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An Index of Donor Performance

By David Roodman

Abstract

The Commitment to Development Index of the Center for Global Development rates 21 rich countries on the "development-friendliness" of their policies. It is revised and updated annually. The component on foreign assistance combines quantitative and qualitative measures of official aid, and of fiscal policies that support private charitable giving. The quantitative measure uses a net transfers concept, as distinct from the net flows concept in the net Official Development Assistance measure of the Development Assistance Committee. The qualitative factors are: a penalty for tying aid; a discounting system that favors aid to poorer, better-governed recipients; and a penalty for "project proliferation." The charitable giving measure is based on an estimate of the share of observed private giving to developing countries that is attributable to a) lower overall taxes or b) specific tax incentives for giving. Despite the adjustments, overall results are dominated by differences in quantity of official aid given. This is because while there is a seven-fold range in net concessional transfers/GDP among the scored countries, variation in overall aid quality across donors appears far lower, and private giving is generally small. Denmark, the Netherlands, Norway, and Sweden score highest while the largest donors in absolute terms, the United States and Japan, rank at or near the bottom. Standings by the 2006 methodology have been relatively stable since 1995.

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An Index of Donor Performance

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Rich nations are often compared on how much they share their wealth with poorer countries. The Nordics and the Netherlands, it is noted, are the most generous with foreign assistance, while the United States gives among the least aid per unit of gross domestic product. Two major international consensus documents issued in 2002, the reports of the International Conference on Financing for Development, in Monterrey, Mexico, and the World Summit on Sustainable Development, in Johannesburg, call on donors to move toward giving at least 0.7 percent of their national income in aid, as few now do. (UN 2002a, p. 9; UN 2002b, p. 52)

The measure of aid implicitly or explicitly referenced in all these comparisons and benchmarks is "net overseas development assistance" (net ODA), which is a measure of aid quantity defined by the donor-funded Development Assistance Committee (DAC) in Paris. DAC counts total grants and concessional (low-interest) development loans given to developing countries, and subtracts principle repayments received on such loans (thus the "net").[2]

Yet it is widely recognized that some dollars and euros of foreign aid do more good than others. While some aid has funded vaccinations whose effectiveness can be measured in pennies per life saved, other aid has handsomely paid donor-country consultants to write policy reports that collect dust on shelves, or merely helped recipients make interest payments on old aid loans. As a result, a simple quantity metric is hardly the last word on donor performance.

[1] The author thanks Mark McGillivray, Simon Scott, and Paul Isenman for helpful comments on earlier drafts, Jean-Louis Grolleau for assistance with the data, and Alicia Bannon and Scott Standley for their contributions to the charitable giving section of this paper.

[2] DAC considers a loan concessional if it has a grant element of at least 25 percent of the loan value, using a 10 percent discount rate.

This paper describes an index of donor performance that takes the standard quantity measure as a starting point. It is motivated by the desire to incorporate determinants of aid impact other quantity into the Commitment to Development Index (CDI) (Roodman 2006c; CGD and *FP* 2006). The aid index was introduced in 2003 has been revised annually.[3] At its heart, it is an attempt to quantify aspects of aid quality. But it also departs from net ODA in its definition of aid quantity, and in factoring in tax policies that support private giving.

Because this aid measure is designed to draw entirely from available statistics, primarily the extensive DAC databases, many important aspects of aid quality are not reflected in the index—factors such as the realism of project designs and the effectiveness of structural adjustment conditionality. Moreover, most variation in aid quality may occur *within* donor's aid portfolios rather than across donors. As a result, while there is a nearly sevenfold range in net aid transfers/GDP among the 21 rich countries scored here, the calculations in this paper reveal nothing like that sort of variation in aid quality across donors. Moreover, including private giving does not change this picture because it appears to be much smaller than official giving in most countries. Thus the sheer quantity of official aid is still the dominant determinant of donors' scores on this index.

Still, the measure does highlight some interesting differences among donors, and does somewhat rearrange the usual standings. Japan is especially hurt by the netting out of its large amounts of interest received. Donors such as Australia and Italy are pulled low by the apparent tendency to spread their small aid budgets thinly, over many projects.

In the last three decades or so, researchers have taken three broad approaches to cross-country quantitative assessment of aid quality. Since at least the early 1970s, econometric studies have been done of the determinants of donors' aid allocations, factors such as recipient's poverty rate and level of oil exports (citations are below). Though often not evaluative in character, the approach offers a way to measure one aspect of aid quality, selectivity, by looking at how responsive aid allocation is to recipient need and development potential. How best to integrate such results with aid quantity into a single performance index is less obvious, however. Attempts to create a single index began with Mark McGillivray (1989, 1994), who essentially computed the weighted sum to each donor's aid disbursements to all recipients, basing weights on recipient

[3] Major changes since 2004 are: purging cancellation of old non-aid loans from gross aid; a new approach to penalizing "project proliferation"; some simplifications in the selectivity weighting; and refinements to the computation of tax policy–induced private giving.

GDP/capita as an indicator of need. The third approach is the newest and most sophisticated. Drawing on the literature on determinants of aid allocation, McGillivray, Leavy, and White (2002), formally model allocation, giving donors utility functions that depend on the commercial and geopolitical value of recipients, as well as on developmental need and potential. They then compute optimal allocations and penalize donors to the extent they deviate from optima.

The donor performance measure described here is closest in spirit to McGillivray's original, but more ambitious than all previous approaches in the scope of information that it combines into single index. It factors quality of recipient governance as well as poverty into the selectivity scoring system, penalizes tying of aid, handles reverse flows (debt service) in a consistent way, penalizes project proliferation (overloading recipient governments with the administrative burden of many small aid projects), and rewards tax policies that encourage private charitable giving to developing countries.

This paper details the calculations and illustrates them with 2004 data, which are the latest available and the basis for the 2006 index. The first six sections describe the computations involved in rating official aid programs: their final output is "quality-adjusted aid quantity" in dollars, or simply "quality-adjusted aid." They treat multilateral and bilateral donors in parallel, so that the World Bank's main concessional aid program, for instance, can be compared for selectivity to Denmark's aid program. The penultimate section describes how the quality-adjusted aid of multilaterals is allocated back to the bilaterals that fund them, in order to give national governments scores on official aid that reflect both their bilateral aid programs and their contributions to multilaterals. The last section describes how the aid index factors in tax policies that favor private charitable giving.

1. The first step: gross aid transfers

The starting point for the calculation of quality-adjusted official aid is gross disbursements of ODA and Official Aid (OA), disaggregated by donor *and* recipient. In DAC terminology, OA is concessional aid meeting the ODA definition, except that while ODA goes to countries conventionally thought of as developing, OA goes to "Part II" countries—most European states that emerged out of the Soviet bloc and richer non-DAC members such as Israel and Singapore. DAC excludes OA from its most frequently cited statistics, perhaps out of concern that assistance to such rich countries stretches the meaning of "aid." I include OA because some Part II countries,

such as Ukraine, are poorer than many Part I countries.[4] And since the selectivity adjustment detailed below heavily discounts aid to the richest developing countries, there is less risk that counting OA will misrepresent aid flows. For simplicity of exposition, I refer henceforth to both ODA and OA as ODA.

DAC reports both commitments and disbursements of ODA, but its press releases normally focus on disbursement. Similarly, I use disbursements. Dudley and Montmarquette (1976) argue that commitments better indicate donor policies, on the idea that recipient absorptive capacity limits largely explain any shortfalls in disbursements. But commitment-disbursement divergences could reflect bottlenecks or unrealism on either side of the donor-recipient relationship. Large and persistent gaps between commitments and disbursements may reflect a tendency of certain donors to promise more than they can realistically deliver, or a failure to learn from history that certain recipients cannot absorb aid as fast as donors hope. On balance, it seems best to stick with disbursements and avoid the risk of rewarding donors for overpromising aid or systematically underestimating the capacity to absorb it.

The definition of gross disbursements used here differs in one respect from DAC's. In recent years, donors have formally cancelled billions of dollars in OOF loans to countries such as Nigeria, Iraq, Pakistan, Cameroon, and the Democratic Republic of Congo (DRC). OOF or "Other Official Finance" loans are ones with too small a concessional element to qualify as ODA, or that are meant for military, export financing, or other non-development purposes. OOF loan cancellations have run in the billions of dollars in recent years. The DRC, in fact, was the world's top ODA recipient in 2003, at just over $5 billion. It turns out that under a Paris Club agreement, donors cancelled $4.5 billion in outstanding OOF loans to the DRC.

When OOF loans are cancelled, they are, in effect, retroactively recognized by the DAC accounting system as ODA grants. This is a reasonable choice *if* the original purpose of the loan was for development and it was merely disqualified as ODA because it was not concessional enough. The DAC system books the transfer at the time it is officially recognized. It would be more accurate to recognize the gradual transfer that occurs year by year as the loans become uncollectible over time. The U.S. government does something like this, regularly assessing the likely collectibility of its outstanding sovereign loans and taking on budget any drop in their ap-

[4] See http://www.oecd.org/document/45/0,2340,en_2649_34447_2093101_1_1_1_1,00.html for lists of Part I and Part II countries.

parent value.[5] DAC does not do this, perhaps in part because of the complexity, in part because past years' data would be constantly revised, and in part because accounting rules and appropriations processes within some of the donor agencies, which govern DAC, create strong disincentives for recognizing such losses.

Unfortunately, the resulting inaccuracies have been glaring in the last few years. The true, current financial value of debt cancellation for countries such as the DRC is far less than the face value. Even Pakistan, which received $1 billion in OOF debt relief in 2003, is a Highly Indebted Poor Country going by the numbers. Much of its cancelled debt may therefore have been uncollectible anyway, suggesting that the true value of the cancellation per se was far lower.[6] Starting in 2005, for which DAC data are not complete at this writing, large debt cancellations for Iraq and Nigeria are also hitting the donors' books, causing what DAC deputy director Richard Carey (2005) has called a "debt bubble" in the ODA total.

The definition of gross disbursements used here therefore excludes forgiveness of non-ODA loans. The reasoning is that the net transfers that do occur are not primarily a credit to current policy. If a Carter Administration export credit to Zaire went bad in the early 1980s, and was finally written off in 2003, the transfer that occurred does not for the most part reflect 2003 development policy.

The starting point for purging OOF loan forgiveness is the formula for DAC's standard gross ODA:

$$\text{Gross ODA} = \text{grants} + \text{ODA loans extended}$$

The term "grants" on the right contains a subtlety relating to debt relief. When DAC accounts for cancellation of ODA loans (not the OOF ones just discussed), it does so with two opposite transactions. The first is a "debt forgiveness grant," which is included under "grants." The second is an "offsetting entry for debt relief," which represents the immediate return of that grant in the form of amortization. It is considered an ODA loan repayment. This mechanism prevents double-counting of forgiven ODA loans, which were already fully counted as aid at disbursement. Since the offsetting entry is considered a reflow, it does not enter gross ODA, but will surface in net ODA in the next section. So canceling any loan, ODA or OOF, increases gross ODA. In fact,

[5] The process occurs within the U.S. government's Interagency Country Risk Assessment System.
[6] Pakistan had an average ratio of present value of debt to exports of 189% during 2001–03 and an average exchange-rate GDP/capita of $497. The corresponding HIPC thresholds are 150% and $885. But Pakistan is not considered a HIPC because it is an IDA-IBRD blend country.

when donors and recipients *reschedule* debt, as under Paris Club agreements, the capitalization of interest arrears is treated as a new aid flow, and is included in "ODA loans extended", under the subheading, "rescheduled debt."[7]

Since the purpose here is to count only transactions that reflect current, actual transfers, I exclude all debt forgiveness grants and capitalized interest, none of which involves actual movement of money. I call the result "gross aid transfers" or simply "gross aid" to distinguish it from gross ODA. Thus:

Gross aid = (grants – debt forgiveness grants) + (ODA loans extended – rescheduled debt)

This removes all debt forgiveness grants, for both ODA and non-ODA loans, from the definition of gross aid. Now, the DAC definition of net ODA, discussed in the next section, does itself remove grants for ODA loan forgiveness, by counting those offsetting entries for debt relief in ODA reflows. So in order to highlight the real departure of gross aid transfers and DAC accounting, I compare gross aid to DAC's Gross ODA net of offsetting entries for ODA loan forgiveness. Table 1 shows the 10 recipients most affected by changing the definition this way for 2004. In all, forgiveness of non-ODA loans accounted for $5.2 billion of reported gross ODA.

