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Do elites benefit from democracy and foreign aid in developing countries?: Comment

by

Henrik Hansen, Louise Lund Rants and Julie Buhl-Wiggers

Abstract

In the study "Do elites benefit from democracy and foreign aid in developing countries" (Journal of Development Economics, 2009) Bjørnskov asks if political elites benefit from foreign aid relative to the rest of the population. He concludes that his results provide qualified support for the hypothesis by indicating that foreign aid is positively associated with elites' share of total income in democratic developing countries, but not particularly so in autocracies. Based on the regressions presented in Bjørnskov's paper, we show that this conclusion is questionable. Foreign aid is not significantly associated with income redistribution in democratic developing countries.

JEL Classification: D31, F35

Keywords: Inequality, Foreign Aid, Democracy



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1. Introduction

The impact of foreign aid on macroeconomic aggregates, notably the growth of GDP per capita, has been analyzed for decades. Nevertheless, we still have no firm conclusions for researchers and policy makers to rely upon with confidence. Although this is frustrating to many, not least the donor agencies in the OECD countries, the research *has* moved us forward and enhanced our understanding of the many possible macroeconomic implications of foreign aid. Also our understanding of the problems and pitfalls in empirical studies of the impact of aid on macroeconomic aggregates has improved. One important paper with a huge impact on foreign aid research was the study by Burnside and Dollar (2000) which introduced a new form of ‘conditionality’ in the aid effectiveness measurement. The basic and intriguingly simple, idea was that aid is only effective in a good policy environment. This idea was modeled using a standard regression equation which included an interaction term between foreign aid and a policy measure. Although the results of Burnside and Dollar were later firmly rejected by other researchers, notably Easterly, Levine and Roodman (2004), the idea that the partial impact of aid may be a function of other factors is now widely accepted by researchers. Today, the impact of aid on macroeconomic aggregates is almost always assumed to be non-constant, and hence to vary across countries, although the regression models are typically assumed to be linear in the unknown parameters.¹

Non-constant partial effects can be modeled in many ways, but the most popular formulation is to include an interaction term in the regression equation whereby the partial effect of aid on some macroeconomic aggregate becomes a linear function of another variable. This is a straight forward way of modeling a ‘conditional effect’. However, the move from the simple linear regression model to models with interactions requires caution when interpreting the results of the regression models. The partial effects cannot be read off the standard regression tables as they are functions, not constants, and, as such, important summary statistics are often not reported. An example illustrating the problems is a recent paper in the *Journal of Development Economics* by Christian Bjørnskov (2009).

Bjørnskov (2009), henceforth CB, asks if “political elites, defined as the share of the population belonging to the upper income quintile, actually benefit from foreign aid relative to the rest of the population.” In the introduction, CB notes that his “results provide qualified support for the pessimist hypothesis by indicating that foreign aid is positively associated with elites’ share of total income in democratic developing countries but not particularly so in autocracies.” Later CB concludes that “[t]he findings neither reject nor confirm the theory that foreign aid in general biases the income distribution by enabling elites to ‘steal’ donor funds. What arises is, instead, the moral paradox that foreign aid *in conjunction with democracy* seems to be associated with a distribution of the national

¹See Roodman (2008) for an in depth analysis of some of the more widely known aid effectiveness studies.

income skewed in favor of the richest part of the population.”

In this paper we show that no moral paradox exist since the conclusion in CB is based on a mis-interpretation of the regression results. When the estimated association between aid and the income quintiles is computed according to standard procedures, we find no significant association in democratic countries, while there appears to be a small, significant, relation in weak democracies and in autocracies associating higher aid flows with a redistribution from the richest quintile to the four other quintiles.

This result is confirmed when we change the regression specification from the simple interaction used in CB to a more general indicator-based specification. Interestingly, our indicator-based regression formulation also shows that the association between aid and income redistribution is mainly significant in weak democracies, while it is more uncertain in autocracies. By this distinction, our model is able to reconcile the statistical evidence with the anecdotal evidence about misuse of aid funds by autocrats like Mobuto Sese Seko in Zaire, Suharto in Indonesia, Ferdinand Marcos in the Philippines and Robert Mugabe in Zimbabwe. CB briefly discuss these dictators although his regression model clearly contradicts the anecdotal evidence as the model predicts a redistribution away from the political elite in autocracies.

The paper is structured as follows. In Section 2 we briefly state the regression model and describe the data. In Section 3 we report the main regression results along with estimates of the partial effects of aid on the income quintiles – conditional on given levels of democracy which are the parameters of interest. We present the more general regression formulation in Section 4, while we offer a few concluding comments in Section 5.

