Biases in the distribution of bilateral aid: a regional decomposition analysis

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Abstract
This paper investigates income and population biases in the distribution of aid and decomposes recipients by geographic region. Previous analyses aggregate recipients and assume biases have an equal impact. Results demonstrate that while a bias towards middle-income and medium-sized countries persists in the full-sample, the extent of such biases differ significantly by region.

Keywords: aid biases, fixed effects, panel model, regional decomposition.
JEL Classification: C23, F35, O50.

I. Introduction

The literature highlights two key biases in the aid allocation process: country-size biases and middle-income biases. A country-size bias usually occurs when aid and population exhibit an inverse relationship (i.e., small-country bias). A middle-income bias occurs when aid rises with the per capita income of a country and then declines after income reaches a point. One reason such biases persist is that donors prefer to allocate limited aid to where it can have the biggest impacts. Aid can be distributed more generously in small countries and middle-income countries have more established institutions, both of which enables more effective and efficient use of aid. Aid biases were acknowledged early in OECD (1969), Henderson (1971), and Isenman (1976). Although several studies since examine population and income biases, the evidence remains mixed (Dowling and Hiemenz 1985; Wall 1995; Gounder and Doessel 1994; Arvin and Drewes 1998, 2001). Some studies find large-country biases while the presence of middle-income biases is mostly inconclusive.

This paper assesses how recipient wealth and size affects the volume of incoming aid based on a decomposition of recipients by geographic region using a fixed-effects panel estimator. While there is a rich literature on aid biases, and aid allocation in general, most studies aggregate recipients and so assume biases have an equal impact. Since there is substantial variation in aid between geographic regions, aggregating aid flows clouds the inter-regional differences in aid, which distorts the analysis. For example, the Middle East tends to receive disproportionately high levels of aid regardless of income or population due to their political importance. Likewise, small island countries in the south Pacific (i.e., Oceania) receive very small amounts of total aid but have extremely high per capita aid levels due to their small size.

This paper utilizes a more comprehensive dataset that allows for the analysis to be undertaken over more countries, regions, and years. In addition, a panel estimator is used to control for recipient effects and estimation biases. Decomposing aid reveals substantial heterogeneity regarding the influence of income and population between geographic regions. In particular, the extent of income and population biases appears stronger in some regions than others. This finding raises concerns regarding the efficacy of the aid regime, which ideally would favour countries with the highest level of poverty and the greatest human need.

II. Data, Model, and Results

Data on bilateral aid for each recipient country are from the International Development Statistics given by the Organisation of Economic Co-Operation and Development (OECD). Aid is the total amount of grants from the 24 countries in the Development Assistance Committee distributed among 157 developing countries and territories between 1970-2007. Data on gross domestic product is taken from UNSTAT and population data is taken from the *Penn World Table* (Heston et al. 2002). Monetary figures are in constant 2007 US dollars. Aid and population are defined in thousands. To discern regional differences in aid biases, the data are decomposed into eight geographic regions defined by the OECD: North Saharan Africa (NSA), Sub-Saharan Africa (SSA), North and Central America (NCA), South America (SAM), Far East Asia (FEA), South Central Asia (SCA), the Middle East (MDE), and Oceania (OCN).

A two-way fixed-effects panel regression estimator is used:

$$\ln(AID)_{it} = \alpha + \beta_1 \ln(GDP_{it}) + \beta_2 \left[\ln(GDP_{it})\right]^2 + \beta_3 \ln(POP_{it}) + \beta_4 \left[\ln(POP_{it})\right]^2 + \beta_5 \ln(POP_{it}) \times \ln(PCGDP_{it}) + \lambda_i + \rho_t + \varepsilon_{it}$$

where $i = 1,\ldots,n$ indicates the number of countries and $t = 1,\ldots,T$ indicates the number of years. The three-part error structure contains group fixed-effects (λ_i), time fixed-effects (ρ_t), and a normally distributed idiosyncratic error term (ε_{it}). Group or country fixed effects controls for permanent differences between countries (i.e., differences across groups that are constant over time) while time fixed effects control for impacts common to all countries but that vary through time (i.e., differences over time that are common to all groups). The dependent variable, AID, is total aid grants to country i in year t. The two key independent variables are per capita gross domestic product (GDP) and population (POP). The quadratic terms, GDP^2 and POP^2, allow for nonlinear relationships with aid. An interaction term between GDP and POP is also included. Estimation involves transforming the data by subtracting the average over time (time-demeaning) and country (group-demeaning) for each observation. Since the natural log is used, to account for zero-level observations the data are monotonically transformed by adding one. If $\beta_1 < 0, \beta_2 > 0$ then a middle-income bias is present. If $\beta_3 < 0$ then there is a small-country bias. Results in Table 1 present estimates obtained for the full-sample and for eight geographic regions. A Chow test yields an F-statistic of 624.59 indicating the null hypothesis of equality of coefficients between regions can be rejected at any level of significance.

For the full-sample, the coefficient on GDP is positive and significant while the coefficient on GDP^2 is negative and significant. This suggests aid is increasing in income but at a decreasing rate, which indicates an aggregate middle-income bias. When decomposing by region, results show a middle-income bias is present in only some of the regions including North and Central America, Far East Asia, the Middle East, and Oceania. The magnitude of the coefficients on GDP and GDP^2 is also much larger than the full-sample, suggesting that the middle-income bias is much stronger in these regions. For South America, however, the coefficient on GDP is positive and significant while GDP^2 is insignificant. Thus, if there is an income bias for South American aid it is not explained as a middle-income bias but rather as a high-income bias. Only the coefficient on GDP^2 is significant (and negative) for South Central Asia which may suggest that aid falls with income only once countries achieve a certain benchmark income level. The coefficients on GDP and GDP^2 are not significant for

North Saharan Africa and Sub-Saharan Africa implying there is insufficient evidence regarding the persistence of income biases for these region.