Table 1. Gross ODA net of offsetting entries for ODA loan forgiveness vs. gross aid transfers, selected recipients, 2004 (million $)

Recipient	Gross ODA net of offsetting entries for ODA loan forgiveness	Gross aid	Difference
Congo, Dem. Rep.	1,846	1,056	791
Angola	1,156	458	698
Nicaragua	1,262	721	541
Madagascar	1,277	760	517
Cameroon	908	470	438
Senegal	1,148	774	374
Zambia	1,355	992	363
Ghana	1,434	1,103	331
Poland	1,544	1,252	292
All Part I countries	92,540	87,302	5,238

Table 2 shows the implications from the donor perspective. Among bilaterals, the United States gave the most gross aid to non-DAC governments and Japan came in second. Among multilaterals, the European Commission disbursed the most, followed by the World Bank's International Development Association (IDA). Most of the calculations in the aid index are done for

[7] In the previous edition of this paper, I asserted incorrectly that ODA loan forgiveness is netted out of gross ODA. I thank Nicolas Van de Sijpe for catching this problem.

each donor-recipient pair. The donor-level totals in Table 2, are *not* used in the calculations, but are summaries for illustration. The final row of the table is an exception: it shows the figures for one donor-recipient pair, the France and Senegal. I will continue the France-Senegal example in order to illustrate the actual calculations at the level of the donor-recipient pair.

Table 2. Gross ODA net of offsetting entries for ODA loan forgiveness vs. gross aid transfers aid by donor, 2004

Donor	Gross ODA net of offsetting entries for ODA loan forgiveness	Gross aid transfers	% reduction from gross ODA to gross aid transfers
Arab Agencies	636	636	0
Arab Countries	4,336	4,336	0
Australia	1,195	1,185	1
Austria	514	345	33
Belgium	972	766	21
Canada	2,115	1,993	6
Czech Republic	74	63	15
Denmark	1,331	1,312	1
Finland	407	407	0
France	8,073	6,098	24
Germany	5,531	4,964	10
Greece	354	354	0
Hungary	30	30	0
Iceland	16	16	0
Ireland	413	413	0
Italy	1,005	888	12
Japan	11,114	10,847	2
Korea	353	353	0
Lithuania	2	2	0
Luxembourg	174	174	0
Netherlands	3,266	3,050	7
New Zealand	160	160	0
Norway	1,587	1,587	0
Other Donors	104	104	0
Poland	40	40	0
Portugal	878	175	80
Slovak Republic	14	14	0
Spain	1,595	1,456	9
Sweden	2,199	2,172	1
Switzerland	1,286	1,277	1
Turkey	392	392	0
United Kingdom	5,684	4,929	13
United States	18,812	18,639	1
AfDF	1,057	1,057	0
AsDF	1,084	1,084	0
CarDB	60	60	0
EBRD	86	86	0
EC	12,577	12,577	0
GEF	150	150	0
IDA	8,842	8,801	0
IDB Sp F	560	560	0
IFAD	283	283	0
Montreal Protocol	60	60	0
Nordic Dev.Fund	74	74	0
Other UN	274	274	0
IMF PRGF	1,204	1,204	0
UNDP	389	389	0
UNFPA	314	314	0
UNHCR	367	367	0
UNICEF	655	655	0
UNRWA	449	449	0
UNTA	444	444	0
WFP	270	270	0
France-Senegal	517	161	69

2. Subtracting debt service

The next step is to net debt service received out of gross aid transfers, in the belief that net transfers are a better measure than gross of the cost to the donor's treasury and benefit to the recipient. This departs somewhat from the approach of the DAC, whose net ODA statistic is net of payments of principal, not interest. The rationale for the DAC approach is an analogy with the capital flow concept of net foreign direct investment. Only return of capital is netted out of net FDI, not repatriation of earnings. Similarly, only amortization is netted out of net ODA, not interest, which can be seen as the donors' "earnings" on aid investment. So the formula for net ODA is simply:

Net ODA = Gross ODA – ODA loans received

(As mentioned in the previous section, ODA loans received does include offsetting entries for forgiveness of ODA loans since they were counted in full as aid at disbursement.)

I find the FDI analogy inapt. In the case of FDI, return of capital can be expected to reduce the host country's productive capital stock much more than repatriation of an equal amount of profits. When the government of Ghana sends a check to the government of Japan for $1 million, it hardly matters for either party whether it says "interest" or "principal" in the check's memo field, that is, whether the transaction enters the capital or current account. It seems unlikely that interest and principal payments have different effects on Japan's treasury or Ghana's capital stock and development.

Moreover, studies have found evidence of defensive lending on the part of bilateral and multilateral lenders, whereby new loans go to servicing old ones (Ratha 2001; Birdsall, Claessens, and Diwan 2002). To the extent that donors are lending to cover interest payments they receive on concessional loans, net ODA counts makes the circulation of money on paper look like an aid increase. Much the same can be said for treating capitalization of interest arrears as new aid.

For these reasons, the CDI aid index treats debt service uniformly. "Net aid transfers" is defined as "gross aid transfers" less debt service actually received on ODA loans. (See Table 3.) However, the design principle followed here, that only actual transfers be counted, introduces another complexity. In DAC accounting, "interested received" includes interest on ODA loans that has been forgiven, not actually paid. Forgiving interest generates two opposite transactions: a debt forgiveness grant and a (forgiven) interest received transaction, which is included in total

interest received. Since the definition of gross aid used here excludes the debt forgiveness grant, it must also exclude the return transaction for consistency; otherwise it will effectively penalize forgiveness of interest. It should treat it neutrally, as a transaction that generates no transfers. Thus:

$$\text{Net aid transfers} = \text{gross aid transfers} - \text{ODA loans received} - (\text{interest received} - \text{interest forgiven})$$

Note that "ODA loans received," unlike "interest received," only counts payments that result in actual transfers. Amortization payments made as the result of debt cancellation agreements are recorded separately, as offsetting entries for debt relief, described earlier. Surprisingly, it is impossible in general using DAC data to determine exactly how much a given aid recipient actually paid a given donor in interest in a given year. DAC Table 2a, the table with disbursements data by donor and recipient only reports total interest received, including forgiven (unpaid) interest. DAC Table 1, however, which contains donor-level aggregates, does make the distinction, and provides a good basis for estimating the shares at the donor-recipient level, via prorating. The portion of "interest received" for each donor-recipient pair that is actually forgiven is assumed to be the same for each of a donor's recipients as it is for all of them together.

Table 3 shows the donor-level amounts that are the basis for the prorating. For most donors, the potential error is small because they a) receive no interest or almost none or b) almost all of the interest they report receiving is actually received rather than forgiven. In 2004, the donor for which the most error could occur is France, which formally received $627 million in interest and actually received $455 million. But even here, errors in the estimated allocation among aid recipients of the $172 million difference should be small relative to France's total bilateral net aid transfers of $3,094 million.

The final column of Table 3 shows net aid transfers by donor. Again, the calculations displayed do not in fact enter the aid index directly and are only illustrative summaries, except for the France-Senegal example at the bottom. Among bilaterals, this adjustment to gross aid particularly affects Japan, which received $7.5 billion in debt service on concessional loans, equal to a striking 69% of its gross aid transfers. Among bilaterals, France, Germany, and the United States were also major recipients of debt service for their size. Multilateral institutions are too, unsurprisingly. At the upper extreme, the IMF's concessional Poverty Reduction and Growth Facility received more than it disbursed.

Table 3. Subtracting Debt Service, 2004

Donor	A. Gross aid transfers[1]	C. Amortization	D. DAC interest received	E. Estimated interest actually paid	F. Net Aid Transfers (A – C – E)
Arab Agencies	636	254	0	0	382
Arab Countries	4,336	586	0	0	3,750
Australia	1,185	0	0	0	1,185
Austria	345	4	1	1	340
Belgium	766	74	4	4	688
Canada	1,993	31	2	2	1,959
Czech Republic	63	0	0	0	63
Denmark	1,312	86	18	18	1,207
Finland	407	0	0	0	407
France	6,098	943	393	341	4,815
Germany	4,964	1,233	396	358	3,373
Greece	354	0	0	0	354
Hungary	30	0	0	0	30
Iceland	16	0	0	0	16
Ireland	413	0	0	0	413
Italy	888	288	0	0	600
Japan	10,847	5,136	2,437	2,327	3,385
Korea	353	20	23	23	310
Lithuania	2	0	0	0	2
Luxembourg	174	0	0	0	174
Netherlands	3,050	544	44	42	2,465
New Zealand	160	0	0	0	160
Norway	1,587	6	0	0	1,582
Other Donors	104	0	0	0	104
Poland	40	0	0	0	40
Portugal	175	5	1	1	170
Slovak Republic	14	0	0	0	14
Spain	1,456	180	20	0	1,276
Sweden	2,172	0	0	0	2,172
Switzerland	1,277	10	0	0	1,267
Turkey	392	0	0	0	392
United Kingdom	4,929	275	2	0	4,653
United States	18,639	1,027	435	433	17,178
AfDF	1,057	137	95	95	824
AsDF	1,084	390	196	196	498
CarDB	60	21	9	9	30
EBRD	86	0	0	0	86
EC	12,577	276	85	85	12,216
GEF	150	0	0	0	150
IDA	8,801	1,546	938	938	6,317
IDB Sp F	560	299	137	137	124
IFAD	283	117	40	40	126
Montreal Protocol	60	0	0	0	60
Nordic Dev.Fund	74	4	5	5	65
Other UN	274	0	0	0	274
IMF PRGF	1,204	1,383	0	0	-179
UNDP	389	0	0	0	389
UNFPA	314	0	0	0	314
UNHCR	367	0	0	0	367
UNICEF	655	0	0	0	655
UNRWA	449	0	0	0	449
UNTA	444	0	0	0	444
France-Senegal	161	7	2.1	1.8	153

[1]From previous table.

3. Discounting tied aid

Most bilateral donors tie some of their aid, requiring recipients to spend it on goods and services from the donor's home country, which reduces recipient governments' freedom to shop for the best deals. Catrinus Jepma's literature survey (1991, p. 58) finds that tying raises the cost of aid projects a typical 15–30%. This suggests that tying reduces the *value* of aid by 13–23 percent. (Consider that a 15-percent cost increase lowers the purchasing power of aid by 1–1/1.15 = 13 percent. Similarly, a 30-percent cost increase cuts the value of aid 23 percent.)

The DAC tying statistics split aid commitments into three categories: untied, tied, and partially untied. "Partially untied aid" comes with restrictions, but ones that are looser than those of "tied aid." To be precise, partially untied aid is subject to the restriction that it must be spent on goods and services from the donor nation *or* developing countries, or else to the restriction that it be spent on goods and services from developing countries only. In principle, the approach taken to penalizing tying is simple. Tied aid is discounted by 20% (a round number in the 13–23% range) and partially untied aid by 10%. No attempt is made to account for unreported, informal, de facto tying that may occur.

Implementation is more complex. The tying figures come primarily from the detailed commitment-level data in DAC's Creditor Reporting System (CRS) database, and are aggregated to the level of the donor-recipient pair. Since the data are for commitments, not disbursements, it is assumed that the same shares of disbursements and commitments are tied, untied, or partially untied. The discount applies to gross aid; returns flows are not discounted since they are assumed to have an opportunity cost equivalent to untied aid. The selectivity discount described in the next section exempts emergency aid, so the tying discount step also splits gross aid into emergency and non-emergency aid and discounts them separately for tying.[8]

Table 4 shows the results of this step, "net tying-discounted aid" by emergency status. Austria, Canada, and the United States suffer most in relative terms from the tying discount.[9]

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[8] For commitments that were missing tying status information, I used a number of backstops to estimate the tied fraction. If the donor was multilateral, I assumed the aid was untied. Otherwise, if at least part of the commitment was reported as technical cooperation, I took this as the tied share. Otherwise, I took the average tied share of all of a donor's commitments, excluding debt forgiveness, from DAC Table 7b, for the most recently available year. This is especially important for the United States, which has not reported tying data since 1996. The estimated tied shares in the index are those it reported for all aid in 1996: 71.6% tied and 0% partially untied.

[9] For simplicity, aid to recipients missing tying information, such as to "Far East Asia unallocated," is assumed untied. Therefore the donor-level totals involve no extrapolations and are simple sums of the feasible estimates at the donor-recipient level.

