AID AND GROWTH REVISITED: IMPACT OF FOREIGN AID ON GROWTH IN SUB-SAHARAN AFRICA

PAUL REIDY
Senior Sophister

This econometrics paper involves an exploration of the link between the foreign aid received by countries in Sub-Saharan Africa and the growth of real GDP per capita, a relationship characterised by the difficulty in establishing causality. Using an approach introduced by Bruckner (2013) Paul Reidy attempts to tackle the simultaneity problems present in such a study. His analysis finds that aid has a positive effect on growth and that this effect is of a similar magnitude the one identified in Bruckner's study.

Introduction

The impact of foreign aid on growth in developing countries has hugely important policy implications. Firstly, if economic growth leads to improved living conditions for the poor (as argued by Dollar and Kraay, 2002) then it is important to know if foreign aid can promote this. Secondly, over $4.6 trillion has been spent on foreign aid by developed countries over the past 50 years (Easterly and Williamson, 2011). This aid has been largely financed by taxpayer money from Western governments and it is important to know if it has been effective.

This paper revisits the question of whether foreign aid has a significant and positive causal effect on real GDP per capita growth. Using the empirical approach employed by Bruckner (2013) to establish causality, it is shown that foreign aid only has a positive impact on economic growth in Sub-Saharan Africa once the simultaneity of aid and growth has been accounted for. This result contrasts with the recent trend in some of the literature to find insignificant or negative effects of foreign aid on growth. We also examine East and West African countries separately and find evidence that foreign aid has different effects in these regions but that the empirical approach is likely be invalid.

Literature Review and Motivation

While we may generally expect that foreign aid should have a positive impact on economic

growth, the aid-effectiveness literature finds ambiguous results. The first generation of this literature generally found a positive relationship between foreign aid and growth. Levy (1988) finds that aid is positively correlated with growth and investment in Sub-Saharan Africa. Sachs *et al.* (2004) argue that in many poor countries incomes are too low to generate the savings needed for investment and sustained growth and therefore foreign aid helps countries escape this poverty trap.

The second generation, by contrast, argues that foreign aid does not have a positive effect on growth and may in fact undermine it. Easterly (2006) argues that foreign aid is often wasted with resources frequently ending up on the black market or being used for unintended and unproductive purposes. Bulir and Hamann (2003) show that aid is significantly more volatile than domestic fiscal revenues which undermines its effectiveness, particularly in countries which are heavily dependent on foreign aid.

In the third generation of the literature, researchers emphasise that the effectiveness of foreign aid on economic growth is context-specific and depends on the presence of a range of other factors. Burnside and Dollar (2000) find that foreign aid positively impacts economic growth in developing countries that have good fiscal, monetary and foreign trade policies. In countries where policies are poor, however, the authors fail to find a significantly positive effect of foreign aid on economic growth. Dalgaard, Hansen and Tarp (2004) find that the size and sign of the impact of foreign aid on long-run productivity can depend on policies, structural characteristics, and the size of the aid flow.

Given the extent of aid-effectiveness literature available it is important to emphasise the unique contribution of this paper. Firstly, while the aid-effectiveness literature generally recognises the serious endogeneity concerns in the aid and growth relationship, Deaton (2010) notes that attempts to deal with this problem so far have largely been unsatisfactory with many of the instruments failing to satisfy the exclusion restriction. Therefore, this paper will use the strategy employed by Bruckner (2013) to estimate the causal effect of foreign aid on growth and argue that this is a valid approach. Secondly, much of the aid effectiveness literature examines a very diverse group of countries. However, Dalgaard *et al.* (2004) argue that geographic location is an important factor in determining aid-effectiveness and Roodman (2007) notes that it has frequently been shown that aid seems to be much less effective in tropical regions. Askarov and Doucouliagos (2015) also suggest that aid works through different channels in different regions. Thus, this paper also builds on Bruckner's (2013) work by confining the study to Sub-Saharan countries as well as smaller subsets of this region, namely East and West African countries. This region was chosen because many Sub-Saharan African countries are among the poorest in the world and it is therefore important to assess the effectiveness of foreign aid here.

