The Impact of Foreign Aid on Income Inequality: Evidence from Developing Countries. Application of the FMOLS Approach

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Abstract

The present study aims to evaluate the impact of foreign assistance on income inequality of selected developing economies. Panel co-integration technique is applied for the purpose of estimation. After confirming the pre-conditions for cointegration, we have applied the Fully Modified-OLS method to estimate the association between foreign aid and income inequality. Controlling for other variables, we find a positive and significant association between foreign aid and inequality. The empirical results are robust concerning the sub-samples of developing economies selected according to the income classification of the World Bank. The empirical results are also robust concerning the alternative measure of income inequality.

Keywords: Foreign Aid, Inequality, Gini Index, Pedroni Test

1. INTRODUCTION

Considering the donor strategy at face value, a main concern of foreign aid is to promote the poor and needy people of developing nations. The donor group dedicated itself in 2000, to achieve the Millennium Development Goals that would generally value the poorest population sections and, thus, decrease inequality in the beneficiary economies (Herzer and Nunnenkamp, 2012).

It is generally perceived that many aid recipient countries have experienced low per capita income. Thus, in the previous studies, the importance of foreign aid to boost GDP growth has become a significant topic. It is still a controversial and long-discussed topic despite the vast empirical and theoretical literature related to the problem. For example, Burnside and Dollar (2000) find an indication of the positive effects of foreign aid on the output

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growth of a country with a reasonable institutional atmosphere. On the other hand, "Easterly (2003) finds that foreign aid does not have any significant impact on growth, even if the beneficiary countries apply good policies".

An extensively large literature on growth aid nexus exists; however, the inequality aid association has taken less consideration in the past studies. To fill the gap, it is important to improve the distribution of aid and its efficiency. Theory shows that aid may make self-centered beneficiaries involve in rent-seeking interests (Economides *et al*., 2008; Younsi *et al*., 2019). Furthermore, donors may distribute aid in a manner that differs from the pro-poor growth style. Numerous channels are present through which aid may rise in further obvious income inequality. We may find mixed results from previous studies. Different studies have used different estimation techniques such as GMM panel techniques, and fixed and random effects. Therefore, we re-analyze the question of the inequality impacts of foreign aid by using panel cointegration and the FMOLS technique. To investigate the long run impact of aid on income inequality, we add to the previous literature by using the panel cointegration method. Panel cointegration is robust under cointegration to a range of estimation issues, such as slope heterogeneity, omitted variables, and endogenous regressors.

Thus, the present study intends to investigate the issue: does foreign aid play a role in expanding or limiting income inequality in developing economies or not. In particular, the present study contributes to the existing literature by employing panel cointegration techniques to investigate the long-run impact of aid on income inequality.

The rest of the paper is organized as follows. Section 2 presents the empirical and theoretical literature on aid and income inequality: Section 3 is based on model specification and empirical methodology, while Section 4 discusses empirical analysis and discussion. "Conclusion and policy implications are given in section 5".

2.   LITERATURE REVIEW

Various "forms of evidence; anecdotal, theoretical, or empirical, do not seem to support the claim that the poor are the primary" recipients of assistance (Khieu, 2013; Lundqvist, 2014). The anecdotal studies suggest that in underdeveloped nations, those who gain the most from foreign aid are the elite of the country and are the ones who lie in the upper income receiving groups (Lundqvist, 2014; Shafiullah, 2011). Many stories exist from several prominent cases, but the famous instances frequently considered in aid literature incorporate billions of dollars of public resource misuse/corruptions "in former

Zaire under Mobutu Seko, in Indonesia under Suharto, and in the Philippines under Marcos" (Bjørnskov, 2010; Shafiullah, 2011; Herzer and Nunnenkamp, 2012; Khieu, 2013).

Another possibility is that a donor may reward more aid to more equal developing countries because in the past they successfully implemented their policies and strategies to combat poverty and to improve the living standard of the poor population. By seeing the positive impact of the past flow of foreign aid, donors may increase the aid volume to equally income-distributed countries as compared to others (Kieu, 2013). On the other hand, another prospect is that if a country is in line with the strategic interests of the donor, the flow of aid might persist despite high-income inequality. According to the literature, aid not only flows through a humanitarian basis but also on donor strategic interest, hence the flow of foreign assistance is irrelevant as concerned is the level of inequality in aid beneficiary countries.

