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Working Paper 04/2018
February 2018

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Does Foreign Aid Reduce Poverty In Sub-Saharan Africa? A Dynamic Panel-Data Analysis

Edmore Mahembe¹ and Nicholas M. Odhiambo

Abstract

The main objective of this study is to examine the effect of official development assistance (ODA) or foreign aid on poverty in Sub-Saharan Africa (SSA) region over the period 1981-2011. This study uses recent dynamic panel estimation techniques, including those methods which deal with endogeneity and simultaneity concerns. To test the robustness of the results, the study uses three different proxies for poverty and five proxies for foreign aid. The main finding of the study is that foreign aid does have statistically significant poverty reduction effect. The results are consistent across all the three poverty proxies. The disaggregating of aid by source and type could not offer conclusive results. On the other hand, the study found that income per capita have around three times higher poverty-reducing effect compared to foreign aid while inequality has a detrimental effect on the fight against poverty.

Keywords: Official development assistance (ODA); foreign aid; poverty; economic growth; inequality; developing countries; dynamic panel data analysis; system GMM

JEL Classification Code: F35 foreign aid, I32 measurement and analysis of poverty, C23 panel data models

1. Introduction

According to the World Bank (1998) and McGillivray, et al. (2006), the provision of development aid started after World War II. The USA established and funded the Marshall Plan in 1947, which was aimed at rebuilding Europe after the war. In recent times, the United National General Assembly promulgated the Millennium Development Goals (MGDs) in the year 2000, which is a set of developmental goals and targets agreed on by the international community, whose primary focus was halving poverty and improving the welfare of the

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world's poorest by 2015 (Sachs, 2005). One of the MGDs' target was halving global poverty by 2015. That is to reduce the proportion of people living on less than US\$1 a day, from about 30 per cent of the developing world's population in 1990, to 15 per cent by 2015 (Besley & Burgess, 2003, p. 3; Sachs, 2005). To achieve the MDGs' goals, rich nations made a commitment to increase aid to poor countries by 0.7 per cent of their gross national income (GNI), a target set during the 1960s. According to the United Nations Human Development Report (2005, p. 16): *"International aid is one of the most powerful weapons in the war against poverty. Today that weapon is under-used and badly targeted. There is too little aid and too much of what is provided is weakly linked to human development"*.

Many recent studies emphasise the importance of economic growth on poverty reduction, arguing that foreign aid can contribute to poverty reduction through sustained economic growth (see Collier & Dollar, 2002; Alvi & Senbeta, 2014). However, this model of aid allocation has been challenged both theoretically and empirically; challenging the assumption that growth is the main channel through which aid affects poverty. Clunies-Ross et al. (2009, p. 595) argue that the promulgation of the MGDs has led to the shifting of the emphasis on foreign aid from increasing economic growth rates to poverty reduction. They further argue that "many of the poverty-reducing measures may themselves serve to increase growth rates..." Collier and Dollar (2001) made a pioneering proposition that foreign aid can be allocated, in order to maximize poverty reduction.

The proponents of foreign aid argue that targeted aid can help eradicate poverty in developing countries (Sachs, 2005; Bahmani-Oskooee & Oyolola, 2009, p. 265); while others such as Easterly (2006) and Collier (2007) maintain that aid has not been effective. Moyo (2009, p. 28) further argues that aid "perpetuates the cycle of poverty and derails sustainable economic growth". Following Burnside and Dollar (2000, 2004) and Kosack (2003), Mahembe and Odhiambo (2017, p. 113) argue that distinguishing channels through which foreign aid affects development, reveals encouraging signs of positive impact of foreign aid on poverty reduction, depending on the choice of channel, the recipient country features and the domestic economic policies.

Although global poverty has dropped substantially over the past few decades, there are noticeable regional disparities (Alvi & Senbeta, 2014, p. 381). East Asia and the Pacific regions

have recorded the sharpest declines in poverty; while Sub-Saharan Africa (SSA) has experienced a substantial upsurge in the number of poor people over the same period (Alvi & Senbeta, 2014). This paper focuses on the effect of foreign aid in the SSA region. The main contribution of this paper to the existing literature is that the study uses latest data and recent panel data estimation techniques, including those methods which deal with endogeneity and simultaneity concerns; and it also uses three different proxies for poverty, and five proxies for foreign aid. Furthermore, the paper also tests the hypothesis that foreign aid is more effective in reducing poverty in democratic countries. According to Knack (2004, p. 251) foreign aid can contribute to democracy in recipient country through (i) technical assistance focusing on strengthening of electoral processes, promotion of civil society organisations, advocating for press freedom; (ii) making giving of foreign conditional on democratisation of the country; and (iii) supporting providing education and increasing the general incomes levels of the citizen, which are assumed to be critical ingredients for improvement in democracy.

The rest of the paper is organised as follows: Section 2 summarises the relevant empirical literature; Section 3 presents the methodology and discusses the data; Section 4 discusses the empirical results; while Section 5 concludes the article, with a brief discussion of policy implications.

2. Empirical Literature on the Impact of Foreign Aid on Poverty

Boone (1996) is one of the earliest papers to empirically test the effectiveness of aid in increasing investment (and therefore growth) and poverty. One of the widely-quoted findings is that aid does not have significant impact on poverty indicators (infant mortality and primary schooling ratios).

Collier and Dollar (2001) developed a model of what they termed 'efficient aid', in which aid would be allocated according to "policy improvements that create a better environment for poverty reduction and effective aid" (Collier & Dollar, 2001, p. 1787). The paper states that "poverty reduction...depends primarily on the quality of economic policy" (Collier & Dollar, 2001, p. 1800). The policy implication from this analysis was that a mixture of good policy and foreign aid can lead to economic growth and poverty reduction. Collier and Dollar (2002) further derived what they termed a 'poverty-efficient'² allocation of aid criteria; and they used

² A poverty-efficient aid program is one which reduces poverty by as much as possible.

it to compare with the actual aid allocations and to estimate the impact on poverty reduction. The authors showed that aid, operating through increased economic growth, was responsible for lifting about 10 million people out of extreme poverty each year. The study further estimated that approximately 19 million people could be lifted out of poverty each year – if aid agencies used a ‘poverty-efficient’ aid-allocation strategy.

Bahmani-Oskooee and Oyolola (2009) used pooled-time series and cross-sectional data for 49 developing countries over the period 1981-2002, in order to estimate the impact of foreign aid on poverty. To control for endogeneity, the study used the 2SLS panel-estimation techniques. The paper found that aid reduces poverty; and that inequality is detrimental to poverty reduction. Chong et al. (2009) used dynamic panel-data methods (GMM-IV) to examine the effect of aid on income inequality and poverty reduction for the period 1971-2002. The study could not find any robust statistical relationship between foreign aid and poverty reduction or income inequality.

Mosley et al. (2004) examined the direct effect of aid on poverty, using the GMM 3SLS methodology in a simultaneous equation set-up. The three main equations were poverty, aid and policy. The policy variable in the analysis was what they termed a ‘pro-poor public expenditure’ (PPE) measure or index. The study found strong evidence that corruption, inequality, and the composition of public expenditure are strongly associated with aid effectiveness (Mosley et al., 2004, p. F236), and concluded that aid allocations which take into account good micro- and macro-policies, income distribution, and GDP per capita, are more effective in reducing poverty.

Masud and Yontcheva (2005) assessed the effectiveness of foreign aid in reducing poverty, using infant mortality and illiteracy or education as proxies for poverty. The paper compared the impact of the two measures of foreign aid: official bilateral and projects aid, which is disbursed through international non-governmental organizations (NGOs) to developing countries. The two methodologies used were two-stage least-squares (2SLS) regression and the system Generalized-Method of Moments (SGMM) approach. The study concluded that NGO aid significantly reduces infant mortality compared to bilateral aid; and that the impact of both types of aid on illiteracy is less significant (Masud & Yontcheva, 2005, p. 20).