Empirical Approach

Endogeneity is a serious concern in examining the relationship between foreign aid and growth. This endogeneity mainly comes in the form of simultaneity bias. In particular, we would generally expect that foreign aid will have a positive effect on economic growth. However, economic growth may also have a negative effect on the amounts of foreign aid received by a country because as countries grow their reliance on foreign aid should fall and/or donor countries may be more likely to reduce aid.

If this simultaneity is present the zero conditional mean assumption is violated and the OLS estimates of the effect of foreign aid on growth will be biased and inconsistent. This may explain why some studies have failed to find that foreign aid has a positive effect on economic growth. Deaton (2010), for example, highlights that studies which use OLS and fail to account for the reverse causality typically find a negative effect of foreign aid on growth.

With the above issues in mind, this paper will follow the empirical strategy used by Bruckner (2013). This involves using a two-part process with 2SLS fixed effects models to address the endogeneity issue and to enable a causal effect of foreign aid on economic growth to be estimated. The two investigations that make up the empirical approach are outlined below.

Investigation 1: The Impact of Growth on Foreign Aid

In this first investigation we will estimate the effect of economic growth on foreign aid. This estimate will help us examine whether simultaneity may be a problem in the aid and growth relationship and will also be used in the second investigation below. The basic regression model in this investigation comes from the original paper and is given by equation (1):

$$\Delta \log(aid_{i,t}) = \beta_1 \Delta \log(y_{i,t}) + \beta_2 war + \beta_3 \Delta pol\, a_i + b_t + e_{i,t} \quad (1)$$

In this equation Δlog (aidi,t) is the log-change of aid per capita. The log-change in foreign aid per capita is used instead of the level because the Im-Pesaran-Shin (2003) test for panel data failed to reject the null hypothesis that the level of foreign aid has a unit root but rejects this null for the first difference of foreign aid. Δlog (yi,t) is the log-change in real GDP per capita. The equation also controls for civil war and changes in the political institutions of the country because these are likely to impact aid inflows. ai represent country fixed effects which help to address the problem of unobservable heterogeneity and control for any long-run (time-invariant) differences across countries which may be driving aid flows such as colonial ties. If we fail to account for this unobserved heterogeneity then

we will get biased estimates. We use fixed effects rather than random effects because we cannot argue that the specific effects will be uncorrelated with the other independent variables in cross-country data. bt are year fixed effects that allow us to control for the effects of the business cycle and other global shocks (Bruckner, 2013).

As highlighted above, the simultaneity problem will cause the OLS estimates of this regression to be biased. In order to overcome this two-stage least squares (2SLS) will be used with log-changes in rainfall, rainfall squared and international commodity prices as Instrumental Variables (IVs) for the log-change in real GDP per capita. The validity of these instruments will be considered later.

Investigation 2: The Causal Impact of Foreign Aid on Growth

In the second investigation we will estimate the effect of foreign aid on growth after accounting for the reverse causality examined in Investigation 1. Consider equation (2) from the original paper below:

$$\Delta \log(y_{i,t}) = \propto_1 \Delta \log(aid_{i,t}) + \propto_2 war + \propto_3 \Delta pol + \alpha_4 \Delta \log(cprce) + \alpha_5 \Delta \log(rain) + \propto_6 [\Delta \log(rain)]^2 + h_i + i_t + u_{i,t} \quad (2)$$

In this equation we are investigating the effect of foreign aid on economic growth. As in equation (1) we control for civil war and changes in political institutions as these are likely to affect real GDP per capita growth. We also control for the instruments used in the first investigation as we have already argued that these have an impact on real GDP per capita growth. hi and it are country and year fixed-effects respectively.

If economic growth has a significant effect on foreign aid, then the OLS estimate of regressing economic growth on foreign aid will be biased. More concretely, if $\beta 1 \neq 0$ in equation (1) then, Cov[Δlog (aidi,t) , ui,t] $\neq 0$ and the OLS estimate of $\propto 1$ will be biased. As Bruckner (2013) notes, the OLS estimate of $\propto 1$ will be upward biased if $\beta 1 > 0$ and downward biased if $\beta 1 < 0$.

