

Where Does Development Aid Go?

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Overseas aid and debt are at the heart of all discussions of the economies of Less Developed Countries. In this essay, Jasper Grosskurth uses econometric methods to examine what determines the level of aid granted to any particular country and also looks at some of the political motivations behind this contentious question.

The Arguments about Aid

In recent years the more industrialised countries (except the US) have restated the goal to bring the level of official development aid (ODA) to 0.7 per cent of their GNP. During the same time there has been much criticism about the distribution of ODA and the intentions behind it. This paper examines four important characteristics of recipients of development aid that might shed some light on the reasons why ODA is granted and what the intentions behind it are.

The official argument for granting ODA is to stimulate development and to eradicate poverty. It is argued that aid is invested for the immediate and future benefit of the recipients. Optimally, an upward economic spiral with rising levels of investment and income would result. Critics doubt these altruistic motives. They claim that aid is often given in order to facilitate loan repayments. This argument is supported by the fact that in 1994 alone less developed countries (LDCs) paid \$169 billion off their \$1,921 billion debt while receiving \$56.7 billion in aid. These streams of capital clearly do not allow any aid to be invested. Thus, ODA is argued to be an indirect subsidy to the lending agents and causes little relief for LDCs. Another critical argument in this discussion is that aid is (mis)used as a way to strengthen military alliances by allowing financially weak countries to buy military equipment.

Outlining the Model

The dependent variable of a model suitably designed to empirically test the significance of these arguments must be the amount of ODA received. Possible explanatory variables include GNP per capita and the Human Development Index (HDI) as measures of poverty and development. The levels of external debt and of military spending as shares of GNP seem fit to test the arguments of the critics of ODA. *A priori*, one would expect HDI and GNP to have a negative influence on the amount of ODA, as richer countries need less financial support. Critics of ODA as a means of poverty relief would expect a positive influence of the level of external debt and the amount of military expenditures. In order to keep the model convenient and within the bounds of this paper the proposed model uses cross-sectional data. This choice is justifiable under the assumption that none of the variables involved are subject to high volatility over a few years across a larger set of countries. Pooled data would produce marginal extra precision at the cost of higher complexity.

Data

The year 1994 was chosen as base year for the estimation as it is the most recent year for which comprehensive data is readily available. The dependent variable 'aid' is measured as the amount of ODA in US\$ given to a given country in 1994 as a share of its GNP in per cent. ODA consists of loans granted by the World Bank, the IMF and other official agencies from the OECD and OPEC countries. GNP per capita is measured in US\$. The HDI is an index compiled of several indicators of development including, among others, life expectancy, literacy and income. It takes a value between 0 and 1. The level of external debt as a share of GNP is measured as a ratio. It is calculated by dividing the amount of external debt per capita in US\$ by GNP per

capita as above. The level of military expenditure is measured as a share of GNP in per cent. It is likely to be underestimated for strategic and political reasons. The set of data includes seventy LDCs selected on the basis of data availability. All sources are generally acknowledged sources of international data. However, internationally aggregated data can not be better than the sum of national data sets.

The data may suffer from a selection bias as it could be argued that countries that receive development aid are often tied to report national data to international agencies. A higher dependency on aid would then result in a higher likelihood of inclusion in the study. The set of data obtained also suffers from multicollinearity. The exogenous variables 'hdi' and 'gnp' are highly correlated (Pearson correlation: 0.748). This is partly due to the fact that income is a component of the HDI. As a result of this the significance of the coefficients for 'hdi' and 'gnp' are likely to be underestimated.

Formulating the Model

The following model results from the considerations above:

$$\text{aid} = a + b_1 \text{ hdi} + b_2 \text{ gnp} + b_3 \text{ debt} + b_4 \text{ military} + u \quad (1)$$

where 'u' is the error-term.

The null hypothesis is:

$$b_1 = b_2 = b_3 = b_4 = 0 \quad (2)$$

The alternative hypothesis is that the null hypothesis is not true, and therefore the model has explanatory power.

Results

After a test-run, Sierra Leone was excluded from the sample. Its high level of aid received ('aid'=164.4% of GNP) strongly biased the regression. No satisfactory reason was found for the exceptionally high level of aid received. The exclusion of Sierra Leone significantly increased the explanatory power of the model, as captured by higher values of the 'R-squared' (adjusted) and 'F' statistics. The F-value more than doubled. No sign changes took place.

Table 1 summarises the adjusted regression output. The null hypothesis may be rejected at the 0.1% level (F= 22.41). The explanatory power of the model is moderate (adjusted R-squared= 55.7%). The coefficients of the variables 'hdi', 'debt' and 'military' exhibit the expected orientation.