Alvi and Senbeta (2012) examined the effect of foreign aid on poverty in a sample of 79 developing countries over the period 1981 to 2004. The estimation method was SGMM, and the paper used three measures of poverty: headcount index; the poverty-gap index and the squared poverty-gap index; two sources of aid: bilateral and multilateral; and two compositions of aid: grants and concessionary loans. The study found that “aid reduces poverty after controlling for average income and income distribution” (Alvi & Senbeta, 2012, p. 968). The study further found that multilateral aid and grants reduce poverty; while bilateral aid and loans do not.

Kaya, et al. (2013) investigates the effectiveness of aid given to the agricultural sector to poverty reduction. The study disaggregated total aid into subcategories, and focused on the agricultural aid. The empirical analysis used four year averaged cross-country data for a panel of 46 developing aid recipient countries over the 1980–2003 period. The main dependent variable is poverty headcount ratio at US\$ 1 while the main explanatory variables are aid given to the agricultural sector and the PPE³. The fixed effects panel estimator was used and found that a 1 percent increase in agricultural aid reduces the headcount poverty ratio by 0.2% in the aid recipient countries. The study also found the growth elasticity of headcount poverty ratio ranges from 1.7 to 3.5 based on different specifications. The paper concluded that agricultural aid is effective in poverty reduction directly and indirectly through growth (Kaya, et al., 2013, p. 593).

A recent study by Arndt, et al. (2015) assessed the impact of aid on economic growth, social welfare indicators (poverty and infant mortality) and intermediate outcomes (such as investment, consumption, health, education and agriculture). The study estimated the long-run cumulative effects of aid in developing countries using limited information maximum likelihood (LIML) and inverse probability weighted squares (IPWLS) estimators in a simultaneous equations model framework, for the period 1970-2007. They found evidence that aid does stimulate growth, improve social welfare indicators and reduces poverty. Though the results indicate that aid does not have a significant effect on inequality, it was found that aid can raise investment, improve school enrolment, boost life expectancy and reduce infant mortality (Arndt, et al., 2015, p. 14).

³ As per per Mosley, et al. (2004).

Table 1 gives a summary of some empirical studies, which used panel data to analyse the effectiveness of foreign aid in reducing poverty. The first panel of shows studies, which used social development indicators as proxies for poverty and the second panel shows studies which used monetary measures of poverty (such as poverty rate, poverty gap and squared poverty gap). As shown in Table 1, the main findings are mixed. Four studies on the first panel found evidence that aid improves social development indicators, two found no evidence and one paper had mixed results⁴. Of the seven studies which investigated the impact of aid on monetary measures of poverty, six found that aid reduces poverty while one did not find significant evidence. The main conclusion from this selective survey of the literature is that the impact of aid on poverty yields inconclusive and conflicting results.

⁴ Masud and Yontcheva (2005) find that NGO aid significantly reduces infant mortality while bilateral aid does not.

Table 1: Summary of Empirical Studies on Aid and Poverty

Study/Author(s)	Period	Countries	Main Dependent Variables	Main Explanatory Variables	Methodology	Main Findings
A: AID AND SOCIAL DEVELOPMENT						
Boone (1996)	1971-1990	96 countries	– Infant mortality and – Primary schooling ratios	– Aid as % of GNP – Per capita GDP growth rate	OLS, IV and Fixed Effects	– Aid does not have significant impact on human development indicators (infant mortality and primary schooling ratios).
Arvin and Barillas (2002)	1975-1998	118 aid-receiving countries.	– GNP per capita	– Aid as % of GNP – Democracy – (Aid) x (Democracy)	Granger causality	– The study results show that aid was not affecting poverty (GNP per capita) and vice versa.
Kosack (2003)	1974-1985	49 developing countries	– Human Development Index (HDI)	– Aid as % of GDP – Democracy index	OLS and 2SLS	– The study finds that aid can directly increase welfare but only in democracies, and not in autocracies. – The paper also finds strong evidence that foreign aid has an indirect effect on poverty and

Study/Author(s)	Period	Countries	Main Dependent Variables	Main Explanatory Variables	Methodology	Main Findings
						well-being if it is spent on disadvantaged poor people.
Masud and Yontcheva (2005)	1990-2001.	58 developing countries	<ul style="list-style-type: none"> – Infant Mortality, – Illiteracy 	<ul style="list-style-type: none"> – NGO aid, – Bilateral aid 	2SLS and System GMM.	<ul style="list-style-type: none"> – NGO aid significantly reduces infant mortality compared to bilateral aid – The impact of both types of aid on illiteracy is less significant
Gomanee, et al. (2005a)	1980-2000	104 countries	<ul style="list-style-type: none"> – HDI – Infant mortality 	<ul style="list-style-type: none"> – Aid as % of GNI – GNP per capita, – Pro-poor public expenditure 	Fixed effects panel.	<ul style="list-style-type: none"> – Aid directly improves welfare indicators and that the impact is greater in low-income countries, compared to middle-income countries.
Hirano and Otsubo (2014)	1990s-2000s	99 countries	<ul style="list-style-type: none"> – Capita Income of the Poorest Quintile 	<ul style="list-style-type: none"> – Growth rate of GDP per capita – Aid as % of GNP – Sectorial aid. 	Panel 2SLS	<ul style="list-style-type: none"> – Economic aid is good for the poor due to its growth-inducing impact, and – Social aid is good for the poor through systematic distributional effects.

Study/Author(s)	Period	Countries	Main Dependent Variables	Main Explanatory Variables	Methodology	Main Findings
Arndt, et al. (2015)	1970-2007	78 countries	– school enrolment, – life expectancy – infant mortality	– Aid as % of GDP	LIML and IPWLS in SEMs	– aid can raise investment, improve school enrolment, boost life expectancy and reduce infant mortality
B: AID AND MONETARY POVERTY						
Mosley, et al. (2004)	1980-2000.	34 countries	– Poverty headcount, – Infant Mortality,	– Aid as % of GNI – GNP per capita, – Pro-poor public expenditure,	GMM 3SLS	– Corruption, inequality, and the composition of public expenditure are strongly associated with aid effectiveness
Mosley and Suleiman (2007)	1980-2002	39 developing & transitional economies	– Poverty headcount	– Aid as % of GNP – GNP per capita, – Agriculture expenditure (%)	GMM 3SLS	– Aid is most effective in reducing poverty if it is used to pro-poor expenditures such as agriculture, education and infrastructure.
Bahmani-Oskooee & Oyolola (2009)	1981-2002	49 developing countries	– Headcount ratio	– Bilateral aid – GPD per capita – Gini coefficient	2SLS panel estimation	– Foreign aid reduces poverty

Study/Author(s)	Period	Countries	Main Dependent Variables	Main Explanatory Variables	Methodology	Main Findings
Chong, et al. (2009)	1971-2002.	136 countries	<ul style="list-style-type: none"> – Poverty rate, – Poverty gap, and – Squared poverty gap 	<ul style="list-style-type: none"> – ODA as a % of GDP (Aid) – Aid squared – Aid x Corruption 	System GMM estimator.	– Insignificant statistical relationship between foreign aid and poverty or income inequality.
Alvi and Senbeta (2012)	1981-2004	79 developing countries	<ul style="list-style-type: none"> – Poverty rate, – Poverty gap, and – Squared poverty gap 	<ul style="list-style-type: none"> – Aid as a % of GNI – GDP per capita – Gini coefficient 	System GMM estimator.	<ul style="list-style-type: none"> – Foreign aid reduces poverty – Multilateral aid and grants reduce poverty – Bilateral aid and loans do not reduce poverty.
Kaya, et al. (2013)	1980–2003	46 developing countries	– Poverty headcount ratio	<ul style="list-style-type: none"> – Agricultural aid – GNP per capita, – Pro-poor public expenditure, 	Fixed effects panel, 3SLS	– Agricultural aid is effective in poverty reduction directly and indirectly through growth
Arndt, et al. (2015)	1970-2007	78 countries	– Poverty headcount (\$1.25 and \$2 a day)	– Aid as % of GDP	LIML and IPWLS	– Aid does stimulate growth, improve social welfare indicators and reduces poverty.