The coefficient on POP for the full-sample is positive and significant, while the coefficient on POP^2 is negative and significant. Rather than a small-country bias, this suggests more populated countries receive more aid but this effect drops off as countries increase in size. That is, aggregate results reflect a bias towards medium-sized countries. Again, however, disaggregating demonstrates how the population bias differs between regions, both in terms of magnitude and direction. Coefficients on POP and POP^2 for South Central Asia, the Middle East, and Oceania share the same sign as the full-sample, implying a medium-country bias. The magnitude of the coefficients for these regions, however, suggests the population bias is much stronger. This effect becomes mixed though when looking at results from other regions. The coefficient is positive and significant on both POP and POP^2 for North and Central America, so aid is strictly increasing in population here (i.e., large-country bias). The coefficient on POP for Far East Asia is negative and significant, which suggests smaller countries in this region actually receive more aid (i.e., small-country bias). The coefficient on POP is insignificant for North Saharan Africa, Sub-Saharan Africa, and South America, although the coefficient on POP^2 is positive and significant in each region. This may imply aid increases with population only once country-size passes a threshold.

The coefficient on the interaction term for the full-sample is negative, implying the marginal effect of income on aid decreases for bigger countries (i.e., richer countries with fewer people receive more aid). This finding is troubling since the most impoverished nations have low incomes and large populations (e.g., Bangladesh, Indonesia, and Nigeria). The interaction coefficient is also negative and significant for most regions but is especially large for the Middle East and Oceania, where the "small rich country" bias is particularly prominent. Conversely, the interaction coefficient is positive and significant for both Sub-

Saharan Africa and South Central Asia, which suggests that poorer and more populated countries receive more aid than richer and less populated countries.

III. Conclusions

Specific biases in the distribution of aid are uncovered and decomposed by region to reveal geographic differences. Results can be placed in the context of the recipient-need and donor-interest models of aid. The recipient-need model suggests if aid is distributed based on need then aid should be negatively associated with income (indicating poorer countries receive more aid) and positively associated with population (indicating countries with more people have greater need and receive more aid). The donor-interest model suggests a positive association between aid and income may be observed, since a better infrastructure suggests the recipient may be a more efficient and effective user of aid. The donor-interest model also implies a positive coefficient on population may be observed since bigger countries may indicate greater political importance and will receive more aid for political reasons.

Results find a bias towards middle-income and medium-sized countries in the full sample. This finding may support either hypothesis of the recipient-need model (aid is given to more populous countries because they have greater need) or the donor-interest model (aid is given to more populous countries because they tend to have more established institutions and are better users of aid). Decomposing aid by geographic region reveals, however, substantial heterogeneity regarding the influence of income and population on aid. While aid is allocated to the more populous middle-sized countries in the full sample, this result does not hold in every region. In some regions, the recipient-need model better represents the distribution of aid, while other regions are better represented by the donor-interest model. Clearly, the balance of human need versus political priority in the distribution of aid depends on the region in question. This finding raises concerns regarding the efficacy of the foreign aid regime.

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Table 1. Regression results by geographic region[a]

	Full	NSA	SSA	NCA	SAM	FEA	SCA	MDE	OCN
ln(GDP)	7.762*	24.734	-1.047	23.103*	7.056*	25.886*	-1.895	56.640*	29.841*
	(0.610)	(15.444)	(1.820)	(2.578)	(1.961)	(2.867)	(2.023)	(3.435)	(4.590)
$[\ln(GDP)]^2$	-0.414*	-0.647	-0.133	-0.770*	0.141	-1.534*	-0.409*	-2.019*	-1.395*
	(0.030)	(0.507)	(0.085)	(0.134)	(0.148)	(0.118)	(0.059)	(0.135)	(0.253)
ln(POP)	1.286**	1.173	-6.024	7.258*	-1.089	-19.538*	11.188*	32.761*	34.787*
	(0.540)	(11.097)	(1.454)	(1.068)	(1.092)	(3.020)	(1.986)	(3.658)	(3.353)
$[\ln(POP)]^2$	-0.088*	0.750*	0.009*	0.567*	0.573*	0.261	-1.010*	-0.381**	-1.702*
	(0.028)	(0.277)	(0.051)	(0.066)	(0.081)	(0.178)	(0.140)	(0.140)	(0.167)
ln(GDP) *ln(POP)	-0.391*	-1.319	0.409*	-1.368*	-1.068*	-0.501*	0.361**	-2.737*	-2.388*
	(0.036)	(0.879)	(0.111)	(0.109)	(0.148)	(0.137)	(0.168)	(0.204)	(0.307)
F-Statistic	88.286	16.177	11.945	48.228	16.588	53.191	157.78	66.378	38.249
Residual SS	32661	239	5490	3234	98	3139	1911	2826	4200
R^2	0.92	0.63	0.96	0.79	0.83	0.62	0.42	0.58	0.72
Number of countries	151	5	48	27	12	13	17	14	15
Total observations	5738	190	1824	1026	456	494	646	532	570

[a] Standard errors are in parentheses.
[*] Significant at 1% level.
[**] Significant at 5% level.
[***] Significant at 10% level.