Table 4. Penalizing tied aid, 2004

	Non-emergency					Emergency				
Donor	A. Gross transfers	B. Tied	C. Partially untied	D. Tying penalty (20%×B+ 10%×C)	E. Tying-discounted gross transfers (A – D)	F. Gross transfers	G. Tied	H. Partially untied	I. Tying penalty (20%×G+ 10%×H)	J. Tying-discounted gross transfers (F – I)
Arab Countries	4,336			0	4,336	0			0	0
Australia	1,018	53	0	11	1,007	167	106	0	21	146
Austria	264	109	0	22	242	81	39	0	8	73
Belgium	666	21	0	4	662	100	0	0	0	100
Canada	1,697	521	18	106	1,591	295	113	1	23	273
Czech Republic	54			0	54	9			0	9
Denmark	1,217	148	0	30	1,187	95	10	0	2	93
Finland	352	29	0	6	346	55	0	0	0	55
France	5,460	489	0	98	5,362	638	37	0	7	631
Germany	4,751	570	0	114	4,637	213	43	0	9	204
Greece	333	179	25	38	294	22	1	12	1	20
Hungary	30			0	30	0			0	0
Iceland	16			0	16	0			0	0
Ireland	375	0	0	0	375	38	0	0	0	38
Italy	813	0	0	0	813	75	0	0	0	75
Japan	10,190	588	82	126	10,065	657	0	0	0	657
Korea	340			0	340	13			0	13
Lithuania	2			0	2	0			0	0
Luxembourg	151	0	0	0	151	23	0	0	0	23
Netherlands	2,712	401	271	107	2,604	339	0	0	0	339
Nordic Dev.Fund	74			0	74	0			0	0
Norway	1,326	0	0	0	1,326	261	0	0	0	261
Other Donors	104			0	104	0			0	0
Poland	40			0	40	0			0	0
Portugal	157	12	0	2	154	18	0	0	0	18
Slovak Republic	14			0	14	0			0	0
Spain	1,359	206	0	41	1,318	97	0	0	0	97
Sweden	1,785	145	0	29	1,756	388	1	17	2	386
Switzerland	900	3	0	1	900	377	36	0	7	370
Turkey	347			0	347	45			0	45
United Kingdom	4,401	0	0	0	4,401	527	0	0	0	527
United States	15,588	8,121	0	1,624	13,964	3,051	2,181	0	436	2,615
AfDF	1,057	0	0	0	1,057	0			0	0
AsDF	1,084	0	0	0	1,084	0			0	0
CarDB	60			0	60	0			0	0
EBRD	86			0	86	0			0	0
EC	11,578	0	0	0	11,578	999	0	0	0	999
GEF	150			0	150	0			0	0
IDA	8,801	0	0	0	8,801	0			0	0
IDB Sp F	560	0	0	0	560	0	0	0	0	0
IFAD	283	0	0	0	283	0			0	0
Mont. Protocol	60			0	60	0			0	0
New Zealand	132	36	0	7	125	27	13	0	3	25
Other UN	274			0	274	0			0	0
SAF+ESAF(IMF)	1,204			0	1,204	0			0	0
UNDP	389			0	389	0			0	0
UNFPA	314			0	314	0			0	0
UNHCR	0			0	0	367			0	367
UNICEF	655	0	0	0	655	0			0	0
UNRWA	0			0	0	449			0	449
UNTA	444			0	444	0			0	0
WFP	270			0	270	0			0	0
France-Senegal	161	11	0	2	159	0.23	0.01	0	0.003	0.23

4. Adjusting for selectivity

It has long been argued that which country aid goes to is an important determinant of its effectiveness (Easterly 2002, p. 35). Some countries need aid more than others. Some countries can use it better than others. There is little empirically grounded consensus, however, on what precisely donors should select for.

For anyone measuring selectivity, two main challenges arise: choosing a mathematical structure to distill numbers on recipient attributes and donor aid allocations into a metric; and choosing the attributes that donors are expected to select for, such as low income, good policies, or good governance. I will discuss my choices at the level of principle, then descend to the details of implementation.

Principles

The oldest approach to measuring selectivity—even if not always thought of as such—is the use of cross-country regressions to explain donors' aid allocations as a function of recipient characteristics. Historically, these have included indicators of geopolitical importance (e.g, oil exports or military expenditure), commercial links (trade with donors), and development need and potential (income, governance) (Kaplan 1975; Dudley and Montmarquette 1976; McKinley and Little 1979; Mosley 1981, 1985; Maizels and Nissanke 1984; Frey and Schneider 1986; Gang and Lehman 1990; Schraeder, Hook, and Taylor 1998; Trumbull and Wall 1994; Alesina and Dollar 1998; Burnside and Dollar 2000; Collier and Dollar 2002; Birdsall, Claessens, and Diwan 2002). In general, bilateral donors appear to be less sensitive to recipient need and potential than to strategic and commercial interests. More limited evidence suggests that multilaterals act oppositely. Almost all the studies that check find a bias in favor of small countries, in the sense that the elasticity of aid receipts with respect to population or GDP is statistically less than 1.

The cross-country regression approach to measuring selectivity is conceptually consistent, but if used to evaluate donors it invites methodological challenges that it might be better to avoid with a simpler approach. This is because it embodies an attempt to *model* donor decision-making and *predict* the effects on allocations of marginal changes in recipient characteristics, all else equal. (That is the meaning of regression coefficient estimates.) With modeling comes the risk of misspecification. If a donor's aid allocations fail to relate to the chosen variables via the chosen functional form, the results may not be meaningful. For example, if a donor specializes in

one region, such as France in francophone Africa, its aid allocations will be highly nonlinear with respect to most indicators of recipient appropriateness, and a linear regression may produce strange results. Similarly if a donor specializes in the poorest nations. Results may also be sensitive to the choice of regressors. The United States gives large amounts of aid to countries such as Russia and Pakistan that appear too poorly governed to make good use of aid for development but have obvious geopolitical value. As a result, regressions that control for geopolitical value may yield a different coefficient on governance for the United States than regressions that do not. This then raises the question of whether evaluations of selectivity should abstract from donors' responsiveness to non-development concerns. Controlling for non-development concerns gives a better picture of the effects of a hypothetical marginal change in an indicator of recipient development potential. Not controlling for it gives a better picture of the general importance of development potential in allocation. It is a question, in other words, of what is meant by "selectivity."

The work of David Dollar and Victoria Levin (2004), used in the World Bank's *Global Monitoring Report* (2005b), stands in the regression tradition and faces some of these questions. The authors estimate the elasticity of a donor's aid disbursements with respect to recipient's income and governance. They do not control for commercial or geopolitical interests. They posit a log-linear (elasticity-type) relationship between aid disbursements and recipient population, GDP/capita, and "institutions/policies" as indicated by the World Bank's Country Policy and Institutional Assessment (CPIA). They do not control for donor interest variables. They do, however, abstract from small-country bias by controlling for population, even though Collier and Dollar (2002) find that global aid could reduce poverty twice as fast if most of it were reallocated to India.

The Dollar and Levin specification has a problem that is relatively specific to it, yet illustrates the general risk that comes with modeling. In the elasticity framework, the only recipients that receive no aid are those with an extreme value on one of the determinants—e.g., infinite GDP/capita or zero CPIA score. Since there are no such countries, an elasticity-based model predicts that every recipient receives aid from every donor. Rising income or falling governance cause *percentage* reductions in aid, but never bring it to zero. Yet 1,523 out of the 4,914 the potential donor-recipient pairs in the DAC database show zero disbursements for 2002 by my

count.[10] The conflict between theory and reality appears when Dollar and Levin attempt, as it were, to take the logarithms of these zeroes in order to perform their log-linear regressions. To avoid infinities, they replace zeroes with a small number, $10,000 (actually, 0.01, since the figures are in millions of dollars). But in natural logs, 0.01 becomes –4.6. For comparison, the largest gross flow in 2002, $1.3 billion from Japan to China, has a log of 7.2. If Dollar and Levin were to replace zeroes with $100 (with a log of –9.2) or $1 (–13.8) they might reach quite different results. An alternative specification that directly confronts the possibility that the distribution of aid disbursements is truncated, such as tobit specification, may be more appropriate. Below, I compare my results to theirs.

The second major approach to evaluating selectivity was initiated by McGillivray (1989, 1992). It is more radically empirical, eschewing any attempt to model allocation procedures or estimate marginal effects, and lends itself more naturally to creating an index that reflects quantity and selectivity. His index is, essentially, the weighted sum of a donor's aid disbursements to all recipients, where the weights are mathematically related to a recipient characteristic such as GDP/capita. If the weights lie between 0 and 1, they can be thought of as discounts that penalize or reward selection for desired characteristics. The ratio of the weighted sum to the unweighted sum measures overall selectivity.[11]

Rao (1994, 1997) points out that donors can maximize their scores on McGillivray's index by concentrating all their aid in the single poorest country. He argues that the source of this perverse result is the failure of McGillivray's index to consider recipients' *post-aid* GDP/capita. On the assumption that aid leads directly to GDP gains, if all aid went to the poorest country, that country's GDP/capita would rise rapidly and make it a less deserving recipient. He revised McGillivray's index to factor in both pre- and post-aid GDP. This introduced a notion of diminishing returns to aid: not diminishing returns to the effectiveness of aid in raising GDP/capita, but diminishing returns to the value of doing so.

The third approach to assessing selectivity is the newest and most sophisticated. Drawing on the cross-country literature on determinants of aid allocation, McGillivray, Leavy, and White

[10] This excludes recipients lacking GDP, population, or (1999) CPIA data, and excludes three atypical donors: Arab Agencies, the Montreal Protocol fund, and the Caribbean Development Bank.

[11] McGillivray's original (1989) index summed aid/recipient population rather than total aid to each recipient. White (1992) questioned the implicit notion of donors "allocating" aid/recipient population: shifting $1 million in aid from small, poor Mali to large, poor India would reduce a donor's score in McGillivray's system because the aid would be lower *per capita* in India. In reply, McGillivray (1992) proposed using absolute aid rather than aid/capita, within the same basic framework.

(2002), formally model aid allocation. They endow donors with utility functions that depend on their allocation of aid among recipients that are characterized by various commercial and geopolitical interest factors and levels of development need and potential. The authors incorporate diminishing returns to aid, compute optimal allocations, and penalize donors to the extent they deviate from their optima. The approach has several disadvantages from the point of view of the CDI. It is conceptually complex. It is vulnerable to challenges analogous to those that apply to the first approach, regarding proper specification. It rewards donors for pursuing geopolitical and commercial interests (though this could be easily changed, to focus purely on recipient need, as appropriate for the CDI). And it penalizes donors for aid allocations that are rather different from the ideal ones even if they do not generate much lower utility. For example, if a donor at the optimal allocation shifts aid between two identical recipients, the marginal utility cost is zero, but the marginal decline in the donor's score would be non-zero.

The approach I take is closest to McGillivray's original. For the purposes of the CDI, it has the advantages of conceptual simplicity; it combines quantity and quality (selectivity) in a natural way that minimizes questions about proper modeling specification. Since it does not model with smooth functional forms, it does not inherently penalize sharp specialization in a certain region or income bracket. It can be combined with other discount factors, such as for tying and project proliferation. It lends itself to a distinction between subflows of aid (emergency and non-emergency). And it can handle net transfers even when they are negative, where some of the common functional forms cannot. (Reverse flows, like zero flows, would bedevil the elasticity approach of Dollar and Levin, for example.)

Here is a simple example of how the chosen system works. The selectivity formula introduced here, it will emerge, assigns Mali a weight of 0.8 for non-emergency aid and Libya a 0.2, for the 2004 data year. A donor whose aid program consisted of giving $1 million to each of these countries would have selectivity-weighted aid of $1 million (0.8 × $1 million = $0.8 million for Mali plus 0.2 × $1 million = $0.2 million for Libya). The donor's "selectivity" is then the ratio of its selectivity-weighted aid to its unweighted aid—in this case 0.5. This is also the average selectivity weight of the donor's recipients, where the average is weighted by how much aid the donor gives to each recipient.

One potentially counterintuitive result of this approach is that a donor that is constitutionally confined to a clientele with low selectivity weights comes off poorly even if it is in some

sense selective within that pool. The best example is the European Bank for Reconstruction and Development (EBRD), which lends to the (relatively rich) nations of the former Eastern bloc. But for purposes of comparing bilateral donors to each other, this is actually as it should be. As will be described below, the "quality-adjusted aid quantities" of multilaterals are ultimately allocated back as credits to the bilaterals. If Germany is to be more rewarded for giving aid to Malawi than Poland, it should also be more rewarded for doing the same indirectly—giving more to the African Development Fund than the EBRD.

