kept the number of instruments under the number of observations by using the collapse option in STATA. In this way, the number

of instruments sets is reduced from 39 to 26 and the instruments from 40 to 26. This result underlines the robustness, serves as a benchmark for the before analysis and strengthens the model. In Table 3 column 1, *FD* is significant and has a positive influence (0.789) on *Income 20* variable. In addition, population growth rate and *Income20* are in a negative relationship.

4.4 Interaction terms of aid and policy

It is commonly believed that poor policy has negative effects on poverty reduction. To test the importance of the quality of institutions, I adopted the policy indicator (*CPIA*) and interaction with total aid and policy indicator (*TODA*CPIA*) and interaction with financial sector aid and policy indicator (*FODA*CPIA*):

Before assessing the regressions, there were no relations between poverty reduction variables, financial sector aid and total aid. But the interaction term of Aid(*FODA and TODA)* and CPIA has meaningful effects on poverty reduction. In the results of the institutions-poverty estimators (Table 4), interaction term of *total aid* and *CPIA(TODAxCPIA)* is significant but influence is adverse, but interaction term of *financial sector aid* and *CPIA(FODAxCPIA)* has a negative influence and significant. Based on the control variable, mobile cellular population, trade, health expenditure and government expenditureare relevant.

IV. Conclusion

Using data from 77 developing countries between 1974 and 2011, the present study examines the effect of financial sector aid on financial development and poverty reduction. The findings of this study shows that poverty is alleviated as a result of financial sector development and implementation of sound policy. In addition, population growth rate, terms of trade, secondary school enrollments and mobile cellular population have significant impact on poverty reduction. The finding is consistent with previous studies, however found that private credit is significantly related to reduced income inequality and poverty (Beck, Demirguc-Kunt, and Levine, 2004). Nevertheless, I included more variables for total aid and financial sector aid.

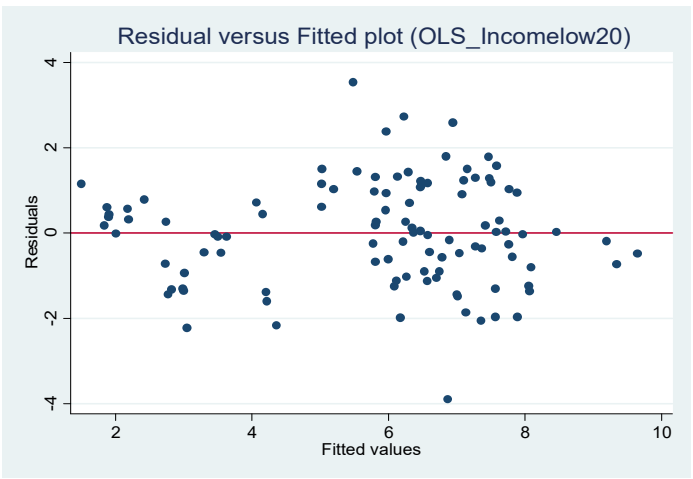
The results of this empirical panel data analysis can be briefed as following: Using financial sector aid is efficient to reduce poverty. Using total aid has an ambiguous effect on poverty, as has been shown byformer studies. More targeted financial sector aid is greatly more effective and plays a role of a significant driver of improvement for the quality of policy. This results has been shown robustly using system-GMM.

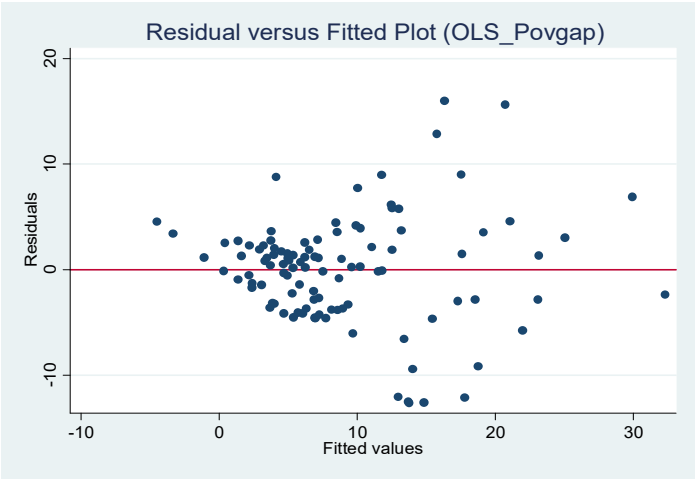
Evidence assembled in the agenda of aid effectiveness driven by the OECD and partner countries shows that universal aid's effectiveness has been enhanced, but there exists little development in accordance with the Paris Declaration commitments set in 2005, like donor coordination and eluding aid fragmentation (OECD 2011). Though, it becomes obvious that effectiveness crucially depends on how aid effectiveness is *measured* as well as *how much* or *how* aid is given. Which country the aid is directed at and which aid type is used to evaluate the effectiveness are matters of importance. In this study I suggest that targeted financial sector aid can have a significant impact in reducing poverty.