Therefore in this stage we will use 2SLS for a second time to overcome this problem, which involves two steps. Firstly, we extract the causal response of foreign aid to economic growth that was estimated in Investigation 1 to get the residual variation in foreign aid that is not caused by growth in real GDP per capita (Bruckner, 2013). This is shown in equation (3):

$$\Delta \log(aid_{i,t})^* = \Delta \log(aid_{i,t}) - \beta_1 \Delta \log(y_{i,t}) \quad (3)$$

Secondly, as in the original paper, we use this 'endogeneity-adjusted aid series' as an instrument for Δlog (aidi,t) to obtain the 2SLS fixed effects estimate of the effect of foreign aid on economic growth. The validity of this instrument will be considered in Section 5. This method overcomes the simultaneity bias and gives a consistent estimate of $\propto 1$, assuming that the error ei,t from equation (1) is uncorrelated with ui,t from equation 2 (Bruckner, 2013).

Dataset

The dataset was sourced from the online data appendix of the Bruckner (2013) paper. It is an unbalanced panel dataset with 1,713 observations from 47 Less Developed Countries (LDCs) for the period 1951-2000. To examine the impact of foreign aid on growth in Sub-Saharan Africa it was necessary to edit the data and exclude observations from outside that region, resulting in the number of observations falling to 1,321. Table 1 lists the variables that will be used in the regression estimates in Stata. Figure 1 shows real GDP per capita growth and net foreign aid flows as a percentage of GNI in Sub-Saharan Africa from 1970-2000.

Variable Name	Key
Country	Country Name
Year	Year of Observation
lgdp	Log of real GDP per capita
lcru_l	Log of rainfall
lcru_l_sq	Log of rainfall squared
loda	Log of net official development aid
polity2	Polity IV Score of Democratic Institutions
war	Civil War Indicator 1 if there is a domestic Civil, 0 otherwise
index_g_l	Log of the Commodity Price Index
Outlier	Outlier indicator 1 if outlier identified by Hadi procedure, 0 otherwise

Table 1: List of Variables

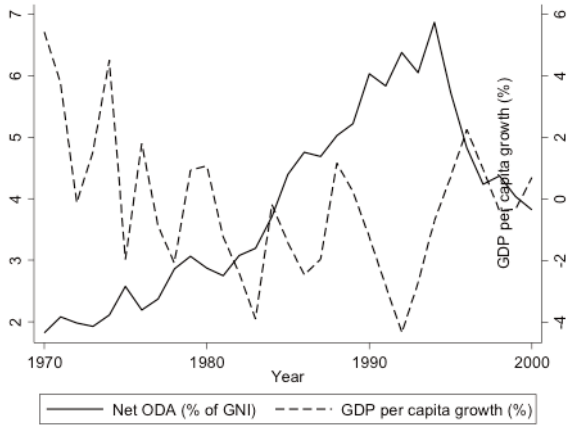

Figure 1: Real GDP Per Capita Growth

	GDP Per Capita Growth		Net ODA per year ($US Millions)	
Country	Mean	Std. Dev	Mean	Std. Dev
Benin	0.81	4.76	110	102
Burkina Faso	0.44	4.42	189	160
Burundi	0.13	7.89	101	94.3
Cameroon	0.62	5.52	227	204
Cape Verde	3.22	6.43	69.7	43.7
Chad	-0.76	7.77	144	96.2
Comoros	0.02	6.65	30.5	16.6
Congo, Republic of	0.75	11.63	86.8	92
Djibouti	-0.45	12.71	93	33.8
Equatorial Guinea	4.79	19.24	24.9	20.8
Eritrea	0.76	8.46	143	34.3
Ethiopia	1.40	6.82	390	388
Gambia, The	0.57	6.90	38.1	35.5
Guinea	-0.13	4.73	139	150
Guinea-Bissau	1.15	12.73	66.9	50.4
Lesotho	2.81	7.95	60.7	48.2
Liberia	-4.78	21.28	77.5	45
Madagascar	-1.07	3.22	195	177
Malawi	1.50	5.24	198	192
Mali	0.71	6.64	219	179
Mauritania	0.58	4.85	179	79.7
Mozambique	0.69	6.05	412	466
Niger	-0.92	6.63	173	132
Rwanda	-0.01	13.80	175	177
Sao Tome and Principe	0.95	9.13	26.5	22
Senegal	-0.34	4.65	302	252
Sierra Leone	-2.21	5.68	84.4	67.3
Somalia	-2.34	8.99	281	218
Sudan	0.21	4.45	471	329
Tanzania	1.24	8.13	513	418
Togo	-0.05	5.90	85	71
Uganda	0.32	5.79	258	298
Zambia	0.29	8.50	327	397
Zimbabwe	1.14	8.24	175	196