2. The regression model and the data

The political elite is not easy to define in cross country studies. Hence, for simplicity CB assumes that the 20 percent richest people in the population is a reasonable proxy for the political elite. Based on this assumption, he formulates a regression model for the five income quintiles. The data on income quintiles are from the UNU-WIDER World Income Inequality Database (WIID). (See UNU-Wider, undated). In the regression analysis the data are organized in five-year epochs spanning the period from 1960 to 2000, and the data on income quintiles are selected to be at or as close as possible to the end of each five-year period.

As in any study of income distributions across countries, there are severe concerns about the data quality. See in particular Atkinson and Brandolini (2001) for critical remarks on the cross country income distribution data. However, data quality is not our main concern in the present context as we are simply replicating CB’s regressions.

The regressors of interest in the model are foreign aid and democracy. Foreign aid is given as the standard measure, Official Development Assistance (ODA), from the DAC

database (OECD, 2006). In the regressions foreign aid is included as a share of GDP in the recipient country and it is log-transformed in order to allow for diminishing returns, which has been found to be important in regressions of aid and growth. (See e.g., Hansen and Tarp, 2001).² Democracy is measured by the Polity IV index of democracy (Marshall and Jaggers, 2004). The democracy variable is defined on the interval $[0, 10]$ with low values indicating undemocratic regimes and high values for democratic countries.

The relationship between the income distribution, democracy, and aid is assumed to be non-linear, and CB models it using an interaction between aid and democracy whereby the regression model for the income quintiles is formulated as

$$q_{jit} = \beta_{aj}(\ln(aid_{it}) - c_a) + \beta_{dj}(democracy_{it} - c_d) + \beta_{daj}(democracy_{it} - c_d)(\ln(aid_{it}) - c_a) + X_{it}\gamma_j + \mu_{ji} + \varepsilon_{jit} \quad j = 1, \dots, 5. \quad (1)$$

Here q_{jit} are the income quintiles in country i and period t , aid and $democracy$ are the measures of foreign aid and democracy while X are additional control variables. The regression model is assumed to have an error component structure with μ_{ji} being a time constant, country specific error term and ε_{jit} an idiosyncratic error term. Finally, c_a and c_d are two constants, chosen by the researcher, ensuring that the regression parameters β_{aj} and β_{dj} are estimates of the partial effects of aid and democracy, respectively, measured at interesting points. The constants are typically chosen to be the sample averages. (See, e.g., Wooldridge, 2009, chapter 6). In CB and the present study the constants are set to be $c_a = 1.538$ and $c_d = 3.619$, which are not exactly the sample averages, but nor are they extreme points in the sample distributions for aid and democracy.³

The control variables (X_{it}) include a dummy for whether the quintiles are based on income/earnings or consumption/expenditure, a dummy for post communist countries, time dummies as well as regional dummies for Asia, Latin America, North Africa, and the Middle East, the Pacific, and Sub-Saharan Africa.

Of more substance, the log of GDP per capita in the initial year of each epoch and its square are also included as are trade openness, measured as the trade-to-GDP ratio, government expenditure as a fraction of GDP, the investment price level, and finally the average annual population growth, and the share of the population living in rural areas. The data for the share of the population living in the rural areas are from WDI while the rest of the data are from Penn World Tables 6.2 (Heston et al., 2006).

Following CB we assume strict exogeneity of the regressors in addition to orthogonality of the country specific error terms and the regressors, such that we can estimate the parameters of the model using the GLS random effects estimator. The initial estimates

²Specifically, aid is transformed using the transformation $\ln(100(aid/GDP) + 1)$ to deal with negative net ODA flows.

³Needless to say the specific choice of constants has no bearing on the statistical properties of the regression model. It is purely a matter of presentation.

of the variance components are based on the within and between transformations, and the covariance-matrix of the parameters is estimated assuming homoskedasticity of the idiosyncratic error terms.⁴

The estimates of prime interest are the partial effects of changes in the aid flow, and it is well-known that in the regression model (1) the partial effects of aid on the quintiles is a linear function of democracy⁵

$$\frac{\partial E(q_j | aid, democracy, X)}{\partial \ln(aid)} = \beta_{aj} + \beta_{daj}(democracy - c_d) \equiv \delta_j(democracy). \quad (2)$$

The variance of the partial effect is typically estimated using the delta method whereby we have

$$\widehat{\text{Var}}(\hat{\delta}_j(democracy)) = \widehat{\text{Var}}(\hat{\beta}_{aj}) + \widehat{\text{Var}}(\hat{\beta}_{daj})(democracy - c_d)^2 + \widehat{\text{Cov}}(\hat{\beta}_{aj}, \hat{\beta}_{daj})(democracy - c_d) \quad (3)$$

Unfortunately, estimates of the partial effects and their standard errors are not reported in CB's article. Instead he focuses on the fact that β_{aj} is statistically insignificant while β_{daj} is significantly negative for the four poorest quintiles while it is significantly positive for the richest quintile. However, this is not sufficient for making conclusions about the partial effect of aid on the income distribution. To do this the partial effects as given in (2) must be estimated and reported and this is what we do in Section 3.