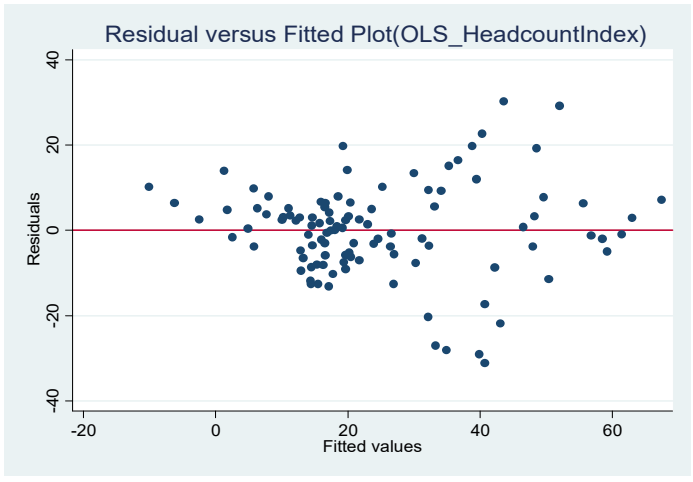
My research has important economic significance for policy makers who are working to eradicate poverty in developing countries. It establishes that financial development is a critical goal for developing countries to achieve. My results adhere to the theory that financial development alleviates poverty by reducing transaction costs in the markets and by recommending a way for the poor to expand savings. Therefore, it might be helpful for policy makers to focus on programs to increase the accessibility of money and constructing financial infrastructures.

Appendix

Figure 2 Residual versus Fitted plot







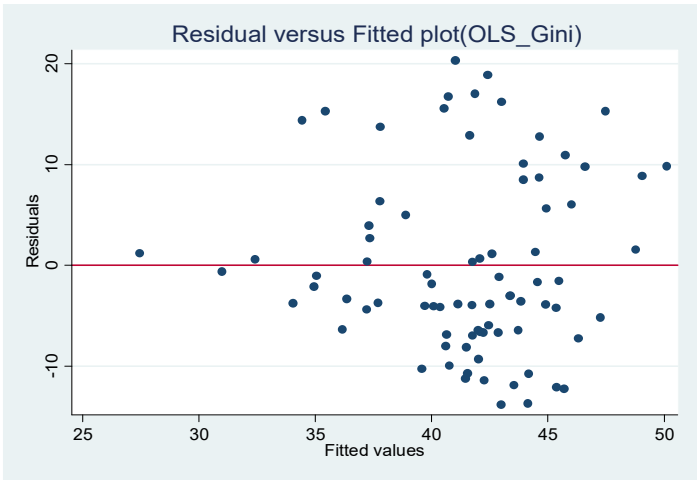


Table 1 Financial Sector Aid and Poverty Reduction, Fixed-Effects

VARIABLES	(1) FE_Income20	(2) FE_Povgap	(3) FE_Headcount	(4) FE_Gini
TODA	-5.49e-05	-0.000547	-0.000520	0.00150
	(0.000117)	(0.000572)	(0.00143)	(0.00173)
FODA	0.000417	-0.00320	0.0137	0.0324
	(0.00793)	(0.0378)	(0.0942)	(0.0513)
o.InitialValue	-	-	-	
mobilecellular	0.0175***	-0.0603**	-0.118**	-0.0371
	(0.00480)	(0.0235)	(0.0586)	(0.0876)
gdppcg	0.0628**	-0.188	-0.457	0.146
	(0.0278)	(0.136)	(0.340)	(0.353)
popgrowth	-0.746	0.155	-5.085	-0.963
	(0.510)	(2.391)	(5.962)	(2.841)
inflation	0.00757	0.144*	0.382*	-0.157
	(0.0168)	(0.0824)	(0.206)	(0.162)
ltrade	0.318	-4.162	-7.925	1.272
	(0.635)	(2.948)	(7.351)	(6.678)
school	-0.474	-0.282	-1.513	-7.665
	(0.626)	(3.110)	(7.755)	(7.054)
health	-0.00285	0.00117	-0.0216	0.0259
	(0.00289)	(0.0141)	(0.0352)	(0.0379)
govexpenditure	-0.00947	0.174	0.593	0.294
	(0.0382)	(0.187)	(0.467)	(0.582)
Constant	7.195**	26.21	67.38	59.43
	(3.382)	(16.39)	(40.87)	(36.31)
Observations	105	105	105	81
R-squared	0.419	0.450	0.442	0.164
Number of countryn	42	41	41	37