Table 2: Summary Statistics

Results

Effect of Growth on Foreign Aid

Table 3 shows the estimates of the effect of growth on foreign aid. We used the modified Wald test and the Wooldridge (2002) test to check for the presence of heteroskedasticity and autocorrelation respectively. In both cases we strongly rejected the null hypothesis of no heteroskedasticity and autocorrelation, suggesting that these two issues are present. We therefore use Huber robust standard errors clustered at the country level that are robust to heteroskedasticity and arbitrary (intragroup) correlation. The OLS estimate of the coefficient on growth is -0.16 and is not statistically significant. However, as highlighted above, we cannot interpret this as the causal effect of growth on foreign aid. If we assume that foreign aid has a positive effect on per capita growth, the OLS estimate will be biased upwards. The 2SLS estimate of the effect of growth on foreign aid implies that a 1 percentage increase in real GDP growth reduces foreign aid by -3.83 per cent and is statistically significant at the 5 per cent level. The absolute size of the effect is much larger than the OLS estimate and highlights the extent of the endogeneity bias. The results for the control variables are also shown in Table 3 but these are not our primary interest in this study.

		OLS				2SLS		
Variable Name	Coefficient	t-stat	SE	p-value	Coefficient	t-stat	SE	p-value
$\Delta\log(y_{i,t})$	-0.16	-1.05	0.16	0.30	-3.83	-2.20	1.74	0.028
War	-0.00	-0.16	0.03	0.88	-0.14	-1.71	0.08	0.087
Δpol	0.00	0.77	0.01	0.45	0.02	1.71	0.01	0.086
No. of Observations	1,047				1,047			

Table 3: Estimates of the Effect of Growth on Foreign Aid (Sub-Saharan Africa)

Effect of Foreign Aid on Growth

With the possible endogeneity issue in mind, Table 4 presents the estimates of the effect of foreign aid on growth. We tested for heteroskedasticity and autocorrelation using the same tests as in the previous section and again found that both issues are likely to be present. Therefore, we use Huber robust standard errors in this investigation too. The OLS estimate of the coefficient on foreign aid is -0.01 and is not statistically significant. However, this OLS estimate is very likely to underestimate the true effect of foreign aid on economic growth because of the downward bias resulting from the fact that economic growth seems to have a negative effect on foreign aid (as highlighted in the previous section). By contrast, the 2SLS estimate implies that a 1 percentage point increase in foreign

aid is associated with an approximately 0.21 percentage increase in real GDP per capita, all else equal, and this estimate is significant at the 1 per cent level.

	OLS				2SLS			
Variable Name	Coefficient	t-stat	SE	p-value	Coefficient	t-stat	SE	p-value
Δlog(aid)	-0.01	-1.05	0.01	0.30	0.21	5.33	0.04	0.00
war	-0.04	-2.23	0.02	0.03	-0.04	-1.93	0.02	0.05
Δpol	0.00	1.89	0.00	0.07	0.00	1.03	0.00	0.30
Δlog(cprce)	0.33	2.29	0.15	0.02	0.68	4.11	0.16	0.00
Δlog(rain)	0.22	2.41	0.09	0.02	0.33	3.15	0.11	0.00
$[\Delta\log(rain)]^2$	-0.02	-2.22	0.01	0.03	-0.02	-2.77	0.01	0.00
R^2	0.09				-0.80			
No. of Observations	1,047				1,047			
F-Statistic	-				6.29			

Table 4: Estimates of the Effect of Foreign Aid on Growth (Sub-Saharan Africa)

Validity of the Instrumental Variables

While Instrumental Variables (IVs) have been used extensively in the aid effectiveness literature, they should always be treated with caution. Two assumptions are particularly important. Firstly, the IVs must be relevant, meaning that $Cov(z, x) \neq 0$ where z is the instrument and x is the endogenous variable. If this is not the case, the estimation strategy will fail to produce consistent estimators. This assumption also affects the variance of the IV estimates as noted in Table 3. Secondly, the chosen IVs must be exogenous. This means that the instrument, z, must not be correlated with the error term, u, in the regression equation of interest - that is, $Cov(z, u) = 0$. If an instrument fails to satisfy this requirement it will not give consistent estimates of the parameter of interest. It is often difficult to test this assumption and so we may have to rely on intuitive reasoning.