Source: Authors' compilation

3. Model Specification and Econometric Methodology

3.1. Model specification

According to Datt and Ravallion (1992), a poverty measure can be decomposed into growth and distributional effects, as follows:

$$P_t = P(Z|\mu_t, L_t) \quad [1]$$

where P_t is the poverty measure, Z is the poverty line, μ_t is the mean income, and L_t is the Lorenz curve at time t . Taking a derivative of Equation (1), will decompose poverty into:

$$\Delta Pov = \Delta Pov^G + \Delta Pov^R \quad [2]$$

This implies that changes in poverty measures can be decomposed into growth (ΔPov^G) and redistribution (ΔPov^R) components⁵. Following Datt and Ravallion (1992), Ravallion and Chen (1997) and recently Alvi and Senbeta (2012 and 2014) Equation 2 can be re-specified into poverty-growth-inequality equation as shown below.

$$\log P_{it} = \alpha_0 + \beta_1 \log Y_{it} + \beta_2 \log G_{it} + \vartheta_i + \varepsilon_{it} \quad [3]$$

where P_{it} is a measure of poverty in country i at time t , β_1 is the growth elasticity of poverty, Y_{it} is the real per capita income (real GDP per capita); while G_{it} is the Gini coefficient for country i at time t , ϑ_i is the unobserved individual country-specific effects, and ε_{it} is the idiosyncratic error term. Both the theoretical and empirical literature suggest that economic growth leads to poverty reduction, thus the expected sign for β_1 would be negative. The coefficient for the Gini (β_2) is expected to be positive; as greater inequality is assumed to lead to increased poverty through hampering the extent to which growth benefits the poor (Hanmer & Naschold, 2000; and Naschold, 2002).

Following Alvi and Senbeta (2012), we augment Equation (3) by incorporating foreign aid into the equation. Furthermore, seminal studies by Bane and Ellwood (1986) and Hoynes, et al. (2006) show that poverty is persistent and therefore past levels of poverty can explain the current and future poverty levels. We therefore introduce the lagged poverty level ($P_{i,t-1}$) as one of the regressors to account for the persistent nature of poverty (Equation 4). The correlation between current levels of poverty and their corresponding lagged values (Table 4)

⁵ See also Akobeng (2016, p. 212).

is higher than the rule of thumb threshold of 0.800 (Asongu & Nwachukwu, 2017, p. 8). Equation 4 is our baseline model, upon which most of our analysis are based on.

$$\log P_{it} = \alpha \log P_{i,t-1} + \beta_1 \log Y_{it} + \beta_2 \log G_{it} + \beta_3 \log AID_{it} + \vartheta_i + \varepsilon_{it} \quad [4]$$

where AID_{it} is the ratio of aid to GNI, our variable of interest. The coefficient of aid (β_3) is expected to be negative.

The augmented model, which takes into account the dynamics of poverty, potential channels through which aid affect poverty and the control variables is fully specified in Equation (5).

$$\begin{aligned} \log P_{it} = \alpha \log P_{i,t-1} + \beta_1 \log Y_{it} + \beta_2 \log G_{it} + \beta_3 \log AID_{it} + \beta_4 X_{it} \\ + \beta_5 \log(DEM_{it} X AID_{it}) + \beta_6 DEM_{it} + \vartheta_i + \varepsilon_{it} \end{aligned} \quad [5]$$

where DEM_{it} and X_{it} represent democracy and all control variables for country i at time t , respectively.

The study includes control variables to avoid omitted variable bias. The literature on the aid-growth-poverty nexus cites the importance of macroeconomic and pro-poor policies, institutions and democracy as the main requirements or channels for aid effectiveness (see World Bank, 1998; Burnside & Dollar, 2000; Mosley, et al., 2004; and Alvi & Senbeta, 2012 among others). We incorporated democracy (or institutional quality), incidences of conflict (which is a tropical issue in SSA) and aid recipient country demographics into our analysis. Asongu and Nwachukwu (2017) caution against having more than five control variables, as this would lead to biases in estimated coefficients due to instrument proliferation.

One of the objectives of this study is to test whether foreign aid can impact poverty through enhancement of democracy. We therefore include the interaction of foreign aid with democracy as shown in Equation (5)⁶. Differentiating Equation (5) with respect to foreign aid (AID_{it}) yields the following:

$$\frac{\partial(POV_{it})}{\partial(AID_{it})} = \beta_3 + \beta_5 \log DEM_{it} \quad [6]$$

⁶ According to Brambor (et al., 2006), all constitutive terms should be included in the interaction model specification.

β_3 and β_5 capture the extent to which democracy in the aid recipient country enhances the effectiveness of foreign aid on poverty reduction. The introduction of the interaction term means that the effect of foreign aid on poverty needs to be carefully interpreted (see Brambor, et al., 2006 and Akobeng, 2016).

3.2. Endogeneity issues and instrumental variables

There is a possibility of endogeneity and simultaneity in our model. Endogeneity is the correlation of the right-hand side (RHS) regressors and the disturbances (Baltagi, 2013, p. 129). The endogeneity problem is usually caused by measurement error, omission of relevant variables, self-selection, and sample selectivity among other reasons. In our model, if aid donors are motivated by poverty reduction, the higher the levels of poverty the greater the desire to give foreign aid to reduce it. Secondly, some donors might be motivated by a desire to stimulate economic growth in an aid recipient country, leading to correlation between foreign aid and growth, which are both RHS regressors. According to Baltagi (2013) endogeneity leads to inconsistency of the ordinary least squares (OLS) regression estimates. To address endogeneity issues and obtain consistent parameter estimates, instrumental variable (IV) methods such as two-stage least squares (2SLS) or generalized method of moments (GMM) may be used.

The IV methods involve the use of relevant instruments that are correlated with foreign aid (our main explanatory variable), but not with the explained variable (poverty). The instrument (commonly referred to as Z) should satisfy following two conditions: (i) $\text{cov}(Z, \text{aid}) \neq 0$, and (B) $\text{cov}(Z, \varepsilon) = 0$, that is; the instrument should be highly correlated with the dependent variable (aid) but uncorrelated with the error, respectively (Asra, et al., 2005, p. 4). Potential external instruments which were developed or collated and tested for suitability in this study include donor's friend dummy (France colony) as used by Boone (1994, 1996), Burnside & Dollar (2000) and Easterly (2005); recipient country's arms imports (Boone, 1994, 1996; Burnside & Dollar, 2000); population size (Burnside & Dollar, 2000; Easterly, 2005); the GDP per capita of OECD⁷ countries multiplied by the inverse of the distance between the aid receiving country and the main OECD countries (Tavares, 2003; Akobeng, 2016) and lagged aid (Dalggaard, et al., 2004). The external instrument which fitted the criteria of being correlated

⁷ The 28 donor countries are United Kingdom, United States, Spain, Sweden, Switzerland, Slovenia, Slovak Republic, Portugal, Poland, Norway, New Zealand, Netherlands, Luxembourg, Korea, Rep., Japan, Italy, Ireland, Iceland, Greece, Germany, France, Finland, Denmark, Czech Republic, Canada, Belgium, Austria, and Australia.

with the explanatory variable (foreign aid) but not with the dependant variable (poverty) is ‘recepient country’s arms imports’ and was therefore used for both the FE (IV) and GMM (IV) estimation.

3.3. Econometric method

The introduction of the lagged dependent variable ($P_{i,t-1}$) in Equations (4 and 5) as part of the regressors introduces new complications. According to Baltagi (2013, p. 155) this dynamic panel regression is characterized by two sources of persistence over time: (i) autocorrelation owing to the inclusion of the lagged dependent variable among the regressors and (ii) individual effects characterising the heterogeneity among the individuals (ϑ_i). Autocorrelation and heterogeneity render the OLS estimator biased and inconsistent. Baltagi (2005 and 2013) also found that the introduction of the lagged dependent variable makes random and fixed effects estimates inconsistent due to correlation of the dependent variable with the transformed error terms.