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2 Financial Sector Aid, Financial Development and Poverty Reduction, System-GMM

VARIABLES	(1) GMM_Income20	(2) GMM_Povgap	(3) GMM_Headcount	(4) GMM_Gini_index
FD	3.219	6.299***	29.51**	0
	(2.236)	(2.179)	(13.37)	(0)
InitialValue	1.100	7.571***	24.55**	3.551***
	(1.038)	(2.213)	(10.72)	(0.205)
mobilecellular	0.0634	-0.436***	-0.987***	-1.447***
	(0.0725)	(0.120)	(0.336)	(0.199)
gdppcg	0.233	2.318	2.080	-4.987***
	(0.229)	(1.465)	(1.598)	(1.703)
popgrowth	-1.876	4.261**	1.969	0
	(1.162)	(1.956)	(4.701)	(0)
inflation	-0.515*	0.366	1.064	-0.120
	(0.300)	(0.246)	(0.877)	(0.358)
ltrade	0	-15.11**	-36.85	0
	(0)	(6.252)	(23.47)	(0)
school	0	0	0	0
	(0)	(0)	(0)	(0)
health	-0.0312*	0.128***	0.350**	0.751***
	(0.0188)	(0.0448)	(0.162)	(0.120)
govexpenditure	0.746**	0.530	-0.238	0
	(0.363)	(1.082)	(3.636)	(0)
L.Incomelow20	-0.210			
	(0.409)			
L.Povgap		-0.981*		
		(0.565)		
L.HeadcountIndex			-0.281	
			(0.460)	
L.gini_index				-0.0324
				(0.199)
Constant	0	0	0	0
	(0)	(0)	(0)	(0)
Observations	29	31	31	16
Number of countryn	8	9	9	6
Hansen Test(p-value)	1	1	1	1
Instruments	39	40	40	25
AB1(p-value)	-0.635	1.191	0.933	1.127
AB2(p-value)	-7.426	-0.349	0.416	-0.00945

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3 Financial Sector Aid, Financial Development and Poverty Reduction, Robustness Checks, System-GMM

VARIABLES	(1) GMM_Income20	(2) GMM_Povgap	(3) GMM_Headcount	(4) GMM_gini_index
FD	0.789*	-0.780	3.160	0
	(0.404)	(1.443)	(2.354)	(0)
InitialValue	0	-1.321	1.404	4.725
	(0)	(1.620)	(2.335)	(17.34)
mobilecellular	0.00677	-0.0832	-0.254***	-0.139
	(0.0428)	(0.0622)	(0.0900)	(0.547)
gdppcg	0.442*	0.0760	0.120	0
	(0.237)	(0.391)	(0.619)	(0)
popgrowth	-0.918**	0	0	0
	(0.427)	(0)	(0)	(0)
inflation	-0.0792**	0.464***	1.064***	0
	(0.0369)	(0.146)	(0.187)	(0)
ltrade	2.990***	-10.51*	-43.63***	0
	(0.698)	(5.974)	(8.207)	(0)
school	0	12.62*	47.10***	0
	(0)	(7.046)	(8.940)	(0)
health	-0.0208*	-0.0116	-0.0653*	0.263**
	(0.0120)	(0.0146)	(0.0377)	(0.126)
govexpenditure	-0.0382	-0.0162	0.667***	0
	(0.0919)	(0.141)	(0.196)	(0)
L.Incomelow20	-0.215			
	(0.178)			
L.Povgap		0.542		
		(0.945)		
L.HeadcountIndex			-0.0511	
			(0.296)	
L.gini_index				0
				(0)
Constant	0	0	0	0
	(0)	(0)	(0)	(0)
Observations	29	31	31	16
Number of countryn	8	9	9	6
Hansen Test(p-value)	1	1	1	0
Instruments	25	26	26	15
AB1(p-value)	0.458	-0.972	-1.381	-0.207
AB2(p-value)	-0.742	-0.747	-0.970	-0.377

