The effects of disaggregated foreign aid on income inequality

By

IM Hyangmi

THESIS

Submitted to

KDI School of Public Policy and Management

In partial fulfillment of the requirements

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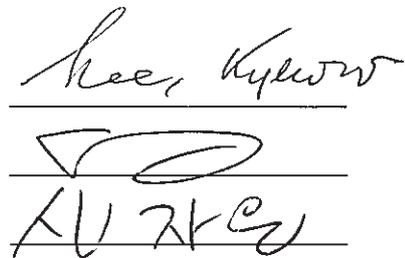in partial fulfillment of the requirements

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ABSTRACT

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Based on the hypothesis that "different sectoral foreign aid has different impacts on income inequality," this paper examines the seven kinds of disaggregated foreign aid (Social aid, Economic aid, Production aid, Multisector aid, Aid relating to Debt, Commodity Aid, and Unallocated aid) on income inequality for a total of 94 ODA recipient countries from 1995 to 2011. This paper utilizes a strongly balanced panel data and the Hausman-Talyor analysis method to control potential endogeneity. Furthermore, this paper not only tests the effect of foreign aid on income inequality at the same years, but 1 to 2 year(s) lagged foreign aid on the current year's income inequality to figure out the importance of the 'timing' of giving specific foreign sectoral aids.

The overall result of the study indicates that Economic aid, Social aid, and Unallocated aid have a statistically negative impact on income inequality, whilst the Multi-sector, Commodity, and Debt aid revealed a positive and mixed result, respectively. Therefore, this paper confirms the hypothesis and concludes through the empirical findings that donor or recipient countries should be prudent in terms of distributing foreign aid if they desire to reduce income inequality via foreign aid.

ACKNOWLEDGMENTS

I would like to express my deepest gratitude to my supervisor, Prof. Kye-woo LEE, who has never given up on my work and always inspired me with great patience. Without him, this thesis could not have been written. It was also a great honor to have Prof. Shun WANG as an adviser. I deeply appreciate his help during my study of econometrics. I also would like to mention my family who always has shown support and an endless love, especially, my mother. Finally, I thank Mr. C. Jung for his support from the start to the end.

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I. Introduction

This paper aims to analyze the impact of disaggregated foreign aid on income inequality and claims that 'different sectoral aids affect income inequality differently'. In particular, this paper tries to find how the foreign aid has been distributed to specific sectors by the recipient countries and how it affected the reduction of income inequality.

1.1. Why do income inequality and foreign aid matter?

Since 1960s, there have been countless debates on the effectiveness of aid on economic growth and poverty reduction without reaching a clear consensus. (Papanek 1973; Hansen and Tarp 2001; Burnside and Dollar 2000; Lensink and White 2002; Kraay and Raddatz 2007; Schabbel 2007; Arndt et al. 2010). However, among the large volume of studies on aid, surprisingly little number of studies have dealt with the relationship between foreign aid and income inequality. Although income inequality may be strongly related to country's economic growth and poverty reduction (Dollar and Kraay 2001, Collier and Dollar 2002 and 2004), it has received only minor attention. Any discussion on the aid effectiveness without considering the relationship between foreign aid and income inequality may lose its validity if such relationship exists.

1.1.1. Income inequality and Poverty Reduction

Severe inequality can give birth to severe poverty. According to the Lopez and Perry (2008), "for a given average income per capita level, higher inequality implies higher poverty levels." Their empirical results show that if Latin America has same inequality levels as predominant in Europe, its poverty rate would be reduced from 25% to 12% with the current level of average income per capita. They also argue that, "countries with higher inequality levels require a faster growth rate to achieve the same poverty reduction than countries with low

inequality (Lopez and Perry 2008)." This means that the elasticity of poverty reduction to the economic growth is lower in the countries with high income inequality.

1.1.2. Income inequality and Economic Growth

Greater income equality can make economic growth more sustainable. Berg and Ostry (2011) found that, "a 10 percentile decrease in inequality…increases the expected length of a growth spell by 50 percent" and they also noted that trade openness and more equal income distribution seem to be the key elements in promoting and sustaining economic growth. Also, Ostry et al. (2014) pointed out the potential capability of equality to undermine the social agreement and create political and economic instabilities and warned the possible reduction in the sustainability and the speed of economic growth (also see Lee, Kye Woo et al. 2002 *Globalization, Growth, Inequality and Social Safety Nets in APEC Economies*, Asian Development Review 19(2): 47-66).

These literatures indicate that income inequality can be both a direct and indirect causes that deter economic growth and poverty reduction. Therefore, it is necessary to figure out the net effect of foreign aid on income inequality to make foreign aid more effective in achieving development objectives.

Also, Paris Declaration (OECD 2005) and Accra Agenda for Action (OECD 2008) clearly state that reducing inequality itself is one of the important goals of giving foreign aid.[1] Hence, by estimating the effect of distributed foreign aid in achieving this goal of Paris Declaration

1. **Paris Declaration on Aid Effectiveness(OECD 2005) I. Statement of Resolve** #2, "At this High-Level Forum on Aid Effectiveness, we followed up on the Declaration adopted at the High-Level Forum on Harmonisation in Rome (February 2003) and the core principles put forward at the Marrakech Roundtable on Managing for Development Results (February 2004) because we believe they will increase the impact aid has in reducing poverty and inequality, increasing growth, building capacity and accelerating achievement of the MDGs."

   Accra Agenda for Action (OECD 2008), #3, "We need to achieve much more if all countries are to meet the Millennium Development Goals (MDGs). Aid is only one part of the development picture. Democracy, economic growth, social progress, and care for the environment are the prime engines of development in all countries. Addressing inequalities of income and opportunity within countries and between states is essential to global progress. Gender equality, respect for human rights, and environmental sustainability are cornerstones for achieving enduring impact on the lives and potential of poor women, men, and children. It is vital that all our policies address these issues in a more systematic and coherent way."

and Accra Agenda for Action, this paper could contribute to setting agendas for further discussion on the effectiveness of aid.

1.2. How to deal with the relationship of foreign aid and income inequality in this paper?

In this research, sectoral foreign ODA (Official Development Aids) data from OECD/ CRS was used to find the effect of specific aid sectors on the income inequality within the 94 countries from the DAC List of ODA recipients during the period of 1995-2011. Note that the sectoral aid categorization does not mean that the donors have provided certain types of services or goods. It refers to the 'sector of destination' of donors' contributions which was obtained from the recipients' answers to the question, "which specific area of the recipient's economic or social structure is the transfer intended to foster"[2]. For example, if an ODA is distributed to develop agricultural education or to build an agricultural storage, then it should be under the 'production-sectors aid' which is the main sector of agriculture, and should not be placed under the education aid or the construction aid. Using this data, this study aims at evaluating the distributional efforts of foreign aid by the recipient countries on inequality reduction. It also attempts to present the way forward to reducing income inequality by promoting aids in specific sectors. If the results are robust enough, this may serve as a 'user's guide' for not only recipients, but also for donors of foreign aid.

The rest of this paper is structured as follows: Section II discusses 'why and how foreign aid leads to income inequality or equality' and review related literatures; Section III talks about the determinants of income inequality and related theories; Section IV presents methodology and data; Section V interprets and presents the empirical results; and Section VI contains conclusion and policy implications.

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2. http://www.oecd.org/dac/stats/purposecodessectorclassification.htm

II. Literature Review

2.1. Why and how the foreign aid and income inequality are related?

Before we move into the argument on the positive or negative effects of foreign aid on income inequality, we should understand why foreign aid and unequal income distribution are related. If the foreign aid is distributed to the necessitous people through proper ways, income inequality is expected to decrease. However, there might be unintended factors that can create unexpected outcomes. Following Layton and Nielson (2009)'s method, this paper will investigate why foreign aid often fails to achieve its purported goals and how the income inequality is affected.

First, the government, which is a main aid distributor, tends to act favorably to "high-income elites" regardless of the government types, such as egalitarian, elitists or laissez-fare. (Boone 1996) In this case, there is a possibility of the government diverting foreign aid from the poor to the elites. Easterly (2003) backs up this claim by saying that the government has little motivation to increase productivity potential of the poor in the fear of bringing political activism that could threaten the current political system. Because of these reasons the poor might get less foreign aid resources than they are supposed to, further widening the income gap between the poor and the rich.

Second, aid conditionality also affects income inequality. Conditionality is what donors attach to foreign aids, namely grants and loans, in order to achieve certain objectives such as corruption reduction, human rights improvement or changing the economic or political system. While a successful targeting and implementation of the conditionality may reduce income inequality, "aid resources are typically fungible and difficult for the donors to deliver them to particular targeted groups or use them to alter the distribution of income. (Collier and

Dollar 2002)"

2.2. Studies on the relationship of foreign aid on income inequality

While there have been a great number of studies on the relationship between foreign aid and economic growth, there are surprisingly small number of empirical researches on the relationship between foreign aid and income inequality despite the potential effect of income inequality on the economic growth. Moreover, unfortunately, among this handful of literatures, the results are often contradicted and highly debated, so that the only common argument one can find is that 'the issue is highly important, but there is no consensus on the relationship between aid and inequality.

Chase-Dunn (1975) and Bornschier et al. (1978) are among the first who were interested in studying the relationship between the foreign aid and inequality. They suggested the positive association between foreign aid and income inequality, but both literatures have the limitation of grounding their arguments on "the Marxist dependency theory", which is now obsolete. (Bjørnskov, 2010). Recently, scholars attempted some empirical analysis on this topic. Although there is only a few, their results can be divided into three clusters; a negative relationship, a positive relationship, and no or mixed relationship between foreign aid income inequality.

2.2.1. Studies showing negative relationship

Chong et al. (2009) pioneered the effect of foreign aid especially aid itself, aid squared and aid multiplied by corruption on income inequality for 116 countries from 1971-2002 using dynamic panel data. Although the result is not robust, they found some weak evidences that foreign aid interacted with democratic institutions is contributive to the improvement of the income distribution. However, there is a limitation that aid itself does not appear to have a

significant effect on reducing inequality.

Shafiullah (2011) examined the foreign aid's impact on income inequality in 94 countries over 20 years and found that the relationship between foreign aid and income inequality is negative, yet the result is very ambiguous in South Asia. Meanwhile previous year's aid (t-1) affects the current year's inequality (t) more than the same year's aid (t), but two years lag (t-2) doesn't show any significant relationship.

Gonzales & Larru (2012) contributes to the negative effects of foreign aid on income inequality. They studied 18 Latin American countries from 1990 to 2008 applying the Simulated Maximum Likelihood method and found that foreign aid had an egalitarian effect on inequality. They focused on Latin American countries which are well known for their high rates of inequality. Tezanos et al. (2013) also supported such result by researching the impacts of ODA grants and loans given to 20 Latin American and Caribbean countries from 1992 to 2007 on inequality-adjusted GDP per capita of relatively lower income groups. They found out that aid is effective with loans than grants and in less-corrupted countries.

2.2.2. Studies with positive relationship

Layton and Nielson (2009) tested the relationship between aid and inequality for 82 countries from 1975 to 2005. They tried to find out the relationship of current / time lagged aid and inequality, and was then tested by omitting Latin America due to its historically bigger inequality than other regions. They concluded that the effect of foreign aid on inequality is between zero and is weakly positive, not negative as it should be. They also suggested that "today's aid's effect today is bigger than today's aid's effect next year", which is in contrast to the Shafiullah's results.

Bjørnskov (2010) also found the positive relationship of aid and income inequality. After investigating 88 countries from the period of 1960 to 2000, he concluded that the economic and political elite groups of upper income quintile benefited from foreign aid more than lower income groups. He found that foreign aid brought about a more skewed income distribution in relatively democratized developing countries, while the effects are insignificant among autocratic nations. That is, "foreign aid given to more democratic countries is associated with a relatively larger share of total income held by the elite groups (Bjørnskov 2010)".

Using panel integration analysis, Herzer and Nunnenkamp (2012) looked at the relationship in 21 countries over the period of 1970-1995. They found a positive relationship and suggested that better accountability is required on both recipients and donors, i.e., aid's inequality increasing effect is not only the problems of the recipient countries, such as corruption and rent-seeking, but also donor's incentive problems, which includes selfish behaviors.