Empirical literature posits a number of approaches to estimating a dynamic panel data (DPD) model with suspected endogeneity problem. These include (i) IV approach proposed by Anderson and Hsiao (1981 and 1982), (ii) first differenced GMM (DGMM) estimator by Arellano and Bond (1991), (iii) bias-corrected least-squares dummy variable (LSDVC) or fixed effects (FE) estimators developed by Kiviet (1995 and Bruno (2005a, 2005b), and (iii) SGMM from Arellano and Bover (1995) and Blundell and Bond (1998). In a model with highly dynamic data, the first two estimation technigues have been proved to suffer from a severe small-sample bias due to weak instruments (Nickell, 1981; Blundell and Bond, 1998). Though the LSDVC approach perfoms well in small, dynamic and unbalanced panel data samples; the model is not suitable where there are endogenous RHS, as it is for “strictly exogenous regressors” (Bruno, 2005b, p. 473).

To overcome the problems of endogeneity, simultaneity, autocorrelation and heterogeneity in our data, we therefore chose the two-step SGMM estimator developed by Blundell and Bond (1998), with orthogonal deviations instead of differencing. The SGMM estimator is an improvement over the DGMM procedure. Blundell and Bond (1998) showed that the SGMM estimator produces dramatic efficient gains over the basic DGMM (Baltagi, 2013, p. 168). Blundell, et al. (2000) observed that “a careful examination of original series and consideration

of the SGMM estimator can usefully overcome many of the disappointing features of the standard GMM estimator for dynamic panel data models” (Baltagi, 2013, p. 168).

Some of the advantages of the SGMM estimation approach over the other methods and its suitability for our sample are briefly explained herein. First, the method is suitable for dynamic or persistent panels. As shown in Table 4, the correlation between all the three proxies of poverty in levels and their corresponding lagged values are higher than the rule of thumb threshold of 0.8. Further, the coefficient of the lagged poverty variables in all estimated equations is highly significant, at 1 percent level. Second, the SGMM addresses biases due to endogeneity (or reverse causality) by controlling for simultaneity and time-invariant omitted variables. This is partially done through the use of lagged explanatory variables as internal instruments. The estimation technique also allows for inclusion of external instruments, the option which was exploited in this study. Third, the technique is suitable in the “small T, large N” context, by addressing the Nickell (1981) bias and applying the “Windmeijer finite-sample correction” (Windmeijer, 2005). In our sample the number of countries (N=40) is greater than the number of years (T=11). Fourth, the approach eliminates the country fixed-effects by differencing the internal instruments to make them exogenous to the fixed effects (Akobeng, 2016, p. 215), but doesn’t eliminate the country differences. The estimator allows the researcher to control for time-invariant country-specific effects and endogeneity of foreign aid (Alvi & Senbeta, 2012, p. 955). Fifth, the two-step SGMM procedure adopted in this study controls for heteroscedasticity.

As discussed above, the persistent nature of poverty may mean that past poverty jointly affects past foreign aid and current poverty, leading to endogeneity. In this instance, internal instruments as provided for under the SGMM framework might not be adequate. This study uses both the external and internal instrumentation provided by the SGMM framework (xtabond2 in Stata). Furthermore, in the SGMM framework, the predetermined and endogenous variables in levels are instrumented by suitable lags in their own first differences and external instrument as well (Blundell & Bond, 1998; Roodman, 2009; Baltagi, 2013). For robustness and comparison of different dynamic panel data estimation methods, the OLS, FE, FE-IV, LSDVC, DGMM and SGMM are all estimated, based on the baseline model (Eqn. 4).

4. Data Sources and Definition of Variables

4.1. Data sources

Our poverty proxies (dependent variable) are from the recently released World Bank poverty and inequality dataset (PovcalNet). The poverty measures in the PovcalNet dataset are estimated by using a programme developed by Chen and Ravallion (2001). The compilation is based on primary information from nationally representative living-standard household surveys. The poverty data are estimated by using a combination of purchasing power parity (PPP) and exchange rates for household consumption. The database currently covers more than one thousand household surveys across 138 developing countries and 21 high-income countries⁸. The poverty measures used in this paper are based on the international poverty line US\$1.90 a day in US dollars in 2011 PPP.

The PovcalNet dataset provides tri-annual estimates of poverty and inequality measures from 1981 to 2008. Thereafter, there are annual data from 2010 and 2013. Since the dependent variable (poverty) is available every three years between 1981 and 2008, and following Alvi and Senbeta (2012), we took three-year averages of our explanatory variables during the same period. As a result, our total panel has 40 countries in Sub-Saharan Africa (see Appendix A for the list of countries); and it covers 11 periods (3-year average from 1981 to 2011).

The foreign-aid data are obtained from the Organisation for Economic Co-operation and Development's Development Assistance Committee (OECD-DAC). The inequality database was from SWIID (Solt, 2016) while real GDP per capita and age dependency ratio are from the World Bank's Development Indicators (WDI 2016). Democracy scores and civil conflict were obtained from the Polity IV Project and Centre for Systematic Peace respectively. The definitions and the construction of the main variables are briefly described below.

4.2. Definition of variables

The dependent variable for this study is poverty. The class of poverty measure used in this study follows the work of Foster *et al.* (1984), which is illustrated as follows:

$$P_{\alpha} = \frac{1}{N} \sum_{i=1}^{N^p} \left(\frac{G_i}{Z} \right) \quad [7]$$

⁸ World Bank (2016). PovcalNet: an online analysis tool for global poverty monitoring: <http://iresearch.worldbank.org/povcalnet/home.aspx>

where α is the sensitivity of the index to poverty; N^p is the number of the poor; Z is the poverty level; and G_i is the poverty gap⁹. The three poverty measures used in this paper are the poverty-headcount index, the poverty-gap index and the squared poverty-gap index. According to Alvi and Senbeta (2012, p. 960), when $\alpha = 0$, the expression in Equation 7 corresponds to the headcount index; $\alpha = 1$ corresponds to the poverty-gap index and $\alpha = 2$ corresponds to the squared-poverty gap index. The headcount index, or the poverty rate measures the proportion of households in a population, with incomes per person below the poverty line. Thus, it measures the prevalence of poverty, in terms of the spread of poverty within the population. Although the headcount index is the most popular measure used by researchers, its main disadvantage is that it doesn't give an indication of the depth of poverty (Schaffner, 2014).

The poverty-gap index measures the depth of poverty; and it takes into account the dispersal of the poor. It averages the proportional income gaps across everyone in the population against the poverty line. According to Schaffner (2014, p. 88), the poverty gap index can be interpreted as the cost per person for eliminating poverty in the entire country¹⁰. The squared poverty-gap index, on the other hand, is sensitive to both global prevalence and the average depth of poverty, as well as the occurrence of deep poverty among the poor. Because of this wider reach, the index is also referred to as the poverty-severity index. It is argued that squaring of the gap or shortfall magnifies the state of those in deepest poverty (Alvi & Senbeta, 2012; Schaffner, 2014).

The key variable in the study is foreign aid. Foreign aid is generally defined as public and private funds given to developing countries – with the main purpose of improving economic development and welfare (Clunies-Ross, et al., 2009, p. 590). The study used the standard definitions used by OECD-DAC. Official Development Assistance (ODA) and Official Aid (OA) includes (i) grants and (ii) concessional loans of more than a year's term, and with a 25 per cent or more grant-element. Aid can also be categorised, according to its source: (a) bilateral, which is from one country's government to another; and (b) multilateral (many-sided), which goes through international institutions, such as the World Bank and the United Nations (UN) Agencies. We disaggregated foreign aid into the two types and two sources, in order to examine the effects of each category on poverty. Since grants do not carry any interest;

⁹ According to Alvi and Senbeta (2012), $G_i = Z - X_i$, where X_i is the per capita income and N is the population size.