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 Poverty Reduction and Interaction terms of aid and policy, System-GMM

VARIABLES	(1) Policy_Income20	(2) Policy_Povgap	(3) Policy_Headcount	(4) Policy_gini_index
FODAxCPIA	0	0	-0.894***	-0.894***
	(0)	(0)	(0)	(0)
TODAxCPIA	-0.000405***	0.00303***	0.0168***	0.0168***
	(0)	(0)	(0)	(0)
InitialValue		0	0	0
		(0)	(0)	(0)
mobilecellular	-0.000665***	-0.234***	-1.474***	-1.474***
	(0)	(0)	(0)	(0)
gdppcg	0	0	0	0
	(0)	(0)	(0)	(0)
inflation	0	0	0	0
	(0)	(0)	(0)	(0)
health	0.0726***	0.00784***	0.433***	0.433***
	(0)	(0)	(0)	(0)
govexpenditure	-0.420***	0.512***	2.414***	2.414***
	(1.49e-10)	(6.09e-10)	(3.25e-10)	(3.25e-10)
L.Incomelow20	-0.203***			
	(1.35e-10)			
L.Povgap		-0.767		
L.HeadcountIndex			-0.788***	-0.788***
			(0)	(0)
Constant	0	0	0	0
	(0)	(0)	(0)	(0)
Observations	7	8	8	8
Number of countryn	4	5	5	5
Hansen Test(p-value)	0.986	0.214	0.931	0.931
Instruments	11	11	11	11

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 Descriptive Statistics for Regression Variables

VARIABLES	Mean	Standard deviation	Observation
TODA	666.7105	1239.959	1086
FODA	10.08713	26.9203	1086
Incomelow20	5.938179	2.236341	246
Povgap	11.57674	10.97536	245
HeadcountI~x	30.28393	22.51546	245
Gini_index	42.21167	9.06797	246
cpia1	3.462919	0.62746	418
cpia2	3.557416	0.735068	418
cpia3	3.116029	0.542272	418
cpia4	3.255981	0.620609	418
cpia5	3.441388	0.509653	418
cpia6	3.427033	0.670596	418
cpia7	3.699761	0.749212	418
Bank_Pvt_C~t	20.55649	15.32235	939
Dep_bank_a~s	25.79431	18.06892	940
Liquid_lia~s	33.30108	19.0892	939
Pvt_banks_~l	21.43333	15.92538	939
Stock_capi~n	21.54767	30.74842	377
Stock_tota~e	9.142261	41.66026	376
Net_intere~n	6.485887	3.638633	795

Overhead_c~s	5.192475	3.005223	796
Bank_credi~p	87.3277	75.82916	1007
InitialValue	1.283157	5.141494	1012
mobilecell~r	10.16702	17.59383	806
gdppcg	2.664875	4.471839	824
popgrowth	2.023307	1.20497	840
inflation	52.28734	902.8929	753
ltrade	4.160976	0.57759	785
school	3.586535	0.707782	494
Health	120.1581	99.51818	968
govexpendi~e	14.77285	11.57835	981

Table 6 Correlations/Covariance Matrix for Principal Component Analysis

	Bank_P~t	Dep_ba~s	Liquid~s	Pvt_ba~l	Stock_~n	Stock_~e	Net_in~n	Overhe~s	Ban
Bank_Pvt_C~t	1								
Dep_bank_a~s	0.9616	1							
Liquid_lia~s	0.8857	0.9485	1						
Pvt_banks_~l	0.9938	0.9633	0.8974	1					
Stock_capi~n	0.1901	0.2364	0.2665	0.2004	1				
Stock_tota~e	0.1978	0.2822	0.3125	0.1899	0.4874	1			
Net_intere~n	-0.4357	-0.4569	-0.5018	-0.4264	-0.1136	-0.2536	1		
Overhead_c~s	-0.3863	-0.4388	-0.4767	-0.3836	-0.2388	-0.3128	0.5059	1	
Bank_credi~p	0.5947	0.4765	0.3575	0.5766	-0.0542	-0.0247	-0.1037	-0.149	
transition~s	-0.112	-0.1974	-0.2644	-0.1224	-0.157	-0.1494	0.1958	0.0796	0

	cpia1	cpia2	cpia3	cpia4	cpia5	cpia6	cpia7
cpia1	1						
cpia2	0.6357	1					
cpia3	0.5589	0.5925	1				
cpia4	0.668	0.7539	0.5742	1			
cpia5	0.49	0.4571	0.4585	0.5044	1		
cpia6	0.7544	0.7606	0.5558	0.7523	0.4997	1	
cpia7	0.5336	0.9051	0.5213	0.6402	0.3448	0.5935	1