The discussion of the correlation between foreign aid and income inequality can be traced back to political backgrounds. First, in an underdeveloped country, there exists an underground economy. In a democratic government, projects and programmes have not been undertaken that favour the poor segment of the economy. Rather, foreign donors limit the flow of resources to these economies and make them dependent on their aid provision. Hence, the governments are supposed to comply with the interest of the foreign donors and are supposed to ignore the poor. In the pretext, to ensure optimal use of foreign aid, the donors interfere and monitor policies of the developing economies from time to time, resulting in disturbance and destabilization of their economic policies (Layton and Nielson, 2009).

One criticism that emerged in opposition to foreign aid is that it has encouraged the flow of skill-biased technology, while in developing economies only limited numbers of workers are supposed to meet the requirement of skilled-biased technology; since the demand is met with lagging supply, thus foreign aid may instead result in income inequality (Aghion, 2003). Some studies also blame globalization for increasing inequality as the economy inclines to produce additional goods and services in which it has a "comparative advantage; thus, it results in an increase in earnings of those involved in international trade only (Evans and Timberlake, 1980; Alderson and Nielsen, 1999; Reuveny and Li, 2003; Layton and Nielson, 2009)

Some studies (Layton and Nielson, 2009; Reuveny and Li 2003) point to the fact that macroeconomic development is one of the reasons for income inequality as beyond a certain level, income inequality tends to increase with increasing economic development as postulated by the Kuznets curve hypothesis. In other words, foreign aid may be associated with increasing

economic development which in turn may be associated with increasing income inequality (Layton and Nielson, 2009). Furthermore, legally bound minimum wage is one of the determinants of increasing inequality. Minimum wage results in unemployment that in turn leads toward income inequality between the employed and the unemployed.

Likewise, demographics are considered to be important causes of changes in inequality. Demographic characteristics such as population aging, differential fertility, youth share in total population, education, fraction of the population employed in informal sector, immigration, and ethnic diversity also have considerable roles in growing inequality (Aghion 2003; Layton and Nielson, 2009).

According to Shafiullah, (2011), easy accessibility of foreign aid also causes distraction of foreign aid towards unproductive sectors that result in inefficient allocation of resources. Furthermore, dependence on foreign aid increases the dependency of the country on foreign sources that further attracts corrupt practices in the economy. As a result, resources are wasted despite the inflow of foreign aid.

A decrease in debt relief can improve income distribution. This is likely if debt relief frees up resources to be devoted in pro-poor projects, for instance, debt-for-health swaps programmes or debt-for-education. In the same line, as aid is fungible, more public resources - cash or in-kind allocations, for example, may also be channeled to the lowest income quintiles, that may improve income distribution (Castells-Quintana and Larrú, 2015).

The available literature, in general, indicates that the effect of foreign assistance on income equality is not straight forward; rather it is contingent upon different socio-economic factors such as institutional quality of a country, and the economic position of a country. More importantly, demographic factors, and debt-related terms and conditions on part of the donors tend to influence the assistance and inequality relationship.

3.   MODEL AND METHODOLOGY

3.1.   Model and Data

To study the effect of foreign aid on inequality, following Herzer & Nunnenkamp (2012), and Kasuga & Morita (2018), we model the association between foreign aid and income inequality in a manner that inequality is used as the dependent variable, while foreign aid and other control variables have been used as independent variables. Thus we use the following model:

$GINI_{it} = \beta_0 + \beta_1 (ODA)_{it} + \beta_2 (GDPpercapita)_{it} + \beta_3 (Tradeopenness)_{it} + \beta_4 (FDI)_{it} +$
$\beta_5 (Democracy)_{it} + \beta_6 (youth\ Population)_{it} + \varepsilon_{it}$ ....(1)

where GINI is used to represent the Gini index. Gini index is used as a proxy for income inequality, while the ODA represents official development assistance used as a proxy for foreign aid. ODA is measured in the current US dollar. Other independent variables used in the model include variables such as GDP per capita, trade openness, foreign direct investment, democracy, and share of the youth population. The democracy variable is an index of democracy that ranges from 0 to 10, where 0 implies the least democratic while democracy value of 10 indicates as the most democratic. FDI and trade openness have been used as a percentage of GDP. FDI is expected to increase inequality owing to the fact that FDI brings technology while technology is supposed to be skilled-biased which in turn is likely to increase the employment of competent workers compared to the low trained workers. Thus, an increase in income inequality is expected. Youth population indexes the share of the population with the age (15-64) years. It represents a working-age population of a country. Data regarding Gini Index were collected SWIID (Standardized World Income Inequality Database), while data associated to other indicators were collected from "World Development Indicators" (WDI) over 1973-2014. Data related to democracy were collected from Freedom House. Since the current research seeks to examine the effect of foreign aid on developing economies; we have collected data related to 32 countries for the purpose. Selection of countries was based on the availability of data; however, we have ensured selection of countries from various regions of the world.

