Does Foreign Aid Work Well in Developing Countries? A Mediating Effect Approach

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Abstract

The purpose of this paper is to find the impact of the coefficient of aggregated and disaggregated aid in Asia, Africa and Latin America due to the causal mechanisms that transmit the effect through mediating variables such as investment, government consumption and import. We employed the fixed effect estimation procedure over the period of 1992-2016 with a sample of 29 countries.

African countries are experiencing a negative total effect of multilateral aid on GDP which mediate via import. In Latin American countries, ODA, which mediates through government consumption, induce a greater positive impact than aid that transmits from investment. In Asian countries, ODA, which mediates through government consumption, induce a less negative impact than aid which transmit from investment. When the amount of ODA mediates through the causal path of import, the positive impact of aid is reduced by around 27 percent in Latin America while the negative impact of aid is reduced by around 55 percent in Asia. In case of aid heterogeneity, bilateral aid induces relatively promising advantage for developing countries. Accordingly, even though we used a different approach and our estimates are therefore not directly comparable to those of Burnside-Dollar (2000), our findings are very consistent with their finding that 'aid effectiveness is conditional on policy'.

JEL codes - E22; F3; F35; H61; O11; O47

Key words: Economic growth; Aid effectiveness; Mediation effect; Residual with regression; indirect effect; Government consumption expenditures

Highlights

- Ø Mediation analysis is one method that unveil the underlying effect of macroeconomics.
- Ø ODA effectively transmit through the mediating variables into the GDP in Latin American countries in contrast to the Asian and African countries.
- Ø Multilateral aid directed to import reduces the GDP in African countries while other mediation paths are not activated.
- Ø In Latin American countries, ODA, which mediate from government consumption, induce greater impact than aid which transmit from investment.
- Ø ODA, which mediate from government consumption, induce less negative impact than aid which transmit from investment in Asian countries.
- Ø When the amount of ODA mediates through the causal path of import, the impact of aid on GDP reduces by around 27 percent

in Latin America.

- Ø The amount of ODA mediates through import contribute to reduce the negativeness of aid on GDP by around 55 percent in Asian countries.
- Ø Bilateral aid is most favourable than multilateral aid in Asian and Latin American countries.

1. INTRODUCTION

Not surprisingly, much of the literature which considered the aid-growth nexus reveals the contradictory nature of research findings which support for different camps on aid effectiveness: aid work; aid does not work; aid work but it depends [Mark McGillivray *et al.* (2005)]. However, Chenery and Bruno (1962) and Chenery and Strout (1966) introduced the dual-gap model which includes domestic resource gap and foreign resource gap. Bacha (1990) and Taylor (1990) discussed about the fiscal gap as a part of resource gap which badly affect to enhance the utilization capacity. Therefore, more scholars argue that foreign aid can supplement the domestic savings, foreign exchange and public revenues and in turn can meet the economic growth. Accordingly, the significant volumes of foreign aid are directed with the purpose of not only filling the macro-economic gaps but also closing the gaps over time in developing countries. Figure 1 graphically illustrate an ambiguous picture of the trends in aggregated official development assistance (AODA) and Gross domestic product (GDP) of selected countries in three developing regions. At a glance, it gives a picture that developing countries are achieving self-sustained growth targets as expected in gap model predictions. Accordingly, does foreign aid increase the recipient countries' ability to mobilize their own resources similarly in each set of countries as per the gap model predictions?

By the way, the influential paper done by Tony Addison et.al (2017), pointed out that "Even if the serious data and econometric difficulties are addressed, which is not always the case, cross country analysis can only suggest a pattern or tendency that holds on average". Nonetheless, before his influential paper, Gomanee et.al (2005) similarly, criticized Burnside and Dollar (2000) and pointed out that such studies do not attempt to specify and test the mechanism by which aid impacts on growth, other than including aid as an explanatory variable in the growth regression. Xiang Zhou et al. (2018) mentioned that many scholars are no longer satisfied with merely establishing the presence of a causal effect between one variable and another; rather, they now seek to identify causal mechanisms that explain such effects. One aspect of this discussion is that even if the volumes of literature reveal the contradictory nature of research findings on aid effectiveness, such studies are based on reduced form specifications which omitted investment that it leads to potential omitted variable bias. If one includes both, aid and investment, there is double counting and the coefficients are biased. On the other hand, the empirical studies on the impact of aid on growth fail to recognize explicitly in regression specifications that aid does not have a direct effect; instead, aid operates via transmission mechanisms, such as investment or government consumption.

The purpose of this paper is to find the impact of the coefficient of aggregated and disaggregated aid in Asia, Africa and Latin America due the causal mechanisms that transmit the effect through mediating variables such as investment, government consumption and import. We took the path of mediating effect approach which employed by Gomanee et.al (2005) and similarly use the residual with regression (RWR) method to examine the impact of aid on GDP, which is transmitted via mediating variables such as investment, government consumption and imports. It permits to measure the total effect of aid on growth, accounting for the effect of causal path in addition to the direct effect. As a result, double counting and omitted variable problems concerning mediators are avoided. It allows us to identify the most influential mediating mechanism and its strength in aid-growth nexus. We applied the fixed-effect estimation procedure to address the heterogeneity problem of geographical and socio-economic differences in our samples.

Gomanee et.al (2005) yield the results by imposing a restriction on coefficients in avoiding an intercept for bivariate supplementary equations. It forces regression line to pass through the origin and allows to yield an incorrect causal path from aid to growth. We include intercept for bivariate regression and permits to get the direction of causal path itself. They restricted their sample to 25 sub Saharan African (SSA) countries. By the way, we compared the aid effectiveness in three geographical regions; Asia, Africa, Latin America, including 29 countries. By ignoring heterogeneity problems in SSA countries, they employed the robust estimation procedure in the sample of over the period of 1970-97. However, we employed the fixed effect estimation procedure over the period of 1992-2016. However, Gomanee et.al (2005) just focus on the aggregated aid and grant while we take into account the aggregated and disaggregated aid-bilateral and multilateral aid- to capture the heterogeneous character of categorical aid.

The annual disbursement of aggregated ODA as a percentage of GDP in Africa is considerably higher than Latin America and Asia (Figure 2). But in Asia, it is considerably less than Africa while moderately higher than Latin America. Despite such large aid inflows, Gomanee et.al (2005) found evidence that sub Saharan African (SSA) countries on average experienced only a 0.6 per cent

growth in real per capita GDP per annum over the period. We found evidence that the ODA effectively transmit through the mediating variables into the GDP in Latin American countries in contrast to the Asian and African countries. African countries are experiencing a negative total effect of aid on GDP which only mediate via import. It is also only for multilateral aid. In Latin American countries, ODA, which mediate from government consumption (probably due to the socio-economic consumption), induce greater impact than aid which transmit from investment. When the amount of ODA mediates through the causal path of import, the impact of aid on GDP reduces by around 27 percent. In contrast, ODA, which mediate from government consumption, induce less negative impact than aid which transmit from investment in Asian countries. But the amount of ODA mediates through