GOUBA (2012) backed up this argument by concluding that tied aid, which is the major type of aid provided to recipient countries, increases income and wealth inequality while untied aid works in an opposite direction. Their effects were similar when they were disaggregated by sector.

2.2.3. Studies with mixed or ambiguous relationship

There are only a handful of literatures that reports mixed results. Cuesta, J. et al. (2006) found that "aid and economic growth affect recipient countries' inequality neither largely nor always in the same direction" and that the regional differences of the effects are present. Saidon et al. (2013) also reported mixed results. However, they disaggregated ODA into four categories (economic, social, production, and multi sector) and first-attempted studying their separate impacts on the income inequality in 75 recipient countries from 1995 to 2009. Their

findings show negative impact of economic aid, positive impact of multi-sector aid, and no significance of the other two sectors. The related literatures are summarized in the **Table A.**

From the above literature review, it is noticed that most of the literatures are focused on measuring the effect of the aggregated aid but they fell short of testing the effects of disaggregated aids on income inequality even though they were aware of the importance of studying their effects.[3] If an aggregated aid was used, the results may have shown potential bias problems and couldn't exactly tell which aid is actually helpful in reducing income inequality. Ouattara and Strobl (2008) and Mavrotas (2006) also emphasized the importance of the disaggregated aid by saying that "our approach tries to illuminate the response of the aid-recipient government to different categories of foreign aid in-flows and the empirical findings clearly demonstrate the importance of the aid disaggregation approach for delving deeper into aid effectiveness issues." Figuring out the effectiveness of disaggregated aids and utilizing those aids to reduce income inequality is an important issue for both aid recipient and aid donor countries

Therefore, this paper uses seven disaggregated foreign aids in the baseline and extended models to estimate the exact and specific relationship between aid and inequality. By using disaggregated aid, this study will contribute to the overcoming of the weakness revealed in the preceding studies.

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3. "Therefore, they suggested that the way in which aid is given to these developing countries be improved and aid agencies determine carefully which types of aid cause inequality to increase." (Layton and Nielson, 2009)
"Deeper insights may be gained by differentiating aid from different types of donors… it could be analyzed whether the distributional effects vary between major forms of aid such as project-specific and general budget support." (Herzer and Nunnenkamp, 2012)

<Table A. Literature Review on the aid's effect on inequality>

Relationship	Study	Effect of Income Inequality	Sample (country/years)	Methodology	Aid Measurement	Inequality Measurement
No and Negative	Chong et al. (2009)	Although the result is not robust, they found some weak evidence that **foreign aid is contributive to the improvement of income distribution** when the democratic institutions are considered.	116(1971-2002)	Fixed effects dynamic panel data /GMM(Generalized Method of Moments)	ODA, EDA, Commitment per GDP	Gini Coefficient sourced from United Nations
Negative	Shafullah (2011)	**Negative** effect; ambiguous effect in South Asia	94(1989-2008)	Fixed and Random effects	Net ODA growth rate	Gini Coefficient sourced from Standardized World Income Inequality Database, SWIID
	Gonzalez & Larru (2012)	Aid has a **negative** (egalitarian) effect.	18(1990-2008) *Latin America	GMM/MLM(Maximum Likelihood Method)	Net disbursement; percentage of GDP; ODA	Gini Coeffcient sourced from Martorano & Cornia(2011) data base
	Tezanos et al. (2013)	Aid on the income inequality is **negatively effective** in Latin America; impact of concessional loans greater than grants and more effective in less-corrupted countries.	20(1992-2007) *Latin America	GMM	Net disbursement; percentage of GDP; ODA	Growth rate of GDP per capita of the population in the nine poorest deciles/UN Economic Commission for Latin America
No and Positive	Layton & Nielson (2009)	The effect of foreign aid on inequality is **no** or **weakly positive**.	82(1975-2005)	OLS/Fixed Effect/Random Effect/2SLS	ODA per Capita (Logarithmized)	Gini Coefficient sourced from Texas Inequality Project
Positive	Bjørnskov (2010)	**Positive** Effect; Interaction of foreign aid and democracy in the recipient countries is associated with income inequality, especially with the higher-income quintile.	88(1960-2000)	Random effects/ Weighted Least Squares(WLS)`	ODA per Capita (Logarithmized)	Shares of national populations belonging to the five income quintiles as treating the upper income quintile as an economic and political 'elite', sourced from WIID
	Herzer& Nunnenkamp (2012)	Aid has an inequality **increasing effect** on the distribution of income.	21(1970-1995)	Panel cointegration techniques	Net Aid Transfer as share of GDP	Estimated household income data sourced from University of Texas Inequality Project
No or Mixed	Cuesta, J. et al. (2006)	Aid affect recipient countries' inequality **little** and **not always in the same direction.** Also, regional differences are existed.	30(1995-1998)	Ordered Probit Model	Aid per capita	Gini Coefficient sourced from WIID
Mixed Results (Positive and Negative)	Saidon et al. (2013)	**Different Sectoral aid affected income inequality differently;** Aid to the economic sector has a negative effect, aid to the multi-sector has a positive effect.	75(1995-2009)	GMM	Log of percentage of GDP; ODA	Gini Coefficient/SWIID

* Positive effect means when foreign aid is given, income inequality increases and negative effect means income inequality reduced.

III. Theories and Determinants of Income Inequality

3.1. What causes income inequality?

The factors that may affect income inequality are as diverse as the researchers who studied this subject. Neumark and Muz (2013) showed that productivity-related indices (quality of life, equity, employment/earnings and job quality, business incubation, human capital, infrastructure, technology/knowledge jobs, and digital economy) could not predict changes in the income distribution whereas the tax-and-cost indices (cost of doing business, size of government, tax rates and tax burden, regulation and litigation, welfare and transfer payment) was able to predict increases in income inequality. As the author acknowledged, due to its disparate characteristic, it is hard to draw firm conclusions on how productivity related indices affect income inequality differently.

Although there are no certain criteria on which variables should be used to analyze income inequality, this paper used frequently discussed variables in the literatures on income inequality issues. The determinants of income inequality are categorized as four factors; Economic, Globalization, Social and political, and Demographic factors.

Determinants of Income Inequality

Economic Factors	Globalization Factors	Social and Political Factors	Demographic Factors
• GDP per capita and Economic growth • Inflation • Tax Revenue • Industry Value Added • Natural Resources	• Trade • FDI	• Democracy • Corruption • Ethnic Tension • Religious Tension	• Rural Population • Life expectancy • School enrollment, Primary • School enrollment, Secondary

3.1.1. Economic Factors

- **GDP per capita and Economic Growth**

The most famous and controversial issue on income inequality is empirically proving Kuznets curve. Kuznets (1955) theoretically explained that there is an inverted U-shape relationship between the income inequality and the economic growth within developing countries; in the early level of economic growth, income inequality increases and after passing a certain point, it starts to decrease through a trickle-down effect. A number of literatures have demonstrated that historically, most countries had followed Kuznets curve. (Adelman and Morris 1973; Robinson and Sherman 1976; Nielsen and Alderson 1995; Barro 2000; Chen 2007; Bhandari et al. 2010; Mollick 2012) There are also lots of empirical results that disprove Kuznets' theory as well. (Ravallion 1995; Deininger & Squire 1998; Fields, 2000; Desbordes & Verardi 2012; Huang et al. 2012) While Dollar and Kraay (2002) didn't show the negative effect of economic growth on income inequality, they found that "economic growth, policies and institutions that support it on average, benefit the poorest in society as much as anyone else".

- **Inflation**

Inflation is considered to be a proxy of macroeconomic volatility. Although some literatures pointed out that the reverse causation may existed between income inequality and inflation, most of them stay on the same page that there is a positive relationship between income inequality and inflation (Beestma & Van der Ploeg 1996; Al-Mahrubi 2000; Crowe 2006) in a way that inflation leads higher inequality (Bulir 1998; Morely 2001; Thalassinos et al. 2012) because the inflation has a greater negative impact on the poor (Albanesi 2007). Moreover, the large share of the income of the poor population is spent on food or energy instead of

saving or investment, thereby affecting them more directly. "As a result, lower income households tended to experience higher inflation rates than higher income groups over the last decade."[4]

- **Tax Revenue**

Tax revenue is a compulsory transfer "to the central government for public purposes" (World Bank).That is, tax revenue has income redistribution impact by spending money on public area such as transfers, health and education "that tends to favor low-income households as well as the growth-enabling infrastructure that can also increase social equity" (OECD 2012). Therefore, this variable should be considered as one of the determinants of income inequality with the potential inequality-reducing effect. In the same vein, Cubero and Hollar (2012) showed the negative impact of tax revenue on income inequality.

- **Industry Value added**

Industry value added, which is a proxy of industrialization of a country, was considered to analyze the impact of economic structural transformation on income inequality. As a country's economy changed from the traditional level of development such as a society relying on agricultural sector or natural resources to the second or third level of industrialization and modernization, income inequality would decrease with the generation of more jobs and capital. On the other hand, some scholars argued that income inequality has risen during the industrialization era. For example, Gottschalk and Smeeding (1999) mention that "a wide range of inequality exists across" industrialized countries "during early 90s to mid-90s." Williamson (1991) also argued in his book "*Inequality, Poverty and History*" that if a certain sector's productivity grows faster than other sectors, the laborer's income in this

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4. http://www.economist.com/blogs/buttonwood/2011/06/inflation-equality-and-debt-crisis

sector will increase and lead to higher income inequality.

- **Natural Resources**

The abundance of natural resources is also an important determinant of income inequality, especially in sub-Saharan African and Latin American regions, where the incomes from the natural resources are higher than other sectors in the economies. Its abundance is supposed to decrease inequality, but high reliance on natural resources bring rents which is usually beneficial to top income group including ruling elites and leads to the income inequality between the rich and the poor. Also, abundant natural resources may retard the development of industrialization or manufacturing sectors (Leamer et al. 1998; Isham et al. 2005). In addition, the amount of the rents from the natural resource is not merely the cause of increasing inequality, but its interaction with other factors such as the status of corruption and ethnic tensions could provide more accurate explainations. For instance, Fum and Hodler (2010) found that "natural resources raise income inequality in ethnically polarized societies, but reduce income inequality in ethnically homogenous societies".

3.1.2. Globalization Factor

- **Trade**

One of the most important but controversial determinants of income inequality is the trade openness. According to the Heckscher-Ohlin theory, trade tends to be more open in the rich (capital abundant) countries and closed in the poor (labor abundant) countries. Thus, the effect of trade on income inequality in developing countries is supposed to be negative. However, this theory face challenges due to its limited assumptions and inconclusive empirical results. Some literature argued that the more a country is open to trade, the more increased inequality in the poor countries (Barro 2000) and the smaller income shares for the

poor people (Milanovic 2005). Also, Meschi and Vivarelli (2009) found that the trade between high income countries and developing countries deteriorate income distribution of the latter. Meanwhile Goldenberg and Pavcnik (2007b) argued that the increase in globalization and rise in inequality appeared at the same time. On the other hand, other literatures oppose these findings by arguing that economic growth driven by the trade benefits the poor (Dollar and Kraay 2004; Birdsall 1998) and that international trade reduces income inequality. (Rodrik 1998). Some other authors argued that there's no relationship between the trade openness and income inequality (Anderson 2005) or the effect of trade on the income inequality is different from country to country (Anderson 2005; Bensidoun et al. 2011).

- **FDI**

Foreign Direct Investment (FDI) is another globalization factor to be examined for its impact on income inequality. FDI can be thought to increase income inequality because if FDI flows into the country, it normally needs the highly educated or skilled labors, whose increased income would lead to the higher income inequality (Tsai 1995). On the other hand, some scholars pointed that if foreign companies employ low-skilled workers, the income inequality could decrease or left unchanged in LDCs (Sylwester 2005; Franco C. 2013). Although the empirical results are mixed, the majority of literatures support the positive effect of FDI on income inequality. (Choi 2006; Chintrakarn et al. 2012).