3.2. Methodology

The ordinary least square estimates are assumed to show biased results as results based on OLS are supposed to suffer from many econometric problems such as heteroscedasticity and autocorrelation. Thus, in this context, it is imperative to examine the existence of unit roots of all included variables in the analysis. The present study used Levin Lin and Chu (LLC) and the I'm Pesaran test to confirm the order of integration. LLC and IPS tests are based on the principle of ADF. After detecting the existence of unit root in the variables, the later step is to check for cointegration among variables. To confirm a long-run association or cointegration among variables, the present study will employ Pedroni (2000) and Kao (1999) tests. After confirmation of cointegration among variables, we will use the FMOLS approach to get long run estimates. The basic and most important feature of the FMOLS approach is that it can

account for potential endogeneity and serial correlation problem and is defined as:

$$\hat{\beta}FM = [\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{it} - \bar{x}_i)]^{-1}[\sum_{i=1}^{N}\{\sum_{t=1}^{T}(x_{it} - \bar{x}_i)\hat{k}_{it}^{+} + T\hat{\Delta}^{+}_{\varepsilon\mu} \qquad \dots (2)$$

where $\hat{k}^{+}_{it}$ is a transformed variable k_{it} which aims to correct the endogeneity problem.

4. RESULTS AND DISCUSSION

4.1. Testing Panel Unit Root

The present study has employed the Levin-Lin-Chu (LLC) test and the Im-Pesaran-Shin (IPS) test to check for the stationarity problem. From Tables 1 and 2, we can see that most variables have insignificant probability value at the level and cannot reject our null hypothesis and accept that the variables are non-stationary. When we take the first difference of our variables both LLC and IPS, test results indicate that most variables have significant probability value and we cannot accept our null hypothesis; rather, we reject our null hypothesis and conclude that all variables are stationary at first difference.

Table 1. Levin-Lin-Chu Test

Variable	Level		First Difference		Outcome
	T statistic	P-value	T statistics	P-value	
Gini Index	0.461	0.677	-7.825	0.0000*	I(I)
ODA	-1.109	0.134	-16.892	0.0000*	I(1)
FDI	4.371	0.200	-7.825	0.0000*	1(1)
Gdp Per capita	-13.295	0.420	-27.809	0.0000*	1(1)
Lyoungpopulation	3.687	0.999	-4.059	0.0004*	I(1)
Democracy	-1.284	0.910	-17.520	0.0000*	I(1)
Trade Openness	-0.005	0.498	-15.370	0.0000*	1(1)

Note: Null hypothesis: time series has a unit root, * implies significance at 1% level.

Table 2. Im-Pesaran-Shin Test

	Level		First Difference		
	T statistics	Probability	T statistics	Probability	
LGini index	-0.213	0.415	-17.046	0.0000*	I(1)
ODA	-2.734	0.103	-23.493	0.0000*	I(1)
FDI	-7.025	O.832	25.465	0.0000*	1(1)
Gdp Per Capita	-16.359	0.280	-35.867	0.0000*	1(1)
young population	27.137	1.000	110.969	0.0002*	I(1)
Democracy	-0.212	0.416	-18.678	0.0000*	I(1)
Trade Openness	-0.073	0.471	-19.826	0.0000*	I(1)

Note: The null hypothesis is that each series contains a unit root, *implies significance at 1% level.

4.2.   Cointegration Test

Table 3 discusses the "Pedroni and Kao tests". The findings of Pedroni test indicate that four test statistics out of eight (within dimension) while two test statistics out of three (between dimensions) are significant leading us to reject the null hypothesis of no cointegration and confirm that cointegration exists among variables. Cointegration results based on Kao's (1999) test are also given in Table 3. The result provides sufficient support to reject the null hypothesis of no cointegration at a 5% level of significance. These estimated values reveal the presence of a long-run association between aid inequality and other included control variables. The confirmation of co-integration allows us to proceed with further estimation.