Having settled the question of mathematical form for measuring selectivity, there remains the question of what donors are supposed to select for. The aid index uses two indicators. The first is GDP/capita, converted to dollars on the basis of exchange rates.[12] The second indicator is the composite governance variable of Daniel Kaufman and Aart Kraay (Kaufmann, Kraay, and Mastruzzi 2005), which is the most comprehensive governance indicator available. The KK composite is an average of indicators on up to six dimensions, available data permitting: democracy, political instability, rule of law, bureaucratic regulation, government effectiveness, and corruption. The six variables are themselves synthesized from several hundred primary variables from more than a score of datasets. GDP/capita and the KK composite have several strengths for measuring selectivity. They have wide coverage. They are updated regularly and made freely available. And they reflect consensus views that a) the richer a country is, the less it needs aid; and b) that institutional quality is a key determinant of development and, most likely, aid effectiveness.

Before descending to the particulars of the selectivity discounting, it is worth reiterating that two concepts are defined here relating to selectivity. The first, selectivity-weighted aid, is a measure of aid allocations that blends quantity and quality, and is of primary interest for grading performance. It possesses the desirable properties of linearity. If a country doubles its aid to every recipient, its selectivity-adjusted aid score will double. If it runs two parallel aid programs, the selectivity-adjusted aid total of the combination is the sum of those for the individual programs.

The second concept is the weighted-average selectivity score of a donor's recipients—the donor's "selectivity." This measure, it should be noted, behaves strangely when applied to do-

[12] PPP-based GDP might seem more meaningful, but it is highly correlated with exchange-rate GDP in logs, so that it gives nearly the same results as used here, and is available for slightly few countries.

nors with net transfers much smaller than gross transfers. Consider this example. Donor X is a development bank. It disburses nothing to Recipient Y, which has selectivity weight 0.6, but *receives* $1 million from Y in debt service, which is treated as negative aid. It disburses the $1 million to Recipient Z, which has weight 0.8. Donor X's selectivity-weighted aid is thus:

$$0.6 \times (-\$1 \text{ million}) + 0.8 \times (\$1 \text{ million}) = \$0.2 \text{ million}.$$

Its score is small but positive because it has transferred funds from a less appropriate to a more appropriate aid "recipient"—perhaps an odd result, but meaningful. Now, what is the "selectivity" of Donor X?

$$\text{selectivity-weighted net transfers} / \text{total net transfers} = \$0.2 \text{ million} / 0 = \infty.$$

The donor has done some good for the developing world on net, according to the measure, with zero net disbursal of funds. It is infinitely efficient.

This extreme example illustrates a counterintuitive result for donors whose net transfers are much smaller than gross transfers (because of debt service). In these cases, the donor's reported "selectivity" can lie outside the range of most of its recipients' selectivity weights. For example, the IDB's Fund for Special Operations disbursed $593 million in 2003. It received $434 million in debt service, for a net aid of only $159 million. Yet it generally transferred funds from countries deemed less appropriate for aid to those deemed more appropriate and so achieves a selectivity score of 0.85 in 2003, it will emerge, which is higher than the selectivity weight of any of its recipients. Mathematically, the 0.85 is a weighted average of selectivity factors between 0 and 1, where some of those weights (net transfers) are negative.

One can avoid such results by measuring selectivity of gross disbursements only, which I call "gross selectivity." In the abstract example above, Donor X has gross selectivity of $0.2 million/$1 million = 0.2. This result seems more meaningful than infinity, but comes at the expense of ignoring the debt service received from Recipient Y.

The sometimes-strange behavior of the version that includes reflows, "net selectivity," does not mean it is inherently flawed. Rather, it points up another subtlety in the question of what is meant by selectivity. The picture conjured by the word "selectivity" is of a donor that only sends funds outward. In fact, donors not only distribute their own money but redistribute that of recipients. What does selectivity mean in such a context? Is a donor that bestows all its net transfers on Malawi almost perfectly selective? Or is it falling far short of the ideal by failing to transfer billions of dollars from Kuwait to Malawi?

The 2006 CDI deals with this problem with a compromise between principle and simplicity. To avoid infinities, it segregates (tying-discounted) disbursements from reflows. It then applies the gross selectivity factor to disbursements, yielding selectivity-weighted disbursements, and applies the same factor to reflows, implicitly assuming that the distribution of a donor's disbursements and reflows across recipients are same. It would be more accurate to separately compute the "selectivity" of the donor's reflows, but would also be more complicated, and tends to generate extreme results in some cases.

Implementation

The flow to which selectivity weights are applied is the output of the previous steps in the construction of the aid performance measure, namely "net tying-discounted aid" and debt service. These quantities are multiplied by two discount factors. The first is linearly related to a country's KK governance score. The linear relationship is such that in the benchmark year of 2001, the data year for the first edition of the CDI, the governance weight ranges exactly between 0 (for the worst-governed country, the DRC) and 1 (for Chile). The second factor is a linear function of a country's log GDP/capita. In 2001, the United Arab Emirates (GDP/capita of $28,751) gets a 0 and the DRC (GDP/capita of $97), defines the upper end for the GDP/capita weights. This upper end is not 1.0, as one might expect, but 1.84, a number chosen so that the highest *combined* selectivity weight (the product of the governance and income factors) *is* 1.0 in the benchmark year of 2001. Table 5 summarizes the weight computations. Kaufmann and Kraay have computed their governance variables for even years since 1996, so the CDI scoring for odd years uses the previous year's KK data.

There are two exceptions to this weighting. First, emergency aid is exempted from the selectivity discounting since it is often effective even in the poorest-governed countries. Second, and new in 2006, is an exemption from the governance discount—the first discount factor—for aid that is meant to *improve* governance, broadly defined. This sort of aid now receives a uniform governance discount of 50%—compared to the 75% discount it would otherwise get in, say, the DRC or Afghanistan. It seems perverse to penalize donors for trying to improve governance where it is low. On the other hand, poor governance may indeed undermine the effectiveness of aid meant to improve it. The choice of a uniform 50% discount seems like a minimally arbitrary, middle-of-the-road response to the problem. Governance aid is defined as that assigned

a code in the 15000's in DAC's Creditor Reporting System database. The headings for these 15 codes are: Government and civil society, general; Economic & development policy/planning; Public sector financial management; Legal and judicial development; Government administration; Strengthening civil society; Elections; Human rights; Free flow of information; Security system management and reform; Civilian peace-building; Conflict prevention and resolution; Post-conflict peace-building (UN); Demobilisation; Land mine clearance; and Child soldiers (prevention and demobilisation).[13,14]

This system implies several valuations, which are meant to be minimally arbitrary but should be made explicit. For one, non-emergency program aid to the highest-weighted recipient in 2001, Mongolia, is precisely as meritorious as emergency aid to any country any year, since the latter is not discounted. All other aid is valued less. And because of the multiplicative weighting structure, non-emergency aid to the richest country is valueless no matter how well-governed the country: by virtue of being the richest its income weight is zero. Similarly, non-emergency, non-governance aid to the worst-governed country is also treated as valueless regardless of how poor the country is. In general, governance quality and income level are each seen as conditioning the other's relevance for aid effectiveness.

Table 6 summarizes the calculations by donor, which, recall, actually take place at the donor-recipient level.

Table 5. Computation of selectivity weights, 2004

Country name	A. Exchange rate GDP/capita, 2003 ($)	B. Log exchange rate GDP/capita	C. GDP selectivity multiplier	D. Kaufmann-Kraay composite governance score, 2004	E. Governance selectivity multiplier	F. Combined selectivity multiplier[1]
Formula:		Log A	(linear map of B onto standard scale)		(linear map of B onto standard scale)	C × E
Bhutan	308	5.73	1.45	0.08	0.67	0.98
Madagascar	249	5.52	1.52	–0.12	0.61	0.93
Ghana	401	5.99	1.36	–0.08	0.63	0.86
Kiribati	614	6.42	1.23	0.13	0.69	0.85
Mongolia	556	6.32	1.26	0.06	0.67	0.84
Gambia, The	268	5.59	1.49	–0.30	0.56	0.84
Malawi	146	4.98	1.69	–0.55	0.49	0.82
Mali	437	6.08	1.34	–0.17	0.60	0.80
Sao Tome and Principe	343	5.84	1.41	–0.32	0.56	0.79
Mozambique	290	5.67	1.47	–0.39	0.53	0.78
Mauritania	454	6.12	1.33	–0.21	0.59	0.78
Lesotho	677	6.52	1.20	–0.02	0.64	0.77
Tanzania	302	5.71	1.46	–0.45	0.52	0.75
Burkina Faso	368	5.91	1.39	–0.41	0.53	0.74

[13] The full CRS purpose classification is at http://www.oecd.org/dataoecd/40/23/34384375.doc.
[14] I think Ian Anderson and Terry O'Brien for comments that led to this change.

Country name	A. Exchange rate GDP/capita, 2003 ($)	B. Log exchange rate GDP/capita	C. GDP selectivity multiplier	D. Kaufmann-Kraay composite governance score, 2004	E. Governance selectivity multiplier	F. Combined selectivity multiplier[1]
Senegal	671	6.51	1.20	–0.18	0.60	0.72
Benin	549	6.31	1.26	–0.29	0.56	0.71
Uganda	259	5.56	1.50	–0.63	0.46	0.70
India	650	6.48	1.21	–0.26	0.57	0.69
Niger	261	5.56	1.50	–0.66	0.45	0.68
Rwanda	225	5.41	1.55	–0.71	0.44	0.68
Zambia	489	6.19	1.30	–0.52	0.50	0.65
Guyana	1,030	6.94	1.06	–0.18	0.60	0.64
Nicaragua	812	6.70	1.14	–0.32	0.56	0.63
Sri Lanka	1,010	6.92	1.07	–0.24	0.58	0.62
Guinea-Bissau	202	5.31	1.58	–0.87	0.39	0.62
Ethiopia	113	4.73	1.77	–1.01	0.35	0.62
Sierra Leone	188	5.24	1.61	–0.90	0.38	0.61
Micronesia, Fed. Sts.	2,090	7.64	0.84	0.27	0.73	0.61
Cape Verde	2,283	7.73	0.81	0.35	0.76	0.61
Cambodia	343	5.84	1.41	–0.76	0.42	0.60
Vietnam	547	6.30	1.27	–0.60	0.47	0.60
Vanuatu	1,560	7.35	0.93	–0.06	0.63	0.59
St. Vincent & the Grenadines	3,439	8.14	0.68	0.68	0.85	0.58
Moldova	582	6.37	1.25	–0.64	0.46	0.57
Namibia	2,711	7.91	0.75	0.35	0.76	0.57
Eritrea	203	5.31	1.58	–0.98	0.36	0.57
Philippines	1,002	6.91	1.07	–0.41	0.53	0.57
Kenya	473	6.16	1.31	–0.74	0.43	0.56
Jordan	1,996	7.60	0.85	0.03	0.66	0.56
Nepal	248	5.51	1.52	–0.94	0.37	0.56
Marshall Islands	1,871	7.53	0.87	–0.03	0.64	0.56
Bolivia	1,005	6.91	1.07	–0.43	0.52	0.56
Morocco	1,555	7.35	0.93	–0.19	0.59	0.55
Egypt, Arab Rep.	987	6.89	1.08	–0.46	0.51	0.55
Kyrgyz Republic	435	6.08	1.34	–0.80	0.41	0.55
Dominica	3,883	8.26	0.64	0.68	0.85	0.55
Armenia	1,187	7.08	1.02	–0.43	0.52	0.53
Honduras	1,052	6.96	1.06	–0.51	0.50	0.53
Maldives	2,219	7.70	0.82	–0.04	0.64	0.52
Uruguay	3,854	8.26	0.64	0.54	0.81	0.52
Suriname	2,540	7.84	0.78	0.05	0.67	0.52
Chile	5,947	8.69	0.50	1.25	1.02	0.52
Papua New Guinea	721	6.58	1.18	–0.72	0.44	0.51
Costa Rica	4,651	8.44	0.58	0.77	0.88	0.51
Thailand	2,558	7.85	0.77	0.03	0.66	0.51
St. Lucia	4,439	8.40	0.60	0.68	0.85	0.51
Comoros	563	6.33	1.26	–0.83	0.40	0.51
China	1,270	7.15	1.00	–0.49	0.50	0.50
El Salvador	2,398	7.78	0.79	–0.06	0.63	0.50
Bulgaria	3,206	8.07	0.70	0.21	0.71	0.50
Togo	392	5.97	1.37	–0.96	0.36	0.50
Guinea	380	5.94	1.38	–0.97	0.36	0.50
Bangladesh	402	6.00	1.36	–0.96	0.36	0.50
Tonga	1,932	7.57	0.86	–0.26	0.57	0.49
Dominican Republic	2,097	7.65	0.84	–0.25	0.58	0.48
Botswana	5,283	8.57	0.54	0.80	0.89	0.48
Belize	3,972	8.29	0.63	0.37	0.76	0.48
Tunisia	2,827	7.95	0.74	–0.01	0.65	0.48
Mauritius	4,965	8.51	0.56	0.66	0.85	0.48
Jamaica	2,961	7.99	0.73	–0.05	0.64	0.46
Grenada	4,879	8.49	0.57	0.54	0.81	0.46
Tajikistan	297	5.69	1.46	–1.13	0.31	0.46
Indonesia	1,082	6.99	1.05	–0.73	0.43	0.45
Solomon Islands	462	6.14	1.32	–1.03	0.34	0.45
Brazil	3,286	8.10	0.69	0.01	0.65	0.45