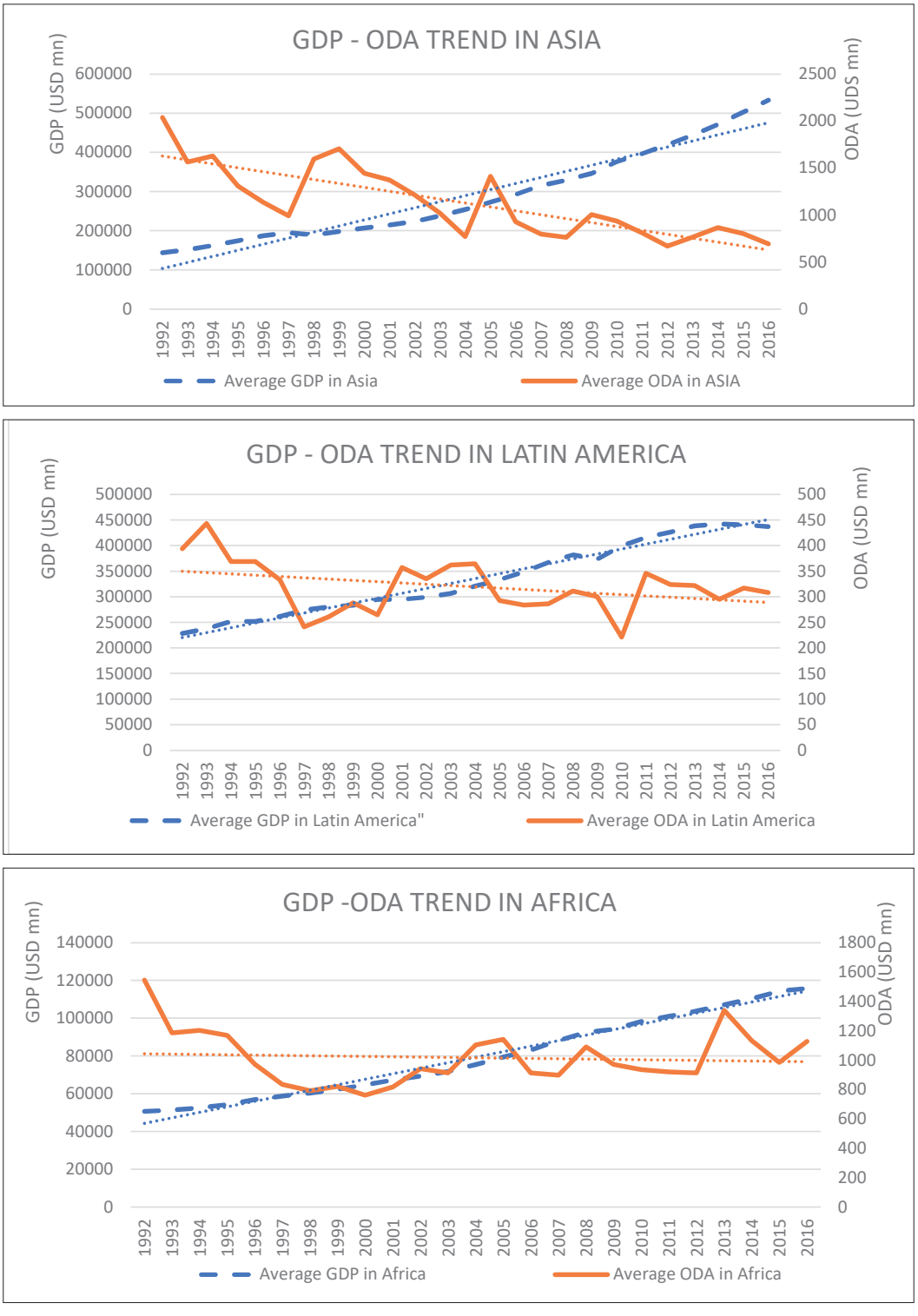

Figure 1. GDP – ODA Trends in Different Geographical Regions

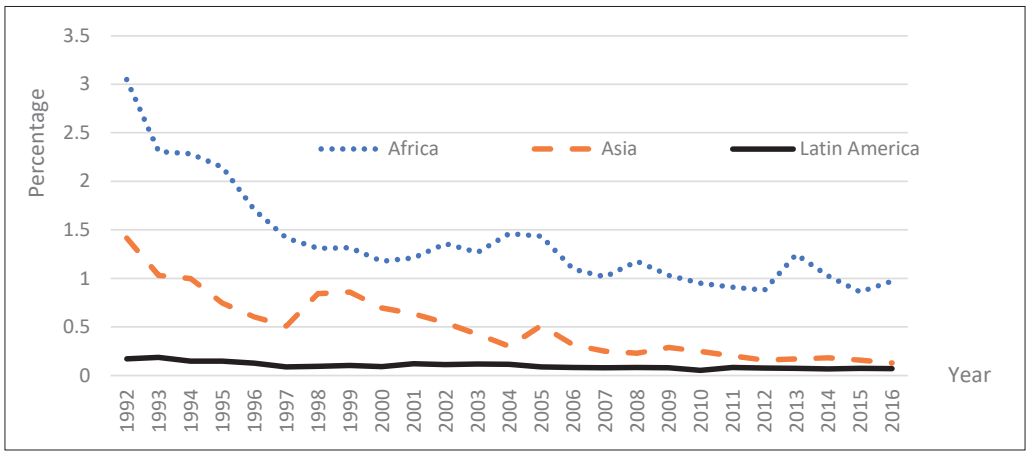

Figure 2. Average Disbursement out of GDP in Developing Regions.

import, however, contribute to reduce the negativeness of aid on GDP by around 55 percent. By the way, bilateral aid is most favourable than multilateral aid in Asian and Latin American countries.

Rest of the paper is organized as follows. Section 2 denote for the literature review. Section 3 present the research concept which focus on the mediating effect mechanism in aid-growth nexus. Section 4 focuses on the data and the econometric methods we used in this paper. Section 5 presents the discussion of the empirical results with respect to the aid effectiveness, and the section 6 contains concluding remarks.

2. LITERATURE REVIEW

The literature emphasizes the requirement for foreign aid in three dimensions. Mark McGillivray *et al.* (2005) pointed out that the early research on aid, dating back to the 1960s, was consistent with the conceptual foundation for the context of the well-known two-gap model of aid, which itself was very much of the Harrod–Domar growth tradition. It assumes that there is an excess supply of labour and that growth is constrained only by the availability of capital, which is determined by the level of savings and the productivity of capital. In this scenario, poor countries continuously remain in poverty because of a lack of savings. Indeed, developing countries that are suffering from insufficient investment turn to foreign aid as a means of filling the resource gap. In addition, the dual-gap model introduced by Chenery and Bruno (1962) and Chenery and Strout (1966) identifies a foreign resource gap, which means the trade gap is a constraint of economic performance in developing countries. Accordingly, foreign aid provides a potential solution for insufficient foreign exchange that is required to purchase foreign capital goods and intermediate goods for investment.

Third, Bacha (1990) and Taylor (1990) recognized that governments of developing countries do not have the required sources of domestic revenue to meet the desired level of utilization capacity. Further, they argue that foreign aid can supplement the insufficient revenue of the recipient's government with the purpose of enhancing utilization capacities. Accordingly, these ideas advocate for a positive aid-growth relationship on the grounds of Harrod-Domar's growth tradition. As Mark McGillivray *et al.* (2005) explained, this would increase investment and, in turn, growth. Eventually this growth could become self-sustaining, and the need for aid would disappear. Papanek (1973), Dowling and Hiemenz (1982), Gupta and Islam (1983), Levy (1988), and Sachs *et al.* (2004) are some of the defenders of these streams of thought.

However, the literature reveals the contradictory nature of research findings on aid effectiveness. Voivodas (1973), Mosley (1980), and Boone (1996) found that there is no impact of aid on economic growth. Griffin (1970) and Griffin and Enos (1970) pointed out the general tendency that the greater the capital inflows from abroad are, the lower the rate of growth in the recipient country. Among a number of interacting reasons for this phenomena, particular attention was paid to the observation that aid leads to lower domestic savings. This idea contested the assertion of gap models that foreign aid leads to a one-to-one increase in savings, and the authors pointed out that a part of foreign aid will be allocated to consumption rather than savings/investment. Weisskopf (1972) and Broone (1996) confirmed this concept again. Mosley P. *et al.* (1987) discussed the micro-macro paradox. The paradox is that the micro-level performance of development projects shows good performance, whilst those of the macro evidence are ambiguous or negative. These authors offered some explanations, such as aid fungibility within the public sector and backwash effects from aid-financed activities that adversely affect economic performance. Swaroop *et al.* (2000) and Easterly (2006) pointed out that foreign aid is being used for unproductive activities. These projects tend to generate a low or negative rate

of return and produce little spill over into other sectors. Bulir and Hamann (2003) showed that aid volatility, especially in aid-dependent countries, undermines the effectiveness of aid. Volatile aid causes economic uncertainty, which leads to poor economic performance. Lensink and Morrissey (2000) showed that while the aid uncertainty variable has a negative impact on growth, aid has a positive effect. This finding confirms the hypothesis that aid in itself contributes to higher growth but that the effectiveness of aid is reduced when aid flows are more volatile. Mark Mcglivery (2005) traced five main alternative views with respect to the negative association of the aid-growth nexus: aid has decreasing returns, volatile aid flows cause uncertainty, external and climatic conditions, political conditions, and institutional quality.

Another trend in the aid effectiveness literature emphasizes that aid is effective but depends on other exogenous factors. Guillaumont and Chauvet (2001) argued that aid effectiveness depends on exogenous environmental factors such as the terms of trade trend, export instability and climatic shocks. Burnside and Dollar (2000) showed that aid has a positive impact on real GDP per capita growth, but only when aid interacts with a policy index variable. In other words, Aid may increase growth but only when the government of a country carries out 'good' fiscal, monetary and trade policies because the key feature of the authors' policy index is that it weighs policy variables such as the openness measure, the inflation rate and the budget surplus according to their correlations with growth. In general, the key argument is that aid will only work if it is spent on the right countries with low inflation, small budget deficits, and openness to trade. Collier and Dehn (2001) and Collier and Hoeffler (2002) reported results consistent with those of Burnside and Dollar (2000). However, Dalgaard and Hansen (2001), Hansen and Tarp (2001), Lensink and White (2001), Jensen and Paldam (2003), Islam (2002), and Ram (2004) failed to find that the interaction term between aid and policy measure is statistically significant in a different context. Dalgaard, Hansen and Tarp (2004) also elaborated that the impact of foreign aid on long-run productivity depends on policies, structural characteristics such as climate-related circumstances, and the size of the aid flow.

Additionally, Heller (1975) and followers such as Gang and Ali Khan (1991), Susana Franco *et al.* (1998), Mavrotas, G. (2002) and Simon and McGillivray (2010) addressed the issue of "fungibility" or the ability of recipient governments to direct aid to uses other than those intended by donors. Mavrotas (2002) found project aid to be more fungible than programme aid in regard to the replacement of government funding. In general, official aid goes to the recipient government's budget and is reshuffled into the budget, and the resources are reallocated as per the unintended pattern of donors. Then, if the aid stimulates tax reduction policy or diverts aid resources to public consumption in the recipient country, it negatively affects or does not affect economic growth.