¹⁰ Assuming that money and resources are targeted perfectly and costlessly.

and no repayment is required; while loans carry interest and need to be repaid their effect on poverty is expected to be different. On the other hand, the literature shows that bilateral aid is usually allocated along colonial lines and strategic alliances; whereas multilateral aid has ‘economic development and welfare’ as the main objectives.

The main independent variables are based on poverty decomposition by Datt and Ravallion (1992) and Ravallion and Chen (1997) who decomposed poverty into growth and distributional effects, which are proxied by real income per capita at 2005 constant prices (*dgpcap*) and the Gini (*gini*) coefficient respectively. The Gini coefficient is a commonly used measure of inequality. The coefficient lies between 0 and 1 (or from 0 to 100%), with higher values signifying higher levels of inequality. Therefore our baseline model consist of poverty, GDP, inequality and foreign aid. Theoretically, we expect increase in income will lead to poverty reduction while increase in inequality will cause a corresponding increase in poverty.

Our control variables¹¹, which complement the decomposition of poverty nexus and have been included in poverty literature, include democracy score (as a proxy for institutional quality, and has also been included as part of the interaction variable in other specifications), civil conflicts (which is a topical issue in SSA), and age dependend ratio (which control for population characteristics). Democracy and conflict variables are normalised so that values are between zero and one while the other variables, except dummies, are in logarithm form.

5. Empirical Analysis and Discussion of Results

5.1. Descriptive analysis

Table 2 shows the descriptive statistics for the data in levels in terms of the mean, median, minimum, maximum and standard deviation of the variables. The summary of the statistics for the poverty headcount index shows significant variations in the poverty levels across the countries in the sample. The proportion of people living below the US\$1.90 per day ranges from a minimum of 0 to 98.80 per cent. Lower levels of poverty, of less than percent for headcount are recorderd in Mauritius and Seychelles while the highest levels of poverty, above 90 per cent, are recorded in DRC, Swaziland, Guinea, Mozambique and Liberia. ODA receipts range from 0.06 percent of GNI to almost 120 percent. The countries with the lowest (less than

¹¹ We also included education (both secondary and primary), globalisation, health, agriculture, trade openness, FDI, remittances and age dependency ratio but this did not significantly change the size and sign of the foreign aid coefficient.

1%) ODA include Mauritius, Nigeria, Botswana, Gabon and South Africa. The same countries with the highest levels poverty are featuring as the top ODA recipients, namely Rwanda, Mozambique and Liberia (which received an average of 120% between 2006 and 2008). The income disparities in SSA in terms of GDP per capita are also very wide, ranging from US\$120 to over US\$12 200.

Table 2: Summary Statistics

Variable	Obs	Mean	Std. dev.	Min	Max	Source
Povhead	439	51.05	24.77	0	98.80	PovcalNet, World Bank
Povgap	439	23.54	15.79	0	74.93	PovcalNet, World Bank
Povsqd	439	14.02	11.70	0	59.31	PovcalNet, World Bank
ODA	423	12.33	12.00	0.06	119.61	OECD- DAC
Bilat	422	7.08	7.12	0.03	67.76	OECD- DAC
Mult	423	4.96	5.15	-0.23	51.75	OECD- DAC
Grants	435	538.14	659.61	0.03	5 255.23	OECD- DAC
Loans	429	188.63	189.42	0.01	1 037.82	OECD- DAC
GDP per capita	434	1 629.49	2 359.27	120.71	12 237.88	WDI, World Bank
Gini coefficient	231	43.25	8.09	23.61	67.21	SWIID (Solt, 2016)
Democracy score	437	-0.67	6.27	-10	10	Polity IV Project
Conflict	429	0.73	1.53	0	7	Center for Systemic Peace
Age deperdent ratio	440	90.45	12.12	41.95	112.88	WDI, World Bank
Arms imports	300	3,28	7,00	333 333	6,92	WDI, World Bank

Notes: The sample comprises 40 SSA countries for the period 1981-2011. These summary statistics are based on raw data, in levels.

Table 4 shows the Pearson (1896) correlation matrix for all the variables, including the lag of the dependent variable. The Pearson correlation coefficient measures the strength and direction of association that exists between two continuous variables. The asterisk (*) next to the coefficients indicates the significance at p-values of 0.05 or lower. All the proxies of aid (ODA bilateral aid, multilateral aid, loans and grants) are positively and significantly correlated with all the poverty proxies. Alvi and Senbeta (2012) argued that the positive association between aid and poverty could be an indication that more aid goes to poor countries. However, this positive correlation between aid and poverty does not necessarily imply a causal relationship. Arms imports, which is an IV for aid is negatively and significantly correlated with ODA, bilateral and multilateral aid while the relation with loans and grants is positive.

5.2. Empirical Results

The main estimation results are presented in Table 4 to Table 6. Table 4 present results for five different estimations, based on the baseline equation (4): (i) OLS; (ii) standard fixed effects (FE), (iii) instrumental variable fixed effects (FE-IV), (iii) DGMM, (iv) SGMM, and (v) LSDVC dynamic panel data models. However, the OLS and FE procedures are used as benchmark models¹², as are they considered biased and inefficient owing to autocorrelation, simultaneity and endogeneity problems.

¹² Roodman (2009, p. 103) argue that as best practice, good estimates of the coefficient for the lagged dependent variable should be below 1.00 and lie between the FE and OLS estimates.

Table 3: Pearson Correlation Matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Lpo vhead	1																	
2. Lpo vgap	0.99*	1																
3. Lpo sqd	0.97*	0.99*	1															
4. Lod a	0.43*	0.43*	0.43*	1														
5. Lbil ateral	0.42*	0.42*	0.42*	0.97*	1													
6. Lmu tilateral	0.46*	0.45*	0.46*	0.94*	0.84*	1												
7. Lgra nt	0.39*	0.34*	0.30*	0.26*	0.31*	0.22*	1											
8. Lloa n	0.28*	0.24*	0.20*	0.30*	0.30*	0.27*	0.69*	1										
9. Lgd pcap	-0.71*	-0.70*	-0.68*	-0.68*	-0.61*	-0.74*	-0.41*	-0.33*	1									

10.lgini_net	0.04	0.09	0.13	-0.17*	-0.14*	-	-0.25*	-0.29*	0.38*	1								
11. democn	-0.29*	-	-0.28*	-0.13*	-0.13*	-	-0.05	-0.20*	0.25*	0.13*	1							
12.Conflict	0.15*	0.15*	0.15*	-0.06	-0.06	-0.05	0.22*	0.01	-	-0.13	-	1						
13. oda*dem	0.18*	0.17*	0.18*	0.63*	0.61*	0.60*	0.15*	0.05	-	-0.12	0.57	-0.13*	1					
14. Age d.r	0.71*	0.68*	0.65*	0.51*	0.51*	0.48*	0.33*	0.36*	-	-0.18*	-	0.12*	0.18*			1		
15.larms	-0.09*	-	-0.12*	-0.37*	-0.35*	-	0.24*	0.11	0.12*	-0.01	-0.04	0.39*	-0.32*	-0.02		1		
16.lagpovhd	0.98*	0.97*	0.96*	0.45*	0.44*	0.47*	0.40*	0.29*	-	0.02	-	0.14*	0.22*	0.70*	-	1		
17.lagpovga p	0.70*	0.76*	0.80*	0.43*	0.44*	0.46*	0.14*	0.12*	-	0.11	-	0.15*	0.21*	0.44*	-	0.73*	1	
18.lagposqd	0.96*	0.97*	0.98*	0.46*	0.45*	0.47*	0.32*	0.24*	-	0.13	-	0.13*	0.21*	0.67*	-	0.97*	0.83*	1

Notes: The asterisk (*) next to the correlation coefficients indicates the significance at p-values of 0.05 or lower.