Country name	A. Exchange rate GDP/capita, 2003 ($)	B. Log exchange rate GDP/capita	C. GDP selectivity multiplier	D. Kaufmann-Kraay composite governance score, 2004	E. Governance selectivity multiplier	F. Combined selectivity multiplier[1]
Romania	3,274	8.09	0.69	–0.01	0.65	0.45
Ukraine	1,376	7.23	0.97	–0.63	0.46	0.45
South Africa	4,792	8.47	0.57	0.43	0.78	0.45
Latvia	5,897	8.68	0.51	0.71	0.86	0.44
Cameroon	884	6.78	1.11	–0.87	0.39	0.44
Fiji	2,986	8.00	0.72	–0.17	0.60	0.43
Lithuania	6,181	8.73	0.49	0.77	0.88	0.43
Georgia	1,084	6.99	1.05	–0.80	0.41	0.43
Burundi	87	4.47	1.85	–1.40	0.23	0.43
Paraguay	1,152	7.05	1.03	–0.78	0.42	0.43
Peru	2,483	7.82	0.78	–0.35	0.55	0.43
Malaysia	5,016	8.52	0.56	0.38	0.76	0.43
Pakistan	604	6.40	1.23	–1.03	0.34	0.42
Albania	2,141	7.67	0.83	–0.48	0.51	0.42
Chad	457	6.13	1.32	–1.12	0.32	0.42
Bosnia and Herzegovina	1,869	7.53	0.87	–0.58	0.48	0.42
Lao PDR	397	5.98	1.37	–1.16	0.30	0.42
Djibouti	1,420	7.26	0.96	–0.73	0.43	0.42
Panama	4,467	8.40	0.59	0.16	0.70	0.42
Macedonia, FYR	2,573	7.85	0.77	–0.39	0.53	0.41
Yemen, Rep.	639	6.46	1.22	–1.05	0.34	0.41
Poland	6,273	8.74	0.49	0.54	0.81	0.39
Estonia	8,050	8.99	0.41	1.06	0.97	0.39
Colombia	2,302	7.74	0.81	–0.55	0.49	0.39
Azerbaijan	1,083	6.99	1.05	–0.96	0.36	0.38
Syrian Arab Republic	1,282	7.16	0.99	–0.91	0.38	0.38
Swaziland	2,117	7.66	0.83	–0.68	0.45	0.37
Slovak Republic	7,578	8.93	0.43	0.74	0.87	0.37
Ecuador	2,293	7.74	0.81	–0.65	0.46	0.37
Guatemala	2,344	7.76	0.80	–0.65	0.46	0.37
Nigeria	573	6.35	1.25	–1.21	0.29	0.36
Turkey	4,384	8.39	0.60	–0.17	0.60	0.36
Argentina	3,883	8.26	0.64	–0.34	0.55	0.35
Central African Republic	319	5.76	1.44	–1.39	0.24	0.34
Barbados	10,079	9.22	0.33	1.13	0.99	0.33
Congo, Rep.	1,251	7.13	1.00	–1.12	0.32	0.32
Mexico	6,441	8.77	0.48	0.04	0.66	0.32
Oman	8,370	9.03	0.39	0.49	0.80	0.31
Hungary	9,938	9.20	0.34	0.90	0.92	0.31
Algeria	2,633	7.88	0.76	–0.82	0.41	0.31
Kazakhstan	2,688	7.90	0.76	–0.82	0.41	0.31
Croatia	7,605	8.94	0.42	0.24	0.72	0.31
Iran, Islamic Rep.	2,415	7.79	0.79	–0.94	0.37	0.29
Russian Federation	4,042	8.30	0.63	–0.63	0.46	0.29
Uzbekistan	454	6.12	1.33	–1.46	0.21	0.28
Czech Republic	10,443	9.25	0.32	0.74	0.87	0.28
Gabon	5,304	8.58	0.54	–0.47	0.51	0.28
Angola	1,745	7.46	0.90	–1.16	0.30	0.27
Liberia	160	5.07	1.66	–1.63	0.16	0.27
St. Kitts and Nevis	10,222	9.23	0.33	0.58	0.82	0.27
Cote d'Ivoire	903	6.81	1.11	–1.38	0.24	0.26
Zimbabwe	389	5.96	1.37	–1.54	0.19	0.26
Belarus	2,211	7.70	0.82	–1.12	0.32	0.26
Afghanistan	202	5.31	1.58	–1.64	0.16	0.26
Sudan	501	6.22	1.29	–1.52	0.20	0.25
Congo, Dem. Rep.	112	4.71	1.77	–1.70	0.14	0.25
Antigua and Barbuda	11,754	9.37	0.29	0.77	0.88	0.25
Lebanon	5,771	8.66	0.51	–0.55	0.49	0.25
Malta	13,582	9.52	0.24	1.25	1.02	0.25
Haiti	446	6.10	1.33	–1.59	0.18	0.23
Seychelles	8,709	9.07	0.38	–0.15	0.61	0.23

Country name	A. Exchange rate GDP/capita, 2003 ($)	B. Log exchange rate GDP/capita	C. GDP selectivity multiplier	D. Kaufmann-Kraay composite governance score, 2004	E. Governance selectivity multiplier	F. Combined selectivity multiplier[1]
Venezuela, RB	4,357	8.38	0.60	–0.97	0.36	0.22
Trinidad and Tobago	11,529	9.35	0.29	0.30	0.74	0.22
Libya	5,167	8.55	0.55	–0.94	0.37	0.20
Turkmenistan	1,269	7.15	1.00	–1.53	0.19	0.19
Korea, Rep.	14,042	9.55	0.23	0.61	0.83	0.19
Saudi Arabia	9,730	9.18	0.35	–0.38	0.54	0.19
Slovenia	16,008	9.68	0.19	0.99	0.95	0.18
Equatorial Guinea	6,236	8.74	0.49	–1.15	0.31	0.15
Bahrain	16,227	9.69	0.18	0.38	0.76	0.14
Cyprus	19,847	9.90	0.12	0.87	0.91	0.11
Israel	19,035	9.85	0.13	0.45	0.79	0.10
Iraq	1,025	6.93	1.07	–1.88	0.09	0.10
Hong Kong, China	23,778	10.08	0.06	1.31	1.04	0.06
Singapore	24,576	10.11	0.05	1.62	1.13	0.06
Kuwait	24,673	10.11	0.05	0.30	0.74	0.04

[1]To allow comparisons over time, the linear maps are designed so that selectivity weights fit exactly in the 0–1 range in a fixed reference year, 2001. In other years, weights can exceed these bounds.

Table 6. Discounting for selectivity, 2004

Donor	Tying-discount gross transfers: A. Non-emergency[1]	Tying-discount gross transfers: B. Emergency[1]	C. Reflows[1]	D. Gross selectivity	Tying- and selectivity-discounted gross transfers (A × D + B)	Selectivity-discounted reflows (C × D)
Arab Agencies	636	0	254	0.59	377	151
Arab Countries	4,336	0	586	0.44	1,908	258
Australia	1,007	146	0	0.54	690	0
Austria	242	73	5	0.46	183	2
Belgium	662	100	78	0.55	467	43
Canada	1,590	272	33	0.57	1,186	19
Czech Republic	54	9	0	0.43	32	0
Denmark	1,185	93	104	0.63	840	66
Finland	345	55	0	0.54	241	0
France	5,362	631	1,284	0.43	2,939	553
Germany	4,637	204	1,591	0.51	2,577	814
Greece	291	20	0	0.41	141	0
Hungary	30	0	0	0.42	12	0
Iceland	16	0	0	0.73	12	0
Ireland	375	38	0	0.65	283	0
Italy	813	75	288	0.49	476	142
Japan	10,065	656	7,463	0.52	5,871	3,866
Korea	280	11	43	0.49	147	21
Lithuania	2	0	0	0.34	1	0
Luxembourg	151	23	0	0.55	107	0
Netherlands	2,603	337	585	0.59	1,867	344
New Zealand	125	25	0	0.54	92	0
Norway	1,326	261	6	0.56	998	3
Other Donors	104	0	0	0.44	46	0
Poland	40	0	0	0.43	18	0
Portugal	154	18	6	0.59	109	3
Slovak Republic	14	0	0	0.44	6	0
Spain	1,317	96	180	0.48	729	86
Sweden	1,755	386	0	0.56	1,369	0
Switzerland	900	370	10	0.54	856	5
Turkey	347	45	0	0.37	172	0
United Kingdom	4,401	527	275	0.59	3,126	163
United States	13,951	2,614	1,461	0.49	9,456	716
AfDF	1,057	0	233	0.72	756	167
AsDF	1,084	0	587	0.56	608	329
CarDB	60	0	30	0.52	32	16
EBRD	86	0	0	0.43	37	0
EC	11,578	999	361	0.48	6,564	174
GEF	150	0	0	0.49	74	0
IDA	8,801	0	2,484	0.53	4,652	1,313
IDB Sp F	560	0	436	0.52	292	228
IFAD	283	0	157	0.59	167	93
Montreal Protocol	60	0	0	0.51	30	0
Nordic Dev.Fund	74	0	9	0.67	50	6
Other UN	274	0	0	0.43	118	0
SAF+ESAF(IMF)	1,204	0	1,383	0.55	657	755
UNDP	389	0	0	0.52	202	0
UNFPA	314	0	0	0.53	167	0
UNHCR	0	367	0		367	0
UNICEF	655	0	0	0.50	327	0
UNRWA	0	449	0		449	0
UNTA	444	0	0	0.49	219	0
WFP	270	0	0	0.53	144	0
France-Senegal	159	0.23	8.7	0.72	114	6.2

[1]From previous tables.

5. Penalizing proliferation

Project proliferation, donor fragmentation, and lack of coordination have long been cited as major problems for aid effectiveness. Donors often act at cross-purposes—one donor's trains won't run on another's tracks, literally or metaphorically. Or donors overload recipient ministries with mission visitations and project reporting requirements (Acharya, de Lima, and Moore 2003; Roodman 2006a, 2006b). Roodman (2006a) shows theoretically how the tendency to proliferate can create bottlenecks in aid delivery on the recipient side, limiting absorptive capacity for aid. A related model in Roodman (2006b) suggests that to maximize aid effectiveness, donors need to fund fewer, larger projects in *smaller* countries else equal since they have less administrative capacity.

Though such transaction costs of aid are widely thought to be substantial, they have mostly defied direct measurement. For example, Brown et al. (2000) set out to measure aid transaction costs in Vietnam but ended up obtaining only anecdotal information. A pair of recent papers has made fresh contributions to analyzing the extent of proliferation and indirectly measuring its costs. Arnab Acharya, Ana Fuzzo de Lima, and Mick Moore (2003) develop indexes of donors' tendency to *proliferate* (disperse) aid among recipients, and of the tendency of recipients' aid to be *fragmented* among many donors. Stephen Knack and Aminur Rahman (2004) measured fragmentation similarly, and find it to be predictive of lower recipient bureaucratic quality. They hypothesize that donors out-compete recipient governments for the scarce resource of skilled nationals.

The inputs to the indexes of proliferation and fragmentation in these papers are data on aid disbursements by donor and recipient, from DAC Table 2a. Given that dataset, the indexes are logical first steps toward measuring proliferation. But this style of analysis also has disadvantages since it looks at allocation of aid across countries rather than allocation across projects within countries. A donor that gives aid to only one country but does so through tiny projects would score perfectly on Acharya, de Lima, and Moore proliferation index since it would not be proliferating at all across recipients, while a donor that provided large, equal-sized blocks of pure budgetary support to several dozen nations would be a major "proliferator."

The idea of the adjustment in the CDI for project proliferation is to weight each dollar of aid based on the size of the "aid activity" of which it is part. The weights depend on the sizes of other projects in the country and the country's governance.