Investigation 1 Instrumental Variables: Relevance and Exogeneity

The IVs used in this investigation are the log-changes in the index of international commodity prices, rainfall and rainfall squared. Deaton (1999) and Miguel *et al*. (2004) show that rainfall and commodity price shocks can significantly impact GDP growth in sub-Saharan Africa. This is because these countries tend to rely on agriculture and on commodity exports (Bruckner, 2013). We can test if this is true by running a regression of real GDP per capita on the exogenous variables. The results of this regression are shown in Table 5. We can clearly see that the three instruments are significant at the 5 per cent level. We

can also note from the negative sign on the quadratic term that after some level rainfall is negatively associated with real per capita growth. This may be because excessive rainfall disrupts agricultural productivity and hence lowers GDP growth (Bruckner, 2013).

Variable Name	Coefficient	t-stat	SE	p-value
Δlog(cprice)	0.34	2.41	0.14	0.02
Δlog(rain)	0.22	2.39	0.09	0.02
$[\Delta\log(\text{rain})]^2$	-0.02	-2.22	0.01	0.03
war	-0.04	-2.23	0.02	0.03
Δpol	0.00	1.73	0.00	0.10
R^2	0.08			
No. of Observations	1,047			
F-Statistic	-			

Table 5: Testing the Validity of Investigation 1 IVs

In order to satisfy the exclusion restriction, the instruments should not be correlated with the error term e(i,t). This means that the IVs should not have an independent affect on foreign aid other than through their effect on GDP per capita growth (Bruckner, 2013). Because we have more instruments than endogenous variables in this case, we can use over-identification tests. The Hansen J-test gives a p-value of 0.33 and hence the test fails to reject the hypothesis that the instruments are uncorrelated with the error term. Intuitively, it also seems unlikely that the instruments here will have an independent effect on foreign aid (which is the dependent variable in this investigation).

Investigation 2 Instrumental Variable: Relevance and Exogeneity

The IV used in this investigation was the endogeneity-adjusted aid series given by Δlog (aidi,t) - β1Δlog (yi,t). We must check that Cov(z, x) ≠ 0 where z represents the chosen IV and x is Δlog (aidi,t). This should be trivially true by definition because our IV is just our aid series adjusted for the reverse causality between foreign aid and growth. We can check this by running a regression of the aid series on the exogenous variables. The results of this regression are shown in Table 6 and we can see that the instrument is highly statistically significant.

In order to be exogenous, the instrument should not be correlated with the error term ui,t. Because we only have one instrument in this case we cannot use the over-identification tests that we used in the previous part. In the unusual case of Investigation 2 in

this paper, it turns out that the exclusion restriction is equivalent to saying that the error term from equation 1 is uncorrelated with the error term from 2. Thus, in order to satisfy the exclusion restriction we have to try to convince ourselves that there are no omitted variables that should be in both equation 1 and equation 2. Although it is difficult to be certain, we hope that the control variables and the fixed effects specifications that we have used in both equations 1 and equation 2 will help to minimise this risk.

Variable Name	Coefficient	t-stat	SE	p-value
$\Delta\log(aid_{i,t})$*	0.56	11.55	0.05	0.0
Δpol	0.00	1.05	0.00	0.30
War	0.00	0.05	0.04	0.96
$\Delta\log(cprice)$	-1.44	-4.35	0.33	0.00
$\Delta\log(rain)$	-0.71	-3.16	0.22	0.00
$[\Delta\log(rain)]^2$	0.05	2.73	0.02	0.01
No. of Observations	1,047			
F-Statistic	-			

Table 6: Testing the Validity of Investigation 2 IVs

Outliers and Sample Size

Easterly *et al.* (2004) argue that outliers often drive the results in regressions which examine the relationship between policies and economic growth. Bruckner (2013) uses the Hadi (1992) procedure to identify and exclude outliers. We follow this method and our results in Table 7 below are very similar to the estimates from Table 4. In particular, the OLS is still insignificant, while the 2SLS estimate remains positive and significant.