Table 7 Eigenvectors of Principal Component

	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8
Bank_Pvt_C~t	0.4626	0.1589	0.09731	0.03192	0.04542	-0.3559	-0.3703	0.6959
Dep_bank_a~s	0.4621	0.09527	0.1501	0.1227	0.01086	-0.1569	0.8455	0.01336
Liquid_lia~s	0.437	-0.03702	0.2066	0.2491	-0.03223	0.8232	-0.1546	0.01857
Pvt_banks_~l	0.4628	0.1532	0.1155	0.04825	0.03932	-0.33	-0.3482	-0.7176
Net_intere~n	-0.2255	0.5294	0.4047	0.0647	-0.7076	-0.00738	-0.01	0.006524
Overhead_c~s	-0.2445	0.4587	0.4871	-0.09445	0.6898	0.0868	0.01645	0.002149
Bank_credi~p	0.2298	0.4021	-0.3718	-0.7674	-0.05839	0.2289	0.04984	-0.01001
transition~s	-0.06172	0.5372	-0.6105	0.5635	0.1233	0.04584	0.006759	-0.00313

	Comp1	Comp2
Stock_capi~n	0.7071	0.7071
Stock_tota~e	0.7071	-0.7071

Table 8 Definition of Varibales and Data Sources

Variable	Definition	Source
TODA	Total ODA as a share of GDP, disbursement	OECD/DAC CRS(2012)
FODA	Sector-specific ODA for Finance as a share of GDP, disbursement	
Incomelow20	Income share held by the lowest 20%	
Povgap	Poverty gap(the distance between the poverty line and the average consumption)	
HeadcountI~x	Headcount poverty index (income below the poverty line of $1.25 a day)	
Gini_index	The Gini coefficient	
cpia1	Country Policy and Institutional Assessment(Fiscal policy)	World Bank(2013)
cpia2	Country Policy and Institutional Assessment(Business Regulatory Environment)	
cpia3	Country Policy and Institutional Assessment((Financial Sector indicator)	
cpia4	Country Policy and Institutional Assessment((Quality of budgetary and Financial management)	
cpia5	Country Policy and Institutional Assessment((Debt Policy)	
cpia6	Country Policy and Institutional Assessment((Trade)	
cpia7	Country Policy and Institutional Assessment((Macroeconomic management)	
Bank_Pvt_C~t	Bank private credit to GDP (%)	
Dep_bank_a~s	Deposit money banks' assets to GDP (%)	
Liquid_lia~s	Liquid liabilities to GDP (%)	
Pvt_banks_~l	Private credit by deposit money banks to GDP (%)	World Bank GFDR(2013)
Stock_capi~n	Stock market capitalization to GDP(%)	
Stock_tota~e	Stock market total value traded to GDP (%)	
Net_intere~n	Bank net interest margin (%)	
Overhead_c~s	Bank overhead costs to total assets(%)	
Bank_credi~p	Private credit by deposit money banks and other financial institutions to GDP(%)	
InitialValue	Initial value of GDP	
mobilecell~r	Mobile Cell phone population	
gdppcg	Annual growth of GDP per capita	
popgrowth	Population growth	World Bank(2013)
inflation	Annual growth of the Consumer Price Index	
ltrade	Log of Total experts and imports of goods and services in percent of GDP	
school	Average growth rate of secondary education enrollment rate	
health	Total health expenditure of GDP(%)	
govexpendi~e	The ratio of general governmental final consumption expenditure to GDP	

Biblography

Aghion, P., & Bolton, P. (1997). A Theory of Trickle Down Growth and Development. *The Review of Economic Studies*.

Ajakaiye, O. (2005). Role of the State in Financial Sector Development in Sub-Saharan Africa, *2003*(December), 88–97.

Alonso, J. A., & Garcimartín, C. (2013). The determinants of institutional quality. More on the debate. *Journal of International Development*, *25*(2), 206–226. http://doi.org/10.1002/jid.1710

Apergis, N., Filippidis, I., & Economidou, C. (2007). Financial deepening and economic growth linkages: A panel data analysis. *Review of World Economics*, *143*(1), 179–198.

