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Development Aid and Growth: An association converging to zero

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Development Aid and Growth: An association converging to zero

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ABSTRACT:

This note deals with a paradox: A literature growing exponentially in spite of the fact that it keeps finding the same result. We draw upon the findings of 106 empirical studies, of which 32 appeared in the last 4 years, to examine whether development aid generates economic growth. The studies report aid effects that have been steadily falling over time. The newer studies find a steady continuation of the downward trend. Using meta-regression analysis, we show that total aid has never had an effect on economic growth. Theoretically, this result might be due to simultaneity bias, but the evidence does not support this notion. There is some evidence that some aid components do have a positive effect on growth.

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I. Introduction

The effectiveness of development aid is a controversial subject that has been researched thoroughly. Most of this literature has the stated aim to explore the effect of development aid on economic growth. This effect is explored in 106 empirical studies, which report a wide range of results.¹ The number of studies keeps growing, with no less than 32 new studies appearing in the past four years, involving 65 researchers, 50 of them new to this literature. Each year sees new data, more estimates and even more researchers join the research effort. This effort matches growth in the underlying real phenomenon: Over a hundred billion dollars are distributed annually as development assistance.

The *standard causality assumption* in this literature is that causality from aid to growth dominates these data, so that development aid does what it claims. We accept this assumption until section III, where we consider reverse causality and whether OLS estimates in this literature suffer from simultaneity bias.

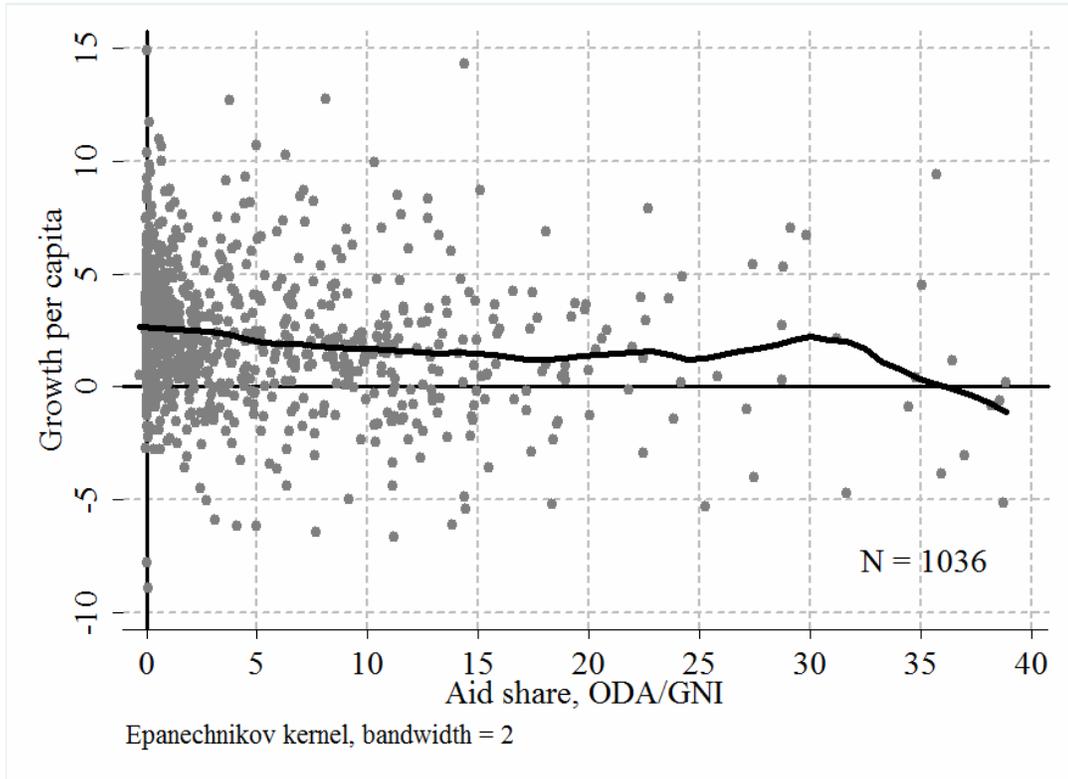
Figure 1 displays the data used by the 106 studies. Given the distribution of the data, it is not surprising that empirical studies have failed to produce a strong and robust aid effectiveness effect. However, several authors claim that the newer studies suggest aid effectiveness, so that aid works. See, for example, Clemens, Radelet and Bhavnani (2004) and the survey by McGillivray, Feeny, Hermes, Lensink (2006). Other new studies (e.g. Rajan and Subramanian 2008) find no support for aid effectiveness.