5.2.1. Baseline analysis

As shown in Table 4, the OLS estimation results of the baseline model (Equation 4)¹³, are in line with economic theory, with all coefficients having the correct signs and significant. The aid coefficient is negative throughout all the different estimation methods except the FE-IV and DGMM, where it is positive and insignificant. The coefficient lagged poverty rate is positive and highly significant in all the different estimation methods, which confirms that poverty is persistent and therefore the dynamic panel data method is the correct specification. However, the OLS, FE and the IVs methods are biased due to the inclusion of the lagged poverty. Flannery and Hankins (2013, p 14) found that the “LSDVC is accurate for exogenous regressors but less accurate for lagged dependent variable in the presence of endogeneity. Therefore, only the results of the more efficient SGMM method will be discussed in greater detail.

Table 4: Results of the Baseline Model

POVERTY HEADCOUNT	Estimation Method					
	OLS	FE	FE2SLS (IV)	LSDVC	DGMM	SGMM
loda	-0.028** (-1.99)	-0.029 (-1.31)	0.258 (0.91)	-0.024 (-1.10)	0.032 (0.32)	-0.092** (-2.30)
lgdpcap	-0 .079*** (-3.24)	-0.254*** (-2.74)	-0.068 (-0.20)	-0.239*** (-2.97)	-0.639 (-1.56)	- 0.259*** (-3.05)
lgini	0.173** (2.43)	0.083 (0.84)	-0.232 (-0.63)	0.051 (0.48)	-0.539 (-0.83)	0.007 (0.01)
lagpovhead	0.998*** (56.63)	0.742*** (16.21)	0.015*** (4.93)	0.884*** (14.59)	0.842*** (7.07)	0.950*** (8.40)
Observations	224	224	146		108	146
R-squared	0.974	0.947	0.516			
Adj. R-squared	0.972					
No. of groups		40	38		24	38

¹³ The baseline model does not have control variables, which are included later in Table 6.

No. of instruments					47	53
AR (1) <i>p</i> -value					0.006	0.004
AR (2) <i>p</i> -value					0.753	0.776
Hansen <i>p</i> -value					1.000	0.988

Notes: Numbers in parenthesis () are *t*-statistics. *** Significance at the 1%, ** Significance at the 5% level, * Significance at the 10% level. All regressions include time dummies, but they are not shown here to save space.

The SGMM results (Table 4 and 5) posit that foreign aid is significant in reducing poverty in the SSA region. A ten percent increase in the level of ODA as a share of gross national income (GNI) will lead to a 0.1% decline in the proportion of people living on less than US\$1.90 per person per day (poverty rate or headcount index). Though the coefficients for poverty-gap and squared poverty-gap index are have a negative sign, they are not statistically significant at 10% level. The two tables also show that on average, a ten percent increase in GDP per capita reduces poverty rate and poverty depth by around 2.6% and 4.2% respectively. In generally, income per capita has relatively larger coefficients than ODA, indicating that economic growth explains a significant part of the decrease in poverty levels. Inequality (Gini coefficient) coefficient is largely positively and insignificant¹⁴ (at 10% level). The positive coefficient is largely in line with economic theory: an increase in income disparity may lead to higher levels of poverty. Ravallion (1997) finds that if initial inequality is high, it can result in rising poverty irrespective of impressive economic growth.

Table 5: Effect of Aggregate Aid on Different Measures of Poverty (SGMM)

Dependent Variables:	Poverty rate	Poverty gap	Squared poverty gap
Loda	-0.092** (-2.30)	-0.083 (-1.06)	-0.106 (-1.11)
Lgdpcap	-0.259*** (-3.05)	-0.422** (-2.68)	-0.429 (-1.52)
Lgini	0.007 (0.01)	0.112 (0.14)	0.596 (1.19)

¹⁴ This is probably due to few data points for Gini. As shown in Table 3, there are only 231 Gini observations in the panel compared to other variables which average at more than 400.

Lagpoverty (rate, gap, squared)	0.950*** (8.40)	0.782*** (5.79)	0.752*** (5.77)
Observations	146	146	146
No. of groups	38	38	38
No. of instruments	53	53	53
AR (1) <i>p</i> -value	0.004	0.005	0.006
AR (2) <i>p</i> -value	0.776	0.653	0.579
Hansen <i>p</i> -value	0.988	0.975	0.986

Notes: All the regressions are estimated using the dynamic two-step SGMM estimator technique developed by Blundell and Bond (1998), with Windmeijer (2005) finite-sample correction. Numbers in parenthesis () are *t*-statistics. *** Significance at the 1%, ** Significance at the 5% level, * Significance at the 10% level. All regressions include time dummies, but they are not shown here to save space.

5.2.2. *Analysis of aid by source and type*

One of the objectives of the study was to analyse whether the effect of aid on poverty varies by type or source of foreign aid. The results (not shown) show that total aid (ODA) and multilateral aid are more likely to reduce poverty in SSA, while the coefficients of other aid proxies are insignificant at the 10% level of significance. This is in line with literature on the allocation of aid, which premises that multilateral aid is most likely to be allocated to sustainable development and poverty-reduction concerns; while bilateral aid is allocated, according to colonial, strategic and other political considerations.

5.2.3. *Adding of control variables and interaction variables*

The results presented in Table 6 are based on the the full model (Equation 5), which includes control variable and the interaction term. The interaction term is aimed at measuring whether democracy enhances the effectiveness of aid in reducing poverty. The dependent variable is poverty headcount rate. The magnitude of the aid coefficient increased slightly on addition of control and interaction variables while the coefficient for income per capita decreased. The inequality coefficient remain insignificant. Main results from Table 6 could be summarised as follows: (i) foreign aid has poverty reduction effect in SSA, and a 10% increase in foreign aid leads to around 1% reduction in poverty headcount rate; (ii) a 10% increase in income per capita leads to approximately 2.6% reduction in poverty. This confirms results from earlier

studies by Dollar and Kraay (2002) who boldly declared that “growth is good for the poor”; and (iii) democracy does not have aid enhancement effect on poverty.

Table 6: Analysis of Total Aid, Democracy and Poverty

LPOVHEAD	POOLED OLS	RE	System GMM
Loda	-0.071*** (-3.24)	-0.024 (-0.75)	-0.083** (-2.67)
Lgdp	-0.070*** (-2.86)	-0.301*** (-3.09)	-0.257*** (-3.83)
Lgini	0.217*** (3.11)	0.111 (1.04)	0.403 (1.44)
Democracy	-0.072 (-0.90)	0.152 (1.07)	0.017 (0.10)
Civil Conflict	0.190 (0.91)	0.163 (0.60)	-0.370 (-1.09)
<i>Democ x ODA</i>	0.055* (1.69)	-0.038 (-0.77)	-0.019 (-0.32)
Lagedr	0.350** (2.59)	0.177 (0.75)	-0.222 (-0.33)
Lagpovhead	0.959*** (40.35)	0.721*** (14.61)	0.994*** (7.17)
Intercept	-1.884*** (-2.78)	1.680 (1.35)	1.598 (0.50)
Observations	221	221	145
R-squared	0.966	0.913	
Adj. R-squared	0.963		
No. of groups		39	37
No. of instruments			57
AR (1) p-value			0.010

AR (2) <i>p</i> -value			0.724
Hansen <i>p</i> -value			0.997

Notes: All the regressions are estimated using the dynamic two-step SGMM estimator technique developed by Blundell and Bond (1998), with Windmeijer (2005) finite-sample correction. Numbers in parenthesis are () are *t*-statistics. *** Significance at the 1%, ** Significance at the 5% level, * Significance at the 10% level.

