Sovereign Credit Ratings and the Effect of Disaggregated Aid on Borrowing

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Abstract:

The fiscal response literature has not examined the access of developing countries to credit markets when examining the effect of aid on fiscal variables. This study employs a model of government financing decisions and examines the impact of credit ratings on the marginal effect of disaggregated foreign aid on sovereign borrowing. The results indicate that credit ratings do not have a significant effect. This supports the contention that conditionality is behind the effect of aid on borrowing.

Prior research has shown that foreign aid can affect the fiscal decisions of recipient governments because it is generally given directly to these governments. These fiscal effects are important. For example, if foreign aid only reduces the recipient country's borrowing without an increase in expenditure on development projects, this may not be in line with the donors' intentions. Previous research on the effects of foreign aid on the fiscal decisions of recipient countries has centered around two broad questions. The first is the fungibility of aid—whether aid funds are spent on their intended purpose (Feyzioglu et al. 1998). The second examines how aid affects broad government fiscal decisions such as revenue efforts, expenditures and borrowing (see for example Morrissey et al. 2003, Feeney and McGillivray 2003). This second subset of research is known as the fiscal response literature.

The standard fiscal response models do not take into account the access of these countries to credit markets. Since the use of such markets is necessary for borrowing, different levels of access to such markets may significantly affect the impact of aid on borrowing decisions of recipient governments. Credit ratings, which hold additional information besides standard macroeconomic fundamentals (Cantor and Packer 1996), estimate the risk of default and affect the terms of and accessibility to the credit market and are thus likely to change the marginal impact of aid on borrowing. To better understand this effect, this paper develops a simple model of government financing that incorporates interaction terms between disaggregated foreign aid and credit rating. The effect of credit ratings is then examined empirically.

Fiscal Response and Disaggregation

Both panel and country studies have been undertaken in the fiscal response literature. Country studies allow for a more detailed look at an individual country and allow for country specific factors to be taken into account while panel studies look at more general cross-national trends. The results summarized in Feeney and McGillivray (2003) were of both kinds. Fiscal response studies have not come to a consensus on the effects of foreign aid on borrowing. Feeney and McGillivray (2003) examine the results for the effect of aid on borrowing in 16 of these prior studies. Half of these found that aid increased borrowing, while the other half came to the opposite conclusion.

Most fiscal response models, based on Heller (1975), use a model where governments attempt to maximize utility by minimizing the difference between target and expected revenue, expenditures and borrowing. This general model depends on the government having target levels for each of these variables and a key difficulty with this approach is that these must be estimated since that data is not generally available. It has been shown that the results of these studies can be highly dependent on the methods used to estimate the target levels (Osei, et al. 2003).

Country studies have reached conflicting results as to how aid affects borrowing with some studies finding that aid is associated with higher levels of government borrowing while others find aid associated with lower levels of borrowing (See Feeney and McGillivray 2003 for an overview). One problem with time series country studies is that they presume the effect of aid on fiscal decisions remains constant over time, though this is probably not the case. For instance, Addison and Osei (2001) find that fiscal

decisions in Ghana have followed an electoral cycle; it is reasonable to think that the effects of aid on fiscal decision may also change.

There have been fewer panel studies. One recent paper, Feeney and McGillivray (2003), examined 79 countries from 1980 to 1997 and found aid to be associated with higher levels of government borrowing. The authors account for country-specific effects by including a dummy variable for each country. In contrast to Osei, et al. (2003), they also report their results are robust to alternate estimates of the variable targets.

Furthermore, aid is not homogenous and its effects may not be either. Mavrotas (2002) examines disaggregated aid to India and Kenya and found that disaggregation of aid into project aid, program aid and technical assistance did matter. A later theoretical paper by Mavrotas and Ouattara (2003) found that different forms of aid such as project aid, program aid, technical assistance, and food aid may have different effects on the fiscal policies of the recipient government because they may be valued differently, have different impacts given different conditions and operate in different ways with different lags. A panel study by Gupta et al. (2003) examining the effect of aid on revenue efforts disaggregated aid into loans and grants and found that the effects of the two had different signs: loan aid had a positive effect on government revenue while grant aid had a negative effect.

