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Can the new aid-growth models be replicated?

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Abstract: The recent literature on the aid-growth relation discusses two competing models: The Good Policy Model, where the key feature is policy times aid, and the Medicine Model, where the key feature is aid squared. Both have been reached on a sample of about 1/3 of the available data. We present a base model, to replicate both models on that data set. It is then replicated on as much of the available data as possible. Within the sample the Good Policy Model proves fragile, while the Medicine Model is more robust. Neither model replicates outside the original data sample. Further, we apply a semi-parametric regression technique to test for an unknown functional form of the aid-growth relation. It rejects that aid is statistically significant. Thus the evidence in favor of an aid-growth relationship – let alone a nonlinear one – is weak.

Keywords: Aid effectiveness, growth, semi-parametric panel regression
Jel: C14, C23, F35, O4

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I. Introduction

For long the relation from development aid to economic growth was found to be dubious – much like the relation from resources to growth. However, during the last 5 years the discussion has been dominated by two new and optimistic models. Both have few *substantial variables*, and reach a *key empirical finding*, which leads to a clear and optimistic *policy prescription*. If aid is *redirected*, it will do much (more) good:

(A) The most influential is ***the Good Policy Model***.[2)] It has three substantial variables: Growth is explained by aid and a good policy index. The key finding is a positive interaction term between aid and good policy. It claims that LDCs choose economic policies independently of expected aid, and then aid gives the policies an extra push. Good economic policies become better, and bad ones worse. Thus aid should be redirected to countries with good policies.

(B) ***The Medicine Model*** appeared as a critique of (A).[3)] It has only two substantial variables: Growth is explained by aid and aid squared. The key finding is a positive aid term and a negative aid squared term. It claims that aid helps all countries, but only up to the optimal dose, Ω. More aid is increasingly harmful. Consequently, aid should be redistributed to be as evenly distributed as possible and never exceed the optimal dose.

The main point in favor of model (A) is that it makes a lot of sense, while model (B) has the advantage that it fits the data better. The empirical support for both models comes from a study of a data set CFS-56 (see table 2), which only covers about 30% of the existing observations for aid and growth. Both models are thus reached from the mining of a particular sub-sample of the data available. Consequently, it is ideal that the remaining 70% of the data are available to test if the models replicate. This is what we do at present.

A problem immediately arises. One reason that the models use so little of the available data is that the authors wanted to control their models for many potentially relevant variables. Few of the *controls* wanted are available for all countries and years desired.

However, once a model has been found, it is easy to strip it down to the minimum necessary for replicating its key finding. A great tool in this exercise is to replace as many controls as possible with country and time dummies. They are truly exogenous and are always available. Our ***base models*** thus only include the substantial models (A) and (B), a set of country and time dummies and initial GDP.

We first make *within sample* replications for the CFS-56 sample, where it is difficult to replicate model (A), while model (B) easily replicates. Secondly, the two base models allow *out*

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2. It was proposed by C. Burnside and D. Dollar (see references).

3. First Hadjimichael et al. (1995) found that aid squared becomes significant in some aid-growth models. It was further developed in the papers by the group of F. Tarp, H. Hansen and C.J. Dalgaard (references), and by H. Lensink and H. White. The model is sometimes termed the *Aid Laffer curve*, but our name has more precise connotations.

of sample replications of the results on (nearly) all the available aid-growth data. Here the results are poor for both models. Model (B) claims that the relation is nonlinear in the aid variable, and we also use a new technique, where the base model contains a semi-parametric estimate of the aid-growth term. It allows us to test if aid affects growth *irrespective* of the shape of the relation, and to see how the *best aid-growth shape looks*.

Section II surveys the new literature, our method and *choice of base model*. Section III considers the data sets. Section IV contains the replications of the two models within the CFS-56 sample. Section V holds the out of sample replications. Section VI looks at the semi-parametric results for the general aid-term. Finally, section VII draws the conclusions.

II. The controversy and the two models

The many researchers investigating the aid-growth relation – see table 1 for definitions – have managed to demonstrate all possibilities: Aid increases growth, $\mu_1 = \partial\phi/\partial h > 0$, the two variables are unrelated, $\mu_1 \approx 0$, or aid harms growth, $\mu_1 < 0$.[4)] One of the authors (Paldam, 1997a) concluded a survey of the literature by stating that the relation was dubious; but then the two new models mentioned appeared. We start by asking why it is so easy to get different results. Then the two new positive models are surveyed, and their policy implications are discussed. Finally the base model is presented.

Table 1. Variables and models discussed

i, t	country and time index
g_{it}	real growth rate
h_{it}, $\phi(h_{it})$	aid in percent of GDP and the generalized aid term
Γ_{it}	good policy index
Y_{it}, y_{it}	GDP in PPP terms, absolute size and per capita
D	fixed effects, $\mathbf{D_i}$ for countries and $\mathbf{D_t}$ for time
$\mathbf{x_{it}}$, $\mathbf{r_i}$	set of "nuisance" variables controlled for, r is a subset
Model (2)	$g_{it} = \mu_1 h_{it} + \gamma_0\Gamma_{it} + \gamma_1\Gamma_{it} h_{it} + \alpha' (\mathbf{x_{it}}, \mathbf{D_t}) + \beta y_{it-1} + \epsilon_{it}$
Model (3)	$g_{it} = \mu_1 h_{it-1} + \mu_2 h_{it-1}^2 + \alpha' (\mathbf{x_{it}}, \mathbf{D_t}) + \beta y_{it-1} + \epsilon_{it}$
Model (4)	$g_{it} = \phi(h_{it-1}) + \alpha' (\mathbf{D_i}, \mathbf{D_t}) + \beta y_{it-1} + \epsilon_{it}$

Note: (2) is the Good Policy Model, (3) is the Medicine Model and (4) is our model for testing the significance of the *generalized aid-term* $\phi(h_{it})$. Further, βy_{it} is the convergence term and ϵ_{it} is noise. The **r**-set is the subset of **x**-set necessary to get the coefficients to the substantial model.

4. A recent survey by Hansen and Tarp (2000) referred to 72 papers on the aid-growth relation. While 40 papers found that aid increased growth, other 31 papers found an insignificant result, and 1 found that aid harmed growth. Our research indicates that the last result is reported too rarely – several of the models presented in our paper give negative coefficients to aid if the country dummies are deleted.

II.1 The aid-growth relation: Why are results so different?

The question in the headline can be answered at two planes. The first is sociological: The aid-growth relation is contested for the usual reasons. Aid is a field where people have both deep beliefs and strong interests, making researchers willing to go quite far torturing the data to make it confess. Our base model is made not to apply undue pressures on the data. The second answer is that it is easy to vary the research in 3 dimensions:

(d1) The aid data are the **O**fficial **D**evelopment **A**id from the OECD, and the **E**ffective **D**evelopment **A**id data-sets made by adjusting each loan in the ODA-set with the gift element:

(1) **ODA-set** is updated every year.
(2) **CFS-set**. EDA-data from Chang, Fernandez-Arias and Serven (1998).
(3) **ELR-set**. Semi-EDA-data from Easterly, Levine and Roodman (2003).

Section III discusses the three data sets. They are all used in the empirical sections.

(d2) The formulation of the substantial model differs as regards the form of the second order term as (A) uses aid times good policy, Πh, while (B) uses aid squared, h^2.

(d3) We are analyzing the two models between 2-3 substantial variables. However, many "nuisance" variables may in principle distort the relation. These are the variables controlled for.