3.1.3. Social and Political Factor

- **Democracy**

Democracy is the most frequently used variable in testing the political regime's effect on income inequality. However, the results are mixed. Intuitively, a democratic regime should be

more beneficial to the poor and reduce income inequality with its redistributive policies such as progressive taxation, price subsidies and minimum wages law (Reuveny and Li 2003) compared to less democratic regimes. This is related to the median voter theorem; politicians tend to make policies which are preferred by majority voters to maintain or expand their power. Median voters are relatively poorer in more unequal countries, (Milanovic 2000; Iradian 2005), thus politicians are expected to make policies for the poor population and reduce income inequality. In line with this theoretical background, some scholars found that democracy has a negative relationship with inequality (Rodrick 1999; Gradstein and Milanovic 2004; Huber et al. 2006), while some other scholars showed that there is a 'Political Kuznets Curve', which is an inequality curve that first rises then decreases after a certain point when politically important issue or regime change takes place. (Chong 2004). The opposite findings exist with the result that democratization indeed increases inequality among OECD countries (Dreher and Gaston 2008). Some other works report no relationship between democracy and inequality (Bollen and Jackman 1985), or negative relationship of inequality with autocratic political system (Beitz 1982).

- **Corruption**

According to ICRG (International Country Risk Guide), "corruption is a threat to foreign investment by distorting the economic and financial environment, reducing the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability (The PRS Group, 2009)."[5] Corruption could raise transaction costs and reduce the productivity of resources (K. Gyimah-Brempong, 2001) and divert government spending to high-income earners or political elites (Gupta, 2002) eventually increasing income inequality. Justesen and Bjørnskov(2014) concluded that "poor people are more likely

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5. https://epub.prsgroup.com/list-of-all-variable-definitions

to be victims of corrupt behavior by street-level bureaucrats as the poor often rely heavily on services provided by the government" in Africa. Therefore, corruption is often related to high-income groups or political elites and hurts the poor by deteriorating economic growth and widening income inequality. Although there are a few literature reporting results about the negative impact of corruption on income inequality in Latin America, (Dobson & Ramlogan-Dobson 2010; Andres & Ramlogan-Dobson 2011) and an inverted U-shape relationship (Li et al. 2000), but the majority of the empirical results support the positive relationship. (Hindriks et al. 1999; Gupta et al. 2002; Gyimah-Brempong & Munoz de Camacho 2006)

- **Ethnic and religious tension**

Factors related to the social instabilities such as ethnic and religious tensions are associated with high income inequality. In the developing countries which experienced colonization, some ethnic groups inherited wealth and power from the colonizer leading to income inequality between ruling ethnic groups and the others. According to Alesina and Glaeser (2004), ethnic factionalism tends to undermine support for the welfare programs that can alleviate income inequality. The ICRG measures ethnic tensions with "the degree of its racial, national, or language divisions", and religious tension with "a measure of the domination of society and/or governance by a single religious group in a way that replaces civil law by religious law, excludes other religious from the political processes, suppresses religious freedom or expressions of religious identity (The PRS Group, 2009)." Some literatures focused on the positive relationship of ethnic or religious factionalism on income inequality. (Alesina et al. 2003; Dincer and Hotard 2011) Among these, Dincer and Hotard (2011) showed that changing 1 unit of ethnic and religious index (from 0 to 1) led 3 percentage point increase of the Gini-coefficient.

3.1.4. Demographic Factor

- **Rural Population**

Rural population to total population ratio is frequently used as a proxy for economic dualism. Boeke (1953) describes economic dualism as a society or a country's economic sectors that consist of a traditional sector, normally related to agriculture or low capital intensified industry and a modern sector. (Boeke 1953 cited from Kuper 2013) Transforming the traditional sectors into modern sectors within the economy is a widely observed phenomenon in the world, but still many developing countries heavily depend on agricultural sector with large rural population. This builds up income inequality. As Kuznets explained in his famous paper, 'Economic Growth and Income Inequality (1955)', which showed indirectly positive relationship between the rural population and income inequality (migration to urban area reduces rural population and income inequality), some literatures share that higher ratio of rural population increases income inequality, (Tsai 1995; Huber et al. 2006) whereas there are other literatures reporting the opposite results. (Alderson and Nielsen 1995; Layton & Nielson 2008)

- **Life Expectancy**

Life expectancy is defined as "the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life (World Development Indicators, 2014)", was added in the model to see the effect of age structure within a country on income inequality. (Østergaard 2013) Normally, life expectancy is related to high income inequality due to the reduction of working age population and the increased burden of supporting the elderly family members. Broad researches have been done to figure out the effect of income inequality on life expectancy, but there's only little literature on the

reverse direction of the causal linkage, especially among the recipient countries. Mason and Lee (2003) found that the aging has a negative impact on income inequality in Taiwan, whereas Zhong (2011) concluded that the aging coupled with industrialization process significantly increased the inequality in rural China.

- **School Enrollment**

Lastly, the ratio of school enrollment was used as one of the demographic factors. School enrollment can portray the education impact on the income inequality. The majority of studies have built a consensus on the idea that education tends to decrease income inequality (Park 1996, Li et al. 1998; Barro 2000; Sylwester 2002) because education opens doors for the poor to earn higher wages through learning skills, acquiring knowledge, and demanding more equitable treatment to the government or political elites. However, studies like Ram (1989) found correlation between education and income inequality; they tend to move in same directions. Many previous studies used the years of schooling as a proxy variable for education (Li et al. 1998; Barro 2000; De Gregoria and Lee 2002), but this paper used the gross ratio of total enrollment at primary and secondary levels because enrollment ratios would be a more precise measure of estimating the number of students who have education opportunity at different levels than the years of education.

While some of the aforementioned determinants have found consensuses among literatures on their impact on inequality, some of the other determinants still remain controversial about their signs despite of the fact that they are known to be significantly affecting inequality. These variables are GDP per capita and it's squared, GDP growth, Democracy, Trade, Rural Population, Inflation and Tax revenue. This paper includes such determinants as control variables and uses them for baseline model estimation. Other determinants are not included in the baseline model due to the conflicted results among the literatures. These factors, however,

were found to be affecting income inequality. Therefore, they were separately tested in the extended models. Those factors are: Natural resources, FDI, Corruption, Ethnic tension, Religious tensions, Life expectancy, and Primary school enrollment. Both baseline and extended models were tested for different time-lags.

IV. Methodology and Data

4.1. Model Specification

The baseline model for the effect of sectoral aids on income inequality can be expressed as the following.

$$Y_{it} = \alpha + AID'_{it}\beta + X'_{it}\gamma + \mu_i + \varepsilon_{it} \quad (1)$$

where,

i stands for country and **t** stands for year,

Y is a measure of income inequality which is proxied by income inequality.

AID is the vector of the sectoral aids which are the core independent variables. These are: Social Infrastructure and Service aid, Economic Infrastructure and Services aid, Production sectors aid, Multi-sector and Cross cutting aid, Commodity aid including general program assistance, and Aid for action relating to debt and unallocated aid.

X is the vector of other independent variables; GDP per capita and its squared value, GDP growth, Trade, Democracy, Rural Population, Inflation, and Tax revenue.

μ denotes unobserved panel-level random effect and **ε** denotes error term.

As previously mentioned in the Introduction sections, sectoral aid does not refer to the type of certain aid, but it means the aid's destination. First, Social Infrastructure and Services Aid (hereinafter Social Aid) is mainly distributed with the purpose of developing human capital or providing better living conditions. Its sub-sectors are aid to education, health and population

related goods and services, family planning and water supply, sanitation and sewerage, and etc. Economic infrastructure and Services Aid (hereinafter Economic Aid) includes support for building networks and goods and services related to promoting economic activity. Aid for energy generation and supply, transportation infrastructure, storage, communication network, banking and finance services are also included in this sector. Production Sectors Aid (hereinafter Production Aid) is aimed at improving productive sectors that consist of agriculture, fishing and forestry, services, industry, mining and construction, and tourism. Lastly, Multi-sector and Cross-cutting Aid (hereinafter Multi-sector Aid) has the purpose of encouraging the sectors related to the environment, gender equality or urban and rural development issues.

So far, the above four main sectors targeted each specific sector, but some contributions are not destined for a certain sector. They are called Non-sector allocable Aids. The Commodity aid and general program assistance (hereinafter Commodity Aid) are aids for general budget support, development food aid, food security assistance and capital goods import support. The aid for Action relating to Debt (hereinafter Debt Aid) covers debt forgiveness, relief multilateral debt and etc. The Unallocated Aid comprises the aids that are not assigned in the above sectoral aids. This includes the aids given to NGOs and the promotion of development awareness. Because it is reasonable to assume that the aid effect is not immediately shown in the same year, this paper will also consider the relationship between one-year (t-1) and two-year (t-2) lagged sectoral aids with the current year(t)'s income inequality. This can be expressed as the following;

$$Y_{it} = \alpha + AID'_{it-1}\beta + X'_{it}\gamma + \mu_i + \varepsilon_{it} \quad (2)$$

$$Y_{it} = \alpha + AID'_{it-2}\beta + X'_{it}\gamma + \mu_i + \varepsilon_{it} \quad (3)$$

Furthermore, the baseline model was extended by including extra variables that are said to affect income inequality in the literatures, but are not captured by the baseline model to control for additional effects.

$$Y_{it} = \alpha + AID'_{it}\beta + X'_{it}\gamma + Z'_{it}\delta + \mu_i + \varepsilon_{it} \quad (4)$$

$$Y_{it} = \alpha + AID'_{it-1}\beta + X'_{it}\gamma + Z'_{it}\delta + \mu_i + \varepsilon_{it} \quad (5)$$

$$Y_{it} = \alpha + AID'_{it-2}\beta + X'_{it}\gamma + Z'_{it}\delta + \mu_i + \varepsilon_{it} \quad (6)$$

In (4), (5) and (6), **Z** stands for the vector of Industry Value Added, Natural Resources rent, FDI(Foreign Direct Investment), Democracy, Corruption, Ethnic Tensions, Religious Tensions, Life Expectancy, Primary school Enrollment ratio, and Secondary school Enrollment ratio.

To improve the efficiency of the estimation, all variables have taken on natural logarithm values except GDP Growth, Inflation and FDI which include negative values. Because of the poverty-alleviating nature of foreign aids, all aid related regressors are expected to have a negative relationship with income inequality and the coefficients with different scales. Therefore, the expected signs of the coefficients of aid variables are all negative. Since the effects of other independent variables on income inequality are inconclusive and controversial, the signs of the other variables could vary across literatures.

4.2. Methodology

The models of this paper can be estimated by using various linear panel-data analysis methods, such as pooled OLS, Fixed Effects, Random Effects, 2SLS with Instrumental variables, and Hausman-Taylor Instrumental Variables. Fixed and Random effects models are preferred over "pooled OLS because it can be biased due to unobserved individual factors

(Lee 2013)". In general, fixed effects model is more suitable than random effect when the unobserved individual factors are correlated with explanatory variables. However, the caveat is that it cannot provide the estimation for time-invariant variables such as regional dummies in the model. Besides, because potential endogeneity of the sectoral foreign aid variables was detected by using Durbin-Wu-Hausman (DWH) Test, 2SLS or Hausman-Taylor (HT) Analysis models can be more appropriate than fixed effects or random effects model. Still, finding strong and valid instruments for 2SLS can become a challenging quest in this case. Instead, the HT estimators can provide better results. According to La (2013) and Lee (2013), HT estimators have the advantage of "not only offering the estimated coefficients of the time-invariant variables but also controlling for potential endogeneity" by using suitable instruments which can be identified with the test of over-identification.

In sum, this paper believes that, among the above model estimators, HT estimator provide the most consistent and unbiased results because sectoral foreign aids seem to suffer from endogeneity and this model includes time-invariant exogenous variables such as regional dummy variables. The null hypothesis of HT estimator is that, "the excluded instruments are valid instruments, i.e., uncorrelated with the error term and correctly excluded from the estimated equation (Shaffer et al. 2013)". In order to use the HT estimator, null hypothesis should not be rejected. The empirical results are reported in Section **V** along with the results of the overall identification test and over-identification test.