5.3. Specification, robustness checks and comparison with other results

A weak identification test is performed on the proposed instruments for the 2SLS-IV estimation method. The testing method involves the computation of the Kleibergen-Paap rk Wald F statistic (Kleibergen & Paap, 2006). As a rule of thumb, Kleibergen–Paap Wald rk F statistic (F-statistics of excluded instruments) greater than 10 is required to reject the null hypothesis that the instruments are weakly identified (Bound, et al., 1995; Baum, 2006)¹⁵. Of all the instruments constructed, the log of arms imports and log previous levels of aid passed the test and were included in the analysis. We conducted the Durbin-Wu-Hausman or C statistic tests, to test the exogeneity of our instruments and tested the exogeneity of foreign aid (Ioda). Foreign aid was found to be endogenous.

Under the GMM framework, the two main robustness checks are (i) checking the consistency of the GMM estimator, or checking whether there is no second-order correlation; (ii) checking the validity of instruments (moments conditions), normally referred to test of overidentifying restrictions. Additional moments conditions were tested using the Hansen (1982) *J* test, which is preferable, owing to its robustness to heteroscedasticity and autocorrelation. We also tested for both 1st and 2nd order serial correlation using the Arellano and Bond (1991) test. By definition, 1st order serial correlation is expected, but not 2nd order for the consistency of the GMM estimator. In all the SGMM estimation (see Table 4-6), the Hansen *J* test for overidentification does not reject the null, and the tests for first order-order and second serial correlation had expected diagnostics. Furthermore, the strongly significant and positive coefficient of the first lag of the dependent variable justified the use of the DPD approach. Lastly, our results are comparable to those of Mosley, et al. (2004), Alvi and Senbeta (2012) and Arndt, et al. (2015).

¹⁵ (Kleibergen & Paap, 2006) strongly assert that the partial R² and the F statistic of the identifying instruments in the first-stage estimation are useful indicators of the quality of the IV estimates and should be routinely reported.

6. Conclusions

The main objective of this study was to examine the effect of foreign aid on poverty in the SSA region over the period 1981-2011. Foreign aid has been touted as the panacea to poverty reduction in developing countries, particularly in Africa. One of the MGDs targets was cutting global poverty by half from the year 1990 to 2015; and one of the tools for reaching this target was to have rich countries increase their ODA allocation to developing countries by 0.7 per cent of rich countries' GNI. The MGDs expired in September 2015; and this paper assesses whether foreign aid has been effective in reducing poverty. The study also tested whether democracy enhances the effectiveness of aid in reducing poverty and investigated the poverty reduction effect of different types of aid.

The study uses recent dynamic panel estimation techniques, including methods which deal with endogeneity and simultaneity concerns. The main findings of the study are summarised as follows: firstly, foreign aid does have statistically significant poverty reduction effect in SSA. Using different poverty proxies and disaggregating of aid by source and type could not conflict, but enhanced this result. Secondly, the study found that income per capita have around three times higher poverty-reducing effect compared to foreign aid while inequality has a detrimental effect on the fight against poverty. Thirdly, democracy does not have aid enhancement effect on poverty.

The implication of this finding is that development partners should continue to focus on poverty reduction as the main objectives of ODA. However, the allocation should be focused on channels, which have more poverty-reduction effect, such as economic growth. Aid recipient countries should also come up with income distributional policies to allow the benefits of growth to accrue to many people, thereby lifting the majority out of extreme poverty.

References

- Acemoglu, D., Johnson, S. & Robinson, J., 2001. The colonial origins of comparative development: An empirical investigation. *American Economic Review*, Volume 91, pp. 369-401.
- Akobeng, E., 2016. Out of inequality and poverty: Evidence for the effectiveness of remittances in Sub-Saharan Africa. *The Quarterly Review of Economics and Finance*, 60(May 2016), pp. 207-223.

- Akobeng, E., 2016. Out of inequality and poverty: Evidence for the effectiveness of remittances in Sub-Saharan Africa. *The Quarterly Review of Economics and Finance*, 60(May), p. 207–223.
- Alvi, A. & Senbeta, A., 2012. Does foreign aid reduce poverty?. *Journal of International Development*, Volume 24, pp. 955-976.
- Alvi, E. & Senbeta, A., 2014. Foreign aid, growth and poverty relation: A quantile regression approach. *The Journal of Development Areas*, 48(3), pp. 380-403.
- Andersen, T. G. & Sørensen, B. E., 1996. GMM estimation of a stochastic volatility model: A Monte Carlo study. *Journal of Business and Economic Statistics*, 14(3), pp. 323-352.
- Anderson, T. W. & Hsiao, C., 1981. Estimation of dynamic models with error components. *Journal of American Statistical Association*, Volume 76, pp. 598-606.
- Anderson, T. W. & Hsiao, C., 1982. Formulation and estimation of dynamic models using panel data. *Journal of Econometrics*, Volume 18, pp. 47-82.
- Angrist, J. D. & Pischke, J.-S., 2009. *Mostly harmless econometrics: An empiricist's companion*. Princeton: Princeton University Press.
- Arellano, M. & Bond, S., 1991. Some tests for specifications of panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, Volume 58, pp. 277-297.
- Arellano, M. & Bover, O., 1995. Another look at the instrumental variable estimation of error components models. *Journal of Econometrics*, Volume 68, pp. 29-51.
- Arndt, C., Jones, S. & Tarp, F., 2015. Assessing foreign aid's long-run contribution to growth and development. *World Development*, Volume 69, p. 6–18.
- Asongu, S. & Nwachukwu, J. C., 2017. Openness, ICT and entrepreneurship in sub-Saharan Africa. *Information Technology & People*, pp. 1-31.
- Asra, A., Estrada, G., Kim, Y. & Quibria, M. G., 2005. *Poverty and foreign aid: Evidence from recent cross-country data*, Mandaluyong: Asia Development Bank, ERD Working Paper Series No. 65.
- Bahmani-Oskooee, M. & Oyolola, M., 2009. Poverty reduction and aid: Cross-country evidence. *International Journal of Sociology and Social Policy*, 29(5(6)), pp. 264-273.

- Baltagi, B. H., 1981. Simultaneous equations with error components. *Journal of Econometrics*, Volume 17, pp. 189-200.
- Baltagi, B. H., 2005. *Econometric Analysis of Panel Data*. 3rd ed. West Sussex: John Wiley & Sons, Ltd.
- Baltagi, B. H., 2013. *Econometric Analysis of Panel Data*. 5th ed. West Sussex: John Wiley & Sons Ltd.
- Barro, J. R., 1999. Determinants of democracy. *Journal of Political Economy*, Volume 107, pp. 159-229.
- Barro, J. R., 2001. *Human capital: Growth, history, and policy: A session to honor stanley*. Cambridge, MA: Harvard University.
- Baum, C. F., 2006. *An Introduction to Modern Econometrics using Stata*. Texas: Stata Press..
- Besley, T. & Burgess, R., 2003. Halving global poverty. *Journal of Economic Perspectives*, 17(3), pp. 3-22.
- Blundell, R., Bond, S. & Windmeijer, F., 2000. Estimation in dynamic panel data models: Improving on the performance of the standard GMM estimator. *Advances in Econometrics*, Volume 15, pp. 53-91.
- Blundel, R. & Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, Volume 87, pp. 115-143.
- Boone, P., 1994. *The impact of foreign aid on savings and growth*, London: CEP Working Paper No. 1265; Centre for Economic Performance, London School of Economics and Political Science.
- Boone, P., 1996. Politics and the effectiveness of foreign aid. *European Economic Review* , 40(1996), pp. 289-329.
- Brambor, T., Clark, W. R. & Golder, M., 2006. Understanding interaction models: Improving empirical analyses. *Political Analysis* , Volume 14, p. 63–82.
- Bruno, G. S. F., 2005a. Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models. *Economics Letters*, Volume 87, pp. 361-366.
- Bruno, G. S. F., 2005b. Estimation and inference in dynamic unbalanced panel-data models with a small number of individuals. *The Stata Journal*, 5(November 4), pp. 473-500.