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Gomanee and et.al (2005) examined aid and growth transmission in sub-Saharan Africa with a focus on how investment is treated in the aid-growth model by employing a residual-generated regressor. This causal inference mechanism enables us to identify that part of the effect on growth of the relevant transmission mechanism that is not due to aid. Accordingly, these authors found a measure of the total effect of aid on growth, accounting for the effect via investment. As a result, double counting and omitted variable problems concerning investment are avoided. They employed the robust estimation procedure in the sample of 25 sub Saharan African (SSA) countries over the period of 1970-97 and found that aid and grant had a positive impact on growth, which is transmitted through aid-financed investment. They yield the results by imposing a restriction on coefficients in avoiding an intercept for bivariate supplementary equations. It that might create an incorrect causal path from aid to growth. However, they further clarified that despite large aid inflows, sub Saharan African (SSA) countries on average experienced only a 0.6 per cent growth in real per capita GDP per annum over the period. On its face, this may appear to be a case of aid ineffectiveness.

3. MEDIATING EFFECT OF AID ON GROWTH

Gomanee (2005) correctly disclosed the dilemma of the aid-growth nexus. By citing Hansen and Tarp (2001), they stated that the implicit growth theory will have investment, not aid, as an argument. Burnside and Dollar (2000) argued that aid adds to investment, whereas policy determines the productivity of investment, and they therefore include an 'aid-policy' interaction term but exclude investment. Similarly, Roodman (2004) did not include investment in any of the regressions. The core argument for this is that "empirical growth studies are based on reduced form specifications and aid-growth regressions typically omit investment" in contrast to the implicit growth theory because foreign aid supplements the saving and finances the domestic resource gap (saving – investment). Accordingly, 'aid is intended to affect growth via its effect on investment. However, not all aid is intended for investment, and not all investment is financed by aid' Gomanne (2005). The issue with this concept is that if one adopts the approach of omitting investment, there is potential omitted variable bias—any effect of investment on growth is attributed to the other variables (especially aid). If one includes aid and investment, there is double counting (as some aid is used for investment), and the coefficients are biased. Nonetheless, investment financed by aid contributes to the economic growth. The conceptual underpinning of this dilemma is that investment works as a mediator of the aid-growth interrelationship. In other words, the effect of aid on growth is transmitted via investment.

In addition to investment, imports and public consumption expenditure also work as mediators of the aid-growth interrelationship. The gap model (Bacha, 1990) argument is useful in identifying these mediating effects of aid on growth. As the domestic resource gap is directly financed by foreign aid, the foreign resource gap (export – import) is also (at least) financed by foreign aid, which is directed to fill the requirements of import investment/intermediate goods and technology. Heller (1975) type studies based on fiscal response paradigm are demonstrated by Gang & Khan, A. (1991), Franco, S. *et al.* (1998), Mavrotas, G. (2002), and Simon and McGillivray (2010), and showed that fiscal policy is a significant determinant of the effects of aid. Official development assistance is issued to the recipient government, and the government reshuffles it into the budget. The budget diverts foreign aid not only to donor-intended investments and socio-economic consumption but also to civil public consumption spending in addition to tax reduction efforts. Such behavioral changes could affect the expansion of the fiscal gap (public revenue – public expenditure), which badly affects the domestic resource gap. In contrast, donor-intended socio-economic consumption such as education and health does not have an impact in the short term, and we would expect some of the aid to go to civil consumption spending, which does not have any impact on growth. It implicitly reduces the effectiveness of foreign aid. Accordingly, foreign aid affects economic growth via imports and public consumption. In other words, imports and public consumption work as mediators of the aid-growth association due to the effect of aid on growth transmitted via those variables. Therefore, investment, imports and public consumption are considered to be potential mediators (X). Conversely, the traditional empirical approach to the aid-growth nexus fails to recognize explicitly that aid has an indirect effect that operates via mediating mechanisms such as investment, government spending and imports. Nonetheless, Judith J. M. R (2017) mentioned that many studies use statistical mediation analysis to unravel the pathways underlying the effect of an intervention on a particular outcome variable.

Mediation analysis, explained simply in Figure 3 (See page 70), is one approach to a causal inference mechanism that attempts to decompose the total effect into the direct effect and the indirect (mediated) effect. The part of the exposure effect that is not mediated by a given set of potential mediators is called the direct effect. In our case, the exposure variable is aid, and the outcome variable is *GDP* [β_1 Path]. The indirect effect, which goes through a mediator variable ($K_2 and\ \beta_2$ path), explains the part of the exposure effect that is mediated by a given set of potential mediators into the outcome variable. Accordingly, β_1 in equation 3 denotes the direct effect, while $\beta_2 K_2$ denotes the indirect effect. The total effect of this decomposition is denoted by $\beta_1 + \beta_2 K_2$.

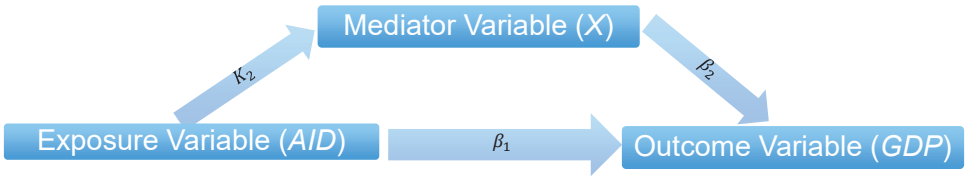

Figure 3. Path diagram of a relatively simple mediation model.

4. SAMPLE AND DATA

Gomanee (2005) argued if the region is demonstrably different from other regions, it is legitimate to sample the region only, and they restricted their analysis to a sample of SSA countries that were suffering from political and economic instability, climatic

and agricultural risk, terms of trade shocks, droughts and, floods than other regions. However, SSA countries are not free from the quality or state of being diverse in character or content, and that approach does not allow for drawing a comparative conclusion in the case of aid effectiveness. However, a natural restriction of cross-country panel estimations is that they provide an average value for a coefficient, and this is not a valid estimate for any particular country. Such results reveal only patterns or empirical regularities and a tendency for aid to contribute to growth through mediators. Therefore, we stratified the sample of 29 countries into three sets of sub-samples, such as 9 Asian countries, 10 African countries and 10 Latin American countries, to capture a close picture of aid effectiveness (see Table 1 in page 12). Accordingly, we compare aid effectiveness across different geographical regions among developing countries. We selected the sample countries for which data on all variables were available for the period of 1992-2016.

Table 1. 29 Countries in the sample

Asian Countries	African countries	Latin American Countries
Bhutan, India, Sri Lanka, Indonesia, Philippine, Vietnam, Mongolia Thailand, Malesia,	Congo, Morocco, Egypt, Ethiopia, Zambia Algeria, Mauritius, Tunisia, Botswana, South Africa	Argentina, Guatemala, Paraguay, Nicaragua, Peru, Brazil, Mexico, Jamaica, Costa Rica, Dominican Rep.
9	10	10

Source: OECD (http://www.oecd.org/dac/stats/documentupload/DAC_List_ODA_Recipients2014to2017_flows_en.pdf)

Our dependent variable is real gross domestic product (*GDP*). The year preceding real GDP is included to capture initial country-specific effects (*GDPO*). The population between the ages 15 and 64 years is used as a proxy for labour force (*L*). We use aggregated and disaggregated aid measures; aggregated official development assistance *(AODA),* multilateral official development assistance (*MulODA*) and bilateral official development assistance (*BiODA*). We use the OECD data for aid measures. We investigate the existence of diminishing returns from aid by adding a quadratic aid term to the growth model. This can be described as limited absorptive capacity for countries to take up large inflows of foreign aid and a problem of Dutch disease effects. Lensink and White (2001), Hansen and Tarp (2001), Dalgaard, Hansen and Tarp (2004), and Gomanee *et al*. (2003) found evidence for a negative effect of aid on growth after a certain threshold level. Even though Gomanee (2005) omitted lagged aid in the general form of specification, we use it to avoid some omitted variable bias in our specification. We include three types of mediating variables, namely, total domestic investment (*INV*), government consumption (*Gcon*) and imports (*Imp*) that mediate the effect of foreign aid on *GDP*. Investment is considered to be a factor of capital accumulation in the growth model. Government consumption includes civil administration consumption and socio-economic (developmental) consumption, which causes improvement in human resources capital. Imports (*Imp*) and exports (*Expo*), which capture openness and trade policy related to economic performance, are separately included in the growth model, as imports play a mediating role in the equation.

We insert inflation (*Inf*) as a policy indicator. Gyimah-Brempong and Traynor (1999) found that political instability has a direct negative effect on growth and an indirect effect via discouraging investment. Guillaumont *et al.* (1999) found that primary instabilities in SSA reduce growth by distorting economic policy: the rate of investment is volatile; hence, the growth rate is lowered. We also hope to identify some of these effects in the estimation. Therefore, we include an indicator of the political features of sampled countries (*DEM*) based on the survey data published by Freedom House (www.freedomhouse.org). The democracy index takes values between 1 and 3 respectively corresponding to freedom, partial freedom, and no freedom. To capture the effect of the economic crises of 1997/1998 and 2007/2008, we use two dummy variables (*Crises97_98* and *Crises08_09*). Estimation is carried out with a panel of 25 years of annual constant level data except for inflation, the democracy index and the crises dummy. All variables measured in financial values represent constant USD values. Unless otherwise stated, the source for all variables is the World Bank data base. Variables with financial values are constant (2010) level values. To convert the nominal values into constant values, all nominal values are deflated (Deflator = Nominal GDP/Constant GDP*100).