4.3. Data

The Data used in this study is the strongly balanced panel data of 94 ODA recipient countries from OECD DAC list with the period of 1995-2011. Country list is provided in **<Appendix 1>** and the statistical summary of variables can be found at the **<Appendix 2>.**

4.3.1. Dependent Variable

The dependent Variable is Gini coefficients as a proxy of income inequality. The net Gini coefficient value was collected from the Standardized World Income Inequality Database (SWIID), V.4.0 (Solt 2013). This SWIID "maximizes the comparability of available income inequality data for the broadest possible sample of countries and years" based on the *Luxembourg Income Study* data as its standard (Solt 2013). [6]

4.3.2. Independent Variables

The core independent variables are sectoral aids which are proxies of disaggregated ODA (Official Development Assistance) sourced from the OECD Credit Reporting System (CRS). Specifically, ODA data used in this paper is in constant prices (2012 million USD dollars) and covers all channels such public sector, NGOs & civil society, Public-Private Partnership (PPP), multilateral organizations, and etc. Note that the type of aid flow is the gross disbursement, and not the commitment of aid. Due to the unavailability of the disbursement aid data from 1995-2002 from OECD, I estimated and calculated data for the period of 1995-2001 based on the commitment aid using the approaches from Clemens et al.(2004) and Saidon et al.(2013). [7] The other variables are sourced from World Bank, WDI (World Development Indicators) except for 'Democracy' which is obtained from Polity IV, and 'Project and Corruption', 'Ethnic and Religious tensions' which had been collected from the PRS GROUP's ICRG (International Country Risk Guide). Each variable's definition, format and sources are listed in **Table B.**

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6. "Database (SWIID) sourced from the United Nations University's World Income Inequality Database V.2.0c, the OECD Income Distribution Database, the Socio-Economic Database for Latin America and the Caribbean generated by CEDLAS and the World Bank, Eurostat, the World Bank's PovcalNet, the UN Economic Commission for Latin America and the Caribbean, the World Top Income Database, national statistical offices around the world, etc." (Solt 2013)

7. Saidon et al.(2013) assume that "the fraction of disbursement in each of aid category in given period is equal to the fraction of commitments in each category in that period." This is adopted from the Clemens et al.(2004) approach, which is testified "theoretically attractive because it is reasonable that the share of aid disbursed for a broad category of purposes generally reflect the share of aid committed for that broad category of purpose" (Clemens et al.2004)

\<Table B. Regression Variables and explanation\>

Variable	Definition	Format	Source URL
Income Inequality ; Gini Coefficient	"Gini index measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality. *(Source: World Bank) Gini_net :* Estimate of Gini index of inequality in equivalized (square root scale) household disposable (post-tax, post-transfer) income" *(source: SWIIDv4.0)*	1-100	http://myweb.uiowa.edu/fsolt/SWIID.html
Total ODA	"Official Development Assistance (ODA) is defined as those flows to developing countries and multilateral institutions provided by official agencies, including state and local governments, or by their executive agencies, each transaction of which meets the following tests: i) it is administered with the promotion of the economic development and welfare of developing countries as its main objective; and ii) it is concessional in character and conveys a grant element of at least 25 per cent." *(source: OECD)*	percentage of GDP	http://www.oecd.org/dac/stats/idsonline.htm
Social Infrastructure and Services Aid	"This main category covers efforts to develop the human resource potential and ameliorate living conditions in aid recipient countries. It includes, but is not exhausted by: **Education**: educational infrastructure, services and investment in all areas. Specialised education in particular fields such as agriculture or energy is reported against the sector concerned. **Health and Population**: assistance to hospitals and clinics, including specialised institutions such as those for tuberculosis, maternal and child care; other medical and dental services, including disease and epidemic control, vaccination programmes, nursing, provision of drugs, health demonstration, etc.; public health administration and medical insurance programmes; reproductive health and family planning. **Water Supply, Sanitation and Sewerage**: all assistance given for water supply, use and sanitation; river development, but excluding irrigation systems for agriculture." *(source: OECD)*	percentage of GDP	http://www.oecd.org/dac/stats/idsonline.htm
Economic Infrastructure and Services Aid	"This major heading covers assistance for networks, utilities and services that facilitate economic activity. It includes, but is not exhausted by**: Energy**: production and distribution of energy, including peaceful use of nuclear energy. **Transportation and Communications**: essentially equipment or infrastructure for road, rail, water and air transport, and for television, radio and electronic information networks."*(source: OECD)*	percentage of GDP	http://www.oecd.org/dac/stats/idsonline.htm
Production Sectors Aid	"This main heading groups contributions to all directly productive sectors. It comprises: **Agriculture, Fishing and Forestry**: crop and livestock development, provision of production requisites such as farm machinery and fertiliser, irrigation, pest control, veterinary services; services to the agricultural sector, fishing and forestry (including tree crops); conservation and extension, land reclamation; land and soil surveys, land and water use; agricultural construction; storage and transport facilities. Agricultural development banks are included under this heading. **Industry, Mining and Construction**: assistance to extractive and manufacturing industries of all kinds, including prospecting and geological surveys, development and refining of petroleum and ores, processing of food and other agricultural products, manufacture of fertilisers and farm machinery, cottage industry and handicrafts and non-agricultural storage and warehousing. **Trade and Tourism**: export promotion, trade, commerce and distribution; banking (including industrial development banks) and hotel and other tourist facilities."*(Source: OECD)*	percentage of GDP	http://www.oecd.org/dac/stats/idsonline.htm
Multi sector & Cross Cutting Aid	Multi sector and Cross cutting aid is to "support for projects which straddle several sectors, with a concentration on the environment, gender projects and urban and rural development *(source: OECD)*	percentage of GDP	http://www.oecd.org/dac/stats/idsonline.htm
Commodity Aid/General Prog. Ass.	"Aid for general budget support, development food aid and food security assistance" *(source: OECD)*	percentage of GDP	http://www.oecd.org/dac/stats/idsonline.htm
Action Relating to Debt	"Action Relating to Debt: debt forgiveness, rescheduling, refinancing, etc." *(source:OECD)*	percentage of GDP	http://www.oecd.org/dac/stats/idsonline.htm
Unallocated/Unspecified Aid	"Aid which cannot be assigned to another part of the table, and in the case of project or sector assistance, commitments for which the sectoral destination had not been specified. Includes aid to non-governmental organizations and administrative costs."*(source: OECD)*	percentage of GDP	http://www.oecd.org/dac/stats/idsonline.htm
GDP per capita/ GDP per capita squared	"GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars."*(source: World Bank)*	USD Net value (Logarithmized)	http://data.worldbank.org/indicator/NY.GDP.PCAP.CD
GDP growth	"Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2005 U.S. dollars." *(source: WDI)*	annual %	http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG
Inflation, GDP deflator	"Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency."*(source: WDI)*	annual %	http://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG

Variable	Definition	Format	Source URL
Tax revenue	"Tax revenue refers to compulsory transfers to the central government for public purposes. Certain compulsory transfers such as fines, penalties, and most social security contributions are excluded. Refunds and corrections of erroneously collected tax revenue are treated as negative revenue."(*source: World Development Indicators, The World Bank*)	percentage of GDP	http://data.worldbank.org/indicator/GC.TAX.TOTL.GD.ZS
Industry, value added	"Industry corresponds to ISIC (International Standard Industrial Classification) divisions 10-45 and includes manufacturing (ISIC divisions 15-37). It comprises value added in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources."(*source: World Development Indicators, The World Bank*)	percentage of GDP	http://data.worldbank.org/indicator/NV.IND.TOTL.ZS
Total natural resources rents	"The economic rent of a natural resource equals the value of capital services flows rendered by the natural resources, or their share in the gross operating surplus; its value is given by the value of extraction. Resource rent may be divided between depletion and return to natural capital. Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents." (*source: OECD/World Bank*)	percentage of GDP	http://data.worldbank.org/indicator/NY.GDP.TOTL.RT.ZS
Trade	"Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product." (*source: World Development Indicators, The World Bank*)	percentage of GDP	http://data.worldbank.org/indicator/NE.TRD.GNFS.ZS
Foreign direct investment, net inflows	"Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) 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. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP." (*source: World Development Indicators, The World Bank*)	percentage of GDP	http://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS
Democracy	"Democracy is conceived as three essential, interdependent elements; i) the presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders. ii) the existence of institutionalized constraints on the exercise of power by the executive. iii) the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation." (*source: Polity IV.*)	0-10 (the higher, the more democratic)	http://www.systemicpeace.org/inscrdata.html
Corruption	"A measure of corruption within the political system that is a threat to foreign investment by distorting the economic and financial environment, reducing the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability, and introducing inherent instability into the political process." (*source: The PRS Group, Inc. Indicators of Religious Tension / ICRG*)	0-6 (The higer score means the less corruption)	https://epub.prsgroup.com/index.php/the-countrydata-gateway
Ethnic Tensions	"A measure of the degree of tension attributable to racial, national, or language divisions. Lower ratings (higher risk) are given to countries where tensions are high because opposing groups are intolerant and unwilling to compromise."(*source: The PRS Group, Inc. Indicators of Religious Tension/ICRG*)	0-6(Higer score means the lower risk)	https://epub.prsgroup.com/index.php/the-countrydata-gateway
Religious Tensions	"A measure of religious tensions arising from the domination of society and/or governance by a single religious group -- or a desire to dominate -- in a way that replaces civil law by religious law, excludes other religions from the political/social processes, suppresses religious freedom or expressions of religious identity. The risks involved range from inexperienced people imposing inappropriate policies to civil dissent or civil war." (*source: The PRS Group, Inc. Indicators of Religious Tension/ICRG*)	0-6(Higer score means the lower risk)	https://epub.prsgroup.com/index.php/the-countrydata-gateway
Rural Population	"Rural population refers to people living in rural areas as defined by national statistical offices. It is calculated as the difference between total population and urban population." (*source: World Development Indicators, The World Bank*)	percentage of total population	http://data.worldbank.org/indicator/SP.RUR.TOTL.ZS
Life Expectancy	"Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life." (*source: World Development Indicators, The World Bank*)	year	http://data.worldbank.org/indicator/SP.DYN.LE00.IN
School enrollment, primary	"Gross enrollment ratio. Primary. Total is the total enrollment in primary education, regardless of age, expressed as a percentage of the population of official primary education age. It can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition." (*source: World Development Indicators, The World Bank*)	% gross	http://data.worldbank.org/indicator/SE.PRM.ENRR
School enrollment, secondary	"Gross enrollment ratio. Secondary, All programmes. Total is the total enrollment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age." (*source: World Development Indicators, The World Bank*)	% gross	http://data.worldbank.org/indicator/SE.SEC.ENRR

V. Empirical Results and Findings

5.1. Results from the Baseline Model

The results from the empirical tests of the Model (1), (2), and (3) are summarized in the **Table C**. Before interpreting the empirical results, one should understand the results from the diagnostic test. First, the overall specification test shows that all models are not rejected with the p-values of the Wald Chi squared test smaller than the lowest levels of significance. This means that at least one of the regression coefficients in the model is statistically significant. Next, the over-identification test demonstrates that we cannot reject the null hypothesis, which states that the excluded instruments are valid variables.

The results from the baseline model (1), (2) and (3) show that the same year (t) and one-year lagged (t-1) sectoral foreign aids have significant correlation with current income inequality (t). Nevertheless, two-year lagged (t-2) aids do not show any statistical significance. This result is consistent with Shiafullah (2011). Also, Social aid, Economic aid, Production aid and Unallocated aid demonstrate negative relationship with income inequality as expected. Still, contrary to the expectation, Multi-sector aid coefficients were positive during the considered period and the signs and significance of Commodity aid and Debt aid coefficients varied depending on the time lag. This outcome is partly consistent with Sadion et al. (2013), which showed negative effects of Social and Economic aids and positive effects of Production and Multi-sector aids on income inequality.