3. Main results

Table 1 reports the regression results for each quintile which are also given in CB's Table 2. In the discussion of the results CB notes that "[p]roceeding to the central estimates, the findings indicate that for the average developing country in the sample, inflows of foreign aid exert a negative influence on the income distribution at levels of democracy above roughly 2.5-3 on the Polity IV index. Turning the estimates the other way, the results can also be interpreted as showing that democracy exerts a negative influence when inflows of foreign aid exceed approximately 7 to 9% of GDP. The estimates are also of economic significance across a substantial part of the distribution and support the notion that aid is detrimental to income equality in *democratic* developing countries."

⁴Clearly, the random effects estimator is inefficient considering estimation of all quintiles as it ignores the cross-equation restrictions on the parameters given from the adding-up constraint: $\sum_{j=1}^5 q_{jit} = 100$ for all countries and periods. However, this cross-equation restriction is typically handled by omitting one of the quintiles in a SUR-regression and subsequently estimating the parameters of the omitted regression by adding up. As the model has identical regressors for each of the quintiles the efficient SUR-regression is identical to the equation-by-equation results presented below. Hence, the loss in efficiency is probably minor. Moreover, if one focuses on the richest quintile versus the rest of the population the regression for this quintile is actually the efficient model formulation given the assumptions.

⁵See, e.g., Wooldridge (2002), chapter 2.

Table 1
Inequality, aid and democracy

Quintile	Q1	Q2	Q3	Q4	Q5
Ln(aid)-1.538	0.067 (0.16)	0.172 (0.19)	0.237 (0.20)	0.098 (0.21)	-0.693 (0.68)
Democracy-3.619	-0.112** (0.04)	-0.090* (0.04)	-0.092* (0.05)	-0.051 (0.05)	0.342* (0.15)
Democracy and aid interaction	-0.064* (0.03)	-0.075* (0.04)	-0.073 (0.04)	-0.088* (0.04)	0.286* (0.13)
Consumption/Expenditure	1.266*** (0.25)	1.461*** (0.31)	1.323*** (0.32)	1.020** (0.32)	-4.590*** (1.03)
Post communist country	3.918*** (0.63)	5.256*** (0.76)	5.411*** (0.81)	4.161*** (0.87)	-18.643*** (2.70)
Initial GDP pc (log)	-7.847** (2.87)	-9.572** (3.49)	-7.943* (3.73)	-3.176 (3.97)	34.099** (12.27)
Initial GDP pc (log), squared	0.475* (0.19)	0.560* (0.23)	0.447 (0.24)	0.132 (0.26)	-2.000* (0.79)
Trade openness	-0.000 (0.00)	0.001 (0.00)	0.001 (0.00)	-0.000 (0.00)	-0.001 (0.01)
Government expenditure	-0.020 (0.01)	-0.023 (0.02)	-0.026 (0.02)	-0.016 (0.02)	0.090 (0.06)
Investment price	0.006* (0.00)	0.009** (0.00)	0.010*** (0.00)	0.008** (0.00)	-0.032** (0.01)
Population growth	-15.293 (14.98)	-26.128 (18.21)	-19.579 (19.31)	-2.790 (20.13)	50.827 (63.93)
Rural population share	-0.004 (0.01)	-0.024 (0.01)	-0.036** (0.01)	-0.045** (0.01)	0.103* (0.05)
Observations	262	262	262	262	269
$\text{Cov}(\hat{\beta}_{aj}, \hat{\beta}_{daj}) \times 10^3$	-0.144	-0.225	-0.267	-0.364	-2.706

Note: time dummies and regional dummies are included in all regressions. *** (**) [*] denotes significance at $p < .01$ ($p < .05$) [$p < .10$]. The parameter estimates for the post communist dummies deviate from the results reported in Bjørnskov (2009) but as all other parameters are identical we conjecture that it must be due to a misprint in the paper.