5. METHODOLOGY

Gomanee (2005) employed a two-step empirical solution that was introduced by Pagon (1984) to capture the effect of aid on growth, accounting for the effect of aid on mediating variables (investment, imports and government consumption spending). At first, they tested whether aid is a direct determinant of the mediating variable and, if so, removed the direct influence of aid by constructing a generated regressor for each mediator. Accordingly, we developed a model based on the specification of the panel

estimation in general terms, which is represented in the following equation:

$$GDP_{it} = \beta_0 + \beta_1 AID_{it} + \beta_2 X_{it} + \beta_z^{'} Z_{it} + u_{it} \qquad (1)$$

Where *GDP* is constant gross domestic product

AID indicates the aggregated and disaggregated aid measures,

AODA – aggregated official development assistance;

MulODA- Multilateral official development assistance

BiODA - Bilateral official development assistance

X is the vector of the mediating variables:

Inv – Total domestic investment,

Gcon – Government consumption

Imp – Imports

Z is the vector of other covariates:

Aid^2 – Squared value of aggregated and disaggregated aid measures

Aid (-1) – Lagged value of aggregated and disaggregated aid measures

Expo – Export of goods and services

GDPO – Year proceeding GDP

L – Age group between 15 and 64 years

Inf – Inflation rate

DEM – Democracy Index

CRISIS97/98 – Global economic crisis dummy 1997/1998

CRISIS08 /09 – Global economic crisis dummy 2008/2009

u - Disturbance term,

i and *t* represent the country and time, respectively.

However, we suppose that not all aid are intended for direct investment, and not all investment is financed by aid. In other words, investment, government consumption and imports are partially financed by aid. Therefore, in the above equation, which includes aid and investment together, there is a double-counting problem, and the coefficients are biased. With regard to eradicating the double-counting problem, if one adopts the approach of omitting investment (or government consumption/imports), there is potential omitted variable bias — any effect of such a variable on growth is attributed to the other variables (especially aid variable) — as such variables are not entirely financed by aid.

5.1 Regression with Residual

To solve the dilemma raised in the standard aid-growth specifications as discussed above, we elaborate our basic equation (1) to incorporate the effect of aid on *GDP* via mediating variables. Accordingly, we employ the regression with residual approach by generating regressors from the residuals of a supplementary equation. Pagan (1984) presented a fairly complete treatment of the econometric problems arising when generated variables appear in a regression equation. Gomanee (2005) employed the same two-step procedure, which can be derived from the asymptotically efficient estimates and the correct values for the standard errors.

In the first step, we regress the following bivariate regression:

$$X_{it} = K_1 + K_2 AID_{it} + U_{it} \qquad (2)$$

Where X represents the mediating variables (*Inv, Gcon, and Imp*); K_1 is the intercept; and U_{it} represents the residual of the specification. Equation (2) estimates the relationship between *AID* and the mediator (X) such that K_2 gives a measure of the strength of the link that exists between them. The expression $[\, X_{it} - (K_1 - K_2 AID_{it})\,]$ represents that part of X that is explained by factors other than *AID,* which is called the residual (U_{it}). We generate the residual series as a variable that represents the part of X that is explained by factors other than *AID* by estimating supplementary equation (2).

In the second step, supplementary equation (2) is substituted into the initial regression 1, and then the mediating variable is replaced by the residual-generated variable that was generated in the first step. This transformation alters only the estimated coefficient on the *AID* variable. This is demonstrated by substituting equation (2) in equation 1 as follows:

$$GDP_{it} = \beta_0 + (\beta_1 + \beta_2 K_2) AID_{it} + \beta_2 U_{it} + \beta_z^{'} Z_{it} + u_{it} \qquad (3)$$

In the fixed-effect estimation, the expression $\beta_2 K_1$ should be dropped from the equation, as it is time invariant. Then, we regress basic equation (3) with the generated residual series. This reveals that OLS gives us the correct and efficient estimates of

variance and coefficient values. Hence, the use of residuals does not invalidate the inferences made, and the coefficient estimates are efficient (Gomanee (2005).

We regress the bivariate supplementary equations with an intercept that explains the data in its own right. However, Gomanee (2005) did not use an intercept for bivariate supplementary equations, and a regression without an intercept suggests that the regression line should run through the origin. If the regression is forced through the origin, then it is assumed that the data are observed accordingly. However, in the case of the bivariate regressions proposed for the model, the data are not observed accordingly, which implies a restriction on the coefficient, often positive, and this might create an incorrect causal path from aid to growth. The residual-generated regressors we constructed with intercept explain the part of the mediating variables (investment/ government consumption/imports) that is not attributed to *AID* using residuals from each bivariate regression. Those residual-generated variables capture the mediating effect of foreign aid.

In cases where the mediating variable (X) has a positive effect on *GDP* and in which *AID* variable has a positive effect on the mediating variable, it provides a larger positive coefficient on aid. If the mediating variable has a negative effect on *GDP,* and *AID* variable is a positive determinant of the mediating variable or vice versa, the coefficient on *AID* variable is reduced. If it transpires that *AID* variable is not a determinant of the variable, there is no effect, and the method is not used.

6. RESULTS AND DISCUSSION:

We first confirmed whether aid influences the mediating variables which affects *GDP*, in a multivariate regression and then we construct residual-generated regressors that represent the part of the mediating variable that is not attributed to *AID* variable by using residuals from the *AID-mediator* bivariate regressions. See equation (2). The same process applied not only for aggregated *ODA* but also for disaggregated aid measures. In each case, the residual-generated regressors are *INVres*, *GCONres*, and *IMPres*. In case of lagged effect, we constructed the following residual generated regressors; *INVres_LA, GCONres_LA, and IMPres_LA*. The estimation results from those supplementary regressions are reported in Table 2 - 4. As we mentioned above, the method is not used for the cases that *AID* variable is not a determinant of the mediator. As a result, we generated residual regressors only for the mediators that have statistically significant coefficients on aid variable.

Finally, the effect of *AID* on *GDP*, accounting for the effect of *AID* on the mediating variables, is estimated by regressing equation (3) with the residual-generated regressors. The estimation results of aggregated and disaggregated aid for Asian countries are reported in tables 5-7. The estimation results from Latin American countries are reported in tables 8-10 and table 11 shows the estimation results of African countries. Tables 5, 8 and the first two columns of table 11 show the estimation results from the general form of the aid-growth specification for three regions, and these are similar to equation (1) with and without investment (model 1 and 2) to compare with the estimation results of the mediation effects. As a whole, Model 1, which omitted investment, is never significantly different from zero in any of the samples except multilateral aid in Asia and Africa. It suggest that aggregated and disaggregated *ODA* completely operates via mediating mechanisms in Latin America. Further it transpires that only *MulODA* has a positive direct effect in Asia while Africa has a negative direct effect. The results are highly consistent with those of previous works. Mosley et al. (1987), for instance, pointed out that "…there appears to be no statistically significant correlation in any post war period, either positive or negative, between inflows of development aid and the growth rate of GNP in developing countries". Furthermore, by quoting Peter Boone (1995, 1996) Burnside and Dollar (2000) mentioned that foreign aid has not raised growth rates in typical poor countries. Moreover, the squared term of different type of aid categories shows evidence supporting the hypothesis regarding diminishing returns from aid in Asia by suggesting that those countries are reaching their maximum levels of absorption capacity for official development assistance. Gomanee (2003) did not find evidence that aid has diminishing returns after the threshold level they identified in developing countries. However, in 2005, they found that aid had diminishing returns in sub-Saharan Africa. Despite the identification problem, when we insert *INV* (model 2), we found evidence that the coefficients for imports and exports are strongly significant in the expected directions for all specifications.