Focusing on the specific results, each equation and its relationship were analyzed. Note that all the variables including the dependent variable are in the natural logarithm form. First of all, the equation (1) shows that when Social aid, Economic aid and Unallocated aid as percentage of GDP increase by 1 percent point, the Gini-coefficient decreases by 0.0254,

<Table C. Baseline Model: Sectoral foreign aids' effect on income inequality>

Dependent Variable :Gini(logarithmized)	Hausman-Taylor Analysis Method			Sign of Coefficient	
Independent Variables	Equation (1) At level	Equation (2) One-year lagged	Equation (3) Two-year lagged	Expected |	Result
SOCIAL Aid	**-0.0254***	-0.0104	-0.0125	(−)	(−)
	(0.0142)	(0.0118)	(0.0111)		
ECONOMIC Aid	**-0.0127***	**-0.0161****	-0.00563	(−)	(−)
	(0.00731)	(0.00633)	(0.00656)		
PRODUCTION Aid	-0.0104	-0.00672	-0.00489	(−)	(−)
	(0.00771)	(0.00765)	(0.00776)		
MULTI-SECTOR Aid	0.00895	0.00889	0.0101	(−)	**(+)**
	(0.00767)	(0.00746)	(0.00768)		
COMMODITY Aid	0.00202	0.00150	-0.00111	(−)	**(+/-)**
	(0.00283)	(0.00258)	(0.00279)		
DEBT Aid	0.000615	**0.00352***	-0.000500	(−)	**(+/-)**
	(0.00215)	(0.00211)	(0.00220)		
UNALLOCATED Aid	**-0.00689****	-0.00418	-0.00113	(−)	(−)
	(0.00337)	(0.00303)	(0.00302)		
GDP per capita	**-0.235****	**-0.338*****	**-0.274****		(−)
	(0.108)	(0.105)	(0.117)		
GDP per capita squared	0.00968	**0.0196****	**0.0157***		(+)
	(0.00804)	(0.00782)	(0.00873)		
GDP growth	-0.000810	0.00125	0.000127		(-/+)
	(0.00141)	(0.00132)	(0.00131)		
Trade	**-0.0878*****	**-0.118*****	**-0.104*****		(−)
	(0.0334)	(0.0331)	(0.0351)		
Democracy	**-0.0244***	**-0.0323****	**-0.0280****		(−)
	(0.0142)	(0.0138)	(0.0142)		
Rural Population	-0.0562	-0.0231	0.0499		(-/+)
	(0.105)	(0.107)	(0.126)		
Inflation	0.000367	-0.000287	-0.000218		(+/-)
	(0.000425)	(0.000523)	(0.000551)		
Tax Revenue	0.000984	0.00355	0.00193		(+)
	(0.0333)	(0.0330)	(0.0348)		
Constant	**5.486*****	**6.205*****	**5.523*****		
	(0.620)	(0.684)	(0.718)		
No. of Observation	318	318	319		
No. of Country	53	56	56		
Overall Specification test	Wald Chi^2(19)=64.77 Prob>chi^2=0.0000	Wald Chi^2(20)=72.21 Prob>chi^2=0.0000	Wald Chi^2(20)=66.58 Prob>chi^2=0.0000		
Over-identification test : Chi^2 (P-value)	9.724(0.2849)	12.134(0.1453)	13.241(0.1038)		
Over-identification Test , Robust	10.129(0.2561)	14.791(0.0633)	11.129(0.1945)		
Over-identification Test, Cluster	9.219(0.3242)	12.980(0.1126)	15.169(0.0559)		

*Note: (1) The value of Over-identification test is the Sargan-Hansen statistic with p-value in parenthesis

(2) The values for regional dummies do not appear in the table although they are included in the analysis.

(3) *, **, *** represent the level of significance at 10%, 5%, 1%, respectively and the figures in parentheses are standard errors.

0.0127 and 0.00689 percentages, respectively at 0.1 significance level for Social and Economic aid and at the 0.05 significance level for Unallocated aid. Equation (2) shows that 1 percent point increase of aid to the economic sector falls 0.161 percent of Gini-coefficient at the 0.05 significance level when the same amount of the rise in Debt aid increases 0.00352 percent of Gini-coefficient at the 0.1 significance level. Equation (3) does not show sectoral aid's statistical significant relationship on the Gini-coefficient. From the above results, it can be said that social sector aid has greater effect than economic sector aid, while economic sector aid has more durable effect than social sector aid. The results were consistent with extended models that also used different time-lags.

Secondly, GDP per capita has a significantly negative impact on the income inequality in all three baseline models, while GDP per capita squared has a positive effect. This result does not show the Kuznet's inverted U-curve. The trade is negatively associated with the income inequality at the statistically significance level in all three equations. This result is consistent with Dollar and Kraay (2004) and the Heckscher-Ohlin model. The democracy shows a negative effect on income inequality and this possibly reflects the median voter theorem. However it is inconsistent with the results from Bjørnskov (2010). Also, in longer period of time, GDP per capita and its squared, trade and democracy, have more effect on inequality than the sectoral aid variables.

5.2. Results from the Extended Models

The extended models include additional independent variables which are not initially included in the baseline models, but are often considered as important determinants of income inequality. Those variables are: industry value added, natural resources, FDI, corruption, ethnic tension, religion tension, life expectancy, and primary and secondary school enrollment ratio. The applied methods are same for the extended models. The

remaining independent variables were added one-by-one in order to avoid *list-wise deletion* and multicollinearity problems. The regression results of equation (4), (5), and (6) which are extended from the baseline model (1), (2), and (3) are summarized in Table D., Table E., and Table F. respectively.

In the Equation (4), the effect of sectoral foreign aids on income inequality became larger and more statistically significant than the baseline model (1). Social aid, Economic aid and Unallocated aid are still have negative impacts on income inequality and the Multi-sector aid is significantly positive at the 0.1 significant level only when Corruption or Primary school enrollment ratio variables are included in the model. In terms of other additional independent variables, Industry value added has the positive effect at the 0.01 significant level. This means that as economic structure transforms from the primitive level to industrialized society, income inequality could worsen. The natural resources also shows a positive sign at 0.1 significant level and is consistent with the general arguments that abundant natural resources may be disadvantageous to the poor. The corruption index demonstrates that the less corrupted a country is, the more equal the society with controlling for other variables. This result is consistent with the general consensus on the corruption's detrimental effect on income inequality as we discussed in the literature review. Other important demographic variables like life expectancy, primary and secondary school enrollment ratio have negative effect on income inequality at the 0.01 significant levels. Note that regardless of the level of education, whether it be a primary level or a higher level, education effects seem to reduce income inequality.

The test result from the equation (5) shows how the previous year's foreign aid affected the current year's income inequality in the extended model. The overall results are similar with the results from the equation (4) with economic aid showing more significant negative

impacts on income inequality when Natural Resources, FDI, Corruption, Ethnic Tension, Religious Tension and Life Expectancy variables are controlled for. The social aid does not show any statistically significance in this instance. Other variables except for the religious tension show the same relationships as the equation (4). The religious tension shows an opposite result with other equations and its coefficient is small and statistically not significant.

Lastly, the result from the equation (6) shows the effect of the foreign aid with the two years of lag on current income inequality. In the result table, the statistical significance of the regressors seems to have disappeared. Only when school variables are controlled, the positive effect of multi-sector aid and the negative effect of unallocated aid on income inequality seem to appear with some statistical significance. At the same time, the signs of the Commodity aid and the debt aid have changed from positive to negative in this equation compared to the equation (4), (5). The coefficients are also small and statistically insignificant in the result.

To sum up the empirical results, it is suggested that current and one year previous aid to the economic sector such as transport and storage construction, communications, energy generation and supply, banking and financial services reduce income inequality with some statistical significance. Also, the current year's aid to the social sector such as education, health, population policies and social infrastructure appear to have a statistically negative impact on the current year's income inequality. Notably, the Unallocated aid which is mainly consisted of the aid to NGOs demonstrates negative effects in all of the extended models with a statistical significance. The Production aid is related to the primitive industries such as forestry, fishing or mining. Its empirical test has resulted with a negative relationship but showed no statistical significance in any of the models. At the same time, the Multi-sector aid which consists of the aids to the environment area and the urban and rural development has

consistently positive effect on the income inequality, even though its significance is not always observed. The Commodity aid such as food assistant and a general budget support or Aid to debt alleviation showed mixed relationship depending on the time periods and the controlled variables.

<Table D. Regression Result of Extended Model – Effect of Sectoral aids on Income Inequality_at level; Equation (4)>

Dependent Variable : lnGini	Hausman-Taylor Analysis Method								
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SOCIAL Aid	-0.0176	-0.0231	-0.0260*	-0.0209	-0.0299**	-0.0278*	-0.0207	-0.0154	-0.0128
	(0.0143)	(0.0141)	(0.0141)	(0.0150)	(0.0150)	(0.0149)	(0.0141)	(0.0138)	(0.0166)
ECONOMIC Aid	-0.0136*	-0.0134*	-0.0127*	-0.0118	-0.0133*	-0.0142*	-0.0147**	-0.00937	-0.0146*
	(0.00739)	(0.00719)	(0.00728)	(0.00760)	(0.00767)	(0.00767)	(0.00729)	(0.00725)	(0.00777)
PRODUCTION Aid	-0.00778	-0.0114	-0.00965	-0.0129	-0.0117	-0.0126	-0.0117	-0.0120	-0.0105
	(0.00775)	(0.00759)	(0.00769)	(0.00841)	(0.00858)	(0.00855)	(0.00768)	(0.00809)	(0.00945)
MULTI-SECTOR Aid	0.0114	0.00970	0.00968	0.0133*	0.00959	0.00993	0.00739	0.0146*	0.0129
	(0.00764)	(0.00757)	(0.00770)	(0.00800)	(0.00793)	(0.00800)	(0.00764)	(0.00767)	(0.00861)
COMMODITY Aid	0.00219	0.00227	0.00198	0.00229	0.00224	0.00224	0.00253	0.000903	0.00158
	(0.00292)	(0.00278)	(0.00281)	(0.00290)	(0.00294)	(0.00295)	(0.00282)	(0.00262)	(0.00272)
DEBT Aid	7.96e-06	0.000522	0.000803	0.000362	0.000554	0.000609	1.54e-06	-0.000537	-0.00212
	(0.00215)	(0.00212)	(0.00214)	(0.00222)	(0.00224)	(0.00225)	(0.00215)	(0.00211)	(0.00220)
UNALLOCATED Aid	-0.00668**	-0.00641*	-0.00736**	-0.0102***	-0.00919***	-0.00962**	-0.00551	-0.00458	-0.00762**
	(0.00333)	(0.00334)	(0.00336)	(0.00354)	(0.00355)	(0.00375)	(0.00336)	(0.00317)	(0.00366)
GDP per capita	-0.107	-0.234**	-0.237**	-0.117	-0.109	-0.110	-0.0145	0.0908	-0.246
	(0.112)	(0.107)	(0.109)	(0.116)	(0.117)	(0.118)	(0.122)	(0.154)	(0.155)
GDP per capita squared	0.00130	0.00928	0.00980	0.00127	9.04e-05	0.000190	-0.00285	-0.0118	0.0102
	(0.00825)	(0.00800)	(0.00808)	(0.00860)	(0.00870)	(0.00872)	(0.00860)	(0.0111)	(0.0107)
GDP growth	-0.000483	-0.000833	-0.000837	-0.000451	-0.000744	-0.000732	-0.00115	-0.000538	-0.000860
	(0.00140)	(0.00139)	(0.00141)	(0.00144)	(0.00145)	(0.00146)	(0.00140)	(0.00148)	(0.00166)
Trade	-0.138***	-0.111***	-0.0953***	-0.125***	-0.109***	-0.104***	-0.0462	-0.0137	-0.0713*
	(0.0364)	(0.0350)	(0.0342)	(0.0368)	(0.0365)	(0.0367)	(0.0341)	(0.0383)	(0.0375)
Democracy	-0.0270*	-0.0283**	-0.0223	0.001000	0.00707	0.00244	-0.0208	-0.0193	-0.0180
	(0.0142)	(0.0142)	(0.0142)	(0.0185)	(0.0193)	(0.0187)	(0.0141)	(0.0136)	(0.0147)
Rural Population	-0.0524	-0.0162	-0.0238	-0.0670	-0.0594	-0.0593	-0.0387	-0.0553	-0.144
	(0.0977)	(0.121)	(0.109)	(0.109)	(0.107)	(0.105)	(0.0922)	(0.105)	(0.104)
Inflation	0.000278	0.000334	0.000229	0.000500	0.000647	0.000602	0.000272	-0.000501	0.000577
	(0.000421)	(0.000418)	(0.000433)	(0.000435)	(0.000438)	(0.000440)	(0.000422)	(0.000536)	(0.000451)
Tax Revenue	0.0245	0.00534	-0.00585	0.0152	0.00975	0.0101	-0.0159	0.0101	0.0514
	(0.0334)	(0.0333)	(0.0336)	(0.0369)	(0.0371)	(0.0373)	(0.0333)	(0.0341)	(0.0351)
Industry Value Added	0.139***								
	(0.0396)								
Natural Resources		0.0183*							
		(0.0108)							
FDI			0.00252						
			(0.00183)						
Corruption				-0.0529**					
				(0.0228)					
Ethnic Tension					-0.0229				
					(0.0239)				
Religious Tension						-0.0175			
						(0.0337)			
Life Expectancy							-0.622***		
							(0.189)		
Primary School Enrollment								-0.271***	
								(0.0549)	
Secondary School Enrollment									-0.187***
									(0.0445)
Constant	4.614***	5.454***	5.368***	5.237***	5.145***	5.099***	6.942***	5.124***	6.466***
	(0.587)	(0.676)	(0.582)	(0.595)	(0.591)	(0.587)	(0.782)	(0.624)	(0.675)
No. of Observations	315	318	315	285	285	285	318	273	223
Number of Country	53	53	52	45	45	45	53	50	46
Overall Specification test	WaldChi²(20) =77.72 Prob>chi2=0.0000	WaldChi²(20) =70.97 Prob>chi2=0.0000	WaldChi²(20) =68.82 Prob>chi2=0.0000	WaldChi²(20) =67.05 Prob>chi2=0.0000	WaldChi²(20) =61.2 Prob>chi2=0.0000	WaldChi²(20) =60.06 Prob>chi2=0.0000	WaldChi²(20) =73.44 Prob>chi2=0.0000	WaldChi²(20) =94.3 Prob>chi2=0.0000	WaldChi²(20) =130.47 Prob>chi2=0.0000
Over-identification test : Chi² (P-value)	11.767(0.2267)	11.452(0.2460)	10.072(0.3447)	9.680(0.3770)	8.513(0.4834)	8.846(0.4516)	10.272(0.3289)	9.887(0.3597)	12.729(0.1753)
Over-identification Test , Robust	14.205(0.1152)	11.555(0.2396)	10.318(0.3254)	8.381(0.4962)	8.255(0.5087)	8.123(0.5218)	11.184(0.2633)	8.976(0.4395)	10.012(0.3495)
Over-identification Test, Cluster	11.331(0.2537)	9.356(0.4051)	9.791(0.3676)	10.685(0.2979)	8.611(0.4739)	9.018(0.4356)	11.640(0.2344)	9.605(0.3834)	11.344(0.2529)