*II.2 Moral hazard and the **x**-set and controlling for counter causality*

We first discuss the never ending story of the **x**-set and then turn to the similar story of the "extra" **x**-set used in 2SLS-estimates controlling for counter causality.

The theory of growth and the empirical literature on cross-country panel regression models are separated by a large gap. This causes the perennial problem of identifying exactly which variables belong in any equation. Hundreds of variables that may or may not enter the **x**-set in relations of the type discussed have been proposed. Fortunately only two sets of controls matter in the estimates discussed. One set is time dummies used by everybody. The second set is variables which are constant for each country – they control for *country differences*. The use of a set of specific variables to control for country differences gives two trade offs:

(i) Countries do differ in ways that should be controlled for, but a large **x**-set allows a search among millions of models, and thus makes moral hazard a key problem. It is better to control for country differences in a *general way that is manipulation proof – as fixed effects.*

(ii) Few controls are available for all aid-data observations, so each control included reduces the data in the tests. This is why Burnside and Dollar used only half the CFS-data. The use of fixed effects for countries allows replications of the models on all the data where the substantial variables of the models are available.

The two models (A) and (B) both aim at answering the same question: When is aid effective and when not? They answer the question with almost the same substantial variables. One of our methodological claims is that *we see no good reason why the two models should need to be controlled for a different set of variables*. Consequently, we claim that a first test of the two models is that they can be replicated on the same data if the specific variables used to control for country differences are exchanged with fixed effects for countries.

Fixed effects convert the data to time series as much as possible.[5] That is precisely what we need in order to answer the policy question: *What happens if aid to a country is increased?*

Causality is problematic in the aid-growth relation. We want to analyze the relation from aid to growth, but it is possible that the relation is from growth to aid. The many studies of the determinants of aid (see Paldam, 1997a, for a survey) do not suggest that the growth-aid relation is strong, but neither is the aid-growth relation. Hence, it is important to control for counter-causality when the aid-growth relation is estimated. Two methods are available: (1) Aid is lagged by one period relative to the growth explained. (2) The relation is estimated by a 2SLS-technique, with suitable instruments in the first step. This gives two problems: To find suitable instruments, and as the they enter almost as the controls in the **x**-set they add to the moral hazard problem. Consequently, method (1) is the most tidy and least manipulable technique.

II.3 Recent empirical evidence and two theories: Good policy or medicine?

The evidence cited in the first paragraph of the section is contrary to the micro evidence, that app. 50% of all development projects were successful and virtually none were harmful, see e.g. Cassen (1994) or Paldam (1997a). Thus the average project should give a positive contribution to growth. The contrast between the weak macro and positive micro evidence was termed the *micro-macro paradox* of aid.

The EDA-based research started with Burnside and Dollar (1997, 2000), presenting the Good Policy Model. It has been shown to be fragile to the country-sample and to the composition of the good policy index,[6] but the results of the research have appealed to many development practitioners and have been widely reported (see World Bank, 1999).[7]

Hansen and Tarp (2000) used ODA-data for the countries of the CFS-56 data set, and showed that an inclusion of aid squared made the interaction term insignificant. Dalgaard and Hansen (2001) showed the same using the CFS-56 data. Lensink and White (2001) reached similar conclusions, though they noted that the result is fragile to the countries included. They explained it in a model with endogenous growth. Aid helps finance government spending that is productive,[8] but has negative incentive effects elsewhere in the economy. At low levels of aid,

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5. Barro (1997; p 36-42) argues against the use of fixed-effect for two reasons: (1) By reducing panel-data to time series information is lost. Our point is that this information should be discarded. (2) It increases the measurement error for the convergence term. This is not our subject at present. However, the conditional convergence term is negative (as it should) in all and significant in about 1/3 of the estimates given.

6. See Dalgaard and Hansen (2001) and Easterly, Levine and Roodman (2003).

7. The model thus says that countries following Bank/Fund macroeconomic advise can be helped.

8. Gørgens, Paldam and Würtz (2003) find no signs that public regulations increase growth.

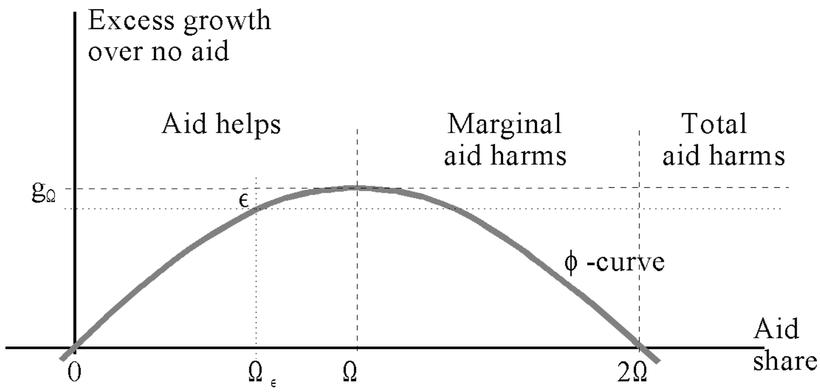
the positive marginal effect aid dominates, but with high aid the negative effect dominates.[9)]

The parametric assumptions used to estimate the Medicine Model does not follow from the theory, and Hansen and Tarp (2000; p.118) note that we are in fact dealing with an unknown functional form. The estimator used in section VI approximates any unknown (continuous) function. It shows that the form of the ϕ-curve is hump-shaped in the CFS-56 data set, but that the shape is unstable to the data sets, and most data sets actually reject any shape.

II.4 The reverse policy implications of the Good Policy Model and the Medicine Model

The *Good Policy Model* has the policy implication that *aid should be concentrated on the countries following good policies*. Burnside and Dollar even calculate the (large) gain for the world if aid is redirected accordingly.

Figure 1. Optimizing the dose in the Medicine Model



The reverse policy conclusions emerge from the Medicine Model, where the ϕ-function is quadratic as shown on Figure 1. Here the growth effect is independent of the policy of the recipient country: (a) If the aid share exceeds Ω the growth generated decreases.[10)] Hence, it is crucial to know the Ω-point. (b) The marginal growth contribution decreases all the way from zero to Ω. Thus aid should be distributed to make the aid shares as equal as possible among all recipients. A lot thus hinges upon the position of the Ω-point is.

In estimates on the CFS-56 data, where both aid and aid squared are significant, Ω is close to 5%, while figure 2a suggests that it may be lower. That corresponds to 12% in the ODA-data

9. Paldam (1997b) is a study of Greenland that has received aid of about 50% of GDP since the early 1950's. It shows how far distortions and aid dependency can go in practice.

10. The welfare argument is that money transferred from DCs with low marginal utilities to LDCs with much higher marginal utilities gives a welfare gain for the world, but marginal utility of income is not zero in the donor country. If we set it at ϵ (measured in LDC growth) then aid should not stop in Ω, but already in Ω_ϵ as drawn on the figure. As the ϕ-curve is flat around its maximum Ω, even a small ϵ may be visible. When Ω is found to be between 5 and 6 we thus choose the lower value.

as is also found in the closest matching ODA-sample (ODA-55). The average aid share is below the Ω-point, but in the WDI (2003) data for 2001 no less than 24 countries did receive ODA-aid in excess of 12%, and 5 are even above 2Ω, where it would be better with no aid at all. Hence a substantial growth gain would result from a redirection of aid, if the model is true. Probably as much as in the redirection suggested by the Good Policy Model.