By correcting the identification problem, we extend our estimation by replacing *INVres* instead of *INV* itself to capture the real causal effect of aggregated and disaggregated ODA via the mediating path. The estimation results for the model 3 report the total effect of all type of aid we considered here, incorporating the mediating effect of investment in each corresponding table. Accordingly, coefficients on *AODA* is positively significant, as expected, in Latin America and it elaborate that one million dollar increases of *AODA* causes to increase the total effect on *GDP* by around 35 million USD. We found a similar result in Gomanee's (2005) work, which is based on SSA. [Note that they did not use an intercept for bivariate supplementary equations, which implies a restriction on coefficients, often positive, that might create an incorrect causal path from aid to growth]. In contrast, the total effect of *AODA* is negative and statistically significant in Asian countries. That is, one million dollars increase in *AODA* causes to decrease the total effect on *GDP* of approximately 9.5 million USD. Comparatively, the indirect effect, which is mediated through

Table 2. Fixed Effect Estimation Results for Bivariate Supplementary Regressions

Sample		Current AODA			Lagged AODA		
		INV	GCON	IMPORTS	INV	GCON	IMPORTS
Asia	AODA	-28.95*** (-4.4)	-8.251*** (-4.28)	-15.24*** (-2.62)			
	AODA (-1)				-29.90*** (-4.49)	-7.70*** (-4.10)	-17.79** (-3.04)
	C	120813.2*** (13.14)	39842.94*** (14.82)	116697.2*** (14.36)	124310*** (13.24)	40254.67*** (-15.2)	122438.8*** (14.86)
	R^2	0.72	0.74	0.60	0.73	0.77	0.62
	Observation	225	225	225	216	216	216
Africa	AODA	-0.32 (-0.35)	-0.10 (-0.19)	0.688 (0.55)			
	AODA (-1)				-062 (-0.66)	-0.26 (-0.46)	-0.09 (-0.07)
	C	19224.8*** (16.48)	13249.9*** (18.97)	23519.7*** (15.38)	19862.6*** (16.90)	13610.21*** (19.50)	24820.6*** (16.33)
	R^2	0.78	0.89	0.77	0.79	0.89	0.79
	Observation	250	250	250	240	240	240
Latin America	AODA	45.51*** (4.49)	44.89*** (5.45)	46.84*** (3.93)			
	AODA (-1)				28.54*** (2.69)	40.04*** (4.88)	33.27*** (2.73)
	C	53426.47*** (13.94)	38007.74*** (12.22)	47327.5*** (10.50)	52757*** (14.95)	40494.5*** (13.08)	52962.74*** (11.54)
	R^2	0.92	0.94	0.86	0.92	0.94	0.87
	Observation	250	250	250	240	240	240

Note: t ratios in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively

Table 3. Fixed Effect Estimation Results for Bivariate Supplementary Regressions

Sample	Multilateral Current ODA				Multilateral Lagged ODA		
		INV	GCON	IMPORTS	INV	GCON	IMPORTS
Asia	MulODA	-134.28*** (-5.71)	-33.88*** (-4.85)	-88.75*** (-4.26)			
	MulODA(-1)				-129.41*** (-5.51)	-29.80*** (-4.43)	-90.83*** (-4.41)
	C	127988*** (14.60)	40588.26*** (15.61)	125828*** (16.23)	128713*** (14.60)	40332.12*** (15.95)	129194.5*** (16.71)
	R^2	0.73	0.74	0.62	0.64	0.77	0.64
	Observation	225	225	225	216	216	216
Africa	MulODA	3.41 (1.34)	2.40 (1.58)	7.63** (2.31)			
	MulODA(-1)				3.01 (1.18)	2.18 (1.44)	6.82** (2.08)
	C	17818.56*** (17.19)	12386*** (19.98)	21822.56*** (16.17)	18288.11*** (17.51)	1266.51 ***20.47)	22596.85*** (16.86)
	R^2	0.79	0.89	0.78	0.89	0.89	0.79
	Observation	250	250	250	240	240	240
Latin America	MulODA	16.82 (0.34)	35.75 (0.88)	95.38* (1.68)			
	MulODA(-1)				-39.99 (-0.80)	18.18 (0.45)	0.47 (0.00)
	C	66749.85*** (16.13)	49756.32*** (14.56)	55369.08*** (11.54)	71788.75*** (17.19)	51991.97*** (15.51)	63578.33*** (13.22)
	R^2	0.91	0.93	0.85	0.92	0.94	0.86
	Observation	250	250	250	240	240	240

Note: t ratios in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively

Table 4. Fixed Effect Estimation Results for Bivariate Supplementary Regressions

Sample		Bilateral Current ODA			Bilateral Lagged ODA		
		INV	GCON	IMPORTS	INV	GCON	IMPORTS
Asia	BiODA	-25.13*** (-3.52)	-7.60*** (-3.66)	-12.77** (-2.04)			
	BiODA(-1)				-25.50*** (-3.53)	-7.01*** (-3.46)	-14.74*** (-2.34)
	C	108841.8*** (13.52)	36798.9*** (15.70)	110010.5*** (15.59)	111446.8*** (13.55)	37317.39*** (16.18)	114433.8*** (15.98)
	R^2	0.71	0.70	0.59	0.62	0.76	0.62
	Observation	225	225	225	216	216	216
Africa	BiODA	-1.21 (-1.08)	-0.67 (-1.00)	-0.64 (-0.44)			
	BiODA(-1)				-1.53 (-1.36)	-0.83 (-1.24)	-1.57 (-1.08)
	C	19842.47*** (19.16)	13674 (22.06)	24658.73*** (18.16)	20406.65*** (19.56)	13991*** (22.60)	25803.16*** (19.17)
	R^2	0.79	0.89	0.77	0.79	0.89	0.79
	Observation	250	250	250	240	240	240
Latin America	BiODA	49.63*** (4.58)	47.91*** (5.45)	46.79*** (3.65)			
	BiODA(-1)				33.22*** (2.98)	43.12*** (4.94)	36.29*** (2.80)
	C	56266*** (16.56)	40964.39*** (14.83)	51175.3*** (12.73)	60684*** (17.50)	43079.68*** (15.75)	55074.5*** (13.56)
	R^2	0.92	0.94	0.86	0.92	0.94	0.87
	Observation	250	250	250	240	240	240

Note: t ratios in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively

investment, is roughly around four times greater in Latin American countries.

However, when we compare the disaggregated aid among three regions, aid effectiveness of bilateral aid mediated through investment is more favorable than multilateral aid. When each type of aid increases by one million USD, *GDP* decrease by around 76 million USD while it increases around 41 million USD due to the indirect effect of bilateral aid in Latin American countries. In Asian countries, an increase of one million USD in each type of aid cause to decreases the *GDP* by around 19 and 7.5 million USD due to indirect effect of multilateral aid and bilateral aid respectively. Considering only the total effect of lagged *AID on GDP*, accounting for the effect of lagged aggregated and disaggregated *ODA* on investment, as the effects of aid on growth should take place over time, we regress the model 6 with *INVres_LA*. We found evidence that the treatment of investment does not alter not only the direction but also the significance level of the coefficients (see model 6 in corresponding tables).

Subsequently, we replaced *GCONres* instead of *Gcon* itself in the growth model (Model 4 in corresponding tables). Aid measures except *MulODA* are approximately increases by around 65% due to indirect effect of government consumption in their own direction in Latin American countries. This result suggests that those countries are enjoying a commodity boom through government consumption and that *AID* has mostly been directed to productive socio-economic consumption and has been spent productively. In Asian countries, we noticed that the *BiODA* is the most accelerating factor when it operates not only via investment but also via government consumption. Whereas, government consumption reduces the estimated coefficient on *AODA* up to -14.19 (by approximately 33 percent) in Asian countries. Considering only the total effect of lagged *AID on GDP*, accounting for the effect of lagged *ODA* on government consumption (Model 7 with GCONres_LA, in corresponding tables), we found evidence that the treatment of government consumption does not alter the direction of the coefficients in Asia and Latin America.

However, we turn back to the mediation effect of imports and the model 5 in corresponding tables reports the estimation results of equation (3) with the generated residual regressor of imports — *IMPres* — instead of import itself. At a glance, in contrast to Latin American countries, we can notice that the ODA mediated through import is favorable in Asian countries. Accordingly, when AODA increases by one million USD, total effect of aid is increased up to -9.19 by around 55 percent in Asia while it is droped down by around 27 percent in Latin America. In case of lagged *AODA*, as a whole, we can observe that the indirect effect which mediated through import (Model 8 with IMPres_LA) helps to mitigate the aid ineffectiveness roughly by half in Asian countries. However, our findings on aid effectiveness are in line with the comment by Cassen and Associates (1994) quoted in McGillivray, M (2005): "… research on the macroeconomic effects of aid deals with relatively large groups of developing countries. Its results are ambiguous. The relationship between aid and growth is rather weak: it can be either positive or negative, depending on the country groupings and the time period chosen".

Ultimately, we found that the impact of aggregated and disaggregated aid in each set of countries is not shown a similar pattern. In contrast to Asian countries, foreign aid may cause to mobilize the Latin American countries' ability to mobilize their own resources as expected in the gap model predictions. The prominent question that we have to address here is why Asian countries are experiencing such negative effect especially via investment and government consumption?

Figure 1 which shows that *ODA* has been decreasing over the years, is very consistent with the negative effect of current and lagged aid. The story of aid ineffectiveness is described by a vicious cycle phenomena. Let's get on here. The negative effect of current and lagged *AID* mediated via investment implies that the rate of return on private capital, as a driving force of investment, is reduced or treated unfavorably by *AID*. As a result, the outcome (*GDP*) is decreased, and this is confirmed by the diminishing marginal effect of current and lagged M*ulODA* which has highest negative influence of ODA. [Mark McGlivery (2005) highlighted the decreasing return on aid as a reason for the negative influence of foreign aid]. According to our discussion, debt servicing is a critical problem for aid recipients in general. It causes to decline the proportion of net *AID*, they receive, as it is directed to settle the capital repayment. On the other hand, donors are discouraged due to the debt risk that arises in poorer aid recipients and tend to reduce *ODA* and turn to a more conditional framework that tie their neck.