*Note: (1) The value of Over-identification test is the Sargan-Hansen statistic with p-value in parenthesis

(2) The values for regional dummies do not appear in the table although they are included in the analysis.

(3) *, **, *** represent the level of significance at 10%, 5%, 1%, respectively and the figures in parentheses are standard errors.

<Table E. Regression Result of Extended Model – Effect of Sectoral aids on Income Inequality_One-year lagged; Equation (5)>

Dependent Variable : lnGini	Hausman-Taylor Analysis Method								
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SOCIAL Aid1	-0.0130	-0.00892	-0.0125	-0.00796	-0.00796	-0.00777	-0.00775	-0.0106	-0.0213
	(0.0117)	(0.0117)	(0.0118)	(0.0121)	(0.0126)	(0.0125)	(0.0117)	(0.0118)	(0.0150)
ECONOMIC Aid1	-0.0101	-0.0159**	-0.0156**	-0.0155**	-0.0168**	-0.0169**	-0.0143**	-0.00242	0.00442
	(0.00681)	(0.00626)	(0.00631)	(0.00646)	(0.00666)	(0.00666)	(0.00634)	(0.00679)	(0.00738)
PRODUCTION Aid1	-0.00693	-0.00707	-0.00755	-0.0101	-0.00956	-0.00962	-0.00672	-0.00378	-0.00295
	(0.00772)	(0.00756)	(0.00763)	(0.00809)	(0.00849)	(0.00835)	(0.00762)	(0.00769)	(0.00849)
MULTI-SECTOR Aid1	0.0104	0.00930	0.00817	0.0121	0.00777	0.00761	0.00846	0.0149**	0.0105
	(0.00743)	(0.00738)	(0.00747)	(0.00764)	(0.00778)	(0.00785)	(0.00743)	(0.00739)	(0.00813)
COMMODITY Aid1	0.00149	0.00178	0.00200	0.00235	0.00222	0.00224	0.00198	0.00118	0.000168
	(0.00266)	(0.00256)	(0.00258)	(0.00261)	(0.00269)	(0.00269)	(0.00258)	(0.00260)	(0.00266)
DEBT Aid1	0.00239	0.00355*	0.00349*	0.00283	0.00320	0.00321	0.00276	0.00342	0.000950
	(0.00213)	(0.00208)	(0.00210)	(0.00214)	(0.00220)	(0.00221)	(0.00210)	(0.00226)	(0.00246)
UNALLOCATED Aid1	-0.00393	-0.00424	-0.00462	-0.00782**	-0.00548*	-0.00548*	-0.00272	-0.00499	-0.00446
	(0.00301)	(0.00300)	(0.00304)	(0.00317)	(0.00321)	(0.00325)	(0.00305)	(0.00307)	(0.00347)
GDP per capita	-0.219**	-0.331***	-0.339***	-0.238**	-0.224**	-0.224**	-0.142	0.103	-0.142
	(0.110)	(0.105)	(0.105)	(0.110)	(0.114)	(0.113)	(0.122)	(0.162)	(0.176)
GDP per capita squared	0.0116	0.0188**	0.0195**	0.0128	0.0116	0.0116	0.00872	-0.0112	0.00355
	(0.00812)	(0.00784)	(0.00785)	(0.00821)	(0.00844)	(0.00842)	(0.00854)	(0.0117)	(0.0124)
GDP growth	0.00125	0.00137	0.00131	0.00270**	0.00191	0.00192	0.000864	0.000745	0.000554
	(0.00132)	(0.00131)	(0.00132)	(0.00137)	(0.00140)	(0.00139)	(0.00132)	(0.00141)	(0.00152)
Trade	-0.159***	-0.135***	-0.124***	-0.162***	-0.140***	-0.139***	-0.0813**	-0.0246	-0.0639
	(0.0353)	(0.0346)	(0.0335)	(0.0354)	(0.0358)	(0.0358)	(0.0340)	(0.0386)	(0.0412)
Democracy	-0.0300**	-0.0349**	-0.0311**	-0.0111	-0.0114	-0.0116	-0.0277**	-0.0203	-0.0118
	(0.0139)	(0.0138)	(0.0138)	(0.0178)	(0.0188)	(0.0183)	(0.0138)	(0.0138)	(0.0145)
Rural Population	-0.0222	-0.00189	-0.00575	-0.0256	-0.0305	-0.0249	2.74e-05	-0.0943	-0.209*
	(0.105)	(0.116)	(0.112)	(0.117)	(0.112)	(0.112)	(0.0974)	(0.101)	(0.121)
Inflation	-0.000227	-0.000303	-0.000438	1.08e-06	2.72e-05	3.20e-05	-0.000319	-0.000696	-0.000307
	(0.000519)	(0.000518)	(0.000544)	(0.000529)	(0.000545)	(0.000545)	(0.000520)	(0.000758)	(0.000685)
Tax Revenue	0.0102	0.00598	-0.0126	0.0192	0.0148	0.0149	-0.00743	-0.00131	0.0266
	(0.0328)	(0.0331)	(0.0341)	(0.0362)	(0.0372)	(0.0372)	(0.0331)	(0.0390)	(0.0417)
Industry Value Added	0.123***								
	(0.0394)								
Natural Resources		0.0130							
		(0.0108)							
FDI			0.00148						
			(0.00175)						
Corruption				-0.0737***					
				(0.0213)					
Ethnic Tension					-0.00145				
					(0.0245)				
Religious Tension						0.000747			
						(0.0313)			
Life Expectancy							-0.528***		
							(0.189)		
Primary School Enrollment								-0.273***	
								(0.0550)	
Secondary School Enrollment									-0.200***
									(0.0489)
Constant	5.505***	6.168***	6.228***	5.441***	5.290***	5.260***	7.215***	5.755***	6.435***
	(0.691)	(0.723)	(0.701)	(0.645)	(0.634)	(0.635)	(0.803)	(0.711)	(0.720)
No. of Observations	314	318	316	285	285	285	318	270	218
Number of Country	55	56	55	47	47	47	56	53	48
Overall Specification test	WaldChi^2(21) =83.45 Prob>chi^2=0.0000	WaldChi^2(21) =75.5 Prob>chi^2=0.0000	WaldChi^2(21) =76.01 Prob>chi^2=0.0000	WaldChi^2(20) =74.76 Prob>chi^2=0.0000	WaldChi^2(20) =58.88 Prob>chi^2=0.0000	WaldChi^2(20) =58.82 Prob>chi^2=0.0000	WaldChi^2(21) =78.22 Prob>chi^2=0.0000	WaldChi^2(20) =96.72 Prob>chi^2=0.0000	WaldChi^2(21) =123.64 Prob>chi^2=0.0000
Over-identification test : Chi^2 (P-value)	13.371(0.1465)	14.006(0.1221)	12.694(0.1770)	12.861(0.1690)	10.718(0.2956)	11.063(0.2714)	12.837(0.1701)	8.618(0.4733)	11.749(0.2278)
Over-identification Test , Robust	16.957(0.0494)	16.691(0.0538)	15.816(0.0708)	15.586(0.0760)	13.730(0.1322)	13.844(0.1280)	14.257(0.1135)	9.092(0.4288)	12.402(0.1916)
Over-identification Test, Cluster	14.696(0.0996)	13.361(0.1469)	13.990(0.1227)	13.781(0.1303)	12.177(0.2035)	11.631(0.2349)	15.066(0.0891)	8.899(0.4466)	12.605(0.1813)

*Note: (1) The value of Over-identification test is the Sargan-Hansen statistic with p-value in parenthesis
    (2) The values for regional dummies do not appear in the table although they are included in the analysis.
    (3) *, **, *** represent the level of significance at 10%, 5%, 1%, respectively and the figures in parentheses are standard errors.

<Table F. Regression Result of Extended Model – Effect of Sectoral aids on Income Inequality_Two-year lagged; Equation (6)>