- Burnside, C. & Dollar, D., 2000. Aid, policies and growth. *American Economic Review*, Volume 90, pp. 847-868.
- Burnside, C. & Dollar, D., 2004. *Aid, policies, and growth: Revisiting the evidence*, Washington DC: World Bank, Working Paper 3251.
- Chen, S. & Ravallion, M., 2001. How did the world's poorest fare in the 1990s?. *Review of Income and Wealth*, 47(3), pp. 283-300.
- Chong, A., Grandstein, M. & Calderon, C., 2009. Can foreign aid reduce income inequality and poverty. *Public Choice*, Volume 140, pp. 59-84.
- Clunies-Ross, A., Forsyth, D. & Huq, M., 2009. *Development Economics*. 1st ed. Berkshire: McGraw-Hill Higher Education.
- Collier, P., 2007. *The bottom billion: Why the poorest countries are failing and what can be done about it*. New York: Oxford University Press.
- Collier, P. & Dollar, D., 2001. Can the world cut poverty in half? How policy reform and effective aid can meet international development goals. *World Development*, 29(11), pp. 1787-1802.
- Collier, P. & Dollar, D., 2002. Aid allocation and poverty reduction. *European Economic Review*, Volume 46, pp. 1475-1500.
- Dalgaard, C.-J., Hansen, H. & Tarp, F., 2004. On the empirics of foreign aid and growth. *Economic Journal*, 114(496), pp. 191-216.
- Datt, G. & Ravallion, M., 1992. Growth and redistribution components of changes in poverty measures. *Journal of Development Economics*, Volume 38, pp. 275-295.
- Dollar, D. & Kraay, A., 2002. Growth is good for the poor. *Journal of Economic Growth*, 7(3), pp. 195-225.
- Dreher, A., Gaston, N. & Martens, P., 2008. *Measuring globalization- Gauging its consequence*. New York: Springer.
- Easterly, W., 2003. Can foreign aid buy growth?. *The Journal of Economic Perspectives*, 17(3), pp. 23-48.
- Easterly, W., 2005. What did structural adjustment adjust? The association of policies and growth with repeated IMF and World Bank adjustment loans. *Journal of Development Economics*, 76(1), pp. 1-22.

Easterly, W., 2006. *The white man's burden: Why the West's efforts to aid the Rest have done so much ill and so little good*. New York: Penguin Books.

Flannery, M. J. & Hankins, K. W., 2013. Estimating dynamic panel models in corporate finance. *Journal of Corporate Finance*, Volume 19, pp. 1-19.

Foster, J., Greer, J. & Thorbecke, E., 1984. Notes and comments: a class of decomposable poverty measures. *Econometrica*, 53(3), pp. 761-766.

Hanmer, L. & Naschold, F., 2000. Attaining the international development targets: Will growth be enough?. *Development Policy Review*, Volume 18, pp. 11-36.

Hausman, J. A., 1978. Specification tests in econometrics. *Econometrica*, 46(6), pp. 1251-1271.

IMF, 2015. *The IMF and the Millennium Development Goals*. [Online]
Available at: <https://www.imf.org/external/np/exr/facts/mdg.htm>
[Accessed 15 May 2015].

Kaya, O., Kaya, I. & Gunter, L., 2013. Foreign aid and the quest for poverty reduction: Is aid to agriculture effective?. *Journal of Agricultural Economics*, 64(3), p. 583–596.

Kiviet, J., 1995. On bias, inconsistency, and efficiency of various estimators in dynamic panel data models. *Journal of Econometrics*, 68(1), pp. 53-78.

Kleibergen, F. & Paap, R., 2006. Generalized reduced rank tests using the singular value decomposition. *Journal of Econometrics*, Volume 127, p. 97–126.

Knack, S., 2004. Does foreign aid promote democracy?. *International Studies Quarterly*, 48(1), pp. 251-266.

Kosack, S., 2003. Effective Aid: How Democracy allows Development Aid to Improve the Quality of Life.. *World Development*, 31(1), pp. 1-22.

Lensink, R. & White, H., 2000. Aid allocation, poverty reduction and the 'Assessing Aid' report. *Journal of International Development*, 12(3), p. 399–412.

Mahembe, E. & Odhiambo, N. M., 2017. On the link between foreign aid and poverty reduction in developing countries. *Revista Galega de Economía*, 26(2), pp. 113-128.

Masud, N. & Yontcheva, B., 2005. *Does foreign aid reduce poverty? Empirical evidence from nongovernmental and bilateral aid*, Washington DC: IMF Working Paper WP/05/100.

- McGillivray, M., Feeny, S., Hermes, N. & Lensink, R., 2006. Controversies over the impact of development aid: it works; it doesn't; it can, but that depends,. *Journal of International Development*, 18(7), p. 1031–1050.
- Mosley, P., Hudson, J. & Verschoor, A., 2004. Aid, poverty reduction and the 'new conditionality'. *The Economic Journal*, Volume 114, pp. F217-F243.
- Moyo, D., 2009. *Dead Aid: Why aid is not working and how there is a better way for Africa*. New York: Farrar, Straus and Giroux.
- Naschold, F., 2002. *Overseas Development Institute, Why Inequality Matters for Poverty*. [Online]
Available at: <http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/3876.pdf>
[Accessed 25 August 2015].
- Nickell, S., 1981. Biases in dynamic models with fixed effects. *Econometrica*, 49(6), pp. 1417-1426.
- Pearson, K., 1896. Mathematical contributions to the theory of evolution—III. Regression, heredity, and panmixia.. *Philosophical Transactions of the Royal Society of London*, Volume Series A, pp. 253-318.
- Ravallion, M., 1997. Can high-inequality countries escape absolute poverty?. *Economics Letters*, 56(1997), pp. 51-57.
- Ravallion, M. & Chen, S., 1997. What can new survey data tell us about recent changes in distribution and poverty?. *The World Bank Economic Review*, 11(2), pp. 357-382..
- Roodman, D., 2009. How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, 9(Number 1), p. 86–136.
- Sachs, J. D., 2005. *The end of poverty: Economic possibilities for our time*. New York: Penguin Books.
- Schaffner, J., 2014. *Development economics: Theory, empirical research, and policy analysis*. Danvers, MA: John Wiley & Sons, Inc..
- Solt, F., 2016. The standardized world income inequality database.. *Social Science Quarterly*, 97(5), pp. 1267-1281.
- Tavares, J., 2003. Does foreign aid corrupt?. *Economics Letters*, 79(1), p. 99–106.

United Nations, 2005. *Human Development Report: International cooperation at cross roads*, New York: UNDP.

Windmeijer, F., 2005. A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, 126(1), pp. 25-51.

World Bank, 1998. *Assessing aid: What works, what doesn't and why..* Washington DC: World Bank.

World Bank, 1998. *Assessing Aid: What Works, What Doesn't, and Why.* New York: Oxford University Press.

World Bank, 2015. *2015 World Development Indicators*, Washington DC: World Bank.

APPENDIX A: SAMPLE COUNTRIES (SUB- SAHARAN AFRICA)

Country Name	Country Code	Country Name	Country Code
Benin	BEN	Madagascar	MAG
Botswana	BOT	Malawi	MAW
Burkina Faso	BFO	Mali	MLI
Burundi	BUI	Mauritania	MAA
Cameroon	CAO	Mauritius	MAS
Central African Republic	CEN	Mozambique	MZM
Chad	CHA	Namibia	NAM
Comoros	COM	Niger	NIR
Congo, Dem. Rep.	DRC	Nigeria	NIG
Congo, Rep.	CON	Rwanda	RWA
Cote d'Ivoire	COT	Senegal	SEN
Ethiopia	ETH	Seychelles	SYC
Gabon	GAB	Sierra Leone	SIE
Gambia, The	GAM	South Africa	SAF
Ghana	GHA	Sudan	SUD
Guinea	GUI	Swaziland	SWA
Guinea-Bissau	GNB	Tanzania	TAZ
Kenya	KEN	Togo	TOG

Country Name	Country Code	Country Name	Country Code
Lesotho	LES	Uganda	UGA
Liberia	LBR	Zambia	ZAM