II.5 Models and variables (see also table 1)

To aid effectiveness literature uses the following framework:[11)]

(1) $g_{ti} = \mu h_{it-j} + \alpha' \mathbf{x_{it-j}} + \beta y_{it} + u_{it}$, which is used in 2 versions:

(2a)	$g_{ti} = \mu_1 h_{it-j} + \gamma_0 \Gamma_{it} + \gamma_1 \Gamma_{it} h_{it} + \alpha'(\mathbf{x_{it}}, \mathbf{D_t}) + \beta y_{it} + u_{it}$	Good Policy Model
(2b)	$g_{ti} = \mu_1 h_{it-j} + \gamma_0 \Gamma_{it} + \gamma_1 \Gamma_{it} h_{it} + \alpha'(\mathbf{r_i}, \mathbf{D_t}) + \beta y_{it} + u_{it}$	reduced version: $\mathbf{r} \subset \mathbf{x}$
(2c)	$g_{ti} = \mu_1 \phi h_{it-j} + \gamma_0 \Gamma_{it} + \gamma_1 \Gamma_{it} h_{it} + \alpha'(\mathbf{D_i}, \mathbf{D_t}) + \beta y_{it} + u_{it}$	our base version
(3a)	$g_{ti} = \mu_1 h_{it-1} + \mu_2 h_{it-1}^2 + \alpha' \mathbf{x_{it-j}} + \beta y_{it} + u_{it}$	Medicine Model
(3b)	$g_{ti} = \mu_1 h_{it-1} + \mu_2 h_{it-1}^2 + \alpha'(\mathbf{r_i}, \mathbf{D_t}) + \beta y_{it} + u_{it}$	reduced model: $\mathbf{r} \subset \mathbf{x}$
(3c)	$g_{ti} = \mu_1 h_{it-1} + \mu_2 h_{it-1}^2 + \alpha'(\mathbf{D_i}, \mathbf{D_t}) + \beta y_{it} + u_{it}$	our base version

The non-linearities are the interacted term in (2) and squared aid in (3). The reduced versions (b) include only specific country controls, and (c) replaces the specific country controls with fixed effects. The general effect of the aid-term is analyzed in section VI with the following model:

(4) $g_{ti} = \phi(h_{it-j}) + \alpha'[\mathbf{D_i}, \mathbf{D_t}] + \beta y_{it} + u_{it}$, where ϕ is an estimated continuous function

Equation (4) leaves out the good-policy index, due to the results reached in sections IV and V.

III. The data

First the three sets of aid-data are discussed, then we turn to the good policy index. Note the two Appendix tables listing the countries included in the different samples. Table 2 surveys the various data-sets used in the regressions.

III.1 The aid data: ODA and EDA

The ODA-data are the net disbursements to LDCs of (non-military) grants and loans with a grant element above 25% made by official agencies of the members of the Development Assistance Committee (DAC) and certain Arab countries. The ODA data are taken from World Development indicators (WDI, 2003). No less than n = 756 observations are available using 4-year averages.

The EDA-data are produced by individual researchers from the ODA series by weighting

11. Note from table 1 that $\phi(h_{it-j})$ is the generalized aid term, α is a vector of coefficients, and u_{it} are the residuals. The βy_{it}-term is the convergence term, where β should be below zero.

each loan or donation by its gift element as well as possible. The CFS-98 data set by Chang, Fernandez-Arias and Server (1998) is the first such set. It covers the period 1966-93 for 98 LDCs. The CFS-56 of Burnside and Dollar (1997, 2000) is an early version of that set. It includes 56 countries only, as Burnside and Dollar conditioned on a number of variables not available for all countries. As more growth rates are now available – and as our base model is less demanding – we replicate the estimate on additional 42 (= 98 – 56) countries and use more than twice as many observations (n = 546) in our replications.

Table 2. Aid data samples

Name	Source	Variant		n
ODA	Official, WDI (2003) used as source	ODA-full	All available in WDI (2003)	756
		ODA-55	Sample for the CFS-56 countries	472
CFS	Chang, Fernandez-Arias and Serven (1998).	CFS-56	Used for both models	269
	EDA-set.	CFS-42	42 unused countries	216
		CFS-full	All 98 countries with updates	546
ELR	Easterly, Levine, Roodman (2001). Updated	ELR-full	All data in sample	586
	version of CFS, extended by ODA-data.	ELR-m3	3 wild observations excluded	583
		ELR-56	Sample for the CFS-56 countries	330

Note: The number of observations is n. The countries covered in each sample are listed in the Appendix. Note that ODA-55 has one country less than CFS-56 and ELR-56 as Somalia was deleted from the Penn-Tables.

Easterly, Levine and Roodman (2003) updates the CFS-data-set, so that observations are available for more countries and it now covers the period 1966-1997. Due to reclassification of data, some variables are no longer available for all countries. Therefore the data set only grows to n = 586 observations. Further, the ELR data set for the periods 1970-73 and for 1994-1997 have been extrapolated from the correlation between EDA and ODA.[12)] The most extreme outlier is that the aid/GDP-ratio is –12.73% for the Seychelles, 1970-3, whereas all other estimates are positive, and in the CFS-data it is no less than 19%. Two other "wild" observations are Guinea Bissau with –5.71% and –4.59% for Gambia. As the Seychelles had low growth in the following period, this observation makes a difference**.**

The ODA data cover the period 1966-2001. There are more countries available in this data set, but some of the countries in the other samples are missing. The estimation period for the original DB-56 data is from 1974 to 1993. With the new ELR data the calculations are extended to cover from 1974 to 1997. The ODA sample contains data from 1966 to 2001.

12. We are grateful for information from D. Roodman. It appears that the Easterly-Roodman team decided *not* to make ad hoc adjustments, but to use the data generated by the procedure followed even if that led to some "strange" observations in the data set.

The average real growth rate of GDP per capita is calculated over 4 periods using local currency as in the other two data-sets. Initial GDP per capita is real GDP per capita in 1996 prices from the latest version of the Penn World Tables. For our aid variable, we use nominal ODA relative to nominal GDP as our aid.

III.2 The correlation of the aid data

Table 3 shows the correlations between the 3 different measures of the aid, using the data for the period 70-93. The correlations are positive and high as expected. The lowest of the three is between ODA and the ELR-data set is 0.79, but this is only due to the 3 “wild” observations. The correlations suggest that models using the different measures should reach qualitatively similar results. There should in principle be a trade off: The EDA data are more precise, but the ODA data are more plentiful.

Table 3. Simple correlation coefficients between measures of aid

	CFS	ELR	ODA
CFS	1	0.847	0.826
ELR	-	1	0.792
ODA	-	-	1

On average the ratio of the ODA-data to the CFS-data (the pure EDA-data) is app. 2.4. This implies that the Ω-points reached by the ODA-variable should be 2.4 times higher than to the EDA-coefficients if the same relation is estimated on the two data sets.

III.3 The good policy index

The good policy index, Γ, is from Dollar & Burnside (2000), who claim that the it is exogenous:

(5) Γ = 1.28 +6.85 Budget Surplus –1.40 inflation +2.16 Trade Openness

The weights have been calculated from a growth regression including the three variables in the index as well as a number of variables. The same index is used in our replications. Unfortunately, the 3 variables are not available for all years and countries for which we have aid and growth data, but we can expand samples with about 60% in replications of the Good Policy Model, relative to the original sample.