Dependent Variable : lnGini	Hausman-Taylor Analysis Method								
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SOCIAL Aid2	-0.00118	-0.0119	-0.0134	-0.0104	-0.0102	-0.00995	-0.0104	0.0122	0.00968
	(0.0113)	(0.0109)	(0.0111)	(0.0114)	(0.0115)	(0.0116)	(0.0112)	(0.0118)	(0.0138)
ECONOMIC Aid2	-0.00185	-0.00528	-0.00532	-0.00183	-0.00339	-0.00385	-0.00572	-0.00189	0.00846
	(0.00670)	(0.00644)	(0.00660)	(0.00684)	(0.00690)	(0.00691)	(0.00656)	(0.00622)	(0.00685)
PRODUCTION Aid2	-0.0108	-0.00538	-0.00474	-0.00758	-0.00891	-0.00922	-0.00497	-0.00485	-0.00425
	(0.00795)	(0.00761)	(0.00779)	(0.00824)	(0.00833)	(0.00835)	(0.00776)	(0.00773)	(0.00863)
MULTI-SECTOR Aid2	0.00839	0.0116	0.00891	0.0102	0.00828	0.00807	0.00988	0.0124*	0.0162**
	(0.00761)	(0.00757)	(0.00779)	(0.00791)	(0.00797)	(0.00816)	(0.00768)	(0.00751)	(0.00791)
COMMODITY Aid2	1.64e-05	-0.00102	-0.00111	-0.000528	-0.000451	-0.000156	-0.000982	-0.000910	-0.00258
	(0.00290)	(0.00274)	(0.00280)	(0.00287)	(0.00293)	(0.00294)	(0.00279)	(0.00299)	(0.00310)
DEBT Aid2	-0.00132	-0.000204	-0.000115	-0.00156	-0.00110	-0.00112	-0.000783	-0.00116	-0.00223
	(0.00222)	(0.00217)	(0.00224)	(0.00232)	(0.00234)	(0.00235)	(0.00221)	(0.00244)	(0.00266)
UNALLOCATED Aid2	-0.00271	-0.000978	-0.00147	-0.00215	-0.000806	-0.001000	-0.000989	-0.00536*	-0.00730**
	(0.00302)	(0.00297)	(0.00305)	(0.00316)	(0.00317)	(0.00318)	(0.00303)	(0.00295)	(0.00322)
GDP per capita	-0.151	-0.273**	-0.275**	-0.131	-0.144	-0.147	-0.206	0.176	-0.0578
	(0.118)	(0.116)	(0.117)	(0.125)	(0.126)	(0.127)	(0.128)	(0.168)	(0.178)
GDP per capita squared	0.00710	0.0149*	0.0156*	0.00587	0.00654	0.00678	0.0119	-0.0159	-0.00168
	(0.00879)	(0.00880)	(0.00877)	(0.00934)	(0.00944)	(0.00945)	(0.00919)	(0.0120)	(0.0125)
GDP growth	4.47e-05	4.85e-05	0.000208	0.000990	0.000497	0.000502	3.78e-05	0.000336	0.000561
	(0.00129)	(0.00129)	(0.00132)	(0.00135)	(0.00135)	(0.00136)	(0.00131)	(0.00140)	(0.00153)
Trade	-0.146***	-0.132***	-0.108***	-0.134***	-0.125***	-0.121***	-0.0935***	-0.0103	-0.0477
	(0.0363)	(0.0370)	(0.0355)	(0.0374)	(0.0377)	(0.0379)	(0.0356)	(0.0418)	(0.0418)
Democracy	-0.0272*	-0.0314**	-0.0282**	-0.00728	-0.00412	-0.00754	-0.0263*	-0.0199	-0.0113
	(0.0142)	(0.0141)	(0.0142)	(0.0184)	(0.0192)	(0.0187)	(0.0142)	(0.0137)	(0.0146)
Rural Population	0.0376	0.126	0.0480	0.0369	0.0514	0.0477	0.0811	-0.0297	-0.277*
	(0.117)	(0.144)	(0.127)	(0.135)	(0.136)	(0.133)	(0.123)	(0.135)	(0.150)
Inflation	-7.88e-05	-6.08e-05	-0.000237	-5.23e-05	-1.17e-05	-1.19e-05	-0.000200	-0.000558	-0.000316
	(0.000534)	(0.000574)	(0.000554)	(0.000559)	(0.000563)	(0.000560)	(0.000549)	(0.000739)	(0.000748)
Tax Revenue	0.0226	0.00932	-0.00171	0.0362	0.0253	0.0229	-0.000161	0.0170	0.0531
	(0.0346)	(0.0352)	(0.0351)	(0.0378)	(0.0380)	(0.0379)	(0.0349)	(0.0374)	(0.0372)
Industry Value Added	0.157***								
	(0.0387)								
Natural Resources		0.0232*							
		(0.0122)							
FDI			0.00146						
			(0.00143)						
Corruption				-0.0548**					
				(0.0217)					
Ethnic Tension					-0.0184				
					(0.0246)				
Religious Tension						-0.000492			
						(0.0323)			
Life Expectancy							-0.177		
							(0.163)		
Primary School Enrollment								-0.289***	
								(0.0577)	
Secondary School Enrollment									-0.211***
									(0.0471)
Constant	4.711***	5.341***	5.574***	4.703***	4.683***	4.660***	5.721***	5.019***	6.179***
	(0.699)	(0.803)	(0.725)	(0.653)	(0.656)	(0.649)	(0.806)	(0.834)	(0.803)
No. of Observations	314	319	317	285	285	285	319	271	217
Number of Country	55	56	55	46	46	46	56	53	47
Overall Specification test	WaldChi²(21) =84.34 Prob>chi2=0.0000	WaldChi²(21) =73.39 Prob>chi2=0.0000	WaldChi²(21) =67.21 Prob>chi2=0.0000	WaldChi²(20) =56.35 Prob>chi2=0.0000	WaldChi²(20) =49.68 Prob>chi2=0.0000	WaldChi²(20) =48.63 Prob>chi2=0.0000	WaldChi²(21) =66.61 Prob>chi2=0.0000	WaldChi²(21) =95.5 Prob>chi2=0.0000	WaldChi²(20) =132.51 Prob>chi2=0.0000
Over-identification test : Chi² (P-value)	14.622(0.1019)	15.431(0.0798)	13.376(0.1463)	13.077(0.1592)	11.196(0.2625)	11.286(0.2566)	14.688(0.0999)	11.999(0.2134)	13.209(0.1534)
Over-identification Test , Robust	13.607(0.1370)	13.543(0.1395)	12.326(0.1956)	11.562(0.2391)	10.257(0.3459)	10.996(0.2759)	9.637(0.3806)	12.984(0.1633)	14.084(0.1194)
Over-identification Test, Cluster	17.922(0.0361)	16.280(0.0613)	15.772(0.0718)	15.473(0.0787)	14.207(0.1152)	14.649(0.1010)	14.927(0.0930)	12.247(0.1997)	13.100(0.1581)

*Note: (1) The value of Over-identification test is the Sargan-Hansen statistic with p-value in parenthesis
(2) The values for regional dummies do not appear in the table although they are included in the analysis.
(3) *, **, *** represent the level of significance at 10%, 5%, 1%, respectively and the figures in parentheses are standard errors.

VI. Conclusion and Policy Implication

When scholars typically discussed about the aid effectiveness, its relationship with income inequality has rarely been taken into consideration even though income inequality may be an important indicator of economic growth and poverty reduction. The reduction of income inequality has been repeatedly emphasized as one of the important development objectives of foreign aid from the Paris Declaration (2005) and Accra Agenda for Action (2008). This implies that there is a growing need for properly measuring the effect of foreign aid on the income inequality. Using the total aid as an explanatory variable for the empirical analysis for this cause is helpful. However, this approach has a shortcoming of not being able to distinguish the sectorally disaggregated aid on the income inequality. Thus, this paper used disaggregated ODA information instead.

This paper analyzed the seven sectoral foreign aids' impact on the income inequality in 94 ODA recipient countries for the period of 1995-2011 using Hausman-Tyalor estimation technique. At first, this paper empirically tested the suggested baseline model. After that, the model was extended so that model could include other commonly referred determinants of income inequality. This paper also used different time lags to figure out the importance of the 'timing' of giving specific foreign sectoral aids.

The empirical results could confirm the hypothesis, 'different sectoral foreign aid has different impacts on income inequality'. In general, the Social, Economic and Unallocated aid have negative impact on income inequality, while the Multi-sector aid and Commodity and Debt aid showed positive and mixed results, respectively. This result highlights the importance of the donor and recipient countries giving careful considerations on the allocation of the aids when their goal is to reduce income inequality in their countries.

With these results, this paper could draw the following policy implications:

1. As two-year lagged foreign aid doesn't turn out to be statistically significant on reducing the current year's income inequality, the allocation of foreign aid should be continuous and repetitive and focused on the social and economic aid where the result showed the most significant negative effect on the income inequality.

2. The seemingly confusing result from the empirical test that multi-sector aid, in which the important issues such as the environment, gender, and urbanization development are included, tend to worsen the income inequality, suggest that the recipient countries should carefully consider the objectives of aid when they allocate their resources on this type of sectoral aid.

3. The Economist[8] reported that nowadays some developing countries have restricted the aid works of NGOs because of their alleged political activities. Nevertheless, the countries should realize that the 'Unallocation aid' which includes the aid to NGOs may reduce the income inequality.

Although the issues of income inequality had received a little attention in the Millennium Development Goals 2000, highlighting these issues in the Post-2015 agenda will contribute to achieving the goals of economic growth and poverty reduction. This paper is intended to help and guide policy makers in choosing which sector they should allocate aids in order to reduce income inequality.

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8 . http://www.economist.com/news/international/21616969-more-and-more-autocrats-are-stifling-criticism-barring-non-governmental-organisations

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<Appendix 1. Country List (DAC List of ODA recipients)>

Europe and Offshoots

Albania Belarus Bosnia Moldova Montenegro Serbia Turkey Ukraine Fiji Papua New Guinea

MENA

Algeria Egypt Iran Jordan Morocco Tunisia Yemen

Sub-Sahara

Angola Benin Botswana Burkina-Faso Burundi Cameroon Cape-Verde Central African Rep. Chad Comoros Djibouti Ethiopia Gambia Ghana Guinea Guinea-Bissau Kenya Lesotho Liberia Madagascar Malawi Mali Mauritania Mauritius Mozambique Namibia Niger Rwanda Sierra Leone South Africa Swaziland Tanzania Togo Uganda Zambia

Asia (East, South and Central Asia)

Armenia Azerbaijan Bangladesh Cambodia China Georgia India Indonesia Kazakhstan Laos Malaysia Mongolia Nepal Pakistan Philippines Sri-Lanka Tajikistan Thailand Turkmenistan Uzbekistan Vietnam

Latin America and the Caribbeans

Argentina Bolivia Brazil Chile Colombia Costa-Rica Dominican Rep. Ecuador El Salvador Guatemala Honduras Jamaica Mexico Nicaragua Panama Paraguay Peru Suriname Uruguay Venezuela

<Appendix 2. Statistical Summary of Variable>

Variable	Obs	Mean	Std. Dev.	Min	Max
cn	1598	47.5	27.14242	1	94
Year	1598	2003	4.900513	1995	2011
SOCaid	1567	.1209516	1.766259	-5.211434	4.238836
ECaid	1544	-1.282163	2.357406	-11.45093	2.936231
PRODaid	1553	-1.660207	2.068761	-9.373946	2.445406
MULaid	1561	-1.656504	1.782025	-7.954072	2.809533
COMaid	1267	-1.795893	3.309425	-21.77764	3.823221
DEBTaid	958	-2.003731	3.209398	-17.34989	4.668122
UNALCaid	1527	-3.536409	2.381003	-12.22389	2.275718
GDPpc	1591	7.043785	1.11696	4.171462	9.58266
GDPpcsq	1591	50.86172	15.85707	17.4011	91.82737
GDPgrowth	1590	4.861701	5.928728	-32.83211	106.2798
Trade	1552	4.230256	.4688308	2.703563	5.395478
Democracy	1239	1.564507	.7468097	0	2.302585
POPrul	1598	3.875377	.5027658	1.871063	4.530328
Inflation	1579	21.90841	178.6351	-23.84594	5399.526
tax_rev	839	2.660458	.4320024	-.0993103	4.111233
IND	1540	3.287983	.4270002	.6323657	4.28658
NTRresou~e	1584	1.627378	1.457025	-5.317255	4.550083
FDI	1500	3.905715	6.856797	-82.8921	91.00733
Corruption	1175	.8146916	.3473834	-.6931472	1.609438
Ethnic	1195	1.317769	.3712343	0	1.791759
Religion	1187	1.444261	.4137104	-2.484907	1.791759
LIFEexpect	1594	4.137847	.1647972	3.441674	4.375626
SCHpri	1331	4.581594	.2431003	3.376053	5.082191
SCHsec	1091	3.925202	.646238	1.641884	4.704866
europeando~s	1598	.0851064	.2791273	0	1
mena	1598	.0744681	.2626133	0	1
asia	1598	.2234043	.4166575	0	1
lacs	1598	.212766	.4093916	0	1
subsahrah	1598	.3829787	.4862653	0	1

Variable Explanation

cn : Country / SOCaid : Social Aid / ECaid : Economic Aid / PRODaid : Production Aid / MULaid : Multi-sector Aid / COMaid : Commodity Aid / DEBTaid : Debt Aid / UNALCaid : Unallocated Aid / GDPpc : GDP per capita/ GDPpcsq : GDP per capita squared / GDPgrowth : GDP growth / Trade : Trade / Democracy : Democracy / poprul :Rural population / Inflation : Inflation / tax_rev: Tax Revenue / IND : Industry Value Added / NTRresou~e : Natural Resources / FDI : FDI / Corruption : Corruption / Ethnic : Ethnic Tension / Religion : Religious Tension / LIFEexpect : Life Expectation / SCHpri : Primary School Enrollment Ratito / SCHsec : Secondary School Enrollment Ratio / europeando~s : European and offshoots / mena : Middle East and North Africa / asia : Asia / lacs : Latin America and the Caribbeans