Calculating "size weights" in a conceptually sound way turns out to be more complicated than calculating selectivity weights. One reason is that the sizes of aid activities range over many orders of magnitude, from $10,000 or smaller to $100 million or bigger. A linear map from this range to a limited span needed for weights, such as [0, 1], would have to consign all projects smaller than $5 million to near-0 weights. A map from *log* project size would work little better, for while it would compress the high end, bringing $10 million and $100 million aid activities closer together, it would explode the low end, generating large weight differences between $1,000 and $10,000 projects. A second complication is that if there is such a thing as too small, there is also such a thing as too big. As Radelet (2004) and Roodman (2006b) argue, large blocks of program support are less appropriate for countries where governance is poor. In such countries, the oft-criticized transaction costs associated with aid activities—meetings with donors, quarterly reports, etc.—also have the benefit of improving measurability of results and holding recipients accountable for outcomes. This makes size fundamentally different from governance and poverty, for which monotonic weighting functions are reasonable: to a first approximation, the poorer or better governed the country, the more appropriate it seems for aid. In contrast, there is in, in some theoretical sense, an *optimal* project size. It should depend on several factors, including how big the receiving country is, how much aid it is receiving, and the quality of its governance.

For these reasons, the new size weighting function in the CDI tends toward zero at both the low and high ends, with a peak in between. More precisely, it is lognormal. This is the most natural functional form for this situation because it has strictly positive support (and project size is never negative), takes strictly positive values (so that size weights are never negative), and is inherently compatible with the tendency of aid activity sizes to range over many orders of magnitude, being a normal function of log project size.

As it happens, aid activities themselves tend to be lognormally distributed by size. Thus the mathematical framework is one where a weighted sum of an approximately lognormal distribution of aid activities is taken using weights from a separate lognormal function. Figure 1 illustrates. The heavy line shows the distribution of aid activities by size in a hypothetical country. The most common size is at the peak of this curve. Because of the lognormal scale, however, the *average size*, which is lifted by a few very large projects, is far to the right of the peak. The dashed line shows one possible weighting curve. The weighting curve drawn here peaks at an

"optimal" size somewhat above the average project size, implying the belief that the average aid dollar is going into aid activities that are too small, and is relatively wide, which indicates some uncertainty about what the true optimal size is, and how much deviation from this optimum matters.

Applying such a weighting function to the distribution of projects hat donors fund forces choices about the height, location, and width of each recipient's size weighting curve. In a near-vacuum of empirical evidence about the costs of proliferation, three principles hinted at above shaped the choices. First, the *actual* distribution of aid activities by size is taken as a starting point. Even though this is probably far from optimal in most countries, the choice serves o minimize arbitrariness and puts some faith in donors' judgments about where large or small projects are most appropriate. Second is a bias toward larger projects. There is more consensus that the proliferation of small projects in countries such as Tanzania and Mozambique is inefficient than that $100,000,000 million loans from Japan and the Asian Development Bank to China are too big, even though one might legitimately question the appropriateness of such *carte blanche* disbursements to a relatively unaccountable, corrupt government. Thus the parameters chosen here lead to formulas that tend to penalize projects on the small side of the observed distributions more than those on the large side. Third is a bias toward agnosticism given the poor understanding of these issues, toward preventing the differences among bilaterals' overall proliferation scores from being too great, manifest as a relatively wide weighting curve.

The choices can be stated precisely, as follows. The data source is the CRS database, for which the unit of observation is the "aid activity," which the CRS reporting guidelines describe as follows:

> An aid activity can take many forms. It could be a project or a programme, a cash transfer or delivery of goods, a training course or a research project, a debt relief operation or a contribution to an NGO. (DAC 2002)

All aid activities in the CRS database are included, except for those coded as being donor administrative costs or debt forgiveness.

Since there are three degrees of freedom in the lognormal family of curves, which can be thought of as height, width, and mode (highest-weighted project size), three constraints must be imposed. The first constraint is that the weighting function must reach a peak value of 1.0, so that only projects of "optimal" size go undiscounted. That fixes the height. To describe how the

mode is determined, let μ_1 and σ_1 be the mean and standard deviation of a recipient's log aid activity size. These are the standard parameters of the lognormal distribution. Let *KK* be the country's Kaufmann-Kraay governance score (on which 0 is average). Then the mode of the weighting function is decreed to occur at size $2^{KK} e^{\mu_1+\sigma_1^2}$. For comparison, if the aid activities are perfectly lognormally distributed, *their* modal size is $e^{\mu_1-\sigma_1^2}$, their median at e^{μ_1}, and their average size at $e^{\mu_1+\sigma_1^2/2}$ (Aitchison and Brown 1963, p. 8). Thus for a country of average governance (*KK* = 0), the "optimal aid activity size" is $e^{\mu+\sigma_1^2}$, which is another step above the average—just as far above the average as the average is above the median, in order of magnitude terms. This choice is meant to be minimally arbitrary. Meanwhile, as a hypothetical country's KK score climbs from 0 to about standard deviation above the mean, to 1.0, the "optimal" project size exactly doubles.[15] This choice is meant to be minimally arbitrary. Finally, the width of the weighting curve, as measured by its standard deviation in log space, is set to twice that of the distribution of projects, that is, to $2\sigma_1$. A relatively broad weighting curve is meant to reflect uncertainty about the true optimal size.

To simplify the calculations somewhat, the weighting is not done project by project. Rather, the mean and standard deviation of log aid activity size of donor's projects in each recipient country are computed. The donor's projects are then treated as if they are perfectly lognormally distributed, thus fully characterized by these two numbers, and size-weighted aid is calculated using a general formula for the integral of the product of two lognormal curves. (See Appendix for details.)

As elsewhere, there are practical complications. Bilateral donors that do not report full CRS commitments data, including Belgium, Spain, and Ireland, are assigned, recipient by recipient, the average weight for donors that do. But the multilaterals that do not provide CRS data are assigned an average size weight of 1.0 for all recipients. Figure 2 shows that most of the multilaterals that do report get size weights near 1. Given this pattern, a figure near 1 is clearly appropriate for the only major multilateral not reporting, the IMF, which disburses in large blocks. Both emergency and non-emergency aid are subject to the discount. For consistency, debt service is discounted too, but by the average size weight for the full distribution of a recipient's pro-

[15] Scores on each of the 6 Kaufmann-Kraay components are standardized to have mean 0 and standard deviation 1. The composite has mean zero and standard deviation 0.93 (in 2002).

jects from all donors. This implicitly assumes that the opportunity cost of debt service is a set of aid activities of a size that is not necessarily typical for the donor in that country, but is typical of all donors. Note that this choice can heavily penalize a donor that disburses aid to a country through small projects and then received comparable amounts of money in debt service. If the debt service is discounted much less than the disbursements for size, a donor's size-adjusted aid can turn negative.

The approach does penalize very large projects in theory, especially in poorly governed countries, but because the parameter choices create a bias toward large projects and a degree of agnosticism, few large projects are actually discounted much. As a result, there is a strong positive correlation between a donor's average project size across all recipients and its average size weight in the CDI. (See Figure 2.) In sum, the approach has a well-defined and somewhat sophisticate theoretical foundation, but in practice, because of the conservative parameter choices, the upshot is essentially a straightforward discount based on each donor's average (log) project size.

Summary calculations at the donor level are in Table 7. As before, the actual calculations take place at the donor-recipient level. At that level, two size weights figure: one for the donor's own portfolio of projects in the recipient country, the other for all donors' projects in each recipient country, which is used for discounting debt service. Multilaterals such as the African and Asian Development Funds and the IDA clearly come out ahead, as they commit aid in much larger blocks than other donors in the countries they assist. Among bilaterals, Denmark stands out.

Since this is the last adjustment for quality, the final column of Table 7 is labeled "net quality-adjusted aid." This is a dollar value that embodies both quantity and quality factors. Since this is first calculated at the donor-recipient level, the next step is aggregating up to the donor level.

Figure 1. Illustration of aid activity size weighting

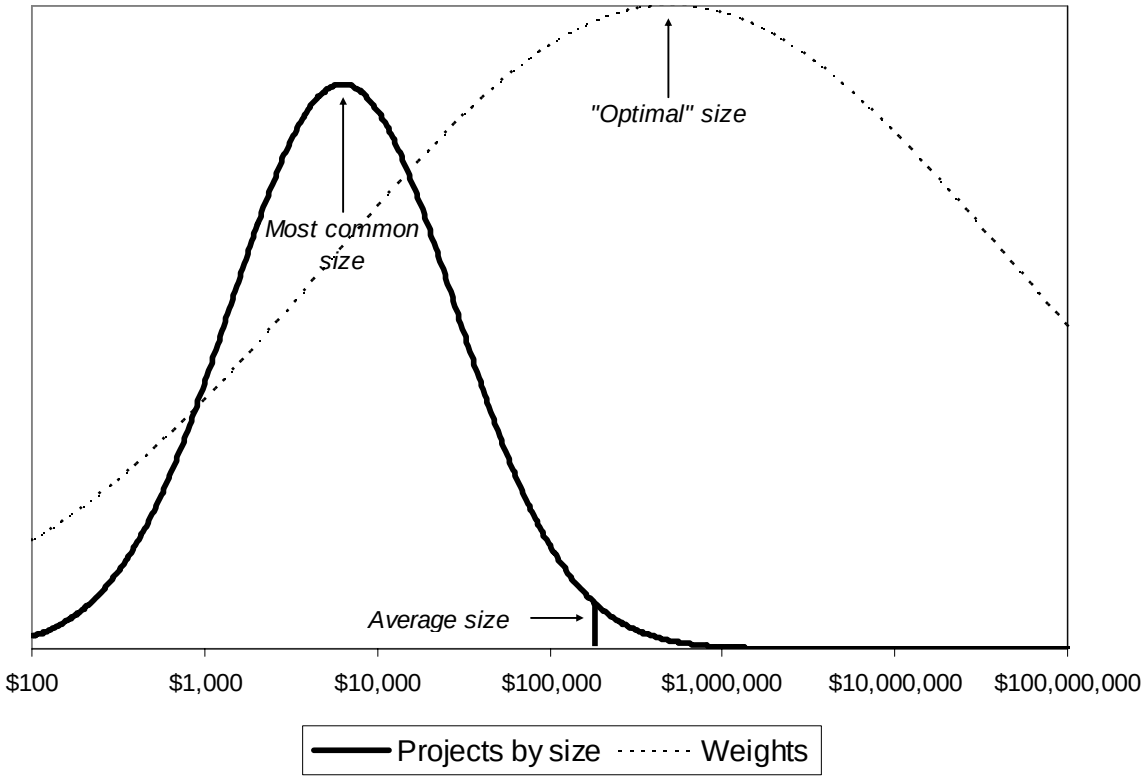

Figure 2. Average size weight in CDI versus average log aid activity commitment, 2003