Whereas, the disbursement capacity of recipient countries is restricted due to the lack of counterpart domestic development financing, specially for the ODA they receive from multilateral agencies. Therefore, recipient governments tend to borrow from domestic and international financial markets which leads to policy distortions.

By the way, recipient governments reshuffle their budgets by favoring unproductive civil administration consumption, such as interest payments, rather than donor-intended socio-economic consumption. Relatively extremes negative total effect of multilateral *ODA* prove that less monitored and low cost *MulODA* is diverted to consumption when compared to *BiODA* which comes from costly financing source. Indeed, consumption oriented fiscal policy measures lead to policy distortions in the macro economy. Burnside and Dollar (2000) pointed out that both the incentive to invest aid and its subsequent productivity as capital are affected by various policy distortions that can lower the return to capital.

Another possibility is the crowding out effect of private investment by aid-financed public investment. Herzer, D. *et al.* (2012) estimated the effect of aid on investment in developing countries by using panel co-integration and causality techniques and

Table 5. ASIAN COUNTRIES
Fixed Effect Estimation Results of Aggregated and Disaggregated ODA on GDP [for with and without investment regressions]

	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
AODA	0.56 (0.279)	-0.577 (-0.333)				
AODA(-1)	1.81* (1.76)	2.96*** (3.31)				
$AODA^2$	-0.0008** (-2.26)	-0.0001 (-0.58)				
MulODA			20.24** * (2.17)	23.22*** (2.99)		
MulODA(-1)			3.62 (1.02)	4.21 (1.43)		
$MulODA^2$			-0.01** (-2.25)	-0.011*** (-2.38)		
BiODA					0.71 (0.37)	-0.31 (-0.187)
BiODA(-1)					1.57 (1.45)	2.75*** (2.88)
$BiODA^2$					-0.001*** (-2.90)	-0.00 (-1.40)
INV		0.30*** (8.43)		0.31*** (9.36)		0.28*** (8.03)
GCON	0.54*** (3.45)	0.57*** (4.19)	0.64*** (4.08)	0.58*** (4.45)	0.53*** (3.43)	0.53*** (3.95)
IMPO	0.06 (1.18)	-0.32*** (-5.05)	0.10** (1.92)	-0.30*** (-4.81)	0.057 (1.10)	-0.31*** (-4.86)
EXPO	-0.10 (-2.07)	0.24*** (3.99)	-0.17*** (-3.30)	0.20*** (3.41)	-0.09** (-1.93)	0.23*** (3.90)
GDPO	0.97*** (39.70)	0.89*** (39.70)	0.96*** (38.24)	0.89*** (39.58)	0.96*** (39.77)	0.90*** (2.50)
L	0.000*** (4.14)	0.00** (2.26)	0.00*** (3.57)	0.00*** (2.71)	0.00*** (4.59)	0.00*** (2.50)
INF	-30.94 (-0.91)	-25.24 (-0.86)	-47.08 (-1.37)	-33.45 (-1.17)	-28.29 (0.84)	-22.87 (-0.78)
DEM	586.83 (0.35)	632.01 (0.44)	593.76 (0.35)	2080 (1.48)	848.58 (0.51)	819.4 (0.57)
CRISIS97/98	-8958*** (-3.78)	-7626.7*** (-3.74)	-9501.6*** (-3.97)	-8272.7*** (-4.15)	-8788.7*** (-3.76)	-7721*** (-3.79)
CRISIS08/09	-5518.33*** (-2.39)	-4352** (-2.19)	-6346.3*** (-2.70)	-6075*** (-3.11)	-5860.3*** (-2.56)	-4747.5*** (-2.38)
C	-21760.5*** (3.33)	-11420.7** (-1.99)	-22128.9*** (3.07)	-18143.7*** (-3.02)	-24206.5*** (-3.66)	-12235*** (-2.06)
R^2	0.99	0.99	0.99	0.99	0.99	0.99
No.of countries	9	9	9	9	9	9
Observations	216	216	216	216	216	216

Note: t ratios in parenthesis; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table 6. ASIAN COUNTRIES
Fixed Effect Estimation Results of Aggregated and Disaggregated ODA on GDP [Current effect]

	Model 3	Model 4	Model 5	Model 3	Model 4	Model 5	Model 3	Model 4	Model 5
AODA	**-9.48*** (-4.51)**	**-14.19*** (-5.98)**	**-9.19*** (-4.09)**						
AODA(-1)	2.96*** (3.31)	2.96*** (3.31)	2.96*** (3.31)						
$AODA^2$	-0.0001 (-0.58)	-0.0001 (-0.58)	-0.0001 (-0.58)						
MulODA				**-18.72** (-2.13)**	**-38.60*** (-3.83)**	**-11.81 (-1.18)**			
MulODA(-1)				4.21 (1.43)	4.21 (1.43)	4.21 (1.43)			
$MulODA^2$				-0.011*** (-2.38)	-0.011*** (-2.38)	-0.011*** (-2.38)			
BiODA							**-7.59*** (-3.86)**	**-11.0*** (-5.42)**	**-7.66*** (-3.69)**
BiODA(-1)							2.75*** (2.88)	2.75*** (2.88)	2.75*** (2.88)
$BiODA^2$							-0.0004 (-1.40)	-0.0004 (-1.40)	-0.0004 (-1.40)
INVres	0.30*** (8.43)	0.30*** (8.43)	0.30*** (8.43)	0.31*** (9.36)	0.31*** (9.36)	0.31*** (9.36)	0.28*** (8.03)	0.28*** (8.03)	0.28*** (8.03)
GCON	0.57*** (4.19)			0.58*** (4.45)			0.53*** (3.95)		
GCONres		0.57*** (4.19)	0.57*** (4.19)		0.58*** (4.45)	0.58*** (4.45)		0.53*** (3.95)	0.53*** (3.95)
IMPO	-0.32*** (-5.05)	-0.32*** (-5.05)		-0.30*** (-4.81)	-0.30*** (-4.81)		-0.31*** (-4.86)	-0.31*** (-4.86)	
IMPres			-0.32*** (-5.05)			-0.30*** (-4.81)			-0.31*** (-4.86)
EXPO	0.24*** (3.99)	0.24*** (3.99)	0.24*** (3.99)	0.20*** (3.41)	0.20*** (3.41)	0.20*** (3.41)	0.23*** (3.90)	0.23*** (3.90)	0.23*** (3.90)
GDPO	0.89*** (39.70)	0.89*** (39.70)	0.89*** (39.70)	0.89*** (39.58)	0.89*** (39.58)	0.89*** (39.58)	0.90*** (2.50)	0.90*** (2.50)	0.90*** (2.50)
L	0.00** (2.26)	0.00** (2.26)	0.00** (2.26)	0.00*** (2.71)	0.00*** (2.71)	0.00*** (2.71)	0.00*** (2.50)	0.00*** (2.50)	0.00*** (2.50)
INF	-25.24 (-0.86)	-25.24 (-0.86)	-25.24 (-0.86)	-33.45 (-1.17)	-33.45 (-1.17)	-33.45 (-1.17)	-22.87 (-0.78)	-22.87 (-0.78)	-22.87 (-0.78)
DEM	632.01 (0.44)	632.01 (0.44)	632.01 (0.44)	2080 (1.48)	2080 (1.48)	2080 (1.48)	819.4 (0.57)	819.4 (0.57)	819.4 (0.57)
CRISIS97/98	-7626.7*** (-3.74)	-7626.7*** (-3.74)	-7626.7*** (-3.74)	-8272.7*** (-4.15)	-8272.7*** (-4.15)	-8272.7** (-4.15)	-7721*** (-3.79)	-7721*** (-3.79)	-7721*** (-3.79)
CRISIS08/09	-4352** (-2.19)	-4352** (-2.19)	-4352** (-2.19)	-6075*** (-3.11)	-6075*** (-3.11)	-6075*** (-3.11)	-4747.5*** (-2.38)	-4747.5*** (-2.38)	-4747.5*** (-2.38)
C	25750*** (3.24)	25750*** (3.24)	25750*** (3.24)	21843*** (2.86)	45656*** (5.41)	7675.74 (0.75)	19300*** (2.44)	39080*** (4.374)	4408 (0.44)
R^2	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
No.of countries	9	9	9	9	9	9	9	9	9
Observations	216	216	216	216	216	216	216	216	216

Note: t ratios in parenthesis; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table 7. ASIAN COUNTRIES
Fixed Effect Estimation Results of Aggregated and Disaggregated ODA on GDP [Lagged effect]