<Appendix 3. Regression with all Time-variant Exogenous Variables (At level)>

Dependent Variable : lnGini	Hausman-Taylor Anlaysis Method																
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
lnSOCaid	-0.00293	-0.00492	-0.00448	-0.00184	-0.0153	-0.0150	-0.0157	-0.0254*	-0.0176	-0.0168	-0.0172	-0.00998	-0.0127	-0.0129	-0.00942	0.0149	0.0286*
	(0.00845)	(0.00841)	(0.00841)	(0.00834)	(0.00982)	(0.00971)	(0.00972)	(0.0142)	(0.0143)	(0.0141)	(0.0140)	(0.0146)	(0.0147)	(0.0147)	(0.0145)	(0.0137)	(0.0166)
lnECaid	-0.00635	-0.00663*	-0.00670*	-0.00643*	-0.00465	-0.00475	-0.00508	-0.0136*	-0.0136*	-0.0145**	-0.0145**	-0.0136*	-0.0126*	-0.0131*	-0.0146**	-0.00406	-0.00587
	(0.00392)	(0.00391)	(0.00390)	(0.00383)	(0.00472)	(0.00466)	(0.00466)	(0.00731)	(0.00739)	(0.00731)	(0.00727)	(0.00745)	(0.00746)	(0.00748)	(0.00745)	(0.00706)	(0.00701)
lnPRODaid	-0.00177	-0.00156	-0.000434	0.000867	-0.00541	-0.00561	-0.00492	-0.0104	-0.00778	-0.00822	-0.00733	-0.00925	-0.00756	-0.00750	-0.00901	-0.0197**	-0.0238***
	(0.00492)	(0.00492)	(0.00492)	(0.00484)	(0.0060)	(0.00593)	(0.00771)	(0.00771)	(0.00775)	(0.00767)	(0.00764)	(0.00823)	(0.00828)	(0.00829)	(0.00825)	(0.00814)	(0.00993)
lnMULaid	0.00547	0.00547	0.00553	0.00497	0.0117**	0.0113**	0.0106*	0.00895	0.0114	0.0115	0.0123	0.0177**	0.0181**	0.0186**	0.0173**	0.0258***	0.0243***
	(0.00467)	(0.00468)	(0.00467)	(0.00457)	(0.00545)	(0.00540)	(0.00542)	(0.00767)	(0.00764)	(0.00755)	(0.00756)	(0.00774)	(0.00772)	(0.00776)	(0.00772)	(0.00738)	(0.00788)
lnCOMaid	-0.000769	-0.000485	-0.000473	-0.000660	0.00376	0.00370	0.00372	0.00202	0.00219	0.00219	0.00214	0.00249	0.00237	0.00228	0.00236	4.63e-05	6.48e-05
	(0.00212)	(0.00217)	(0.00217)	(0.00213)	(0.00251)	(0.00249)	(0.00249)	(0.00283)	(0.00292)	(0.00288)	(0.00286)	(0.00289)	(0.00287)	(0.00288)	(0.00286)	(0.00252)	(0.00240)
lnDEBTaid	-0.00234	-0.00223	-0.00198	-0.00180	-0.00120	-0.00119	-0.000835	0.000615	7.96e-06	-7.42e-05	8.89e-05	-0.000442	-0.000618	-0.000731	-0.00102	-0.000195	-0.00136
	(0.00196)	(0.00172)	(0.00172)	(0.00170)	(0.00170)	(0.00170)	(0.00188)	(0.00215)	(0.00215)	(0.00211)	(0.00211)	(0.00215)	(0.00214)	(0.00215)	(0.00213)	(0.00201)	(0.00215)
lnUNALCaid	-0.00561**	-0.00551**	-0.00579**	-0.00558**	-0.00603**	-0.00614**	-0.00612**	-0.00689**	-0.00668**	-0.00645**	-0.00703**	-0.0105***	-0.0109***	-0.0117***	-0.0107***	-0.00671**	-0.00860**
	(0.00231)	(0.00231)	(0.00232)	(0.00228)	(0.00267)	(0.00265)	(0.00265)	(0.00337)	(0.00333)	(0.00331)	(0.00330)	(0.00341)	(0.00341)	(0.00358)	(0.00356)	(0.00323)	(0.00338)
lnGDPpc	-0.0766***	-0.126*	-0.109	-0.0897	-0.184**	-0.189**	-0.185**	-0.235**	-0.107	-0.109	-0.106	0.0446	0.0527	0.0560	0.213	0.524***	0.380**
	(0.0138)	(0.0752)	(0.0753)	(0.0740)	(0.0859)	(0.0869)	(0.0869)	(0.108)	(0.112)	(0.112)	(0.112)	(0.117)	(0.117)	(0.117)	(0.131)	(0.168)	(0.175)
lnGDPpcsq		0.00413	0.00306	0.00170	0.00691	0.00708	0.00700	0.00968	0.00130	0.00121	0.000864	-0.00977	-0.0106	-0.0112	-0.0199**	-0.0410***	-0.0293**
		(0.00565)	(0.00566)	(0.00556)	(0.00633)	(0.00656)	(0.00656)	(0.00804)	(0.00825)	(0.00823)	(0.00827)	(0.00863)	(0.00862)	(0.00866)	(0.00923)	(0.0121)	(0.0124)
GDPgrowth			-0.00134	-0.00122	0.000967	0.00105	0.000949	-0.000810	-0.000483	-0.000500	-0.000500	0.000158	0.000218	0.000241	-7.64e-05	-0.00140	-0.00280*
			(0.000823)	(0.000810)	(0.00110)	(0.00109)	(0.00109)	(0.00141)	(0.00140)	(0.00139)	(0.00138)	(0.00139)	(0.00138)	(0.00139)	(0.00138)	(0.00137)	(0.00149)
lnTrade				-0.0332*	-0.0595***	-0.0628***	-0.0651***	-0.0878***	-0.138**	-0.154***	-0.166***	-0.226***	-0.231***	-0.229***	-0.186***	-0.0916**	0.0237
				(0.0188)	(0.0225)	(0.0233)	(0.0233)	(0.0334)	(0.0364)	(0.0374)	(0.0382)	(0.0408)	(0.0408)	(0.0409)	(0.0438)	(0.0425)	(0.0493)
lnDemocracy					0.000788	-0.000622	0.00130	-0.0244*	-0.0270*	-0.0304**	-0.0291**	-0.00625	0.00111	-6.26e-05	0.00642	0.00734	0.00893
					(0.0111)	(0.0111)	(0.0112)	(0.0142)	(0.0142)	(0.0143)	(0.0143)	(0.0187)	(0.0192)	(0.0193)	(0.0193)	(0.0185)	(0.0180)
lnPOPrul						0.0110	0.0120	-0.0562	-0.0524	-0.0309	-0.00872	-0.0130	-0.0112	-0.0203	-0.00183	0.0546	-0.0581
						(0.0879)	(0.0872)	(0.105)	(0.0977)	(0.109)	(0.115)	(0.118)	(0.118)	(0.119)	(0.114)	(0.128)	(0.140)
Inflation							0.000449	0.000367	0.000278	0.000265	0.000106	0.000240	0.000204	0.000156	-0.000622	0.000391
							(0.000372)	(0.000425)	(0.000421)	(0.000416)	(0.000425)	(0.000427)	(0.000427)	(0.000430)	(0.000427)	(0.000528)	(0.000559)
lntax_rev							0.000984	0.0245	0.0267	0.0207	0.0482	0.0521	0.0544	0.0334	0.0214	-0.0120
							(0.0333)	(0.0334)	(0.0335)	(0.0338)	(0.0368)	(0.0368)	(0.0369)	(0.0361)	(0.0347)
lnIND									0.139***	0.135***	0.140***	0.171***	0.176***	0.174***	0.153***	0.184***	0.0390
									(0.0396)	(0.0405)	(0.0405)	(0.0408)	(0.0408)	(0.0409)	(0.0416)	(0.0562)	(0.0622)
lnNTRresource									0.0109	0.0112	0.0160	0.0155	0.0174	0.0174	0.00477	-0.00813
									(0.0109)	(0.0110)	(0.0111)	(0.0111)	(0.0114)	(0.0113)	(0.0103)	(0.0108)
FDI											0.00284	0.00265	0.00263	0.00273	0.00292	0.00293*	-0.000177
											(0.00181)	(0.00180)	(0.00181)	(0.00179)	(0.00178)	(0.00190)
lnCorruption												-0.0709***	-0.0746***	-0.0728***	-0.0708***	-0.0557**	-0.0656***
												(0.0224)	(0.0225)	(0.0226)	(0.0224)	(0.0221)	(0.0220)
lnEthnic													-0.0351	-0.0340	-0.0259	0.118***	0.107***
													(0.0229)	(0.0229)	(0.0230)	(0.0336)	(0.0367)
lnReligion														-0.0240	-0.0205	0.0343	0.0591*
														(0.0333)	(0.0330)	(0.0316)	(0.0321)
lnLIFEexpect															-0.493**	0.0692	-0.814
														(0.204)	(0.226)	(0.593)
lnSCHpri																-0.334***	-0.237***
																(0.0615)	(0.0779)
lnSCHsec																	-0.0853
																	(0.0804)
Constant	4.157***	4.207***	4.147***	4.220***	4.888***	4.766***	4.866***	5.486***	4.614***	4.608***	4.696***	4.187***	4.219***	4.267***	5.529***	2.620***	7.190***
	(0.146)	(0.274)	(0.275)	(0.280)	(0.327)	(0.495)	(0.459)	(0.620)	(0.587)	(0.612)	(0.666)	(0.634)	(0.634)	(0.639)	(0.840)	(0.946)	(2.284)
No. of Observations	691	691	688	683	532	532	532	318	315	315	312	280	280	280	280	236	187
No. of Country	76	76	76	76	69	69	69	53	53	53	52	44	44	44	44	41	39
Overall Specification Test	Wald Chi2(12)=62.49	Wald Chi2(13)=61.52	Wald Chi2(14)=65.45	Wald Chi2(15)=73.60	Wald Chi2(16)=90.79	Wald Chi2(17)=93.75	Wald Chi2(18)=95.36	Wald Chi2(19)=64.77	Wald Chi2(20)=77.72	Wald Chi2(21)=81.98	Wald Chi2(22)=87.84	Wald Chi2(23)=99.67	Wald Chi2(24)=102.88	Wald Chi2(25)=103.13	Wald Chi2(26)=109.31	Wald Chi2(27)=164.03	Wald Chi2(28)=223.78
	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000	Prob>chi2=0.0000
Over-identification Test Chi2 (P-value)	0.317(0.5736)	6.481(0.0391)	6.735(0.0808)	10.253(0.0364)	15.182(0.0096)	14.325(0.0262)	14.349(0.0453)	9.724(0.2849)	11.767(0.2267)	12.428(0.2575)	12.116(0.3550)	12.053(0.4414)	12.237(0.5083)	13.151(0.5147)	15.091(0.4449)	14.599(0.5542)	13.173(0.7245)
Over-identification Test, Robust	0.215(0.6431)	5.508(0.0637)	5.673(0.1287)	8.988(0.0614)	13.107(0.0224)	12.679(0.0484)	12.849(0.0759)	10.129(0.2561)	14.205(0.1152)	14.547(0.1495)	14.962(0.1843)	13.892(0.3077)	14.959(0.3099)	15.402(0.3512)	15.860(0.3914)	15.287(0.5037)	18.006(0.3885)
Over-identification Test (cluster,country)	0.240(0.6243)	5.033(0.0807)	5.421(0.1434)	7.246(0.1234)	12.050(0.0341)	12.423(0.0532)	12.160(0.0954)	9.219(0.3242)	11.331(0.2537)	11.054(0.3533)	12.027(0.3616)	13.723(0.3188)	15.572(0.2730)	16.853(0.2641)	17.805(0.2730)		

*Note: (1) The value of Over-identification test is the Sargan-Hansen statistic with p-value in parenthesis
(2) The values for regional dummies do not appear in the table although they are included in the analysis.
(3) *, **, *** represent the level of significance at 10%, 5%, 1%, respectively and the figures in parentheses are standard errors.