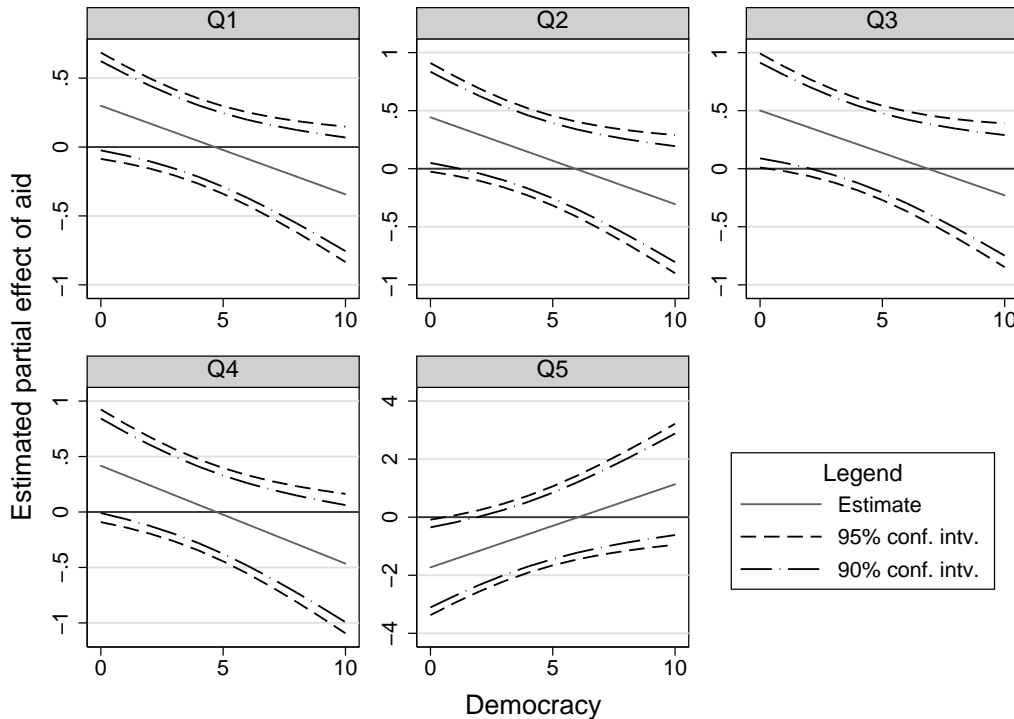
However, this conclusion does not follow from Table 1 as the variance of the partial effect of aid is only reported for $democracy = c_d = 3.619$, and at that point it is not statistically significant for any of the quintiles.

Hence, to look into the result we report the estimates of the partial effects of aid on the five quintiles in Figure 1. The lines in the plots are estimates of the population parameters given in (2), while the confidence bands are computed from the standard variance formula given in (3) and the standard normal approximation. As the democracy index is bounded by zero and ten, by definition, the plots show the estimated partial effects for all possible values of democracy.

Figure 1 clearly reveals that foreign aid has no significant association with income redistribution in democracies in the present model. The partial effect of aid is insignificant, at

Figure 1

The estimated partial effect of $\ln(\text{aid})$ on the five income quintiles.



conventional levels, for all values of the democracy index above approximately 2. Moreover, if anything, the regression model shows that aid is associated with redistribution *away from* the elite in weak democracies and in autocracies.⁶ Which of the poorer quintiles that gain from this redistribution is uncertain, but it appears to be ‘the middle class’ defined as the second, third and fourth quintiles. This result is not mentioned at all in CB.

In Table 2 we report the estimated partial effects of aid when the sample is restricted in different ways as specified by CB. In Panel A of Table 2 the sample is restricted by excluding low quality data (the quality indicator is included in WIID); Panel B restricts the sample by excluding middle income countries (having a real GDP per capita above USD 6,000); Panel C excludes extreme aid observations (below one percent or above 30 percent of GDP) while Panel D excludes the post-communist countries.

CB uses the four sample restrictions in Table 2 to illustrate the robustness of the estimated parameters in the regressions. However, this robustness is not that clear when considering the estimates of the partial effect of aid. The partial effects are more or less the same when the sample is restricted to exclude the low quality data (Panel A) and also when

⁶For simplicity we will define a weak democracy as having a democracy score larger than zero but less than or equal to two, while an autocracy has a democracy score of zero.

Table 2

Robustness of the partial effect of aid to sample restrictions.