Asian Development Bank (2001). Long-Term Strategic Framework, 7

Atiq, Z., & Haque, E. (2013). Financial Development and Economic Growth : The Role of Financial Liberalization.

Bank, W., Burnside, B. C., & Dollar, D. (2004). Aid, Policies, and Growth: Revisiting the Evidence *, (March).

Barro, R. (2000). Inequality and Growth in a Panel of Countries. *Journal of Economic Growth*, *32*, 5–32. http://doi.org/10.1016/j.jhealeco.2006.07.003

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, inequality and the poor. *Journal of Economic Growth*, *12*(1), 27–49. http://doi.org/10.1007/s10887-007-9010-6

Biørn, E. (2010). A tutorial for panel data analysis with stata, 1–12.

Bo, C., & Street, W. P. (2008). A Composite Index of Economic Integration in the Asia-Paci … c Region. *Economic Outlook*.

Bollen, K. A., & Brand, J. E. (2008). Fixed and Random Effects in Panel Data Using Structural Equations Models, (January).

Brüderl, J. (2005). Panel Data Analysis, (March).

Busse, M & Hoekstra. R. (2013). The Effectiveness of Aid in Improving Regulations:Empirical Evidence and the Drivers of Change in Rwanda.

Canavire-bacarreza, G. (2008). Income in Latin America and the Caribbean Financial Development and the Distribution of Income in Latin America and the Caribbean, (3796).

Caselli, F. (2005). CEP Discussion Paper No 667 January 2005 Accounting for Cross-Country Income Differences. *Differences*, (667).

Chea, A. C. (2011). Financial Sector and Economic Development : How Institutions , Financial Markets , and Prudential Oversight can be Enhanced to Accelerate Economic Growth and Sustainable Development in Sub-Saharan Africa, *1*(3), 291–307.

Chee, Y. L. (2010). The Impact of FDI and Financial Sector Development on Economic Growth : Empirical Evidence from Asia and Oceania, *2*(2), 107–119.

Claessens, S. & Feijen, E.(2006). Financial Sector Development and the Millennium Development Goals.

Collier, B. P., & Dollar, D. (n.d.). How Policy Reform and Effective Aid Can Meet the International Development Goals.

Collier, P., & Dollar, D. (2002). Aid allocation and poverty reduction. *European Economic Review*, *46*(8), 1475–1500.

Commerciale, U., & Bocconi, L. (2009). Working paper series, (April).

Countries, D. (2014). Financial Inclusion and Microfinance : On the Cases of ODA and Analysis of the Poverty Reduction Effect, *4*(13).

Croissant, Y., & Millo, G. (n.d.). Panel Data Econometrics in R : The plm Package.

Declaration, P., Agenda, A., Level, H., & Effectiveness, A. (2011). Accelerating progress in aid effectiveness : from here to 2011 해외원조의 효과성을 높이기 위한 OECD 의 노력, (2008), 2008–2011.

Deepening, F. (2013). Giordano Dell-Amore Foundation FINANCIAL DEEPENING AND ECONOMIC GROWTH : EVIDENCE FROM ASIAN ECONOMIES Author (s): John Thornton All use subject to JSTOR Terms and Conditions DEEPENING AND ECONOMIC GROWTH : FINANCIAL, *18*(1), 41–51.

Desmet, K. (n.d.). Breaking the misconceptions : An analysis of the effects financial liberalization on financial development using index measures Zeynep Özkök Supervised by : Dr . Klaus Desmet Breaking the misconceptions : An analysis of the effects financial liberalizatio.

Development, F. (n.d.). Determinants of Financial Development.

DIFID. (2004). The Importance of Financial Sector Development for Growth and Poverty Reduction, (August).

Dollar, D., & Clinton, B. (2012). Growth is Good for the Poor living, *7*(3), 195–225.

Evidence, C., Beck, T., Demirguc-kunt, A., & Levine, R. (2004). Finance , Inequality and Poverty :

Fowowe, B., & Abidoye, B. (2005). A Quantitative Assessment of the Effect of Financial Development on Poverty in African Countries, 1–20.

Gonzalez-vega, B. C., & Gonzalez-vega, C. (n.d.). Theme : Macro Economic Policy and Reality Deepening Rural Financial Markets : Macroeconomic , Policy and Political Dimensions DEEPENING RURAL FINANCIAL MARKETS :

Gottschalk, R. (2000). HOW MUCH EXTERNAL FINANCING WILL BE NEEDED IN THE NEW.