	Model 6	Model 7	Model 8	Model 6	Model 7	Model 8	Model 6	Model 7	Model 8
AODA	-0.577 (-0.333)	-0.577 (-0.333)	-0.577 (-0.333)						
AODA(-1)	**-6.24*** (4.79)**	**-10.63*** (-6.25)**	**-4.80*** (-2.89)**						
$AODA^2$	-0.0001 (-0.58)	-0.0001 (-0.58)	-0.0001 (-0.58)						
MulODA				23.22*** (2.99)	23.22*** (2.99)	23.22*** (2.99)			
MulODA(-1)				**-36.22*** (-7.01)**	**-53.70*** (-8.64)**	**-26.28*** (-4.09)**			
$MulODA^2$				-0.011*** (-2.38)	-0.011*** (-2.38)	-0.011*** (-2.38)			
BiODA							-0.31 (-0.187)	-0.31 (-0.187)	-0.31 (-0.187)
BiODA(-1)							**-4.63*** (-3.79)**	**-8.40*** (-5.30)**	**-3.75*** (-2.40)**
$BiODA^2$							-0.0004 (-1.40)	-0.0004 (-1.40)	-0.0004 (-1.40)
INVres_LA	0.30*** (8.43)	0.30*** (8.43)	0.30*** (8.43)	0.31*** (9.36)	0.31*** (9.36)	0.31*** (9.36)	0.28*** (8.03)	0.28*** (8.03)	0.28*** (8.03)
GCON	0.57*** (4.19)			0.58*** (4.45)			0.53*** (3.95)	0.53*** (3.95)	0.53*** (3.95)
GCONres_LA		0.57*** (4.19)	0.57*** (4.19)		0.58*** (4.45)	0.58*** (4.45)			
IMPO	-0.32*** (-5.05)	-0.32*** (-5.05)		-0.30*** (-4.81)	-0.30*** (-4.81)		-0.31*** (-4.86)	-0.31*** (-4.86)	-0.31*** (-4.86)
IMPres_LA			-0.32*** (-5.05)			-0.30*** (-4.81)			
EXPO	0.24*** (3.99)	0.24*** (3.99)	0.24*** (3.99)	0.20*** (3.41)	0.20*** (3.41)	0.20*** (3.41)	0.23*** (3.90)	0.23*** (3.90)	0.23*** (3.90)
GDPO	0.89*** (39.70)	0.89*** (39.70)	0.89*** (39.70)	0.89*** (39.58)	0.89*** (39.58)	0.89*** (39.58)	0.90*** (2.50)	0.90*** (2.50)	0.90*** (2.50)
L	0.00** (2.26)_	0.00** (2.26)_	0.00** (2.26)_	0.00*** (2.71)	0.00*** (2.71)	0.00*** (2.71)	0.00*** (2.50)	0.00*** (2.50)	0.00*** (2.50)
INF	-25.24 (-0.86)	-25.24 (-0.86)	-25.24 (-0.86)	-33.45 (-1.17)	-33.45 (-1.17)	-33.45 (-1.17)	-22.87 (-0.78)	-22.87 (-0.78)	-22.87 (-0.78)
DEM	632.01 (0.44)	632.01 (0.44)	632.01 (0.44)	2080 (1.48)	2080 (1.48)	2080 (1.48)	819.4 (0.57)	819.4 (0.57)	819.4 (0.57)
CRISIS97/98	-7626.7*** (-3.74)	-7626.7*** (-3.74)	-7626.7*** (-3.74)	-8272.7*** (-4.15)	-8272.7*** (-4.15)	-8272.7*** (-4.15)	-7721*** (-3.79)	-7721*** (-3.79)	-7721*** (-3.79)
CRISIS08/09	-4352** (-2.19)	-4352** (-2.19)	-4352** (-2.19)	-6075*** (-3.11)	-6075*** (-3.11)	-6075*** (-3.11)	-4747.5*** (-2.38)	-4747.5*** (-2.38)	-4747.5*** (-2.38)
C	26825.70*** (3.33)	49790*** (5.34)	9675 (0.91)	22070*** (2.89)	45732.43*** (5.42)	6736 (0.65)	20061*** (2.52)	40119*** (4.45)	4053 (0.39)
R^2	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
No.of countries	9	9	9	9	9	9	9	9	9
Observations	216	216	216	216	216	216	216	216	216

Note: t ratios in parenthesis; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table 8. LATIN AMERICAN COUNTRIES
Fixed Effect Estimation Results of Aggregated and Disaggregated ODA on GDP [for with and without investment regressions]

	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
AODA	-1.55 (-0.09)	-17.35*** (-2.58)				
AODA(-1)	-2.17 (-0.30)	5.22* (1.83)				
$AODA^2$	-0.01 (-0.80)	0.006 (1.18)				
MulODA			88.08 (1.48)	-33.12 (-1.28)		
MulODA(-1)			-59.69** (-2.28)	15.19 (01.33)		
$MulODA^2$			-0.55*** (-3.20)	0.04 (0.63)		
BiODA					-14.04 (-0.81)	-16.23** (-2.33)
BiODA(-1)					-0.64 (-0.08)	4.84 (1.56)
$BiODA^2$					0.006 (0.38)	0.007 (1.02)
INV		1.15*** (33.57)		1.15*** (31.25)		1.15*** (33.60)
GCON	1.98*** (6.03)	1.44*** (10.78)	1.85*** (5.85)	1.40*** (10.28)	2.06*** (6.21)	1.45*** (10.82)
IMPO	0.12 (1.09)	-0.45*** (-9.15)	0.12 (1.11)	-0.45*** (-8.82)	0.11 (1.00)	-0.46*** (-9.25)
EXPO	0.23* (1.86)	0.56*** (10.79)	0.22* (1.82)	0.56*** (10.56)	0.23* (1.84)	0.57*** (10.80)
GDPO	0.59*** (8.51)	0.43*** (15.19)	0.61*** (9.47)	0.43*** (15.57)	0.55*** (8.05)	0.42*** (15.22)
L	-0.001 (-0.99)	6.55e-05 (0.11)	-0.001 (-0.85)	-2.32e-05 (-0.04)	-0.000 (-0.71)	7.48e-05 (0.13)
INF	30.30*** (3.06)	-11.03*** (-2.64)	30.15*** (3.24)	-14.19*** (-3.36)	31.44*** (3.13)	-11.48*** (-2.60)
DEM	-7639.7* (-1.67)	-4126** (-2.24)	-7809* (-1.89)	-5154*** (-2.93)	-8881** (-1.95)	-4233.55** (-2.60)
CRISIS97/98	2216.64 (0.50)	375 (0.21)	1846 (0.44)	935 (0.52)	2927 (0.66)	482 (0.27)
CRISIS08/09	-4702.74 (-1.10)	-6200.32*** (-3.62)	-5745 (-1.41)	-6343.6*** (-3.65)	-3878 (-0.91)	-6307*** (-3.67)
C	63643.49*** (3.08)	42788.44*** (5.13)	58794*** (2.94)	44169*** (5.16)	63095*** (3.03)	42192*** (5.03)
R^2	0.99	0.99	0.99	0.99	0.99	0.99
No.of countries	10	10	10	10	10	10
Observations	240	240	240	240	240	240

Note: t ratios in parenthesis; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table 9. LATIN AMERICAN COUNTRIES
Fixed Effect Estimation Results of Aggregated and Disaggregated ODA on GDP [Current effect]

	Model 3	Model 4	Model 5	Model 5	Model 3	Model 4	Model 5
AODA	35.18*** (5.18)	99.95*** (11.77)	78.57*** (9.11)				
AODA(-1)	5.22* (1.83)	5.22* (1.83)	5.22* (1.83)				
$AODA^2$	0.006 (1.18)	0.006 (1.18)	0.006 (1.18)				
MulODA				-76.30*** (-2.89)			
MulODA(-1)				15.19 (1.33)			
$MulODA^2$				0.04 (0.63)			
BiODA					40.79*** (5.69)	109.04*** (12.17)	87.44*** (9.61)
BiODA(-1)					4.84 (1.56)	4.84 (1.56)	4.84 (1.56)
$BiODA^2$					0.007 (1.02)	0.007 (1.02)	0.007 (1.02)
INV				1.15*** (31.25)			
INVres	1.15*** (33.57)	1.15*** (33.57)	1.15*** (33.57)		1.15*** (33.60)	1.15*** (33.60)	1.15*** (33.60)
GCON	1.44*** (10.78)			1.40*** (10.28)	1.45*** (10.82)	1.45*** (10.82)	1.45*** (10.82)
GCONres		1.44*** (10.78)	1.44*** (10.78)				
IMPO	-0.45*** (-9.15)	-0.45*** (-9.15)			-0.46*** (-9.25)	-0.46*** (-9.25)	-0.46*** (-9.25)
IMPres			-0.45*** (-9.15)	-0.45*** (-8.82)			
EXPO	0.56*** (10.79)	0.56*** (10.79)	0.56*** (10.79)	0.56*** (10.56)	0.57*** (10.80)	0.57*** (10.80)	0.57*** (10.80)
GDPO	0.43*** (15.19)	0.43*** (15.19)	0.43*** (15.19)	0.43*** (15.57)	0.42*** (15.22)	0.42*** (15.22)	0.42*** (15.22)
L	6.55e-05 (0.11)	6.55e-05 (0.11)	6.55e-05 (0.11)	-2.32e-05 (-0.04)	7.48e-05 (0.13)	7.48e-05 (0.13)	7.48e-05 (0.13)
INF	-11.03*** (-2.64)	-11.03*** (-2.64)	-11.03*** (-2.64)	-14.19*** (-3.36)	-11.48*** (-2.60)	-11.48*** (-2.60)	-11.48*** (-2.60)
DEM	-4126** (-2.24)	-4126** (-2.24)	-4126** (-2.24)	-5154*** (-2.93)	-4233.55** (-2.60)	-4233.55** (-2.60)	-4233.55** (-2.60)
CRISIS97/98	375 (0.21)	375 (0.21)	375 (0.21)	935 (0.52)	482 (0.27)	482 (0.27)	482 (0.27)
CRISIS08/09	-6200.32*** (-3.62)	-6200.32*** (-3.62)	-6200.32*** (-3.62)	-6343.6*** (-3.65)	-6307*** (-3.67)	-6307*** (-3.67)	-6307*** (-3.67)
C	42788.44*** (5.13)	159290*** (14.66)	137684.6*** (12.45)	44169*** (5.16)	42192*** (5.03)	164352*** (14.49)	140676*** (12.18)
R^2	0.99	0.99	0.99	0.99	0.99	0.99	0.99
No.of countries	10	10	10	10	10	10	10
Observations	240	240	240	240	240	240	240

Note: t ratios in parenthesis; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.
Bivariate supplementary regression of MulODA on INV and Gcon does not provide statistically significant coefficients. Therefore, the model 3and 4 is dropped in case of multilateral ODA.