The reader should note that the good policy index gives a highly significant coefficient of about 1 in all regressions, where it is included. Good policies increase real growth by 1 percentage point. The problem is if it interacts with or is independent of aid.

IV. Within sample replications of the two models

Both models were originally estimated on the aid CFS-56 data (see table 2). They are published with references to a homepage with all data used. It is, of course, easy to replicate the estimates on these data (we do not present the recalculations).[13)] After the replication we have stripped the models down to the minimum and tried to replace the controls with the general country controls of the base model. These results are presented in the tables of this section.

Throughout the paper we report coefficients and absolute values of robust t-statistics, which are computed using standard errors that are heteroscedasticity and clustering consistent. Till section VI we use the standard testing strategy, where significance is judged by t-statistics. The fixed effects for countries are always "differenced" out by the *within* transformation.

Table 4. The Good Policy Model estimated on CFS-56 data

Model	(1)	(2)	(3)	(4)
Aid data	CFS-56	CFS-56	CFS-56	CFS-56
Period	70-93	74-93 L	70-93	74-93 L
h_{it}, aid share - L	–0.01 (0.04)	0.27 (1.27)	0.32 (1.32)	0.69 (1.68)
Γ_{it}, good policy	**0.68 (3.63)**	**0.68 (2.85)**	**1.04 (3.58)**	**1.10 (4.28)**
$\Gamma_{it}h_{it}$, interacted - L	**0.18 (2.53)**	–0.02 (0.18)	–0.13 (0.99)	**–0.20 (2.11)**
Y, GDP-level	–0.65 (1.15)	–0.42(0.63)	–2.07 (1.55)	–2.47 (1.61)
x_1, institutions	**0.73 (4.26)**	**0.76 (3.86)**	not in	not in
x_2, Africa	**–2.09 (2.70)**	**–2.61 (3.29)**	not in	not in
x_3, Orient	**1.38 (2.46)**	**1.67 (3.61)**	not in	not in
Time dummies	yes	yes	yes	yes
Country dummies	not in	not in	yes*	yes*
Number of obs	270	234	267	230
R^2	0.39	0.36	0.53	0.55

Note: Bold indicates significance at the 5% level. L indicates that aid is lagged one period, in columns (2) and (4). * Country dummies are differenced out. In our panel regressions 2 observations are necessary for each country so 3-4 observations cannot be used. Brackets contains t-statistics.

IV.1 The Good Policy Model

The model is (2a) from section II.4. The two substantial variables are Γ_{it} and $\Gamma_{it}h_{it}$. The **x** set contains 7 variables: (x_1) institutional quality index from Keefer and Knack (1995), (x_2) Africa

13. The original data are used in the within sample replications even when some observations (e.g. the GDP-data) have been marginally revised. Also, t-ratios in the replications are "only" adjusted for heteroscedasticity and not for clustering, to get as close as possible.

(South of Sahara) dummy, (x_3) East Asia dummy, (x_4) political assassinations, (x_5) ethnical fractionalization, (x_6) the product of x_4 and x_5 and (x_7) financial depth M2/GDP. The substantial results – γ_0 to Γ_{it} and γ_1 to $\Gamma_{it}h_{it}$ – are almost independent of the last four controls, but they fall and turn insignificant if either of the three first controls are deleted. The three necessary controls – x_1 to x_3 – are all constant for each country, and thus act as controls for country differences.

The results are given in table 4. Column (1) gives virtually the same results as in the original article. It also states that 5 observations were deleted for being too extreme. We have followed this procedure. The inclusion of these observations reduces the significance, but it does not change the results very much. Column (3) shows what happens if the 3 specific controls for country differences are replaced with fixed effects. Here all substantial effect disappears and signs even change. Thus we have demonstrated that the Good Policy Model is generated precisely by the *country differences that are not controlled for by the institutional quality index, the Africa dummy and the East Asia dummy*. We find this unconvincing.

The Good Policy Model is uncontrolled for reverse causality. We argued above that the most tidy procedure is to lag aid as done in column (2) and (4) of the table. This turns the coefficients to the interaction term more negative and in column (4) it is even significantly negative. The reader may ask if (1) or (4) is the most reasonable model, and thus if the "true" interaction term is +0.18 or –0.20. Thus the Good Policy Model is a fickle construct.

VI.2 The Medicine Model

The Medicine Model turns out to be easy to reproduce on the CFS-56 data. It is fairly robust to the controls, but it needs either a 2SLS-estimate or a lag. Table 5 shows results of OLS-estimates – for the model looking most like the ones of table 4, for easy comparability.

Table 5. The Medicine Model estimated on CFS-56 data

Model	(1)	(2)	(3)	(4)
Aid data	CFS-56	CFS-56	CFS-56	CFS-56
Period	70-93	74-93 L	70-93	74-93 L
h_{it}, aid share - L	0.28 (0.70)	**0.78 (2.19)**	0.50 (0.86)	**1.32 (2.32)**
h_{it}^2, aid squared - L	–0.02 (0.31)	**–0.064 (2.38)**	–0.04 (0.81)	**–0.12 (2.81)**
Y, GDP-level	–0.59 (1.05)	–0.26 (0.41)	–2.03 (1.47)	–2.13 (1.48)
x_1, institutions	**0.89 (4.77)**	**0.94 (4.57**)	not in	not in
x_2, Africa	**–2.29 (3.01)**	**–2.87 (3.60)**	not in	not in
x_3, Orient	**2.54 (4.78)**	**2.95 (5.10)**	not in	not in
Time dummies	yes	yes	yes	yes
Country dummies	not in	not in	yes*	yes*
Number of obs	270	234	267	269
R^2	0.31	0.34	0.49	0.52

Note: See note to table 4.

The coefficients to the three controls are much the same as before, but now they can easily be replaced by the fixed effect without much effect to the estimates of the two substantive effects: μ_1 to h_{it-1} and μ_2 to h_{it-1}^2. The size of the two effects reported by Dalgaard and Hansen (2001) using 2SLS-estimation and a larger set of controls are 1.35 to aid and –0.13 to aid squared, so our simplified lagged replication (4) is very close. We shall consequently use that model for the out of sample replications, as it can be replicated on all available data.

The key finding from table 5 is that both substantive coefficients μ_1 and μ_2 to aid and aid squared are fairly stable. Clearly, the Medicine Model is far superior to the Good Policy Model when it comes to robustness in the within sample replications.

Finally, it is worth pointing out that when the calculated parables from the 4 estimates are drawn – as sketched on figure 1 – they all look similar with a Ω-point of between 5 and 6%. The one for the model in column (4) is included as the quadratic curve on figure 2a below.

V. The out of sample replications of the two models

We now want to replicate the two models on the remaining 70% of the data. This is most difficult for the Good Policy Model, here we base the replications on the models in columns (1) and (3) in table 4. For the Medicine Model we use column (4) in table 5 for the replications. It allows us to use all available aid date in the replications.