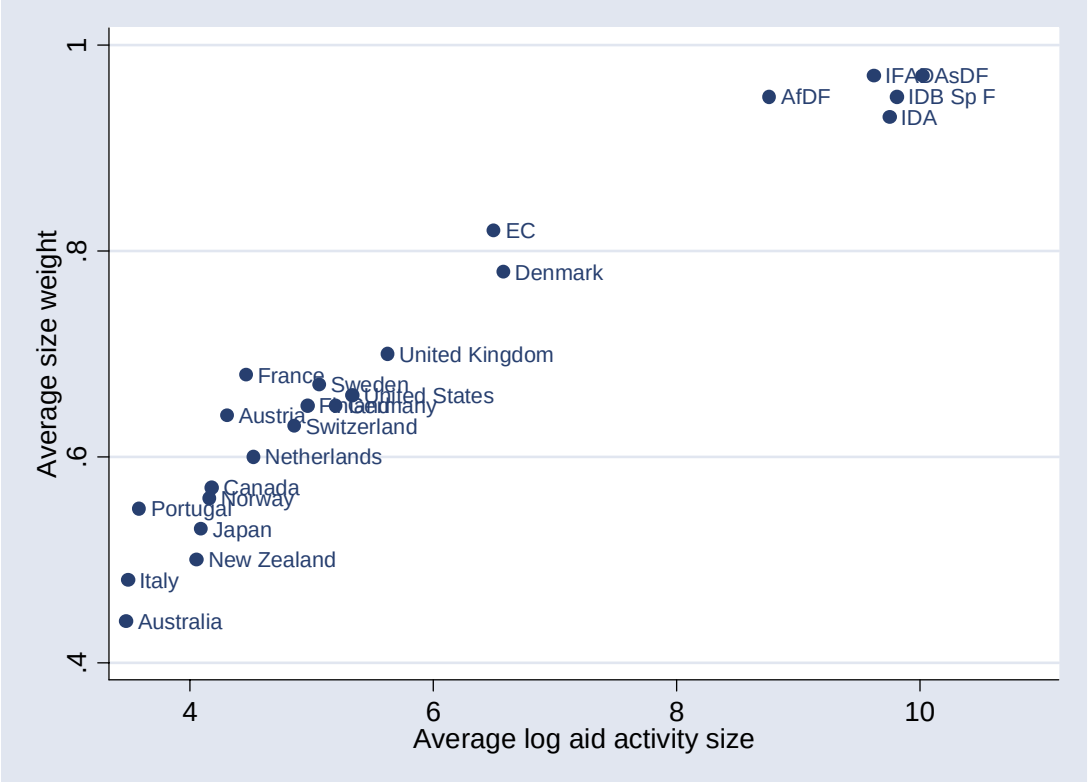

Table 7. Discounting for proliferation, 2004

Donor	A. Tying- and selectivity-discounted gross aid[1]	B. Selectivity-discounted reflows[1]	C. Size weight	D. Recipient average size weight	E. Gross quality-adjusted aid (A × C)	F. Quality-adjusted repayments (B × D)	Net quality-adjusted aid (E + F)
Arab Agencies	377	151	0.79	0.79	296	118	178
Arab Countries	1,908	258	0.75	0.75	1,440	195	1,245
Australia	690	0	0.48	0.63	332	0	332
Austria	183	2	0.53	0.74	98	2	96
Belgium	467	43	0.76	0.76	355	33	322
Canada	1,186	19	0.67	0.75	799	14	784
Czech Republic	32	0	0.73	0.73	24	0	24
Denmark	840	66	0.71	0.76	593	50	543
Finland	241	0	0.66	0.75	159	0	159
France	2,939	553	0.64	0.72	1,874	400	1,474
Germany	2,577	814	0.64	0.71	1,657	578	1,078
Greece	141	0	0.79	0.79	110	0	110
Hungary	12	0	0.74	0.74	9	0	9
Iceland	12	0	0.78	0.78	9	0	9
Ireland	283	0	0.78	0.78	221	0	221
Italy	476	142	0.50	0.72	240	103	137
Japan	5,871	3,866	0.58	0.68	3,408	2,617	791
Korea	147	21	0.72	0.72	106	15	91
Lithuania	1	0	0.72	0.72	0	0	0
Luxembourg	107	0	0.75	0.75	80	0	80
Netherlands	1,867	344	0.67	0.76	1,243	262	982
New Zealand	92	0	0.56	0.62	51	0	51
Norway	998	3	0.59	0.78	586	2	584
Other Donors	46	0	0.73	0.73	33	0	33
Poland	18	0	0.74	0.74	13	0	13
Portugal	109	3	0.48	0.72	52	2	50
Slovak Republic	6	0	0.76	0.76	5	0	5
Spain	729	86	0.73	0.73	534	63	471
Sweden	1,369	0	0.76	0.77	1,034	0	1,034
Switzerland	856	5	0.50	0.76	427	4	423
Turkey	172	0	0.76	0.76	131	0	131
United Kingdom	3,126	163	0.77	0.77	2,406	126	2,280
United States	9,456	716	0.65	0.70	6,191	499	5,692
AfDF	756	167	0.96	0.79	723	132	591
AsDF	608	329	0.96	0.76	581	249	332
CarDB	32	16	0.62	0.62	20	10	10
EBRD	37	0	0.72	0.72	27	0	27
EC	6,564	174	0.72	0.74	4,734	128	4,607
GEF	74	0	0.68	0.68	50	0	50
IDA	4,652	1,313	0.94	0.79	4,371	1,032	3,338
IDB Sp F	292	228	0.95	0.79	278	180	98
IFAD	167	93	0.96	0.76	160	71	90
Montreal Protocol	30	0	0.60	0.60	18	0	18
Nordic Dev.Fund	50	6	0.78	0.78	38	5	34
Other UN	118	0	0.69	0.69	81	0	81
SAF+ESAF(IMF)	657	755	0.82	0.82	540	620	-80
UNDP	202	0	0.77	0.77	157	0	157
UNFPA	167	0	0.76	0.76	127	0	127
UNHCR			0.79	0.79			
UNICEF	327	0	0.77	0.77	253	0	253
UNRWA			0.67	0.67			
UNTA	219	0	0.75	0.75	165	0	165
UNTA	219	0	0.75	0.75	165	0	165
WFP	144	0	0.79	0.79	113	0	113
France-Senegal	114	6.2	0.72	0.81	82	5	77

[1]From previous tables.

6. Aggregation to the donor level

In principle, this aggregation is matter of simple sums over recipients. But data problems intrude. Not all aid in the DAC database is fully disaggregated by recipient country, partly because administrative costs at headquarters are hard to allocate, partly because aid can support projects or programs intended to benefit an entire region or continent. The United States, for example, gave $2.435 billion in gross transfers in 2003 to "Least developed countries unspecified," $130 million to "Americas Unspecified," and a separate $37 million to "North and Central America Unallocated." In addition, it is impossible to assign selectivity weights to some recipients for lack of values for GDP/capita or the KK composite. These aid flows cannot be discounted for selectivity without further assumptions. Similarly, some recipients, including recipient groups like those just mentioned, have no commitments listed in the CRS database for some donors, so that no size weight can be directly computed.

Leaving out aid that cannot be directly discounted for selectivity or size would understate donors' contributions. So such aid is incorporated as follows. For each sub-continental region, as defined in the DAC database, such aid is discounted by the donor's average selectivity and size weights for aid that *can* be directly discounted. Once this discounting is done, all selectivity-discounted aid to each region is summed. This procedure repeats at the level of the continent, then the Part, then the aid recipient universe.[16]

7. Allocating multilateral quality-adjusted aid to bilaterals

Since the motivation for this exercise is to compare national governments, it is important to give bilaterals credit for their contributions to multilateral institutions. This final step in computing the index of official aid performance is done in a way that is the mirror image of the standard DAC approach. In the DAC approach, each bilateral's contribution to each multilateral is imputed forward to recipient countries based on the multilateral's allocation across recipients in the same year. So if Japan gives $50 million to the Asian Development Fund in some year, and 10% of the AsDF's net ODA goes to Indonesia that year, then 10% × $50 million = $5 million is imputed as Japan-Indonesia aid. In the CDI, the process runs the other way, because it is necessary to transmit back the information about the multilaterals' aid quality contained in their quality-

[16] The DAC database divides Part II counties not into continents but into two major groups—former eastern bloc nations, and relatively rich non-DAC members. For the present calculations, these two groups are treated as "continents."

adjusted aid totals. So in the aid index, bilaterals receive credit for the aid programs of multilaterals in proportion to the bilaterals' contributions to those multilaterals during the same year. For example, since Germany accounted for 19.90% of net contributions to the IDA during 2004, it receives credit for 19.90% of the IDA's quality-adjusted aid of $3.338 billion, or $664 million.[17] (See Table 8.)

The penultimate column of Table 8 is the final measure of official aid performance: quality-adjusted aid as a share of donor Gross National Income. GNI figures are converted to dollars using market exchange rates, and are from the DAC.

Despite the quality adjustments, what most distinguishes donors from each other in this index is still the sheer quantity of aid they disburse, especially when measured as true net transfers. Denmark, the Netherlands, Norway, and Sweden are large donors by DAC's net ODA measure, and they score highest on this one too, with at least 0.29% of GNI for 2004. The two largest donors by DAC's standard net ODA measure, Japan and the United States score among the lowest on this index, Japan at 0.04%, the United States at 0.06%. One reason for Japan's low score is that its true net transfers are much lower than its net ODA; at $6.433 billion, they put Japan well behind France, Germany, and the United Kingdom.

The final column of Table 8 offers a quantitative measure of aid quality: the ratio of quality-adjusted aid to net aid transfers. U.S. aid quality is low despite large projects, because it channels the lion's share of its aid through its bilateral program, which features high tying and low selectivity for poverty and good governance. Japanese aid quality also registers low, in part because the tying penalty, computed as a fraction of gross aid, looms large relative to its much-smaller net aid. The leaders are Sweden, Belgium, and the United Kingdom (all at 44%) and Ireland (at 47%).

Although the final scores are expressed as percentages of GNI, they should not be compared to other variables so expressed, such as net ODA/GNI, only to each other. The selectivity adjustment, for example, could have super-weighted aid to the most appropriate recipients rather than discounting it to less appropriate ones. This equally meaningful choice would make little difference for the relative results, but would raise scores across the board.

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[17] A few small multilaterals, such as the Central American Bank for Economic Integration receive contributions in but do not themselves report to DAC on their own aid allocations (examples include). This made it impossible to compute their quality-adjusted aid and allocate it back to bilaterals. To prevent contributions to these unscored multilaterals from being dropped, a simple extrapolation was performed based on each bilateral's ratio of quality-adjusted allocated back from scored multilaterals to contributions the donor made to those multilaterals.

I back-calculate this index of official aid performance to explore time-series as well as cross-sectional variation in scores. What sets the starting point of the time frame is the availability of the Kaufmann-Kraay governance variable—for even years in 1996–2004. For odd years, I use the previous year's score, except that 1995 calculations also use the 1996 KK scores. This allows calculation of the index for 1995–2004. Total quality-adjusted aid/GNI of bilaterals declined somewhat over this period. The simple average was 0.19% in 1995 and 0.15% in 2004, and the correlation of 1995 and 2004 scores is 0.94.[18] (See Figure 3.)

Aid quality (quality-adjusted aid/net aid transfers) is more volatile, and appears be falling. It averaged 456% in 1995 and 370% in 2003.[19] The underlying reason appears to be slow declines in selectivity for governance and increasing proliferation. This seems opposite in tenor from the finding of Dollar and Levin (2004) of increasing selectivity since 1985.

Table 8. Allocating multilateral quality-adjusted aid to bilaterals, 2004

		Net aid			Quality-adjusted aid					
Country	Gross aid	Bilateral	Multilateral	Total	Bilateral	Multilateral	Total	GNI	**Adjusted aid/GNI**	Adjusted/ Net aid
	(million $)	----- (million $) -----			----- (million $) -----			(million $)	----- (%) -----	
Australia	1,460	275	1,185	1,460	332	116	448	595,630	**0.08**	31
Austria	771	427	340	766	96	176	272	290,943	**0.09**	36
Belgium	1,509	743	688	1,431	322	310	633	357,207	**0.18**	44
Canada	2,601	608	1,959	2,568	784	275	1,060	970,536	**0.11**	41
Denmark	2,240	928	1,207	2,135	543	311	854	240,474	**0.35**	40
Finland	747	340	407	747	159	100	259	185,126	**0.14**	35
France	9,799	3,700	4,815	8,515	1,474	1,530	3,004	2,058,806	**0.15**	35
Germany	9,634	4,670	3,373	8,043	1,078	1,950	3,028	2,729,147	**0.11**	38
Greece	595	241	354	595	110	85	196	204,300	**0.10**	33
Ireland	610	198	413	610	221	65	287	156,186	**0.18**	47
Italy	3,289	2,401	600	3,001	137	822	959	1,669,301	**0.06**	32
Japan	13,895	3,048	3,385	6,433	791	1,031	1,822	4,759,022	**0.04**	28
Netherlands	4,753	1,703	2,465	4,168	982	683	1,665	573,127	**0.29**	40
New Zealand	213	54	160	213	51	18	69	90,623	**0.08**	32
Norway	2,249	662	1,582	2,244	584	211	795	251,528	**0.32**	35
Portugal	395	219	170	389	50	86	136	164,404	**0.08**	35
Spain	2,493	1,037	1,276	2,313	471	430	901	1,018,232	**0.09**	39
Sweden	2,819	646	2,172	2,819	1,034	196	1,231	350,192	**0.35**	44
Switzerland	1,647	370	1,267	1,637	423	177	600	376,621	**0.16**	37
United Kingdom	8,237	3,308	4,653	7,961	2,280	1,247	3,527	2,179,558	**0.16**	44
United States	22,161	3,522	17,178	20,700	5,692	1,726	7,418	11,656,110	**0.06**	36

[18] These figures exclude Greece, which did not report to DAC for 1995, and may have given essentially no aid.
[19] Figures exclude Greece.