Table 10. LATIN AMERICAN COUNTRIES
Fixed Effect Estimation Results of Aggregated and Disaggregated ODA on GDP [Lagged effect]

	Model 6	Model 7	Model 8	Model 6	Model 7	Model 8
AODA	-17.35*** (-2.58)	-17.35*** (-2.58)	-17.35*** (-2.58)			
AODA(-1)	38.17*** (12.41)	95.94*** (15.78)	80.75*** (13.09)			
$AODA^2$	0.006 (1.18)	0.006 (1.18)	0.006 (1.18)			
BiODA				-16.23*** (-2.33)	-16.23** (-2.33)	-16.23** (-2.33)
BiODA(-1)				43.178*** (12.84)	105.99*** (15.94)	89.16*** (13.27)
$BiODA^2$				0.007 (1.02)	0.007 (1.02)	0.007 (1.02)
INVres_LA	1.15*** (33.57)	1.15*** (33.57)	1.15*** (33.57)	1.15*** (33.60)	1.15*** (33.60)	1.15*** (33.60)
GCON	1.44*** (10.78)	1.44*** (10.78)	1.44*** (10.78)	1.45*** (10.82)		
GCONres_LA					1.45*** (10.82)	1.45*** (10.82)
IMPO	-0.45*** (-9.15)	-0.45*** (-9.15)	-0.45*** (-9.15)	-0.46*** (-9.25)	-0.46*** (-9.25)	
IMPres_LA						-0.46*** (-9.25)
EXPO	0.56*** (10.79)	0.56*** (10.79)	0.56*** (10.79)	0.57*** (10.80)	0.57*** (10.80)	0.57*** (10.80)
GDPO	0.43*** (15.19)	0.43*** (15.19)	0.43*** (15.19)	0.42*** (15.22)	0.42*** (15.22)	0.42*** (15.22)
L	6.55e-05 (0.11)	6.55e-05 (0.11)	6.55e-05 (0.11)	7.48e-05 (0.13)	7.48e-05 (0.13)	7.48e-05 (0.13)
INF	-11.03*** (-2.64)	-11.03*** (-2.64)	-11.03*** (-2.64)	-11.48*** (-2.60)	-11.48*** (-2.60)	-11.48*** (-2.60)
DEM	-4126** (-2.24)	-4126** (-2.24)	-4126** (-2.24)	-4233.55** (-2.60)	-4233.55** (-2.60)	-4233.55** (-2.60)
CRISIS97/98	375 (0.21)	375 (0.21)	375 (0.21)	482 (0.27)	482 (0.27)	482 (0.27)
CRISIS08/09	-6200.32*** (-3.62)	-6200.32*** (-3.62)	-6200.32*** (-3.62)	-6307*** (-3.67)	-6307*** (-3.67)	-6307*** (-3.67)
C	111764*** (13.25)	170186*** (15.33)	146007*** (12.89)	112119*** (13.22)	174373*** (15.34)	149041*** (12.85)
R^2	0.99	0.99	0.99	0.99	0.99	0.99
No.of countries	10	10	10	10	10	10
Observations	240	240	240	240	240	240

Note: t ratios in parenthesis; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.
Bivariate supplementary regression of lag MulODA are not provide statistically significant coefficients. Therefore, the model 3, 4 and 5 are dropped in case of multilateral ODA.

Table 11. AFRICAN COUNTRIES
Fixed Effect Estimation Results of Aggregated and Disaggregated ODA on GDP [All estimations]

	Model 1	Model 2	Model 5	Model 8
MulODA	-3.80*** (-2.80)	-3.75*** (-2.69)	**-2.24* (-1.65)**	-3.75*** (-2.69)
MulODA(-1)	-0.73 (-1.26)	-0.72 (-1.25)	-0.72 (-1.25)	**0.62 (0.97)**
$MulODA^2$	0.0009** (2.23)	0.0009** (2.16)	0.0009** (2.16)	0.0009** (2.16)
INV		0.004 (0.15)	0.004 (0.15)	0.004 (0.15)
GCON	-0.12 (-1.48)	-0.13 (-1.43)	-0.13 (-1.43)	-0.13 (-1.43)
IMPO	0.20*** (5.50)	0.19*** (4.80)		0.19*** (4.80)
IMPres			0.19*** (4.80)	
IMPres_LA				0.19*** (4.80)
EXPO	0.01 (0.52)	0.01 (0.53)	0.01 (0.53)	0.01 (0.53)
GDPO	0.92*** (44.17)	0.92*** (42.66)	0.92*** (42.66)	0.92*** (42.66)
L	0.000*** (4.99)	0.000*** (4.70)	0.000*** (4.70)	0.000*** (4.70)
INF	1.11 (0.09)	1.19 (0.10)	1.19 (0.10)	1.19 (0.10)
DEM	-105.93 (-0.24)	-109.94 (-0.25)	-109.94 (-0.25)	-109.94 (-0.25)
CRISIS97/98	-322 (-0.64)	-317.59 (-0.63)	-317.59 (-0.63)	-317.59 (-0.63)
CRISIS08/09	-958.69* (-1.87)	-967.56* (-1.87)	-967.56* (-1.87)	-967.56* (-1.87)
C	902.29 (0.85)	912.75 (0.85)	5227.18*** (3.47)	5380*** (3.52)
R^2	0.99	0.99	0.99	0.99
No.of countries	10	10	10	10
Observations	240	240	240	240

Note: t ratios in parenthesis; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively. The bivariate supplementary regression of current and lag MulODA provide statistically significant coefficients only on import. Therefore, the model 3, 4 and model 6, 7 are dropped.

enlighten our finding regarding aid ineffectiveness, which is mediated by investment in Asian countries. This result suggests that private investment must be considered a key determinant of economic growth, and development aid does not exploit its full growth potential. In conclusion, fiscal policy measures that respond to *AID* affect the crowding out of private investment and unfavorably treat the rate of return to capital and result in a lower *GDP*. Thus, the story describes a vicious cycle, which leads to the chronic phenomenon of a debt trap that offsets all the economic performance of poor aid recipients.

7. CONCLUSION

This paper focuses on the comparison of aid effectiveness in developing regions such as Asia, Africa and Latin America. Even if the AODA decreases or over the period of time in Asia and Latin America while it is constant in African countries, GDP indicates a growing trend in each group of countries. This image support for the gap model predictions that suggest AID would supplement savings and thereby increase investment and, in turn, growth. Eventually, this growth can become self-sustaining, and the need for aid will disappear. This paper tries to clarify the above confusion based on the statistical mediation analysis, and to that end, we examine the impact of aggregated and disaggregated aid on GDP, which is transmitted via mediating variables such as investment, government consumption and imports by employing a fixed effect estimation procedure. Our sample comprises 29 countries over the period of 1992 to 2016.

We found evidence that the ODA effectively transmit through the mediating variables into the GDP in Latin American countries in contrast to the Asian and African countries. African countries are experiencing a negative total effect of aid on GDP which only mediate via import. It is also only for multilateral aid. In Latin American countries, ODA, which mediate from government consumption (probably due to the socio-economic consumption), induce greater impact than aid which transmit from investment. When the amount of ODA mediates through the causal path of import, the impact of aid on GDP reduces by around 27

percent. In contrast, ODA, which mediate from government consumption, induce less negative impact than aid which transmit from investment in Asian countries. But the amount of ODA mediates through import, however, contribute to reduce the negativeness of aid on GDP by around 55 percent. By the way, bilateral aid is most favourable than multilateral aid in Asian and Latin American countries.

The negative effect of current and lagged AID mediated via investment implies that the rate of return on private capital is reduced or treated unfavourably by AID. As a result, the outcome (GDP) is decreased. In that sense, foreign aid causes a decline in domestic savings instead of supplementing such savings. This is the economic asymmetry which such countries are facing. In conclusion, the discussion based on the results rejects Gomanee et al.'s (2005) conclusion, which emphasizes that "aid can be effective even if policies are bad". However, though we use a different approach and our estimates are not directly comparable to those of Burnside-Dollar (2000), our findings are much more consistent with theirs, as they suggest that aid effectiveness is conditional on the policy environment.

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