Green, C. J., Kirkpatrick, C. H., & Murinde, V. (2006). POLICY ARENA FINANCE FOR SMALL ENTERPRISE GROWTH AND POVERTY REDUCTION IN DEVELOPING COUNTRIES y, *1030*(July 2003), 1017–1030. http://doi.org/10.1002/jid

Greene, W. H. (2003). *Econometric Analysis*. (P. Education, Ed.)*Journal of the American Statistical Association* (Vol. 97). Prentice Hall. http://doi.org/10.1198/jasa.2002.s458

Gries, T., Kraft, M., & Meierrieks, D. (2008). Working Paper Series Linkages between Financial Deepening , Trade Openness and Economic Development : Causality Evidence from Sub-Saharan Africa Linkages between Financial Deepening , Trade Openness and Economic Development : Causality Evidence from.

Guillaumont Jeanneney, S., & Kpodar, K. (2008). Financial Development and Poverty Reduction: Can there Be a Benefit without a Cost? *IMF Working Papers*, *08*(62), 1. http://doi.org/10.5089/9781451869248.001

Hansen, H., & Tarp, F. (2000). Aid and growth regressions, (January).

Hassan, M. K., Sanchez, B., & Yu, J.-S. (2011). Financial development and economic growth: New evidence from panel data. *The Quarterly Review of Economics and Finance*, *51*(1), 88–104. http://doi.org/10.1016/j.qref.2010.09.001

Hatcher, L. (1994). Principal Component Analysis. *A Step-By-Step Approach to Using the SAS System for Factor Analysis and Structural Equation Modeling*, 1–56. http://doi.org/10.1002/ibd.21544

Honohan, P. (2003). Financial Development , Growth and Poverty : How Close Are the Links ?

Honohan, P., & King, M. (2012). Cause and Effect of Financial Access: Cross-Country Evidence from the Finscope Surveys. In *IIIS Discussion Paper* (Vol. No. 399, p. 399). Institute for International Integration Studies, Trinity College Dublin.

Introduction, A., & Bias, H. (n.d.). Fixed and Random Effects Models.

Investigation, A. E. (2011). Finance And Poverty Reduction In China :, *10*(8), 103–114.

Kappel, V. (2010). CER-ETH – Center of Economic Research at ETH Zurich The Effects of Financial Development on Income Inequality and Poverty Economics Working Paper Series The effects of financial development on income inequality and poverty ∗, (March).

Khan, D., Ahmad, E., & Jan, W. U. (2012). Financial Development and Poverty Alleviation : Time Series Evidence from Pakistan, *18*(11), 1576–1581. http://doi.org/10.5829/idosi.wasj.2012.18.11.1265

Kirkpatrick, C. (2001). FINANCE AND DEVELOPMENT RESEARCH PROGRAMME, (30), 1–29.

Kiyotaki, N., & Moore, J. (2005). Financial Deepening. *Journal of the European Economic Association*, *3*(2), 701–713. http://doi.org/10.1162/1542476054472964

Kpodar, K., & Singh, R. J. (2011). Does Financial Structure Matter for Poverty ? Evidence from Developing Countries. *Wps5915*, (December).

Levine, R. (2004). Finance and growth : thory and evidence, (September).

Levine, R. (2008). Finance and the poor, (September 2007), 1–13.

Levine, R., Zervos, S., & Levine, B. R. (2008). Stock Markets , Banks , and Economic Growth, *88*(3), 537–558.

Magee, L. (2007). ECON 761 : Two Stage Least Squares (2SLS) Example, (November).

Nelson, R. R. (1966). American Economic Association (K1). *Science*. http://doi.org/10.1126/science.151.3712.867-a

Network, D. A. C., & Reduction, P. (n.d.). Accelerating Pro-Poor Growth through Support for Private Sector Development.

Ngugi, B. R., Amanja, D., & Maana, I. (n.d.). CAPITAL MARKET , FINANCIAL DEEPENING AND ECONOMIC GROWTH IN KENYA, 1–19.

Morrissey,O. (2002). Recipient governments' willingness and ability to meet aid conditionality:The effectiveness of aid finance and conditions, World Institute for Development Economics.