Doucouliafos and Paldam (2008) report a meta-regression analysis (MRA) of 68 studies (from 1968 until 2004) that contain a total of 541 estimates of aid effectiveness. Their study shows aid ineffectiveness, with a clear downward trend in the results. Since their study, the number of reported estimates has more than doubled from 541 to 1,217, in just 4 years. The aim of this note is to apply MRA to the new evidence. We demonstrate that the *ineffectiveness* result is even stronger after the last 4 years of intense scrutiny.

All along the result of this research effort would have been perfectly clear, if the literature had been *quantitatively summarized* by the appropriate tools: Total aid was and is ineffective in generating economic growth. A second aim of this paper is to apply MRA to a different strand of the literature: the effects of individual components of aid, such as technical assistance, project aid, and program aid.

1. The list of the 106 empirical studies and the data used in this paper are available from the authors. Our literature search was completed at the end of 2008. We are aware of new studies, e.g. Nowak-Lehman *et al.* (2009), which adopt a range of techniques, with similar results to the previous literature.

Figure 1: Development Aid and Economic Growth, 1960-2005



Notes: The figure shows 1,036 of the 1,052 observations available between 1960 and 2005 divided in intervals of 5 years (1960-65, 1965-70, ..., 2000-2005). 16 extreme observations have been removed: They do not change anything of substance. The real growth rate per capita is from the Maddison data and the share of aid (ODA) is in percent of the GNI. The solid line is a kernel regression showing the best “moving average” with a fixed bandwidth.

II. Estimation and results

Empirical studies estimate some a variant of a generic growth model:

$$g_{it} = \alpha + \mu h_{it} + \gamma_1 x'_{1it} + \varepsilon_{it} \quad (1)$$

where the variables g and h denote the real growth rate and the aid share, respectively, i and t index country and time, x is a vector of controls, and ε are the residuals. Aid effectiveness is given by $\partial g / \partial h = \mu > 0$.

The key measure of interest is the coefficient μ . Following standard practice in meta-analysis, we collect estimates of μ that are conceptually comparable within and between the 106 studies. These are converted into partial correlations, r , in order to reach a common unit of measurement of the strength of the association between aid and growth.²

2. The use of partial correlations in meta-analysis is common, see Djankov and Murrell (2002). There is insufficient information in many studies from which to calculate elasticities.

A standard tool for drawing statistical inferences from the results of empirical studies is MRA.³ This is a secondary data analysis, applying regression analysis to the results of primary data regression analysis. A frequent problem in any regression analysis is sample selection, which can distort inference. Our dataset consists of all comparable estimates of the effect of aid on growth reported in 106 empirical papers. However, it is possible that there are missing observations, especially if estimates are chosen on the basis of statistical significance (De Long and Lang 1992).

Equation (2) combines comparable estimates of the effect of aid on growth⁴ while controlling for the effects of sample selection:

$$r_{ij} = \beta_0 + \beta_1 SE_{ij} + u_{ij} \quad (2)$$

where r_{ij} is the i^{th} partial correlation of aid and growth from the j^{th} study, SE is the standard error of each estimate, and u denotes errors. If there is no publication selection in a literature, there should be no association between SE and r and, hence, $\beta_1 = 0$. Finding $\beta_1 > 0$ suggests that estimates are selected for their statistical significance.⁵ Equation 2 may have heteroscedasticity. Hence, Stanley (2008) recommends estimating the weighted least squares (WLS) version, which is derived from dividing equation (2) by SE . Accordingly, we estimate the following equation:

$$t_{ij} = \beta_1 + \beta_0/SE_{ij} + v_{ij} \quad (3)$$

where $t_{ij} = r_{ij}/SE_{ij}$, $v_{ij} = u_{ij}/SE_{ij}$. The coefficient β_0 still measures the size of the partial correlation of aid and growth, corrected for sample (publication) selection (see Stanley 2008). The data support aid effectiveness if $\beta_0 > 0$. The constant (β_1) measures the extent of publication selection. As studies typically report more than one estimate, clustered data analysis is used to correct the OLS standard errors.

Our key results are presented in table 1. Columns 1 and 2 present the MRA using unadjusted and clustered standard errors, respectively. The accumulated evidence suggests a very small partial correlation of aid on growth ($\beta_0 = +0.02$) which is insignificant once data

3. The tools are surveyed in Hunter and Schmidt (2004). Applications in economics include Görg and Strobl (2001), Roberts and Stanley (2005), Mookerjee (2006), and Disdier and Head (2008).

4. To test the validity of combining the studies, the precision of each estimate was regressed on the Social Science Citation Index Impact Factor of the journal in which the estimate is reported. We find no difference in the precision of estimates on the basis of this index of journal quality (coefficient of -1.50 and a t-statistic of -0.98).