Table 6. The Good Policy Model estimated on the CFS data

Model, equal to	(1) = (t4,1)[1)]	(2)	(3) = (t4,3)[1)]	(4)
Aid data	CFS-56	CFS-62	CFS-56	CFS-65
Period	70-93	70-93	70-93	70-93
h_{it}, aid share	–0.01 (0.04)	0.05 (0.46)	0.32 (1.32)	0.38 (1.51)
Γ_{it}, good policy	**0.68 (3.63)**	**0.84 (3.37)**	**1.04 (3.58)**	**1.06 (3.36)**
$\Gamma_{it}h_{it}$, interacted	**0.18 (2.53)**	0.06 (0.94)	–0.13 (0.99)	–0.00 (0.00)
Y, GDP-level	–0.65 (1.15)	–0.08 (0.17)	–2.07 (1.55)	–1.69 (1.22)
x_1, institutions	**0.73 (4.26)**	0.27 (1.78)	not in	not in
x_2, Africa	**–2.09 (2.70)**	–0.12 (1.73)	not in	not in
x_3, Orient	**1.38 (2.46)**	**1.84 (2.81)**	not in	not in
Time dummies	yes	yes	yes	yes
Country dummies	not in	not in	yes*	yes*
Number of obs	270	307	267	337
R^2	0.39	0.30	0.49	0.46

Note: See note to table 4. (2) and (4) are not cleaned for outliers.

1. "= (t4,1)" means equal to table 4, column (1) and "= (t4,3)" means table 4, column (3).

V.1 Replications on the full CFS-data set

The CFS-data contains 42 countries not included in the CFS-56 data, and furthermore more years have been added to the growth data, so we are able to replicate both models on more data.

Table 6 shows the results for the Good Policy Model. Unfortunately, neither the good policy index nor the index for the quality of institutions is available for much all countries, but we can still expand the samples with 30-60%. Clearly, the model does not replicate.

Table 7. The Medicine Model estimated on CFS-data

Model, equal to	(1) = (t5,4)	(2)	(3)
Aid data	CFS-56	CFS-42	CFS-full
Period	74-93	74-97	74-97
h_{it-1}, aid share	**1.32 (2.32)**	0.26 (1.17)	**0.60 (2.95)**
h_{it-1}^2, do squared	**–0.12 (2.81)**	**–0.02 (2.53)**	**–0.035 (3.81)**
Y, GDP-level	–2.13 (1.48)	**–0.78 (3.48)**	**–2.41 (2.40)**
Time dummies	yes	yes	**yes**
country dummies	yes	yes	**yes**
Number of obs	269	216	546
R^2	0.52	0.38	0.43

Note: See note to table 4.

The replication of the Medicine Model is presented in table 7. Column (2) shows what happens if the estimate is replicated on the "unmined" CFS-42 data. The quadratic term is still significant, but it is much smaller, and the coefficient to aid unsquared is now insignificant. If it disregarded, aid is harmful at any level. If the insignificant term is included the Ω-point is 6.5. Column (3) presents the estimate for all 98 countries and all years now available. The result is precisely as expected from column (1) and (2), Both coefficients are significant due to the original 56, but only half as large as before, due to the added observations. Thus in this sample, we still get some evidence in favor of the Medicine Model, but the Ω-point moves to 8.5.

V.2 Replications on the ELR- and ODA-data sets

Both the ELR and the ODA data sets are larger than the CFS data set – this should allow us to reach higher levels of significance if either model replicates, but the regression results are much weaker for both models.

Table 8 holds the replications of the Good Policy Model. Due to lack of data for the good policy index and the institutional quality index we "only" manage to do our replications with about 400 observations, but the results all fail to support the model. The interacted term, $\Gamma_{it}h_{it}$, is insignificant throughout. We have also – unsuccessfully – tried to replicate the Good Policy Model on ELR-56 and ODA-55 data, which covers the 56 countries of the CFS-56 data set, but for more years. The results are parallel to what Easterly et al. (2003) found, and we have added the additional (negative) evidence of the ODA data set.

Table 8. The Good Policy Model estimated on ELR- and ODA-data

Model	(1)	(2)	(3)	(4)	(5)	(6)
Aid data	ELR-full	ELR-m3	ODA-full	ELR-full	ELR-m3	ODA-full
Period	70-97	70-97	66-97	70-97	70-97	66-97
h_{it}, aid share	0.02 (0.16)	0.012 (0.10)	0.01 (0.35)	0.18 (1.09)	0.18 (0.92)	0.0015 (0.03)
Γ_{it}, good policy	**0.77 (3.86)**	**0.78 (3.66)**	**0.89 (4.51)**	**0.88 (3.28)**	**0.88 (3.29)**	**1.06 (4.11)**
$\Gamma_{it}h_{it}$, interacted	0.07 (1.05)	0.07 (0.96)	–0.00 (0.27)	0.03 (0.25)	0.03 (0.25)	–0.02 (1.36)
Y, GDP-level	–0.17 (0.41)	–0.18 (0.42)	–0.66 (1.62)	–1.08 (1.18)	–1.08 (1.13)	**–2.46 (2.43)**
x_1, institutions	0.21 (1.66)	0.21 (1.65)	**0.90 (4.51)**	not in	not in	not in
x_2, Africa	–1.19 (1.92)	–1.18 (1.89)	**–1.54 (2.64)**	not in	not in	not in
x_3, Orient	**2.19 (3.84)**	**2.18 (3.66)**	**1.77 (3.74)**	not in	not in	not in
Time dummies	yes	yes	yes	yes	yes	yes
Country dummies	not in	not in	not in	yes*	yes*	yes*
Number of obs	380	379	397	413	412	427
R^2	0.30	0.30	0.33	0.41	0.42	0.50

Note: See note to table 4.

Table 9 shows the results for the Medicine Model. Our base model allows us to use all observations available. The quadratic term fails in all regressions, and aid unsquared fails in all but one regression. It is the full ELR-data set, but it is due to the 3 “wild” observations that probably should be deleted. When they are deleted the term fails.

Table 9. The Medicine Model estimated on ELR- and ODA-data

	ELR data (EDA)		ODA-data
Model	(1)	(2)	(3)
Aid data	ELR-full	ELR-m3	ODA-full
Period	73-97	73-97	66-01
h_{it-1}, aid share	**0.21 (2.58)**	0.18 (0.62)	0.095 (1.62)
h_{it-1}^2, do squared	–0.003 (0.48)	0.001 (0.07)	–0.001 (1.26)
Y, GDP-level	**–3.04 (3.48)**	**–3.13 (3.09)**	**–2.76 (3.51)**
time dummies	yes	yes	yes
country dummies	yes	yes	yes
Number of obs	586	583	756
R^2	0.43	0.43	0.47

Note: See note to table 4.

The ODA sample which covers a longer period and includes altogether 111 countries. Here the linear and the quadratic term are both insignificant, though they have the same signs as in the CFS-56 data set. We have also replicated the results for the ELR-56 and the ODA-55 data set for the countries also present in the CFS-56 data, but for more years (regressions are not included). The results are once again insignificant, but the results for ODA-55 are close to the ones of Hansen and Tarp (2000) approaching significance at the 10% level for aid unsquared. However, the extra year added is enough to make significance fall below the 10% level.

VI. The significance of the general aid term and its form

We now replace the arbitrary parametric form for the aid-growth relation with a generalized semi-parametric form. First the method will be introduced, then the results are presented and finally a few concluding remarks are added.

VI.1 A semi-parametric term in a panel regression with fixed effects[14)]

The technique approximates $\phi(h)$ by a weighted sum of continuous functions, where the weights are estimated. The functions are cubic splines with four equidistanced knots in an interval on the real axis chosen such that all data can be included. The fixed effects for countries are treated as usual. The parameters can be estimated consistently by ordinary least squares.