Table 3. Cointegration Results Based on Pedroni and Kao Tests

Alternative Hypothesis: Individual AR Coefs.(within dimension)				
	Statis	Prob	Weighted Statistic	Prob
Panel v statistics	1.343	0.0896***	-3.644	1.000
Panel rho-Statistic	1.223	0.889	3.328	1.000
Panel PP-Statistic	-2.403	0.0081*	-1.706	0.044**
Panel ADF-Statistic	-0.679	0.249	0.811	0.0791***
Alternative hypothesis: individual AR coefs. (between dimension)				
	Statistics		Probability	
Group rho-Statistic	3.706		1.000	
Group PP-Statistic	-5.001		0.000*	
Group ADF-Statistic	-1.275		0.010**	
Cointegration Results Based on Kao Test				
	T statistics		Prob.	
ADF	-0.615		0.0269**	

Note: Null hypothesis: no cointegration, trend assumption: No deterministic trend where *,**, *** represent 1%, 5%, and 10% level of significance respectively. "The number of lags was determined by the Schwarz criterion with a maximum number of 4 lag."

4.3.   Estimation Results

Table 4 presents the empirical findings based on FMOLS results. The findings indicate that foreign assistance has a significantly positive impact on income inequality. In other words, the findings indicate that a rise in foreign aid is responsible for growing income inequality in developing economies.

Table 4. Long run Results based on FMOLS Approach

Variables	Coefficient	t-statistic	P-value
ODA	0.001	2.817	0.004**
FDI	0.002	1.137	0.255
Trade openness	-0.026	-1.497	0.047**
Young population	0.154	1.733	0.083***
GDP per capita	-0.011	-4.767	0.000**
Democracy	0.001	0.723	0.469
Adjusted R2	0.68		

Note: *,**,*** implies 1%, 5% and 10% level of significance.

The estimated results confirm our established hypothesis. The size of the coefficient shows that a one-unit increase in foreign aid leading to an increase of 0.1 percentage of income inequality in developing nations. According to Herzer and Nunnenkamp (2012), one of the possible reasons for the ineffectiveness of foreign aid in lowering inequality is the ruling elite that is the major recipient of foreign aid. Furthermore, the wealthier population might have more benefit than the poor segment in earning the gains produced by aid. Especially, in emerging nations where the more affluent people are usually provided with network, good quality education, and additional assets. Therefore, the rich and the elite class are more expected to have the opportunity to contribute and use from aid inflow (Todaro and Smith, 2011). According to Bjørnskov (2010) and Layton and Nielson (2009), the rich and the ruling elite have additional encouragement to distribute their aid money to projects with higher prospects of urgent accomplishment. Consequently, they decide a place of their activities in less challenging situations, where the population does not need resources (Bjørnskov, 2010; Herzer and Nunnenkamp, 2012; Layton and Nielson, 2009).

The estimated coefficient of FDI is positive but statistically insignificant. The positive association between FDI and inequality suggests that inward Foreign Direct Investment (FDI) is linked to broadening income inequality in the developing countries. Generally, the developed nations are supposed to transfer innovative technology to developing countries through the FDI network. The influx of FDI increases the demand for skilled employees, that is supposed to result in increasing inequality (Lundqvist, 2014). However,

according to our results, though the sign is positive it is statistically insignificant, Thus, FDI may not increase inequality in developing economies, rather it may have beneficial effects on economic growth and filling the saving and resource gap.

Trade openness is inversely related to income inequality in the developing nations. The result is significant at 5%. The findings indicate that a one percentage change in trade openness leads to a decrease in inequality by 2.57 percent. It is in line with the traditional trade theory. As the Heckscher-Ohlin theorem postulates that countries based on the difference in the abundant resource while developing countries tend to have an abundance of labour, thus they are supposed to specialize in labour-intensive products. Hence, increasing trade openness helps increase the demand for low-skilled labour, and as a result, a decrease in income inequality is the possible outcome at least in the long-run. Our results are consistent with the results of (Georgantopoulos and Tsamis, 2011; Jaumotte, Lall, and Papageorgiou, 2013; Reuveny and Li, 2003).