Model

This paper uses a simple model of government financing in order to examine the effect credit ratings have on the marginal effect of disaggregated grant and loan aid on borrowing. This model treats government expenditure as a function of the expenditure in

the prior year, the change in international credit rating, the change in loan in grant and

loan aid, interaction terms between the current credit rating and the change in loan and

grant aid. Government revenue is found with a similar function, using prior revenue in

place of prior expenditure. Government borrowing is a function of current expenditure,

revenue, and loan and grant aid. The equations are as follows:

(1) $EXP = \alpha_0 + \alpha_1 EXP_{-1} + \alpha_2 \Delta CR + \alpha_3 \Delta LAID + \alpha_4 \Delta GAID + \alpha_5 (CR*\Delta LAID) +$

 $\alpha_6 (CR*\Delta GAID) + \varepsilon_{EXP}$

(2) $REV = \beta_0 + \beta_1 REV_{-1} + \beta_2 \Delta CR + \beta_3 \Delta LAID + \beta_4 \Delta GAID + \beta_5 (CR*\Delta LAID) +$

 $\beta_6 (CR*\Delta GAID) + \varepsilon_{REV}$

(3) $BOR = \gamma_0 + \gamma_1 EXP + \gamma_2 REV + \gamma_3 \Delta LAID + \gamma_4 \Delta GAID + \gamma_5 LAID_{-1} + \gamma_6 GAID_{-1} + \varepsilon_{BOR}$

where EXP is government expenditure, REV is government revenue, BOR is government

borrowing less aid in the form of loans, ΔCR is change in credit rating, LAID is loan aid,

and GAID is grant aid. All changes (Δ) are from the prior year, and a -1 subscript

indicates the value from the prior year.

Present year government expenditures, revenues and borrowing are endogenous

variables in this system and all other variables are exogenous. By placing equations (1)

and (2) into (3), government borrowing is obtained in terms of exogenous variables:

(4) $BOR = \gamma_0 + \gamma_1[\alpha_0 + \alpha_1 EXP_{-1} + \alpha_2 \Delta CR + \alpha_3 \Delta LAID + \alpha_4 \Delta GAID + \alpha_5(CR*\Delta LAID) +$

   $\alpha_6(CR*\Delta GAID)] + \gamma_2[\beta_0 + \beta_1 REV_{-1} + \beta_2 \Delta CR + \beta_3 \Delta LAID + \beta_4 \Delta GAID +$

   $\beta_5(CR*\Delta LAID) + \beta_6(CR*\Delta GAID)] + \gamma_3 \Delta LAID + \gamma_4 \Delta GAID + \gamma_5 LAID_{-1} +$

   $\gamma_6 GAID_{-1} + \varepsilon$

Thus, the marginal effects of an increase in grant and loan aid on borrowing are:

(5) $\delta BOR/\delta \Delta LAID = \gamma_1\alpha_3 + \gamma_1\alpha_5 CR + \gamma_2\beta_3 + \gamma_2\beta_5 CR + \gamma_3$

(6) $\delta BOR/\delta \Delta GAID = \gamma_1\alpha_4 + \gamma_1\alpha_6 CR + \gamma_2\beta_4 + \gamma_2\beta_6 CR + \gamma_4$

which can be rewritten as

(7) $\delta BOR/\delta \Delta LAID = \gamma_1\alpha_3 + \gamma_2\beta_3 + \gamma_3 + (\gamma_1\alpha_5 + \gamma_2\beta_5)CR$

(8) $\delta BOR/\delta \Delta GAID = \gamma_1\alpha_4 + \gamma_2\beta_4 + \gamma_4 + (\gamma_1\alpha_6 + \gamma_2\beta_6)CR$

$(\gamma_1\alpha_5 + \gamma_2\beta_5)$ and $(\gamma_1\alpha_6 + \gamma_2\beta_6)$ thus show the effect that credit rating has on the marginal effect of changes in loan and grant aid on borrowing.

As the credit rating of a country increases, borrowing should become less expensive. Thus all else equal, if the effect of aid on borrowing is related to the cost of borrowing, higher credit ratings should lead to a more positive marginal impact of loan and grant aid on borrowing and $(\gamma_1\alpha_5 + \gamma_2\beta_5)$ and $(\gamma_1\alpha_6 + \gamma_2\beta_6)$ should be positive. Furthermore, γ_1 should be positive as higher levels of expenditure should lead to more

borrowing, and γ_2 should be negative as higher revenue levels should lead to less borrowing, all else equal.

The expected signs of α_3, α_4, β_3, β_4, γ_3, and γ_4 are less clear. McGillivray and Morrissey (2000) give several plausible reasons why increased aid could lead to either increased or decreased government borrowing. Increased government borrowing could be the result if the aid was conditional on matching spending. Another possibility is that countries may believe that they will be receiving more aid than they actually do, change their fiscal decisions accordingly, then are required to borrow to make up the difference. Furthermore, creditors may feel that the aid flows will make the recipient country more able to repay its debts and thus will be willing to loan them more (reflected through an increased credit rating). However, evidence suggests that credit ratings are persistent (Harms and Rauber 2004) so this is less likely in the short term examined by this paper. Borrowing could decrease if aid was conditional on reducing borrowing or debt level or if the aid funds were used as a substitute for loans. Note that if conditionality is behind a fall in borrowing as a result of aid, then this would not be affected by the credit rating of the country.