Democracy	A. Excluding data quality below 4					B. GDP per capita less than USD 6000				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
0	0.40** (0.20)	0.41* (0.25)	0.55** (0.25)	0.42 (0.26)	-1.93** (0.85)	0.28 (0.22)	0.58** (0.26)	0.65** (0.28)	0.63** (0.29)	-2.06** (0.92)
2	0.30* (0.17)	0.30 (0.21)	0.42* (0.22)	0.27 (0.23)	-1.44* (0.74)	0.14 (0.18)	0.38* (0.22)	0.45* (0.24)	0.38 (0.24)	-1.32* (0.78)
4	0.19 (0.17)	0.19 (0.20)	0.30 (0.21)	0.12 (0.22)	-0.94 (0.70)	0.01 (0.17)	0.19 (0.21)	0.24 (0.22)	0.13 (0.23)	-0.58 (0.74)
6	0.09 (0.18)	0.08 (0.22)	0.17 (0.22)	-0.03 (0.23)	-0.45 (0.76)	-0.13 (0.19)	0.00 (0.23)	0.04 (0.25)	-0.11 (0.26)	0.16 (0.82)
8	-0.02 (0.21)	-0.03 (0.25)	0.05 (0.26)	-0.18 (0.27)	0.04 (0.88)	-0.26 (0.24)	-0.20 (0.28)	-0.17 (0.30)	-0.36 (0.31)	0.90 (0.99)
10	-0.12 (0.25)	-0.13 (0.30)	-0.08 (0.31)	-0.33 (0.32)	0.54 (1.06)	-0.40 (0.29)	-0.39 (0.35)	-0.38 (0.37)	-0.60 (0.38)	1.64 (1.22)
	C. 1% < aid < 30%					D. Excluding post-communist countries				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
0	0.59** (0.29)	0.76** (0.36)	0.66* (0.38)	0.46 (0.39)	-2.00 (1.23)	0.14 (0.21)	0.28 (0.26)	0.43 (0.27)	0.47* (0.28)	-1.40 (0.91)
2	0.31 (0.24)	0.42 (0.30)	0.39 (0.32)	0.19 (0.33)	-0.98 (1.03)	0.03 (0.18)	0.15 (0.22)	0.29 (0.23)	0.27 (0.24)	-0.84 (0.78)
4	0.02 (0.23)	0.08 (0.29)	0.12 (0.31)	-0.07 (0.32)	0.05 (0.99)	-0.08 (0.17)	0.02 (0.21)	0.16 (0.22)	0.08 (0.23)	-0.29 (0.73)
6	-0.27 (0.26)	-0.26 (0.33)	-0.16 (0.35)	-0.33 (0.36)	1.07 (1.13)	-0.19 (0.18)	-0.10 (0.22)	0.02 (0.23)	-0.12 (0.24)	0.26 (0.79)
8	-0.55* (0.32)	-0.60 (0.40)	-0.43 (0.42)	-0.59 (0.44)	2.09 (1.39)	-0.30 (0.21)	-0.23 (0.26)	-0.12 (0.27)	-0.31 (0.28)	0.82 (0.92)
10	-0.84** (0.40)	-0.95* (0.50)	-0.70 (0.52)	-0.85 (0.54)	3.12* (1.71)	-0.40 (0.26)	-0.36 (0.32)	-0.26 (0.33)	-0.51 (0.34)	1.37 (1.11)

Note: the regression specification is identical to the regression in Table 1. ** [*] denotes significance at $p < .05$ [$p < .10$].

the middle income countries are excluded (Panel B). However, restricting the aid flow to be within one and 30 percent of GDP (Panel C) changes the slope of the partial effect for the poorest and the richest quintiles such that there actually appears to be a redistribution from the poorest to the richest in democracies—at least at the 10 percent level of significance. Finally, we find the former communist countries to be very important for the results as we record no significant partial impact of aid on the income distribution, at the 5 percent level, when the 17 observations from these countries are excluded.

4. Results using a more general regression specification

Even though CB's conclusion regarding income redistribution and aid is in error the significant interaction term between aid and democracy is intriguing. Therefore, in this section, we look a little deeper into the partial effects of aid and democracy by generalizing the regression model (1) to allow for slightly more general partial effects of aid and

democracy on the income distribution. Specifically, we consider the regression model

$$q_{jit} = \sum_{k=0}^{G_a} \beta_{akj}(\ln(\text{aid}_{it}) \times \mathbf{I}_{[\text{democracy} \in D_k]}) + \sum_{l=1}^{G_d} \beta_{dlj}(\text{democracy}_{it} \times \mathbf{I}_{[\ln(\text{aid}) \in A_l]}) + X_{it}\gamma_j + \mu_{ji} + \varepsilon_{jit} \quad j = 1, \dots, 5. \quad (4)$$

where $\mathbf{I}_{[\text{democracy} \in D_k]}$ and $\mathbf{I}_{[\ln(\text{aid}) \in A_l]}$ are indicator functions used to categorize the democracy and aid variables while the control variables and the error component structure are the same as in regression (1).