Interestingly, an increase in the supply of young population is related with a rise in income inequality. The findings are in line with theory. An increase in labour supply causes wages to decrease because fewer job and economic opportunities are available in developing economies. While in developing countries, the majority of the workers is low-skilled, hence, an increase in the youth population is linked with an increase in income inequality. The results are in line with the findings of Alderson and Nielsen (1999).

Estimated results suggest an inverse and significant relationship between GDP per capita and income inequality. Although its magnitude is very small yet our estimated coefficients are consistent with the economic philosophy that the association between GDP growth and inequality can move in the same direction at least in the short run, while in the long run, a rise in per capita income may have a negative effect on income inequality. Kuznets (1955) claims that in the early stage of development, a country's economic growth as well as income inequality rises. As economies grow and develop, inequality is expected to lower the income gap between the rich and the poor. Our results are consistent with Banerjee and Duflo (2003) and Panizza (2002).

The impact of democracy on income inequality is positive but statistically insignificant. As far as its magnitude is concerned, it shows that a one-unit change in a democracy leads to an increase of inequality by 0.08 percentage. Despite the small magnitude, the estimated sign does not support our established hypothesis that democracy leads to a decrease in inequality. One possibility is that the level of democracy prevailing in the developing counties is not mature when compared with that of the developed economies.

The majority of the ruling elites is members of the parliament and has a substantial role in policymaking; they are expected to mold policies that seemingly help the poor but fulfill the interest of the ruling elite.

4.4.   Robustness Check

To confirm the validity of our results we perform different robustness tests. First, we split our data into sub-sample by countries income group[1] to extract the difference between these groups such as "low income, lower middle income, and upper-middle-income countries" and re-estimate with the FMOLS. However, it is important to mention that inequality based on SWIID is used as a measure for inequality for different classifications of income. Furthermore, to check whether our results are robust for alternative inequality dataset or not, we utilize the Household Income Inequality dataset (EHII)[2].

Table 5 reports the FMOLS results for "lower middle-income countries, low-income countries, and upper-middle-income countries". FMOLS results for the sub-groups of the entire sample confirm our main findings that a positive association exists between foreign aid and inequality; however, in the case of lower-income countries, foreign aid has an insignificant impact on income inequality. As for foreign aid and other control variables on inequality FDI shows a positive but insignificant impact "in the panel of low, middle, and upper-income countries" confirming our finding that there exists a positive relationship between FDI and inequality.

Trade openness and democracy results also confirm our main estimation while GDP per capita is inversely related in the lower middle and upper-middle-income countries, while it is positively related with inequality in

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[1]Income classification is based on the World Bank Atlas method, where the lower-middle-income economies are those with a GNI per capita between \$1,026 and \$4,035; upper-middle-income economies are those with a GNI per capita between \$4,036 and \$12,475 and high-income economies are those with a GNI per capita of \$12,476 or more".

[2] "Globally, there are different datasets available for income inequality such as the World Bank's Povcal Net, the Luxembourg Income Study and Wealth Study Databases (LIS, LWS), the Standardized World Income Inequality Database (SWIID), the World Income Inequality Database (WIID), the World and Wealth Income Database (WID. world), All the Gini's dataset, the Estimated Household Income Inequality dataset (EHII) and the Global Consumption and Income Project (GCIP). The databases reviewed differ considerably in purpose, coverage, data sources, and indicators provided. Some of them are just repositories of estimates compiled from primary and other secondary sources. Others provide original estimates based on microdata from, mainly, a growing number of household surveys."

the case of low-income nations. It proves the presence of Kuznets inverted u-shaped curve. According to this hypothesis at the advanced level of development, per capita income is inversely associated with income inequality; as income (per capita) rises, income inequality declines, while on the other hand at the lower level of development GDP per capita, it is positively related to income inequality.

Table 5. Robustness Estimates

	Lower Middle Income	Low Income	Upper Middle Income	Inequality Index Based on EHII
ODA	0.0005***	0.0020	0.0004*	0.0003**
	(-0.0002)	(-0.0034)	(-0.0002)	(0.0080)
FDI	0.0007	0.0090	0.0290	-0.009*
	(-0.0018)	(-0.0140)	(-0.2090)	(-0.0020)
Trade Openness	-0.0370	-0.0049	-0.0381	0.0245*
	(0.0177)**	(-0.0412)	(0.0140)*	(-0.0171)
Young Population	0.0511	1.7180***	0.2204*	-0.2324
	(-0.1100)	(-0.9502)	(-0.1041)	(-0.0901)
GDP Per Capita	-0.0700**	0.0770	-0.0009	0.0005**
	(-0.0680)	(-0.2928)	(-0.0130)	(0.0016)
Democracy	0.0021***	0.0001	0.0090*	0.0033*
	(-0.0010)	(-0.0090)	(-0.0013)	(0.0020)
Adjusted R2	0.6500	0.5800	0.5600	0.8800

Note: values in () shows standard errors while *, **, *** shows 1%, 5% and 10% level of significance.