Nkusu, M., & Sayek, S. (2004). Local Financial Development and the Aid-Growth Relationship. *IMF Working Papers*, *04*(238), 1. http://doi.org/10.5089/9781451875775.001

Odhiambo, N. M. (2009). Financial deepening and poverty reduction in Zambia: an empirical investigation. *International Journal of Social Economics*, *37*(1), 41–53. http://doi.org/10.1108/03068291011006166

Paper, W. (2012). Benchmarking Financial Systems around the World, (August).

Paper, W. (2011). Does Financial Structure Matter for Poverty ? Evidence from Developing Countries, (December).

Perera, L. D. H., & Lee, G. H. Y. (2013). Have economic growth and institutional quality contributed to poverty and inequality reduction in Asia? *Journal of Asian Economics*, *27*, 71–86. http://doi.org/10.1016/j.asieco.2013.06.002

Pilhyun, K. (n.d.). The Effects of Financial Sector Development on Innovation as an Engine of Sustained Growth.pdf.

Press, C. (2013). Gurley and Shaw on Money in a Theory of Finance Author (s): Alvin L . Marty Source : Journal of Political Economy , Vol . 69 , No . 1 (Feb ., 1961), pp . 56-62 Published by : The University of Chicago Press Stable URL : http://www.jstor.org/stable/182, *69*(1), 56–62.

Raghuram G. Rajan and Luigi Zingales. (n.d.). Financial Dependence and Growth.

Reality, R. T. (2012). *Aid and the Private Sector : and Development ?*

Report, T. R. (n.d.). *FINANCIAL SECTOR DEVELOPMENT IN THE PACIFIC DEVELOPING*.

Roodman, B. D. (2006). GMM in Stata 1, (103).

Rosner, B. (n.d.). THE UCLA UNDERGRADUATE The Impact of Financial Development on Poverty in Developing Countries.

Roundtable, E., Africa, N.-O., & Initiative, I. (2009). DEEPENING AFRICAN FINANCIAL MARKETS FOR GROWTH AND INVESTMENT, (November), 21–40.

Rousseau, P. L., & Wachtel, P. (2011). What is happening to the impact of financial deepening on economic growth? *Economic Inquiry*, *49*(1), 276–288.

Sachs, J. D. (2012). From millennium development goals to sustainable development goals. *The Lancet*, *379*(9832), 2206–2211. http://doi.org/10.1016/S0140-6736(12)60685-0

Schneider, C. J., & Tobin, J. L. (2010). Christina J. Schneider and Jennifer L. Tobin.

Schneider, C., & Tobin, J. (2011). Eenie, Meenie, Miney, Moe? Institutional Portfolios and Delegation to Multilateral Aid Institutions* Christina Schneider, (2010), 1–38.

Spamann, H. (2008). “LAW AND FINANCE” REVISITED. *Working Paper*.

Takeshi, I., & Shigeyuki, H. (2010). INSTITUTE OF DEVELOPING ECONOMIES IDE DISCUSSION PAPER No . 249 HOW HAS FINANCIAL DEEPENING AFFECTED POVERTY REDUCTION IN INDIA ? EMPIRICAL ANALYSIS USING STATE-LEVEL PANEL DATA, (249).

TARP, H. H. and F. (2000). Aid effectiveness disputed, *398*, 375–398.

Uddin, G. S., Shahbaz, M., Arouri, M., & Teulon, F. (2014). Financial development and poverty reduction nexus: A cointegration and causality analysis in Bangladesh. *Economic Modelling*, *36*, 405–412.

Ueda, R. M. T. and K. (n.d.). Financial Deepening, Inequality, and growth_A Model_based quantitative Evaluation.pdf.

Veiderpass, A. (2007). *Foreign aid , economic growth and efficiency development A Data Envelopment Analysis approach*.

Weiss, J. (2008). The Aid Paradigm for Poverty Reduction: Does It Make Sense? *Development Policy Review*, *26*(4), 407–426. http://doi.org/10.1111/j.1467-7679.2008.00416.x

Woo, K. (2011). 공적개발원조 배분정책과 실적: 선진국과 한국의 비교.

Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data*. *booksgooglecom* (Vol. 58). MIT Press. http://doi.org/10.1515/humr.2003.021

World, T. H. E., & Group, B. (2015). Financing for Development Post-2015, (October 2013).

Zhuang, J., Gunatilake, H., Niimi, Y., Khan, M. E., Jiang, Y., Hasan, R., … Huang, B. (2009). ADB Economics Working Paper Series Financial Sector Development , Economic Growth , and Poverty Reduction : A Literature Review Financial Sector Development , Economic Growth , and Poverty Reduction : A Literature Review, (173).