The distribution of democracy shows a distinct spike as almost 30 percent of the observations have a democracy index of 0. When defining categories for democracy we therefore separate out these observations in one category and subsequently use five equal size intervals from 0 to 10:

$$D_0 = 0, \quad D_k = (2(k-1); 2k], \quad k = 1, \dots, 5. \quad (5)$$

For aid we use a slightly coarser definition by categorizing into four intervals:

$$A_1 = (-\infty, 1], \quad A_2 = (1, 2], \quad A_3 = (2, 3], \quad A_4 = (3, \infty). \quad (6)$$

Using these intervals for the indicators the parameters of (4) are estimated by the random effects estimator. The results are shown in Table 3.

The regressions in Table 3 support the result that the partial effect of aid is a significant redistribution away from the richest quintile towards the ‘middle class’ in weak democracies. We also find redistribution away from the richest quintile in autocracies although this result is only marginally significant at a 10 percent level. Interestingly, there is a significant negative partial effect of aid on the income share of the poorest quintile in relatively strong democracies. However, it is not possible say who gains from this as the impact on the other quintiles is insignificant. Hence, we cannot say that it benefits the elite. Finally, we find no support for the claim that democracy is detrimental to the income distribution when a country receives high aid flows. In general the partial effect of democracy is statistically insignificant for all levels of aid flows.

The bottom part of Table 3 reports tests of equality of the partial affects across the categories for democracy and aid, respectively. At conventional levels, we cannot reject the hypothesis of equal size effects of democracy across the four aid groupings. To gain efficiency, we utilize this result and estimate a more parsimonies model in which democracy is included as a standard linear regressor. The result of the simpler model is reported in Table 4. The results clearly confirm that the re-distributional results are associated with countries having weak democracies whereas aid induced redistribution in autocracies is less clear.

Table 3

Inequality, aid and democracy when the interaction between aid and democracy is categorized

Quintile	Q1	Q2	Q3	Q4	Q5
ln(aid)*I(democracy = 0)	0.221 (0.20)	0.343 (0.24)	0.452* (0.26)	0.442* (0.27)	-1.625* (0.86)
ln(aid)*I(0 <democracy<= 2)	0.433** (0.22)	0.601** (0.27)	0.649** (0.28)	0.372 (0.29)	-2.205** (0.94)
ln(aid)*I(2 <democracy<= 4)	-0.160 (0.25)	0.027 (0.31)	0.260 (0.32)	0.293 (0.33)	-0.443 (1.08)
ln(aid)*I(4 <democracy<= 6)	-0.494 (0.33)	-0.274 (0.40)	-0.231 (0.41)	-0.135 (0.42)	1.134 (1.38)
ln(aid)*I(6 <democracy<= 8)	-0.777** (0.39)	-0.427 (0.48)	-0.263 (0.49)	-0.032 (0.49)	1.538 (1.64)
ln(aid)*I(8 <democracy<= 10)	-0.868 (0.54)	-0.288 (0.66)	-0.094 (0.68)	0.322 (0.69)	1.311 (2.29)
Democracy*I(ln(aid)<= 1)	0.006 (0.05)	0.017 (0.06)	0.014 (0.06)	0.058 (0.07)	-0.104 (0.22)
Democracy*I(1 <ln(aid)<= 2)	0.153* (0.08)	0.141 (0.10)	0.132 (0.10)	0.073 (0.11)	-0.564 (0.35)
Democracy*(2 <ln(aid)<= 3)	0.149 (0.13)	0.075 (0.16)	0.054 (0.17)	0.001 (0.17)	-0.389 (0.55)
Democracy*(3 <ln(aid))	0.229 (0.19)	0.117 (0.24)	0.072 (0.24)	-0.054 (0.25)	-0.455 (0.82)
Consumption/Expenditure	1.200*** (0.25)	1.363*** (0.30)	1.226*** (0.31)	0.983*** (0.32)	-4.377*** (1.02)
Post communist country	3.627*** (0.63)	4.898*** (0.77)	5.138*** (0.82)	4.102*** (0.88)	-17.773*** (2.73)
Initial GDP pc (log)	-7.541*** (2.90)	-9.392*** (3.56)	-7.557** (3.80)	-2.936 (4.05)	33.874*** (12.47)
Initial GDP pc (log), squared	0.461** (0.19)	0.551** (0.23)	0.427* (0.25)	0.119 (0.26)	-1.999** (0.80)
Trade openness	-0.001 (0.00)	-0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.001 (0.01)
Government expenditure	-0.021 (0.01)	-0.024 (0.02)	-0.025 (0.02)	-0.015 (0.02)	0.091 (0.06)
Investment price	0.006** (0.00)	0.009*** (0.00)	0.010*** (0.00)	0.008*** (0.00)	-0.032*** (0.01)
Population growth	-25.237 (15.38)	-36.864* (18.84)	-28.362 (19.96)	-5.006 (20.90)	87.573 (65.92)
Rural population share	0.003 (0.01)	-0.018 (0.01)	-0.030** (0.01)	-0.043*** (0.02)	0.081* (0.05)
Observations	262	262	262	262	269
Equality of democracy effect	0.053	0.158	0.165	0.807	0.127
Equality of aid effect	0.008	0.071	0.136	0.472	0.078