	OLS				2SLS			
Variable Name	Coefficient	t-stat	SE	p-value	Coefficient	t-stat	SE	p-value
$\Delta\log(aid)$	0.00	0.06	0.01	0.96	0.18	6.36	0.03	0.00
war	-0.03	-3.54	0.01	0.00	-0.03	-3.29	0.00	0.00
Δpol	0.00	1.78	0.00	0.09	0.00	0.90	0.01	0.37
$\Delta\log(cprce)$	0.27	3.13	0.09	0.00	0.41	3.73	0.11	0.00
$\Delta\log(rain)$	0.19	2.24	0.08	0.03	0.30	2.95	0.10	0.00
$[\Delta\log(rain)]^2$	-0.01	-2.07	0.01	0.05	-0.02	-2.60	0.01	0.00
R^2	0.05				-0.69			
No. of Observations	1,026				1,026			
F-Statistic	-				7.34			

Table 7: Estimates of the Effect of Foreign Aid on Growth Excluding Outliers (SSA)

East and West Africa

Table 8 below shows the estimates of the effect of foreign aid on growth in East and West Africa. The results suggest that foreign aid has a positive impact on growth in West Africa while it has a negative impact in East Africa. This may lend support to the idea that foreign aid can work through different channels. However, we cannot reliably interpret the results presented in this table because it was found that the instruments were not significant predictors of $\Delta\log(y_{i,t})$ in Investigation 1, meaning that it is likely that we suffer from the problem of weak instruments in this case. Imbens and Wooldridge (2007) show that statistical inference can be very misleading in the case of weak instruments.

	West Africa				East Africa			
Variable Name	Coefficient	t-stat	SE	p-value	Coefficient	t-stat	SE	p-value
$\Delta\log(aid)$	0.28	2.54	0.11	0.01	-0.14	-3.17	0.04	0.00
war	-0.08	-1.35	0.07	0.18	-0.02	-2.44	0.01	0.02
Δpol	0.00	0.47	0.00	0.64	0.01	-2.42	0.00	0.02
$\Delta\log(cprce)$	0.61	1.23	0.50	0.22	-1.35	-1.27	1.06	0.20
$\Delta\log(rain)$	0.38	1.73	0.22	0.08	0.50	3.34	0.15	0.00
$[\Delta\log(rain)]^2$	-0.03	-1.73	0.02	0.08	-0.04	-3.56	0.01	0.00
R^2	-1.16				-0.24			
No. of Observations	424				445			

Table 8: Estimates of the Effect of Foreign Aid on Growth

Possible Extensions

Alternative Econometric Methods

The majority of the studies which examine the relationship between foreign aid and economic growth use either OLS or 2SLS. The Arellano-Bond (1991) or Blundell-Blond (1998) GMM models are suitable alternatives which account for the endogeneity problem and also conveniently incorporate fixed effects. Under these models the lagged values of the endogenous variables are used as instruments (Rajan and Subramanian, 2005). It would be interesting to see if the results of this study could be replicated using these or other econometric methods.

Lagged Effect and Diminishing Returns

This study has focused on the contemporaneous or immediate effect of foreign aid on economic growth. It would be very useful to see if the results differ if we allow for the

fact that lagged aid values are likely to have an effect on economic growth. This would allow us to assess the medium and long-term impact of foreign aid on growth. Additionally, it would be useful to investigate whether there are diminishing returns to aid by including a squared aid term as in Rajan and Subramanian (2005).

Channels

While some useful policy insights can be drawn from looking at relationships between foreign aid and growth on a cross-country basis, examining the channels at work at a country or region specific level may be more fruitful for future research assessing aid effectiveness. Bourguignon and Sundberg (2007) advocate opening the `black box' and investigating the chain of causality from donors to policymakers and from policymakers to policies and outcomes more closely.

Conclusion

The effectiveness of foreign aid in developing countries continues to provoke heated debate amongst NGOs, Western governments and development academics. This paper contributes to the extensive aid effectiveness literature by employing the empirical approach proposed by Bruckner (2013) to estimate the causal effect of foreign aid on economic growth in Sub-Saharan African countries. Our estimates indicate that a 1 per cent increase in foreign aid will lead to a 0.2 per cent increase in real GDP per capita once the simultaneity problem has been addressed, which is broadly similar to the results from the original paper. The OLS estimates, on the other hand, were statistically insignificant.