Table 10. The semi-parametric model estimated on 5 data-sets

	EDA-data				ODA-data
Model / Corresponds to	(1) / (t5,4)	(2) / (t7,3)	(3) / (t9,1)	(4) / (t9,2)	(5) / (t9,3)
Aid data	CFS-56	CFS-98	ELR-full	ELR-m3	ODA-full
Period	74-93	74-97	74-97	74-97	66-01
ϕ-term to aid	Fig 2a	Fig 2b	Fig 3	Not given	Fig 4
Y, GDP-level	–2.32 (1.66)	**–2.61 (2.48)**	**–3.31 (3.17)**	**–3.11 (2.97)**	**–2.59 (3.27)**
Time dummies	yes	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes	yes
ACH-test 1 for aid term	3.27 [a)]	2.94 [b)]	2.75 [c)]	1.88	1.72
ACH-test 2 for not linear	**5.58**	**4.47**	n/a	n/a	n/a
Number of obs	269	546	586	583	756
R^2	0.53	0.43	0.44	0.44	0.47

Note: See note to table 4. The critical values for the ACH-test are 4.18 (5% level) 3.22 (10% level). In (a) and (b) the t-tests of both aid and aid squared are significant in the corresponding parametric regression. For (c) only the aid term is significant in the corresponding regression.

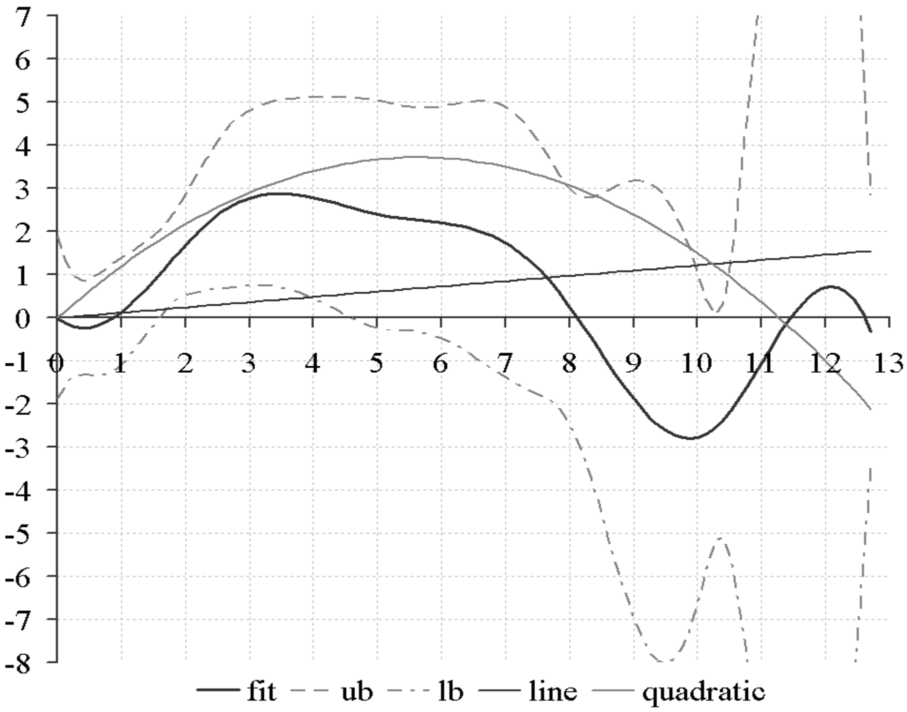
14. We are now estimating (4) $g_{ti} = \phi(h_{it-j}) + \alpha'[\mathbf{D_i, D_t}] + \beta y_{it} + u_{it}$, where $\phi(h_{it-j})$ can take any continuos form. The method is explained in Gørgens, Paldam and Würtz (2003), which also refers to the proofs.

Each regression produces a “normal” set of coefficients to the linear terms and a graph for the aid term. The graphs show the semi-parametric aid-growth relation and its point-wise 95% confidence bands, which are wider, where there are few observations. It also includes the fitted values from a linear regression and the relevant aid squared models referred to.

For the nonlinear relationship estimated, we perform the ACH-specification test suggested by Aerts, Claskens and Hart (1999). It is done in two versions: ACH test 1 compares the model estimated with a null that is the same model without the aid term. The critical values used are asymptotic values from Hart (1997). If we find evidence of a relationship, we go on to the second test: ACH test 2 tests the null of the linear model against a general nonlinear alternative.

As the output for each regression includes a bulky graph we only present the results for four main cases: The original CFS-56 sample, the CFS-98 data set, the ELR and the ODA sample. In addition we add the regression on the more reasonable ELR-m3 data.

Figure 2a. Aid-term in the base model on the CFS-56 data, n = 269



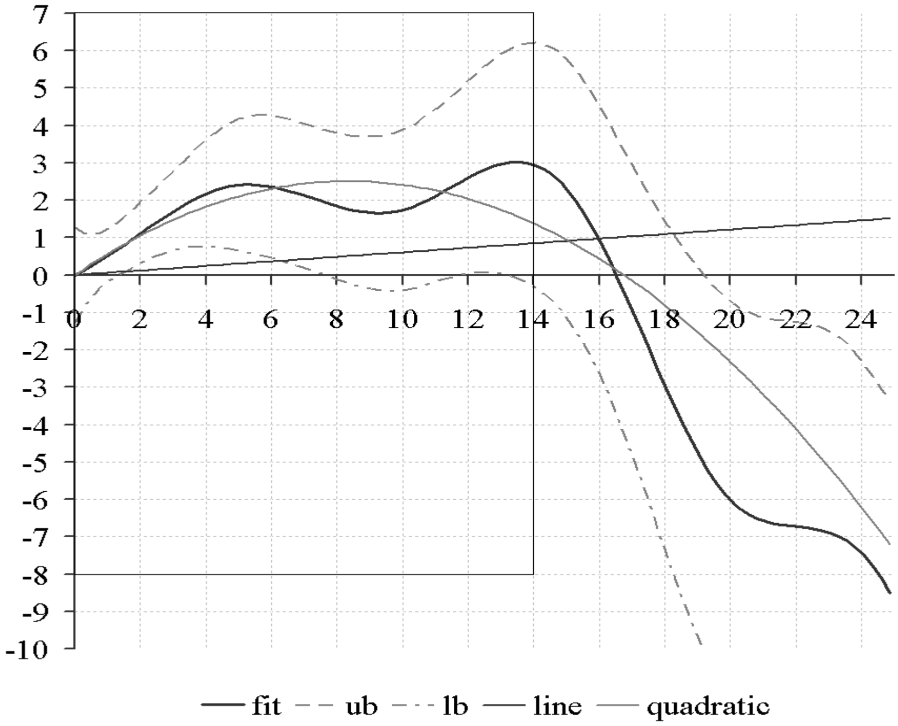
Note: The size of the graph is marked by a box on the other graphs. The upper and lower 95% bounds of the fit are “ub” and “lb”.

VI.2 Results: Main table and discussion of the results based on CFS-data

The 5 AHC (1) tests in table 10 tell a sad story of insignificance. The only marginally significant result for the aid term is at the 10% level. As expected it is for the CFS-56 sample.

Starting with the original CFS-56 countries, we thus reject the null of the model at the 5% level without aid, but not at the 10% level. Further, we reject the model with the linear term only against a general nonlinear alternative at the 5% level. Looking at the estimated function, we see a tendency for the function to fall briefly in a short interval and then increase till about 3% of GDP. Then the function decreases for a while until it finally increases again after 10%.