5. For details on this regression see Card and Krueger (1995) and Stanley (2001, 2008).

dependence is controlled for (column 2).⁶ Table 1 also presents the MRA for the estimates of individual components of aid, such as technical assistance, project aid, and program aid. When all estimates from these diverse measures are pooled, there is again no evidence of aid having any effect on growth, once data dependence is controlled for.

Table 1. The Partial Correlation of Development Aid and Economic Growth

	Aggregate measure of aid		Disaggregate measure of aid	
	(1)	(2)	(3)	(4)
	WLS	WLS, CDA	WLS	WLS, CDA
β_1 , constant	0.30 (2.81)	0.30 (0.87)	-0.26 (-0.74)	-0.26 (-0.42)
β_0 , partial correlation of aid and growth	0.02 (3.81)	0.02 (1.13)	0.07 (3.09)	0.07 (1.45)
Unweighted average	0.06	0.06	0.05	0.05
Number of studies	103	103	15	15
Number of estimates	984	984	233	233

Notes: All estimates based on equation 3. WLS is weighted least squares. CDA is clustered data analysis. Figures in bold are statistically significant at the 5% level of significance. The 984 + 233 = 1,217 estimates are the comparable studies of aid effectiveness mentioned in the text. The unweighted average is the average partial correlation from the reported estimates.

The MRA for the individual components in table 2 shows positive effects from short term aid and project aid, while program aid appears to be detrimental to growth. These results are promising and raise the hope that aid might be made to work. However, the number of estimates is small and, hence, it might be premature to conclude that the case for these types of aid is proven: More independent replication is needed.

As the aggregate r of aid on growth is zero, it is not obvious how we should interpret the result that some components of aid might have a positive effect. It suggests that reforms of present aid policies are possible. However, it might be related to the micro-macro paradox, which has been known since Mosley (1987), that half of all aid projects work, and few harm the recipient, but still the aggregate has no effect. This clearly needs to be explored further.

6. Following Cohen's (1988) guidelines, a partial correlation less than $|0.10|$ is regarded as small. Consequently, the partial correlation of +0.02 is neither statistically nor economically significant.

Table 2. Partial Correlations for Disaggregate Measures of
Development Aid on Economic Growth

	(1)	(2)	(3)	(4)	(5)	(6)
	Grants	Technical assistance	Short term aid	Project aid	Program aid	Multilateral aid
WLS	+0.14 (2.55)	-0.06 (-0.52)	+0.22 (3.47)	+0.28 (4.94)	-0.14 (-1.15)	-0.16 (-1.01)
WLS, CDA	+0.14 (1.80)	-0.06 (-0.39)	+0.22 (14.95)	+0.28 (4.10)	-0.14 (-5.37)	-0.16 (-1.53)
Number of estimates	27	24	27	55	30	9

Notes: See notes to Table 1. The data come from 15 studies that report estimates of the components.

An alternative way to view this literature is to compare the evolution of the literature over time. Column 1 of table 3 traces the exponential growth in the number of studies and estimates reported in the literature over time. Column 2 reports the associated r of aid and growth, derived from estimating equation 3 for different time periods. The r of aid and growth has fallen from +0.23 in the pre-1980s literature to +0.02 when the newer studies are included. In all cases, r is not statistically significant different to zero. *With the accumulation of more evidence, the effect of aid on growth is converging to zero.*

Table 3. The Evolution of the Partial Correlation of
Total Development Aid and Economic Growth

	(1)	(2)	(3)	(4)	(5)
	Number of estimates [studies]	Estimates of β_0 from equation 3	Unweighted average	% change in unweighted average	Precision weighted average
Pre 1980	24 [7]	0.231 (0.71)	0.267	-	0.262
Pre 1990	88 [15]	0.080 (0.70)	0.204	-24%	0.190
Pre 2000	245 [34]	0.041 (0.67)	0.153	-25%	0.131
Pre 2009	984 [103]	0.023 (1.13)	0.059	-61%	0.045

Notes: See notes to Table 1. Figures in round brackets denote t-statistics using standard errors that are robust to heteroskedasticity and data clustering.

Column 3 reports the associated unweighted average, while column 5 reports the average r using the estimate's precision (1/SE) as weights.⁷ In all cases, r is falling over time, instead of

7. The unweighted r treats all estimates equally, whereas the weighted r assigns greater weight to the more precise estimates. Both averages might be biased by sample selection, necessitating the use of equation 3.

rising, as it should if donors learn by doing. In the first decade of the new century, the size of the reported aid effectiveness fell by 61% (column 4). The difference between columns 2 and 3 (or 2 and 5) can be attributed to the effects of sample selection.