Note: time dummies and regional dummies are included in all regressions. *** (**) [*] denotes significance at $p < .01$ ($p < .05$) [$p < .10$].

Table 4

Inequality, aid and democracy when the partial effect of aid is categorized by democracy

Quintile	Q1	Q2	Q3	Q4	Q5
ln(aid)*I(democracy = 0)	0.214 (0.20)	0.331 (0.24)	0.436* (0.26)	0.426 (0.27)	-1.552* (0.86)
ln(aid)*I(0 <democracy<= 2)	0.511** (0.21)	0.628** (0.26)	0.663** (0.27)	0.315 (0.28)	-2.298** (0.90)
ln(aid)*I(2 <democracy<= 4)	0.022 (0.21)	0.103 (0.26)	0.307 (0.27)	0.197 (0.28)	-0.753 (0.91)
ln(aid)*I(4 <democracy<= 6)	-0.135 (0.19)	-0.128 (0.23)	-0.140 (0.24)	-0.314 (0.25)	0.541 (0.82)
ln(aid)*I(6 <democracy<= 8)	-0.247 (0.22)	-0.139 (0.27)	-0.027 (0.28)	-0.188 (0.30)	0.402 (0.95)
ln(aid)*I(8 <democracy<= 10)	-0.129 (0.31)	0.109 (0.38)	0.239 (0.40)	0.138 (0.40)	-0.372 (1.33)
Democracy	-0.008 (0.05)	0.017 (0.06)	0.016 (0.06)	0.070 (0.06)	-0.097 (0.21)
Consumption/Expenditure	1.214*** (0.25)	1.375*** (0.31)	1.239*** (0.31)	0.981*** (0.32)	-4.354*** (1.02)
Post communist country	3.669*** (0.64)	4.947*** (0.77)	5.183*** (0.83)	4.089*** (0.89)	-17.843*** (2.75)
Initial GDP pc (log)	-7.349** (2.91)	-8.880** (3.55)	-7.023* (3.79)	-2.528 (4.04)	32.023*** (12.43)
Initial GDP pc (log), squared	0.447** (0.19)	0.518** (0.23)	0.393 (0.24)	0.094 (0.26)	-1.882** (0.80)
Trade openness	-0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	-0.000 (0.01)
Government expenditure	-0.021 (0.01)	-0.023 (0.02)	-0.025 (0.02)	-0.013 (0.02)	0.089 (0.06)
Investment price	0.006** (0.00)	0.009*** (0.00)	0.010*** (0.00)	0.008*** (0.00)	-0.033*** (0.01)
Population growth	-24.456 (15.51)	-36.842* (18.90)	-28.496 (19.98)	-4.845 (20.83)	83.293 (66.11)
Rural population share	0.001 (0.01)	-0.019 (0.01)	-0.031** (0.01)	-0.042*** (0.02)	0.085* (0.05)
Observations	262	262	262	262	269
Equality of aid effect	0.016	0.035	0.050	0.078	0.028

Note: time dummies and regional dummies are included in all regressions. *** (**) [*] denotes significance at $p < .01$ ($p < .05$) [$p < .10$].

Table 5

Robustness of the partial effect of aid to sample restrictions in the new regression specification.