Table 1. Summary of Main Regression Output		
Aid = 22.1 - 41.0 hdi + 0.00174 gnp + 4.58 debt + 1.24 military		
<u>Predictor</u>	<u>Coefficient</u>	<u>t-Ratio (p value)</u>
Constant	22.066	5.33 (0.000)
Hdi	-40.995	-5.42 (0.000)
Gnp	0.0017369	1.76 (0.084)

Debt	4.575	4.55 (0.000)	
Military	1.2408	2.13 (0.037)	
F = 22.41	R-sq. = 58.3%		R-sq. (adj.) = 55.7 F = 22.41

The intercept value of 22.1 suggests a high level of aid being granted. However, the negative coefficient of 'hdi' (-41.0) is relatively large. The debt coefficient of 4.5 has to be seen in relation to an average level of debt of 1.02 times GNP. This makes the impact of debt on the level of aid received rather small compared to the HDI. The average level of military expenditures (2.67) has on average even less influence, with a coefficient of 1.2.

Against prior expectations the coefficient for 'gnp' is positive. It is, however, very small (0.0017). Even the high average GNP of 1300.9 does not help GNP to overcome the status of the least influential variable with an average impact of 2.6 percentage points on aid. With a t-value of 1.76 (p=0.084) it is also the least significant variable. The variables 'hdi' and 'debt' are significant at the 0.1% level ($t_{\text{hdi}} = -5.42$; $t_{\text{debt}} = 4.55$). The variable 'military' is significant at the 5% level with a t-value of 2.13.

Applying White's general heteroskedasticity test, the null hypothesis of no heteroskedasticity may be rejected at the 0.05% level. This significantly exceeds the relevant critical value of 31.32 at p=0.005. The Spearman rank correlation test suggests heteroskedasticity in the variables 'hdi' (t-value of the Spearman rank test = -2.97), 'gnp' (-3.96) and 'debt' (4.59). Thus, the value for the standard deviation and consequently, the t-ratios and the significance levels of the respective variables are biased. The size and the direction of the bias depend mainly on the exact relationship between the true values of the observed variable and the true variance.

There are several potential causes of the heteroskedasticity. The low R2 of model (1) suggests that an important variable might be omitted. Possible omitted variables include variables capturing the political situation, the occurrence of natural disasters and the degree of dependency on foreign trade. Another potential cause is outliers that strongly bias the regression. Mozambique is a likely candidate. However, the exclusion of Mozambique from the sample would only marginally reduce the level of heteroskedasticity.

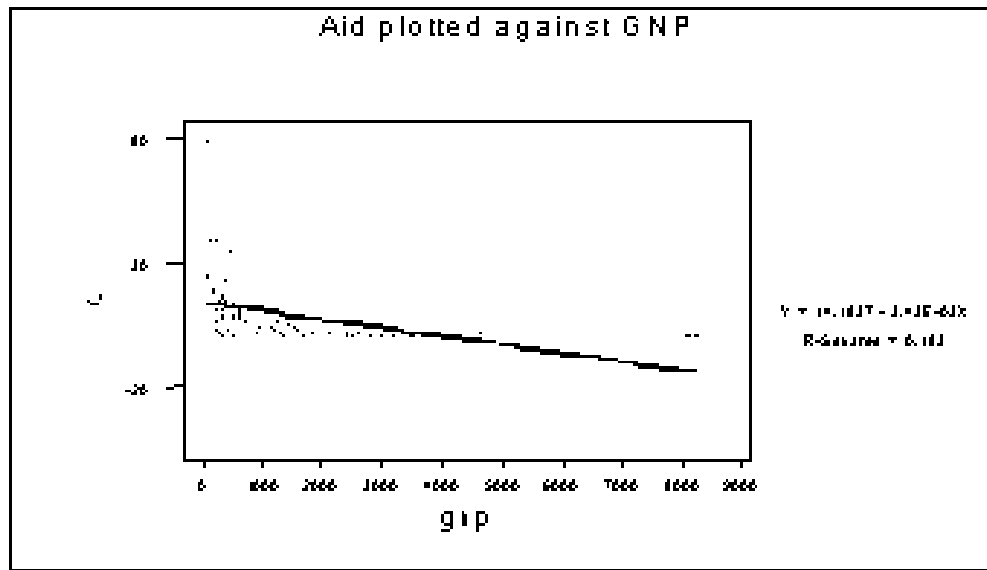
A closer look at the suspected relationship between the observed variable and its residual may help to transform the data in order to reduce the level of heteroskedasticity. This is, however, beyond the scope of this paper.