III. A note on causality: does the standard assumption hold?

We now turn to the claim that aid ineffectiveness results estimated by OLS suffer from simultaneity bias. If the bias is substantial and downward, aid may still be effective. Two bodies of evidence about reverse causality will be examined.

One body of literature (of 30 papers with 211 estimates) analyzes the effect of growth in the recipient country on the aid it is allocated.⁸ Applying equation 3 to the growth-to-aid literature produces a small *positive* partial correlation of +0.013, with a t-statistic of 1.22. Thus, the simultaneity bias in the aid effectiveness literature is small. Of course, the growth-to-aid literature itself may have a simultaneity bias, generated by the aid-to-growth relation.⁹

The second body of literature consists of studies that try to adjust the estimates for simultaneity: in the aid effectiveness literature this applies to 40 studies that provide 219 estimates of aid effectiveness corrected for simultaneity bias using a variety of instruments and estimators. Table 4 reports the effect of these efforts on the partial correlations.

Table 4. The Effect of Simultaneous Estimation Techniques on the Results

	Pre 1980	Pre 1990	Pre 2000	All
Column (2) From Table 3	0.231 (0.71)	0.080 (0.70)	0.041 (0.67)	0.023 (1.13)
β_0 , aid to growth	0.237 (0.74)	0.080 (0.69)	0.073 (1.25)	0.024 (1.19)
β_2 , endogeneity dummy	0.148 (0.77)	-0.152 (-1.06)	-0.176 (-2.76)	-0.013 (-0.74)
R ²	0.03	0.03	0.07	0.02
Number of estimates	24	88	245	984
N_S , adjusted for simultaneity	1	11	24	219

Notes: See notes to Table 1. The regression run is $t_{ij} = \beta_1 + \beta_0/SE_{ij} + \beta_2 S_{ij}/SE_{ij} + v_{ij}$, where S_{ij} is a binary dummy that is one for estimates done with simultaneous estimators, while it is zero elsewhere.

8. The list of studies and associated data are available from the authors.

9. The world may be so mischievous that the aid-to-growth and the growth-to-aid effects are of the same size, but with opposite signs, so that they cancel out each other, and the picture on Figure 1 results. This implies that aid is countercyclical, a property of aid that has never been confirmed. In fact, a small body of literature exists, since Pallage and Robe (2001), showing that aid is procyclical.

Table 4 demonstrates that the studies which have attempted to control for simultaneity have found no effect on the aid-to-growth estimate.¹⁰ The small positive bias suggested by the growth-to-aid literature, turns out to be insignificant. It is notoriously difficult to find good instruments, so maybe the lack of results simply reflects the low quality of the instruments tried.¹¹ However, until some evidence to the contrary is found, we have to treat the aid effectiveness literature to be what it claims: A set of estimates of the causal effect of aid on growth.

IV. Conclusion

Our study analyzes the avalanche of new studies of aid effectiveness on growth. There are now 106 papers which have reported 1,217 estimates. We use meta-regression analysis to correct the average finding for the effects of publication selection. This analysis of the results of decades of research suggests that on average, development aid is ineffective in generating growth. It has often been claimed that the literature suffers from simultaneity bias, but to date the many attempts to find such a bias have failed.

There is a striking pattern in the results: as the number of estimates has increased, the partial correlation of aid and growth has declined. It is a thought provoking observation that the literature on the one side keeps expanding and on the other side keeps showing the same result. All the literature seems to be doing is to confirm aid ineffectiveness more and more strongly.

We consider also the effects of different components of development aid. Here the results are more promising. Our analysis suggests that researchers should refocus their attention away from aggregate measures of aid to more disaggregate ones. The marginal contribution of another aggregate aid on growth estimate is minimal. One interpretation of the results from Table 2 is that disaggregate data might offer information on that portion of total aid that is least affected by simultaneity bias.¹² The use of disaggregate aid data coupled with improved instruments might very well offer improved estimates of the effect of aid on growth.

10. Several studies, such as Burnside and Dollar (2000), had simultaneous estimates in the working paper version, but gave them up in the final version, as these did not matter for the results. The new econometric exercise by Nowak-Lehmann et al. (2009) confirms that corrections for simultaneity have no effect.

11. The whole of the empirical growth literature is sensitive to the choice of instruments; see Bazzi and Clemens (2009).

12. We thank an anonymous referee for this interpretation.

That total aid does not generate growth is an important finding. It suggests to policy makers and aid donors to look elsewhere, particularly to more focussed aid allocations. However, it is useful to ask at what point research effort should be redirected. The efficient allocation of scarce resources requires moving resources to activities of higher value. It appears to us that the growing interest in total aid effectiveness runs the real danger of resource misallocation.

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