Democracy	A. Excluding data quality below 4					B. GDP per capita less than USD 6000				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
0	0.32 (0.21)	0.35 (0.25)	0.51* (0.26)	0.45 (0.27)	-1.81** (0.88)	0.18 (0.22)	0.45 (0.27)	0.59** (0.29)	0.65** (0.30)	-1.89** (0.94)
(0;2]	0.64*** (0.21)	0.67*** (0.26)	0.77*** (0.27)	0.45 (0.28)	-2.68*** (0.90)	0.49** (0.23)	0.71*** (0.28)	0.78*** (0.29)	0.45 (0.30)	-2.47** (0.96)
(2;4]	0.14 (0.22)	0.15 (0.26)	0.42 (0.27)	0.30 (0.28)	-1.15 (0.91)	0.01 (0.23)	0.19 (0.28)	0.39 (0.29)	0.32 (0.30)	-0.88 (0.95)
(4;6]	0.04 (0.20)	-0.04 (0.24)	-0.07 (0.24)	-0.28 (0.25)	0.17 (0.83)	-0.18 (0.21)	-0.13 (0.26)	-0.18 (0.27)	-0.31 (0.28)	0.78 (0.89)
(6;8]	-0.06 (0.23)	-0.04 (0.28)	0.02 (0.29)	-0.24 (0.30)	0.09 (0.99)	-0.29 (0.25)	-0.17 (0.30)	-0.09 (0.32)	-0.21 (0.33)	0.64 (1.05)
(8;10]	0.03 (0.32)	0.17 (0.37)	0.32 (0.39)	0.26 (0.40)	-0.69 (1.33)	-0.18 (0.35)	0.05 (0.42)	0.11 (0.44)	0.05 (0.44)	0.03 (1.44)
	C. 1% < aid < 30%					D. Excluding post-communist countries				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
0	0.55* (0.29)	0.68* (0.36)	0.60 (0.38)	0.45 (0.40)	-1.83 (1.25)	0.06 (0.21)	0.19 (0.26)	0.39 (0.28)	0.48* (0.29)	-1.29 (0.93)
(0;2]	0.62** (0.28)	0.76** (0.35)	0.71* (0.38)	0.28 (0.40)	-2.06* (1.23)	0.43* (0.23)	0.53* (0.28)	0.63** (0.30)	0.35 (0.31)	-2.14** (1.00)
(2;4]	-0.02 (0.31)	0.06 (0.39)	0.23 (0.40)	0.07 (0.42)	-0.08 (1.31)	-0.06 (0.23)	0.03 (0.28)	0.33 (0.29)	0.26 (0.30)	-0.67 (0.98)
(4;6]	-0.21 (0.26)	-0.24 (0.33)	-0.24 (0.35)	-0.43 (0.37)	1.22 (1.14)	-0.26 (0.20)	-0.26 (0.25)	-0.23 (0.26)	-0.37 (0.27)	0.95 (0.89)
(6;8]	-0.59* (0.32)	-0.53 (0.40)	-0.26 (0.44)	-0.25 (0.47)	1.61 (1.43)	-0.32 (0.23)	-0.24 (0.28)	-0.10 (0.30)	-0.26 (0.31)	0.76 (1.01)
(8;10]	-0.63 (0.43)	-0.47 (0.54)	-0.18 (0.59)	-0.16 (0.62)	1.31 (1.92)	-0.23 (0.32)	0.03 (0.39)	0.19 (0.41)	0.12 (0.41)	-0.11 (1.38)

Note: the regression specification is identical to the regression in Table 4. *** (**) [*] denotes significance at $p < .01$, ($p < .05$), [$p < .10$].

We test the robustness of the new model formulation using the same sample restrictions as suggested in CB whereby the robustness results are comparable to the estimates in Table 2. Table 5 gives the estimated partial effects of aid when the model is estimated under the four sample restrictions. In general, the robustness results lend strong support to the full sample results as the redistribution results in weak democracies are significant in all four cases, and in Panels A and B the precision of the estimates is even better than for the full sample. Further, in contrast to the results in Table 2 the redistribution result is also significant when we exclude the post communist countries. Finally, when we exclude the extreme aid flows, we again find a marginally significant negative effect on the poorest quintile in relatively strong democracies, but we cannot say who benefits from this.

Overall, we conclude that aid has no statistically significant relationship with income redistribution in democratic developing countries. This is so using both the regression formulation in CB and our own more general formulation.

5. Conclusion

This paper illustrates the problems often encountered in interpreting regression models with non-constant partial effects of some regressors. Specifically, we show that the conclusions drawn in a recent paper by Bjørnskov (2009) do not follow from the regressions presented in the paper.

Bjørnskov argues that foreign aid is positively associated with elites' share of total income in democratic developing countries, but not particularly so in autocracies. This makes Bjørnskov conclude that donors are facing a moral dilemma, arguably because they must choose between democracy and income equality.

We show that the conclusion drawn from a set of regressions is questionable. There is no statistically significant association between the income distribution and foreign aid in democratic developing countries. Instead, Bjørnskov's model shows a statistically significant association between aid and the income distribution in non-democratic countries, and the association is negative in the sense that higher aid is associated with a lower income share for the richest quintile. The results are confirmed when we formulate a more general regression model, which allows the partial effect of aid on the income distribution to be a non-continuous function of democracy.

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