As far as the alternative income inequality index is concerned, the empirical results based on the FMOLS are presented in 4 columns of Table 5. The results show that the coefficient of aid is positive and statistically significant. Thus, we can conclude that our results are not only robust – according to classifications of income such as lower, low, and upper-income countries but also according to the alternative income inequity index.

5. CONCLUSION AND POLICY IMPLICATIONS

Developing countries, in general, are main recipients of foreign aid as developing countries tend to suffer from the twin deficits i.e., the fiscal and trade deficit. Since they have low saving rates and are unable to finance their development projects from domestic resources, resultantly, they approach multilateral donor agencies and make bilateral arrangements to get foreign aid. Thus, foreign aid is expected to play a role by filling the saving-investment gap to finance development projects in developing countries. Accordingly, foreign aid is expected to play a role in boosting economic growth and reducing poverty

in the developing economies. However, over the past few decades, it is evidenced by several countries that the increasing inflow of foreign aid has resulted in increasing income inequality in several developing countries. Many believe that foreign is not utilized properly; hence, the true benefits of foreign aid do not reach the poor segment of the society.

The present study thus attempts to examine the impact of foreign aid on income inequality of selected developing economies. For this purpose, we have utilized annual data over 1973-2014 for a cross-section of thirty-two (32) countries. For estimation, we have used the cointegration approach introduced by Peroni and Kao while for long-run estimates, we have used the FMOLS approach. The latter approach performs better to account for serial correlation and endogeneity problems. Furthermore, to check the robustness of the results, we have examined the impact of foreign aid for different developing countries according to the income classification of the World Bank. We also have used an alternative measure of income inequality to examine the impact of foreign aid on income inequality.

The findings indicate that the inflow of foreign aid assistance is associated with increasing income inequality in the developing economies. The findings are robust as almost the same results tend to hold in the case of all income groups of the developing economies selected for empirical analysis. Furthermore, the results are robust concerning the alternative measure of income inequality. Other independent variables show expected signs as increasing per capita income is associated with increasing income inequality, while inequality is also shown to have increased with democracy. FDI does not have any significant impact on income inequality.

The findings are important from policy perspectives. As the developing economies are highly dependent upon foreign aid owing to the fact that their domestic savings are low, they have limited foreign exchange to support their currency and finance their imports. Hence, they resort to foreign aid. Since our results show that foreign aid has increased inequality, there is a need to utilize foreign aid appropriately. For this purpose, the foreign aid resources need to be channelized to pro-poor sectors, which may generate economic opportunities for the poor. If foreign aid is not utilized properly, the loans will have to be paid back in the shape of debt servicing in the future, further penalizing the poor in the shape of increasing taxation and increasing inflation.

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APPENDIX

Table A1. List of Countries

Upper Middle Income Countries	Upper Middle Income Countries	Upper Middle Income Countries	Low-Income Countries	Middle Income Countries
Egypt	Indonesia	Lesotho	Bangladesh	Argentina
EI Salvador	Iran	Madagascar	Cameroon	Botswana
Ghana	Kenya	Malawi	Cote D'Ivoire	Bostswana
Guatemala	Nigeria	Malaysia		
Honduras	Pakistan	Mauritius		
India	Philippine	Morocco		
Swaziland	Thailand	Nicaragua		
Sri Lanka	Tuni sia	Uganda		
Dominican Republic	Zambia			