However, the validity of these results rests on the assumption that the empirical approach used by Bruckner (2013) is appropriate. While we have conducted some robustness tests in this paper, space constraints prevented a more complete examination of the method and results. The use of instrumental variables in development literature remains controversial and so our results should be interpreted with caution. Nonetheless they provide an interesting new platform which should be useful for future research on aid effectiveness.

References

Arellano, M., and Bond, S. 1991. 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations'. Review of Economic Studies, 58:2:277-97.

Askarov, Z. and Doucouliagos, H. 2015. 'Development Aid and Growth in Transition Countries'. World Development, 66:383-399.

Baum, C.F. 2001. 'Residual diagnostics for cross-section time series regression models'. The Stata Journal, 1:1:101-104.

Blundell, B. and Bond, S. 1998. 'Initial conditions and moment restrictions in dynamic panel data models'. Journal of Econometrics, 87:1:115-143.

Bourguignon, F. and Sundberg, M. 2007. 'Aid Effectiveness: Opening the Black Box'. American Economic Review, 97:2:316-321.

Bruckner, M. 2013. 'On the Simultaneity Problem in the Aid and Growth Debate'. Journal of Applied Econometrics, 28:126-150.

Bulir, A., and Hamann, A.J. 2003. 'Aid Volatility: An Empirical Assessment'. IMF Staff Papers, 50:1:64-89.

Burnside, C. and Dollar, D. 2000. 'Aid, Policies, and Growth'. The American Economic Review, 90:4:847-868.

Dalgaard, C.J., Hansen, H. and Tarp, F. 2004. 'On The Empirics of Foreign Aid and Growth'. The Economic Journal, 114:191-216.

Deaton, A. 1999. 'Commodity prices and growth in Africa'. Journal of Economic Perspectives, 13:23-40.

Deaton, A. 2010. 'Instruments, Randomization, and Learning about Development'. Journal of Economic Literature, 48:2:424-55.

Dollar, D. and Kraay, A. 2002. 'Growth is good for the poor'. Journal of Economic Growth, 7:195-225.

Drukker, D.M. 2003. "Testing for serial correlation in linear panel data models."The Stata Journal, 3:2:168-77.

Easterly, W., Levine, R., and Roodman, D. 2004. 'Aid, policies, and growth: a comment'. American Economic Review, 94:774-78.

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 Press.

Easterly, W. and Williamson, C. R. 2011. 'Rhetoric versus reality: the best and worst of aid agency practices'. World Development, 39:11:1930-49.

Hadi, A. 1992. 'Identifying multiple outliers in multivariate data'. Journal of the Royal Statistical Society, 54:761-71.

Im, K.S., Pesaran, M.H., and Shin, Y. 2003. 'Testing for Unit Roots in Heterogeneous Panels'. Journal of Econometrics, 115:53-74.

Imbens, G. and Wooldridge, J. 2007. What's New in Econometrics? NBER Lecture Notes Summer 2007.

Levy, V. 1988. 'Aid and growth in Sub-Saharan Africa: the recent experience'. European Economic Review, 32:9:1777-95.

Miguel E., Satyanath S., and Sergenti E. 2004. 'Economic shocks and civil conflict: an instrumental variables approach'. Journal of Political Economy, 112:41:725-53.

Rajan, R.G. and Subramanian, A. 2005. 'Aid and Growth: What Does the Cross-Country Evidence Really Show'? IMF Working Paper.

Roodman, D. 2007. 'The Anarchy of Numbers: Aid, Development, and Cross-country Empirics'. World Bank Economic Review, 21:2:255-77.

Sachs, J., McArthur, J.W., Schmidt-Traub, G., Kruk, M., Bahadur, C., Faye, M., McCord, G. 2004. 'Ending Africa's poverty trap'. Brookings Papers on Economic Activity, 1.

Wooldridge, J. M. 2002. Econometric Analysis of Cross Section and Panel Data. Cambridge, MA: MIT Press.

Wooldridge, J.M. 2014. Introduction to Econometrics. United Kingdom: Cengage Learning.