A Closer Look At The Explanatory Variables

In order to further examine the properties of the four explanatory variables each of them was individually used as regressor against 'aid'. The coefficient of 'hdi' has very high explanatory power (R2(adj)= 39.5%). The 'hdi'-model is very significant with an impressive F-value of 45.4%. Its coefficient slightly decreases, but it is still the single most useful variable to explain the amount of aid received.

The coefficient for 'gnp' changes its orientation and is now negative. This makes 'gnp' the most unreliable variable of the model. The R2(adj) of 17.1% is disappointing, even though the model and the coefficient are significant at the 1% level. A look at Figure 1 suggests that the influence of 'gnp' on 'aid' might be more significant below a threshold level of roughly \$1800 per capita. In order to check this, a Chow test was applied to test the alternative hypothesis that there is a structural change in the aid-GNP relationship at a level of \$1800.

Figure 1



The null hypothesis that there is no structural change may be rejected at the 1% level. The F-value of 9.87 is significantly larger than the critical value of 4.98. For the set of 16 rich countries 'gnp' is not significant at the 10% level ($p=0.158$). For the 53 countries with a GNP smaller than \$1800 the variable 'gnp' is significant at the 0.1% level. Its coefficient increases significantly to a value of -0.015. The rationale behind this characteristic might be that richer countries only get aid under exceptional circumstances. These might for example be political reasons (as in the case of South Korea) or the occurrence of natural disasters like earthquakes and hurricanes.

The regressor 'debt' is again highly significant while exhibiting an $R^2(\text{adj})$ of 28.0%. However, this variable should be interpreted with care. As ODA consists mostly of loans it would be logical to assume that the relationship is two-fold. A Hausmann specification test was applied to test the null hypothesis that there is no simultaneity problem concerning 'aid' and 'debt'. The null hypothesis may be rejected at the 0.1% significance level. The consequence of this is that the estimated parameters are biased and not consistent. A simultaneous equation method of estimation would be more appropriate to estimate the relationships at hand.

The amount of military expenditure does not have large explanatory power ($R^2(\text{adj})=5.3\%$). However, both the restricted model and the coefficient of the variable 'military' are significant at the 5% level. The low explanatory power might be due to the low number of strategically important LDCs. It would be interesting to check the parameters of this variable during the height of the cold war.

Directives for Political Decisions

In order to assess the political consequences, let us for the time being assume that the results of the main regression in table 1 are generally confirmed by further studies that overcome the errors and biases of this study. According to the evidence presented it seems likely that the amount of ODA increases with decreasing levels of development. This is in support of the argument that development aid is granted to less developed countries.

However, it is highly ironic that the main measure of monetary wealth (i.e. GNP) has relatively little explanatory power when it comes to the distribution of monetary transfer to LDCs. It seems that the donors of aid rely on the belief that loans provide solutions even if the problem is not one of too little wealth. Development seems not to be a matter of wealth alone. From the study above one would conclude that the role of GNP is generally overestimated. There should be more emphasis on how to efficiently

organize resources (including aid).

The level of external debt seems to be an important factor. After all, debt is the one problem that can definitely be solved with money. However, given the current crisis in Brazil it is not at all clear that loans can stimulate development in the long-run. The argument that a bankruptcy process for countries would be highly beneficial to development should receive more attention in this context. The altruistic argument for ODA may very well be questioned. It is in this light that ongoing campaigns for debt relief as a means to achieve long-term economic development should be viewed with some sympathy.

The influence of the amount of military spending is hard to establish as the data for this variable is not very reliable. It generally consists of outliers where large military expenditures coincide with large amounts of aid. Thus, it is hard to draw general conclusions concerning this factor. A deeper analysis of the properties of the outliers would probably shed some light on the issue.

Fields for Further Research

On the basis of the suggestive results of this study, more research is needed. The model will have to be extended to include likely omitted variables. It will then have to be formulated in a way that overcomes the simultaneous equation problem. At the same time the model should be extended to include pooled data in order to pick up the development of trends and lagged variables. Further research into the explanatory variables themselves is also necessary. In particular, the relationship between the level of aid and the external debt would have to be clearly formulated. A detailed study might also include an analysis of the budget allocations of aid recipients. It would be interesting to take a closer look at possible structural budgetary spending patterns. If the critical arguments empirically outweigh the arguments in support of ODA, the main focus of future research must be on how to help LDCs to embark on sustainable and long-term paths of economic growth.

Bibliography

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