Figure 2b. Aid-term in the base model on the CFS-98 data, n = 546

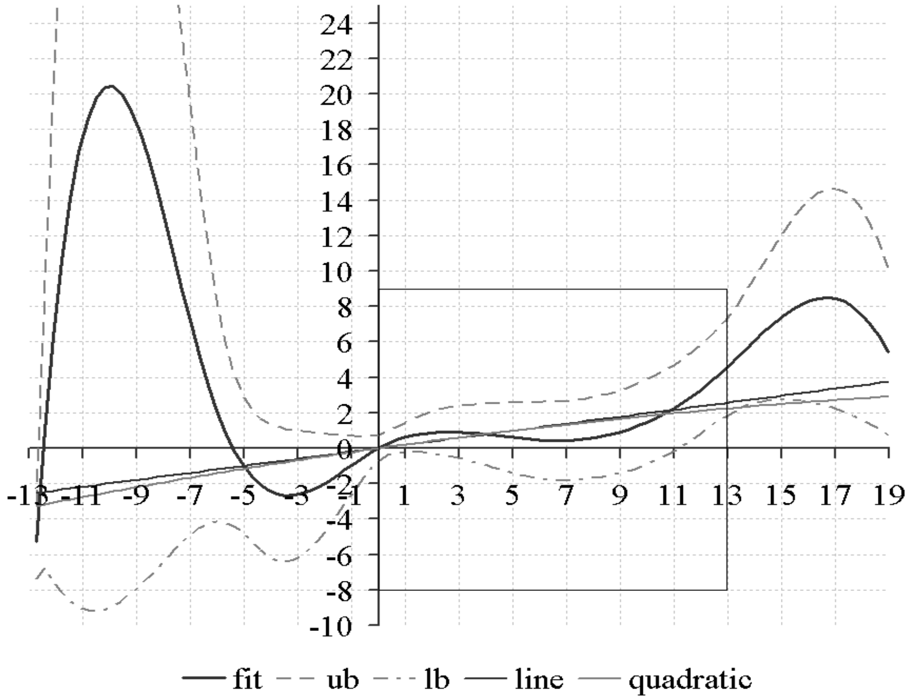


Extending the CFS-data, the ACH-test suggests that the relationship is insignificant. We cannot reject the null of the model without aid. The estimated shape shows an increasing function till around 5%, then it briefly decreases for a while until it starts increasing again till around 14% and then decreasing. Thus using more data, we have disagreement between the t-tests in the quadratic model and the ACH-tests as will be discussed in VI.4.

VI.3 Results based on ELR- and ODA-data

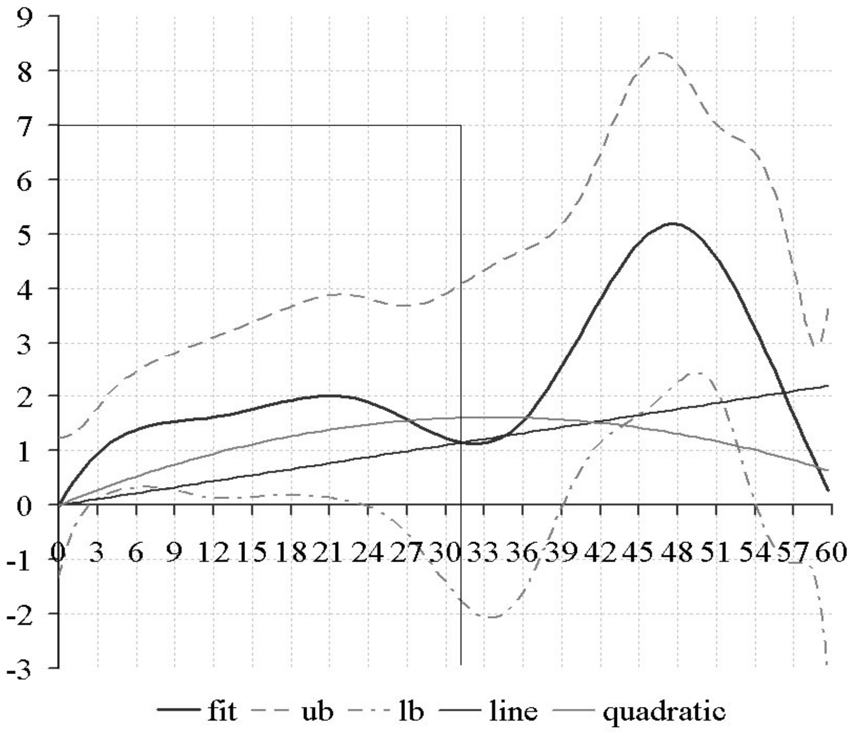
For the ELR data set, we get a strange shape (mainly due to the 3 "wild" observations) suggesting that countries which are repaying debt rather than receiving aid get a lot of growth. However, the ACH-test rejects relationship between aid and growth. The coefficient on the linear aid term is significant by the t-test, when all observations are included, but rejected when the 3 "wild" observations are removed from the data set. Thus it appears that the ACH-test is less sensitive to the wild observations than the t-statistics. Using the ELR-56 subset, we also find evidence of no relationship. This case does not include the wild observations.

Figure 3. Aid-term in the base model on the ELR-full data, n = 586



Note: The “crazy” and insignificant peak at –10 is due to the 3 “wild” observations.

Figure 4. Aid-term in the base model on the ODA-full data, n = 756



Note: The aid-axis of the box showing the section corresponding to figure 2a is multiplied by 2.4.

Finally, for the full ODA sample we get a strange two-humped curve. However, the relationship is insignificant. This is also the case when we use only the 55 countries from the DB-56 set. From a visual inspection of the 4 figures and additional ones not presented.[15)] Two observations emerge: A common trait of the estimated relationships is that they all have a positive section at low levels of aid, and many but not all of the curves have a negative tail as in the CFS data. However, these results are rejected by the tests – mostly rather decisively.

VI.4 A statistical comment: The disagreement of the tests

The ACH-tests in table 10 and the t-tests in the matching parametric regressions disagree in three out of 5 cases (see notes to table). This is possible but puzzling as both are asymptotic tests.

Consider first columns (1) and (2). We here supplement the ACH-test 1 with the ACH-test 2, which has the linear model as the null. It rejects the linear model in columns (1) and (2) like the t-test. Thus it is possible to achieve significant results using t-statistics with coefficients that go both ways, while the ACH-test show that the model as such is not improving. In column (3) the 3 "wild" observations give a significant coefficient with the t-test, but not with the ACH-test. Thus the ACH-test is less sensitive to outliers than the t-test.

We conclude that the ACH-test 1 on the generalized aid-term is the proper way to test if aid affects the growth rate.

VII. Conclusions: Weak results and the "do no harm" criterion

After the gloomy results of the macro literature on aid effectiveness from its start in the 1950s till the mid 1990s two optimistic models appeared. (A) the Good Policy Model where aid helps in countries with governments that pursue sound economic policies, and (B) the Medicine Model by which aid helps up to a point after which it turns harmful.

The papers presenting both theories are written after a thorough examination of a data set that covers only about 30% of available evidence. Our paper has studied the robustness of the models within the sample and if they replicate in the remaining 70% of the data. In the within-sample study the Good Policy Models prove fickle, while the Medicine Model is remarkably robust. However, in the out of sample replications both models fail. What is even worse is that a generalized aid-term proves insignificant in the large data sets available.

Our findings are thus consistent with the possibility that the recent discussion of aid effectiveness builds upon the mining of a fluke in a particular subset of the data.