Data and Results

Assuming that ε_{EXP}, ε_{REV}, and ε_{BOR} are not correlated, then Equations 1-3 describe a recursive system and OLS regression can be used to find the values of the coefficients. This paper uses data on a series of 29 developing and transitional countries from 2002 and 2003. Because the model of government financing requires information on the

previous year, the only year examined is 2003. The list of countries examined is found in the Appendix.

Credit ratings are from *Institutional Investor*, which publishes international credit ratings twice a year and are on a scale of 1 to 100 where a higher rating indicates less risk of default. Following Harms and Rauber (2004), the mean of the two credit ratings given in a year is taken to create an annual credit rating. Information on country expenditures, revenue and foreign and domestic borrowing are from the International Financial Statistics database. Quantity of loan and grant aid are from the OECD's International Development Statistics database.

The amount given for the sum of domestic and international borrowing in the IFS is not equal to expenditure less total aid and revenue. An alternate value of borrowing is found by finding this residual under the assumption that borrowing must be used to fund government expenditures not paid for through revenues and foreign aid. OLS regressions will be performed on both measures of borrowing. In both regressions, the amount of borrowing used does not include aid in the form of loans. To correct for heteroscedasticity resulting from differing country size, the Hubert/White/Sandwich estimator of variance is used.

Only countries with complete data for all variables were used. This limits the sample size and excluded countries may share important characteristics. This is important, given the results of Easterly et al. (2003) and Jensen and Paldam (2003), who found many of the results in the aid/growth literature are dependent on the sample used and results can break down when the sample is expanded.

The results for the regressions on expenditure and revenue are as follows:

Table 1: Regression of Expenditure (Equation 1)

Independent Variable	Coefficient Estimate	t-statistic
Expenditure$_{-1}$	1.037111	29.13
ΔCredit Rating	7.12E+08	3.1
Δ Loan Aid	-3.521065	-1
Δ Grant Aid	5.218159	0.42
Δ Loan Aid*Credit Rating	0.1255025	0.95
Δ Grant Aid*Credit Rating	-0.2178605	-0.4
Constant	2.26E+08	0.61
R-squared	0.9945	

Table 2: Regression of Revenue (Equation 2)

Independent Variable	Coefficient Estimate.	t-statistic
Revenue$_{-1}$	1.108306	43.2
ΔCredit Rating	4.95E+08	3.19
Δ Loan Aid	-1.979564	-0.74
Δ Grant Aid	-0.249291	-0.03
Δ Loan Aid*Credit Rating	0.0127275	0.03
Δ Grant Aid*Credit Rating	0.0680444	0.66
Constant	8.72E+07	0.34
R-squared	0.9972	

The high R-squared values are due almost entirely to the presence of the lagged variable. When the regressions were run without the lagged variables, the R-squared values for the two equations were 0.0969 and 0.0599 respectively. Furthermore, coefficients for many variables, including all variables dealing with aid, are statistically insignificant at any reasonable level. This gives no evidence that credit ratings affect the marginal impact of disaggregated aid on expenditures or revenue.

When the regression is run on borrowing when borrowing data is found using the IFS data, the results are as follows:

Table 3: Regression of Borrowing Using IFS Data (Equation 3)

Independent Variable	Coefficient Estimate.	t-statistic
Expenditure	1.175938	27.31
Revenue	-1.185384	-28.51
Δ Loan Aid	-1.074735	-13.05
Δ Grant Aid	-0.7693987	-2.17
Loan Aid$_{-1}$	-1.05E+00	-3.67
Grant Aid$_{-1}$	-0.3772587	-1.43
Constant	-9.91E+07	-1.08
R-squared	0.9860	

When the regression is run on borrowing using the residual value as the amount borrowed, because by definition borrowing is exactly determined by the explanatory variables, the coefficient of expenditure is 1 and the coefficients of all other independent variables are -1. This is expected because under this definition of borrowing, Equation 3 is an identity. For both definitions of borrowing, coefficients between the two ways of obtaining borrowing data have the same signs and are largely very similar.