Table. A2 Summary of Literature

Name	Countries /Sample	Technique	Aid Proxy &/ Data Source	Income Inequality Proxy& Data Source	Results
Herzer and Nunnenkamp (2012)	21 Countries	DOLS, FMOLS	Percentage of GDP; Net Aid Transfers (NAT)/ Center for Global Development	Gini Index/ EHII	Aid Reveals an Inequality Increasing Effect on Income Distribution
Layton and Nielson (2009)	82 Countries and Over 1,100 Observations (1975-2005)	OLS /2SLS Logit Model	Log of Aid Per Capita/, WDI, World Bank and (OECD)	Gini Index/ University of Texas Inequality Project	The Study Concludes That Foreign Aid Is Positively Related to Income Inequality.
Shafiullah (2013)	94 Countries (over 20 Years)	Fixed Effect	NAT , ODA/ World Bank and OECD	Gini Index/ SWIID	Aid Causes Small Reductions In Inequality.
Ali and Ahmad (2013)	Pakistan (1972-2007)	Phillip-Perron Unit Root, ADF, cointegration	Aid Percentage of GDP/ World Bank	Gini Index/ World Bank, Economic Survey of Pakistan	Aid Is Positively Related To Income Inequality.
Chong *et al.* (2009)	116 Countries (1971-2002)	(GMM)	Percentage of GDP; ODA/ OECD, (EDA), Chang *et al.* 1999 (World Bank)	Gini Index/ WIID	Aid Is Inversely Related With Income Inequality.
Bjørnskov (2010)	88 Countries (1960-2000)	Weighted Least Squares (WLS)	Log of Official Development Assistance as % of GDP/ OECD	Shares of the Population Belonging to Each of the Five Income Quintiles	Positive Association And Potential Causality Exist Between Aid And Inequality In Democracies, But In Nondemocratic Settings, The Effect Is Missing.
Azid *et al* (2006)	43 Countries (1993-2005)	Fixed Effect	Net ODA Received Per Capita/ World Bank	Gini Index/ Calculated by Gross Income	Foreign Aid Increases Income Inequality.

Table A3. Description of Variables

Variables	Measurement	Definition	Source
Gini Coefficient	0-100	"Gini index measures the degree to which the distribution of income or consumption expenditure among individuals or households within an economy vary from a perfectly equal distribution(WDI)"	WIID 3C(2015)
Net ODA Received Per Capita	Current US Dollar	"net ODA received divided by mid-year population. (WDI)"	WDI(2015)
Trade Openness	% of GDP	"Trade openness is the sum of exports and imports of goods and services measured as a share of gross domestic product. (WDI)"	WDI(2015)
GDP Per Capita	Current US Dollar	"GDP per capita is gross domestic product divided by population. (WDI)"	WDI(2015)
FDI	% of GDP	"net outflows of investment from the reporting economy to the rest of the world and is divided by GDP (WDI)"	WDI (2015)
Democracy	0-10	"The Polity IV democracy measure ranges from 0 (least democratic). to 10 (most democratic)"	Freedom House

Table A4. Heteroscedasticity Tests Results

	Chi-square	Probability
Breusch-Pagan Test	0.18	0.669
White Test	12.96	0.989
Null Hypothesis: Homoscedasticity		

Table A5. Levin-Lin-Chu Test (lower middle income)

Variables	Level		First Difference		Outcome
Lower-Income					
	T statistic	P-value	T statistics	P-value	
Gini Index	2.64	0.995	-2.209	0.013*	I(1)
ODA	-2.236	0.754	-8.171	0.0000*	I(1)
FDI	-1.422	0.077	-21.605	0.0000*	1(1)
GDP Per Capita	-13.025	0.153	-30.447	0.0000*	1(1)
Young Population	3.93	1	0.115	0.0001*	I(1)
Democracy	0.276	0.608	-16.517	0.000*	I(1)
Trade Openness	-0.332	0.369	-17.464	0.0000*	I(1)
Lower Middle Income					
Gini Index	-1.2	0.115	-8.767	0.0000*	I(I)
ODA	-0.958	0.168	-14.455	0.0000*	I(1)
FDI	-2.155	0.2	-17.825	0.0000*	1(1)
GDP Per Capita	-9.404	0.347	-25.117	0.0000*	1(1)
Young Population	-2.074	0.19	-2.109	0.017*	I(1)
Democracy	-1.165	0.121	-14.14	0.000*	I(1)
Trade Openness	0.649	0.742	-14.409	0.000*	1(1)
Upper Middle Income					
Gini Index	-0.02	0.48	-13.4	0.000*	I(1)
ODA	-4.41	0.241	-18.59	0.0000*	I(1)
FDI	-1.247	0.106	-4.886	0.0000*	1(1)
GDP Per Capita	-7.444	0.245	-13.67	0.0000*	1(1)
Young Population	0.668	0.748	1.891	0.0001*	I(1)
Democracy	-0.597	0.275	-9.87	0.000*	I(1)
Trade Openness	-0.399	0.346	-6.599	0.0000*	I(1)

Note: Null hypothesis: each time series contains a unit root: *implies significance at 1% level.