However, we have found no evidence that moderate aid harms growth and the poverty of the poor countries is a terrible malady, so perhaps we should heed the advice Hippocrates gave to the medical profession 2500 years ago (in Epidemics, Bk. I, Sect. XI): "*... to help, or at least to do no harm.*"

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15. We have run the semi-parametric regressions for all cases given in tables 5, 7 and 9. The results for cases not included are much as could be expected.

References:

Aerts, M., Claeskens, G., Hart, J.D., 1999. Testing the Fit of a parametric Function. *Journal of the American Statistical Association* 94 (447): 869-879.

Barro, R.J., 1997. *Determinants of Economic Growth. A Cross-Country Empirical Study*. MIT Press: Cambridge, MA.

Burnside, C., Dollar, D., 1997, 2001. Aid, Policies and Growth. *American Economic Review* 90: 847-868. Earlier in Policy Research Working paper 1777, The World Bank, Development Research Group, Washington, DC.

Cassen, R., (1986, 1994). *Does Aid Work?* Clarendon: Oxford.

Chang, C. C., Fernandez-Arias, E., Serven, L., 1998. *Measuring Aid Flows: A New approach*. World Bank. URL: <http://www.worldbank.org/research/growth/ddaid.htm>.

Dalgaard, C.J., Hansen, H., 2001. On Aid, Growth and Good Policies. *The Journal of Development Studies*, 37: 17-41.

Easterly, W., Levine, R. Roodman, D., 2003. New data, New doubts. NBER working paper 9846.

Gørgens, T., Paldam, M., Würtz, A., 2003. How Does Public Regulation Affect Growth? Working paper, Aarhus University.

Hadjimichael, T.M., Ghura, D., Muhleisen, M., Nord, R., Ucer, E.M., 1995. Sub-Saharan Africa: Growth, Savings, and Investment, 1986-93. IMF: Occasional Paper, No. 118.

Hansen, H., Tarp, F., 2000. Aid Effectiveness Disputed. In F. Tarp and P. Hjertholm, eds. *Foreign Aid and Development. Lessons Learnt and Directions for the Future*. Routledge Studies in Development Economics: London.

Hart, J.D., 1997. *Nonparametric Smoothing and Lack-of-Fit tests.* New York: Springer Verlag.

Heston, A., Summers, R., Aten, B., 2002. Penn World Tables Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP).

Keefer, P., Knack, S., 1995. Institutions and Economic Performance: Cross-country Tests Using Alternative Institutional Measures. *Economics and Politics* 7: 207-227.

Lensink, R., White, H., 2001. Are There Negative Returns to Aid? *Journal of Development Studies* 37: 42-65.

Paldam, M., 1997a. *Dansk u-landshjælp. Altruismens politiske økonomi*. Aarhus UP: Aarhus, Denmark.

Paldam, M., 1997b. Dutch disease and rent seeking: The Greenland model. *European Journal of Political Economy* 13: 591-614.

WDI, 2003. *World Bank Indicators* 2003, CD-ROM.

World Bank, 1999. *Assessing Aid: What Works, What Doesn't and Why*. Oxford UP: Oxford, UK.

Appendix table 1 of 2: Countries included in samples

	CFS-56	CFS-full	ELR-full	ODA-full
Albania				I
Algeria	I	I	I	I
Angola		I	I	I
Antigua & Barbuda				I
Argentina	I	I	I	I
Armenia				I
Bangladesh		I	I	I
Barbados		I	I	I
Belize		I	I	I
Benin		I	I	I
Bhutan			I	
Bolivia	I	I	I	I
Botswana	I	I	I	I
Brazil	I	I	I	I
Bulgaria			I	I
Burkina Faso		I	I	I
Burundi		I	I	I
Cambodia				I
Cameroon	I	I	I	I
Cape Verde		I	I	I
Central African Rep.		I	I	
Chad		I	I	I
Chile	I	I	I	I
China		I	I	I
Colombia	I	I	I	I
Comoros		I	I	I
Congo, D.R. (Zaire)	I	I	I	I
Congo, Rep.		I	I	I
Costa Rica	I	I	I	I
Cote d'Ivoire	I	I	I	I
Croatia				I
Cyprus				I
Czech Rep.			I	I
Dominica				I
Dominican Rep.	I	I	I	I
Ecuador	I	I	I	I
Egypt	I	I	I	I
El Salvador	I	I	I	I
Equatorial Guinea				I
Ethiopia	I	I	I	I
Fiji		I	I	I
Gabon	I	I	I	I
Gambia	I	I	I	I
Ghana	I	I	I	I
Grenada		I	I	I
Guatemala	I	I	I	I
Guinea		I	I	I
Guinea Bissau		I	I	I
Guyana	I	I	I	I
Haiti	I	I	I	I
Honduras	I	I	I	I
Hong Kong			I	I
Hungary			I	I
India	I	I	I	I
Indonesia	I	I	I	I
Iran		I	I	I
Iraq			I	
Israel				I
Jamaica	I	I	I	I
Jordan		I	I	I
Kenya	I	I	I	I
Korea	I	I	I	I
Lao PDR			I	
Lebanon				I
Lesotho		I	I	I
Liberia		I	I	
Macao				I
Madagascar	I	I	I	I
Malawi	I	I	I	I
Malaysia	I	I	I	I
Mali	I	I	I	I
Malta		I	I	
Mauritania		I	I	I
Mauritius		I	I	I
Mexico	I	I	I	I
Mongolia			I	
Morocco	I	I	I	I
Mozambique		I	I	I
Myanmar		I	I	
Namibia				I
Nepal		I	I	I
Nicaragua	I	I	I	I

Appendix table 2 of 2: Countries included in samples

	CFS-56	CFS-full	ELR-full	ODA-full		CFS-56	CFS-full	ELR-full	ODA-full
Niger	I	I	I	I	Sri Lanka	I	I	I	I
Nigeria	I	I	I	I	St. Kitts & Nevits		I	I	I
Oman		I	I		St. Lucia		I	I	I
Pakistan	I	I	I	I	Sudan		I	I	
Panama		I	I	I	Suriname			I	
Papua New Guinea		I	I	I	Swaziland		I	I	I
Paraguay	I	I	I	I	Syria	I	I	I	I
Peru	I	I	I	I	Tanzania	I	I	I	I
Philippines	I	I	I	I	Thailand	I	I	I	I
Poland			I	I	Togo	I	I	I	I
Romania			I	I	Tonga		I	I	
Russian Federation			I	I	Trindidad & Tobago	I	I	I	I
Rwanda		I	I	I	Tunisia	I	I	I	I
Samoa		I	I	I	Turkey	I	I	I	I
Saudi-Arabia			I		Uganda		I	I	I
Sct. Vincent & Grenadines		I	I	I	Ukraine				I
Senegal	I	I	I	I	Uruguay	I	I	I	I
Seychelles		I	I	I	Vanuatu		I	I	I
Sierra Leone	I	I	I	I	Venezuela	I	I	I	I
Singapore			I	I	Yemen				I
Solomon Islands		I	I		Zambia	I	I	I	I
Somalia	I	I	I		Zimbabwe	I	I	I	I

Note: The letter "**I**" indicates inclusion of a country in the sample. Two observations from Sao Tome and Principe have been excluded as they are so extreme in the ODA sample that they cause perfect colinearity when using the semi-parametric estimator with four equidistanced knots.

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