These estimated coefficients are used to find $(\gamma_1\alpha_5 + \gamma_2\beta_5)$ and $(\gamma_1\alpha_6 + \gamma_2\beta_6)$, the effect that credit rating has on the marginal effect of changes of loan and grant aid on borrowing respectively. Depending on the value of borrowing used in the regressions, $(\gamma_1\alpha_5 + \gamma_2\beta_5)$ is 0.1325 or 0.1128 (the former using IFS data for borrowing and the latter using the residual). Similarly, the two values for $(\gamma_1\alpha_6 + \gamma_2\beta_6)$ are -0.4617 and -0.2858. Theoretically these values are predicted to be positive, however the empirical results do not offer support either for or against this hypothesis due to the insignificance of the α and β coefficients.

Discussion

This paper found that credit ratings had no significant impact on the effect of disaggregated aid on expenditures and revenues, and thus on borrowing in the short term. This result supports the contention that the effect of aid on fiscal variables is due at least in part to the conditionality of the loans instead of other reasons such as spending in excess of actual loans granted or aid being a substitute for borrowing. If conditionality is in fact the reason behind the effect of aid on fiscal variables, credit ratings should not have an effect on that impact. Possible avenues of future research include using country studies to examine this issue taking country specific factors into account, focusing on a single fiscal response variable or looking at the effect of credit ratings over a longer time period.

Appendix

Table 4: List of Countries

Bahamas	Guatemala	Nepal
Barbados	Haiti	Nicaragua
Bolivia	Hungary	Pakistan
Botswana	Kahzahkstan	Philippines
Bulgaria	Kenya	Russia
Burundi	Lesotho	Slovenia
Columbia	Mali	Swazililand
Czech Republic	Mauritus	Thailand
Ecuador	Mexico	Uganda
Georgia	Morocco	

References

Addison T and R. Osei (2001), "Taxation and Fiscal Reform in Ghana," Discussion Paper No. 2001/97, United Nations University, World Institute for Development Economics Research.

Cantor, R. and F. Packer, (1996), "Determinants and Impact of Sovereign Credit Ratings", FRBNY Economic Policy Review, 2, 37-54.

Easterly W., R. Levine and D. Roodman (2003), "New Data, New Doubts: A comment of Burnside and Dollar's 'Aid, Policies and Growth' (2000)", NBER Working Paper No. 9846, National Bureau of Economic Research.

Feeny, S. and M. McGillivray (2003), "Aid and Public Sector Borrowing in Developing Countries", Journal of International Development, 15, 989-998.

Feyzioglu, T., V. Swaroop and M. Zhu (1998), 'A Panel Data Analysis of the Fungibility of Foreign Aid', World Bank Economic Review, 12, 29-58.

Jensen, P. and M. Paldam (2003), "Can the new aid-growth models be replicated?," Working Paper No. 2003-17, Department of Economics, University of Aarhus.

Gupta, S., B. Clements, A. Pivovarsky and E. Tiongson (2003), "Foreign Aid and Revenue Response: Does the Composition of Aid Matter?," IMF Working Paper 03/176.

Harms, P. and M. Rauber (2004), "Foreign Aid and developing countries' creditworthiness," Working paper 04.05, Study Center Gerzensee.

Heller, P (1975), "A model of public fiscal behavior in developing countries: aid investment and taxation," American Economic Review, 65, 429-445.

Mavrotas, G. (2002), "Foreign Aid and Fiscal Response: Does Aid Disaggregation Matter?," Weltwirtschaftliches Archiv (Review of World Economics), Vol.138, 534-559.

Mavrotas, G. and B. Ouattara (2003), "The Composition of Aid and the Fiscal Sector in an Aid-Recipient Economy: A Model", Discussion Paper No. 2003/11, World Institute for Development Economics Research.

McGillivray, M. (2002), "Aid, Economic Reform and Public Sector Fiscal Behaviour in Developing Countries", CREDIT research paper No. 02/11, Centre for Research in Economic Development and International Trade, University of Nottingham.

 McGillivray, M. and O. Morrisey (2001), "A Review of Evidence on the Effects of Fiscal Aid", CREDIT research paper No. 01/13, Centre for Research in Economic Development and International Trade, University of Nottingham.

McGillivray, M. and B. Ouattara, (2003), "Aid, Debt Burden and Government Fiscal Behaviour", Discussion Paper No. 2003/33, World Institute for Development Economics Research.

Osei, R., O. Morrissey, T. Lloyd (2003), "Modelling the Fiscal Effects of Aid: An Impulse Response Analysis for Ghana," CREDIT research paper No. 03/10, Centre for Research in Economic Development and International Trade, University of Nottingham.