Table A6. Im-Pesaran-Shin Test

Lower-Income					
Variables		Level	First difference		Outcome
	T statistic	P-value	T statistics	P-value	
Gini Index	3.434	0.997	2.443	0.0000*	I(I)
ODA	-1.999	0.247	-5.207	0.0000*	I(1)
FDI	-0.598	0.274	-17.825	0.0000*	1(1)
GDP Per Capita	-9.404	0.347	-25.117	0.0000*	1(1)
Young Population	-2.074	0.190	-2.109	0.017*	I(1)
Democracy	-1.165	0.121	-14.140	0.000*	I(1)
Trade Openness	0.649	0.742	-14.409	0.000*	1(1)
Lower Middle Income					
Gini Index	-1.251	0.105	-14.036	0.0000*	I(1)
ODA	-2.778	0.103	-19.462	0.0000*	I(1)
FDI	-4.306	0.832	-21.605	0.0000*	1(1)
GDP Per Capita	-13.025	0.153	-30.447	0.0000*	1(1)
Young Population	3.930	1.000	0.115	0.0001*	I(1)
Democracy	0.276	0.608	-16.517	0.000*	I(1)
Trade Openness	-0.332	0.369	-17.464	0.0000*	I(1)
Upper Middle Income					
Gini Index	3.757	0.878	12.537	0.013*	I(1)
ODA	-4.835	0.615	-16.519	0.0000*	I(1)
FDI	-12.08	0.077	-9.457	0.0000*	1(1)
GDP Per Capita	-6.383	0.531	-12.656	0.0000*	1(1)
Young Population	2.095	0.978	2.408	0.0001*	I(1)
Democracy	-0.679	0.248	-5.776	0.000*	I(1)
Trade Openness	2.897	0.941	-7.744	0.0000*	I(1)

Note: Null hypothesis: each time series contains a unit root: *implies significance at 1%level.

Table A7. Pedroni Test Results (lower income)

	Alternative Hypothesis: Individual AR coefs.(within dimension)											
	Lower Income				Lower Middle Income				Upper Middle Income			
	Statistic	Prob.	Weighted Statistic	Prob.	Statistic	Prob.	Weighted Statistic	Prob.	Statistic	Prob.	Weighted Statistic	Prob.
Panel v statistics	11.981	0.000***	0.4596	0.032*	11.452	0.000***	-3.18	0.9993	-1.439	0.092***	-1.57	0.000*
Panel rho-Statistic	-0.728	0.023*	0.5006	0.069**	-1.493	0.067**	2.613	0.995	1.426	0.021*	1.74	0.09***
Panel PP-Statistic	1.975	0.025*	0.45	0.673	-0.668	0.025**	-1.5044	0.066**	0.242	0.595	0.933	0.053*
Panel ADF-Statistic	1.86	0.968	0.235	0.593	-0.868	0.1925	-2.412	0.0079***	0.405	0.012	1.121	0.593

	Alternative Hypothesis: Individual AR coefs (between dimension)					
	Lower Income		Lower Middle Income		Upper Middle Income	
	Statistics	Prob.	Statistics	Prob.	Statistics	Prob.
Group rho-Statistic	0.373	0.6457	2.946	0.998	1.839	0.064**
Group PP-Statistic	1.193	0.088***	-3.169	0.000*	0.389	0.254*
Group ADF-Statistic	1.076	0.859	-2.167	0.015**	0.63	0.859

Note: Null hypothesis: no cointegration, trend assumption: No deterministic trend where *,**, *** represent 1%, 5%, and 10% level of significance respectively. The number of lags was determined by the Schwarz criterion with a maximum number of 4 lag.

Table A8. Results of Kao Test

		T statistics	Prob.
Lower Income	ADF	-0.108	0.0312**
Low Income	ADF	0.526	0.03**
Upper Middle Income	ADF	-0.114	0.054**

Note: The null hypothesis implies that there exists no cointegration among variables: trend assumption no deterministic trend. Automatic lag selection based on HQIC with a maximum of 9 ** 5% level of significance.