Figure 3. Total quality-adjusted aid/GNI by bilateral donor, 1995–2004

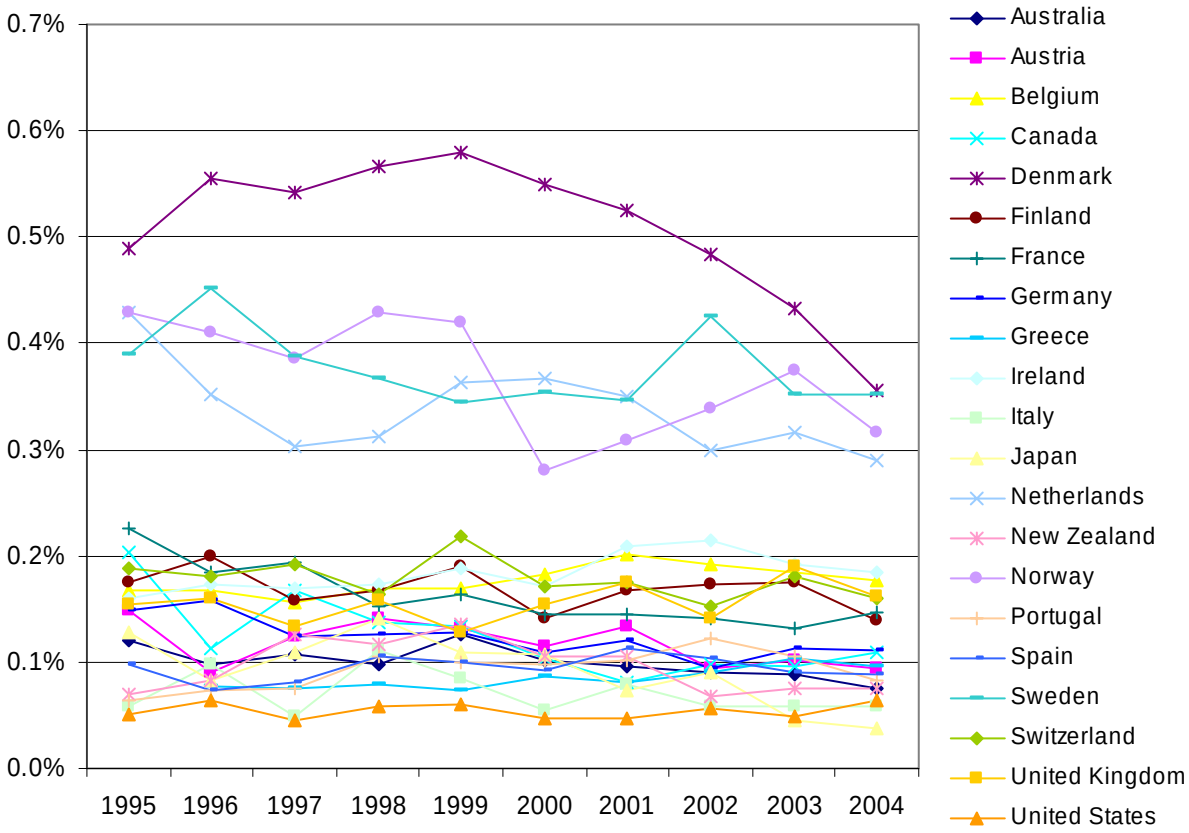
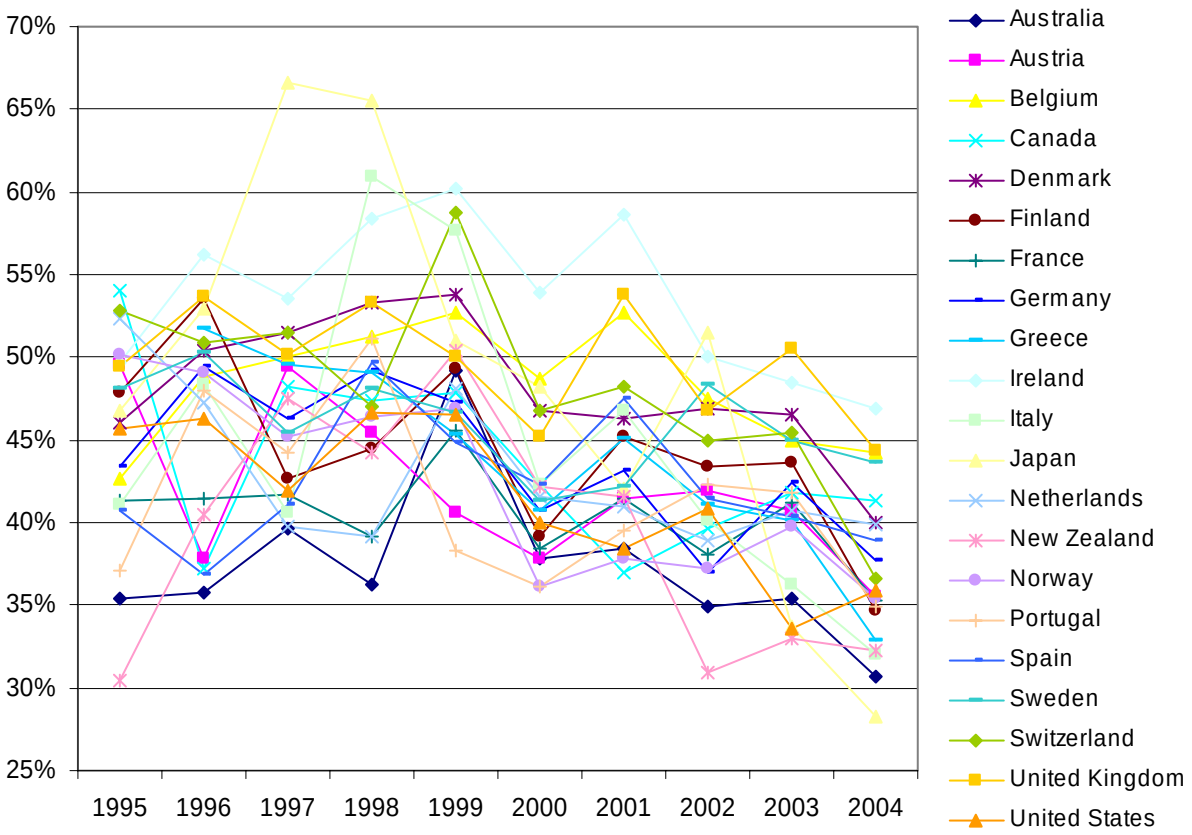


Figure 4. Total quality-adjusted aid/net aid by bilateral donor, 1995–2004



8. Rewarding tax policies that support private giving[20]

The focus so far as been on foreign aid in the sense of public expenditure. However, private citizens also give aid to developing countries, usually via non-governmental organizations. Private giving is of course not public policy per se, but it is influenced by public policy—fiscal policy in particular. The aid index therefore incorporates estimates of the charitable giving caused by public policy. The approach taken here is to estimate the proportional increase in giving caused by each country's tax policies, compare that to actual giving, then work backwards to estimate how much giving would have occurred in the absence of the policies and how much is a credit to their presence. Two aspects of fiscal policy are considered. First are targeted income tax incentives that lower the "price" of giving. Second is the total tax revenue/GDP ratio: lower taxes leave citizens and corporations with more after-tax income to give to charity.

[20] Scott Standley contributed to this section.

The approach taken here will seem simplistic to some and too sophisticated to others. To make the calculations practical, we make several simplifying assumptions. Each country's tax policies are complex and idiosyncratic. No two households are in exactly the same financial position, and so the tax codes present different incentives to different households. And of course different people respond to the same incentives differently. On the other hand, the sophistication of the calculations, such as it is, should not be read to imply that we see our estimates as beyond improvement.

According to a survey reported in Roodman and Standley (2006), all but three index countries—Austria, Finland, and Sweden—offer income tax incentives for charitable giving. Australia, Belgium, Denmark, Germany, Greece, Ireland, Japan, Netherlands, Norway, Switzerland, the United Kingdom, and the United States allow partial or full deduction of charitable donations from taxable income. Canada, France, Italy, New Zealand, Portugal, and Spain offer partial credits—through the tax code, they reimburse a percentage of donations. These incentives lower the price of giving in the sense that a dollar of forgone after-tax income buys more than a dollar of charity. Charitable donations can fund the operations of non-profit groups working in developing countries, such as Oxfam and CARE, or they can go to foundations that fund such projects.

We translate the presence of a tax incentive into an estimate of the increase in charitable giving in three steps. First, we express the tax measure as a price effect. For credits, this step is straightforward. Canada's 29% tax credit, for example, reduces the price of giving by 29%. For deductions, we used a crude but available proxy for the marginal income tax rate faced by the households with above-average incomes that appear to generate most charity. This proxy is the marginal income tax rate for people at 167% of the income level of the average production worker, from the OECD Tax Database. For example, the rate is 31.4% for the United States in 2003, so deductibility of charitable giving in the United States is treated as reducing the price by 31.4%. The second step is to factor in whether the deduction or credit is capped. In countries where high-income, high-giving people account for most charity in the aggregate, caps can severely limit the incentive effect in practice. Precisely how much, however, is hard to know, especially because there is little information about the distribution of giving by income group outside the United States. Given the uncertainty, we factor caps in coarsely, by taking the simple average of the below- and above-threshold price incentives. For most countries with caps, the above-

threshold price incentive is 0—there is no tax incentive to exceed the cap—so the price effect is halved. The exception is Greece, which offers full deductibility up to €2,950 a year, then imposes a 10% tax above that limit. Since the Greece's representative marginal income tax is 25.2%, the above-threshold price incentive is the difference between this and the special tax rate, i.e., 15.2%. So the simple average of the below- and above-threshold rates for Greece is 20.2%. (See Table 9.)

Finally, having estimated the price effect, we couple it with an estimate of the price elasticity of giving. Research puts it at around 0.5 in the United States (Andreoni 2001). Thus, if a representative individual in the United States faces a price effect of 31.4%, full deductibility of charitable contributions multiplies giving by a factor of $(1 - 0.314)^{-0.5} = 1.208$, for a 20.8% increase.

The procedure is similar for the effect of lower total taxes. When the overall tax ratio is lower, individuals have more money to give to charity. Thus, while high marginal tax rates *increase* the incentive to give when we look at the price effects of tax deductions, they *decrease* the incentive to give when we look at income effects. Among the 21 scored countries, the tax revenue/GDP ratio in 2000, the last year with data available for the *first* edition of the CDI, ranged from 27.1% in Japan to 53.8% in Sweden (OECD 2004). To reward countries for lower tax ratios, we need a baseline against which to define lowness. We choose Sweden's 2000 tax ratio, the highest. We combine this with an estimate of the income of elasticity of giving of 1.1 (Andreoni 2001). The United States, to continue the example, is treated as having reduced its total tax burden in 2003, the last year with data available for the 2006 CDI, from Sweden's 2000 ratio of 53.8% to the actual 25.6%. (Sweden's 2000 ratio is used every year for a consistent benchmark.) This hypothetically raises the privately claimed share of GDP from 46.2% to 74.4%, an increase of 61.0%.[21] As a result, the lower U.S. tax burden is estimated to multiply charity by

$$\left(\frac{1-0.256}{1-0.538}\right)^{1.1} = 1.689, \text{ for a 68.9\% increase.}$$

The two multipliers are then combined and divided into observed giving in order to estimate giving in the absence of these favorable policies. Observed giving is "grants by NGOs"

[21] Some share of the revenue funds transfer payments, which increase recipients' disposable income and should therefore increase charitable giving. However, the transfer payments going to the high-income people that appear to account for most charity are probably relatively small.

from DAC Table 1; it counts contributions by foundations and individuals, which do ordinarily go through NGOs, but excludes official aid that is channeled through NGOs. Just as with official aid, grants by NGOs to Part 2 countries are also counted. The result is a set of estimates for the dollar increase in private giving to developing countries caused by fiscal policy. In the U.S. case, the multipliers combine to 1.208 × 1.689 = 2.04. Observed giving of $10.369 billion in 2004 happens to be 2.04 times $5.084 billion, so U.S. policy is credited for the difference, $5.285 billion. (See Table 10.)

To incorporate the results on charitable giving attributed to policy into the main quality-adjusted aid measure, it is necessary to adjust the charitable giving results for quality in parallel fashion. As noted above, quality-adjusted aid cannot be directly compared or added to simple aid totals. Moreover, private giving too can go to countries that are more or less appropriate for aid, and can contribute to the problems of project proliferation. As a rough adjustment in the absence of information on the quality of private aid, the CDI discounts policy-induced private giving by the simple average of the quality discounts for the bilaterals' own aid programs, relative to net aid transfers, which is 64% for 2004.

Incorporating private giving turns out to have small effects on the scores. In the case of the United States, a country often pointed to as a stingy public donor and a generous source of private charity, the result is $1.909 billion in quality-adjusted charitable giving attributed to tax policy. Added to the country's $7.418 billion in official quality-adjusted aid, this raises the final U.S. score on the aid index from 0.06% to 0.08% of GNI, leaving the country ahead of only Italy and Japan. (See Table 11.)

Table 9. Computation of price incentive of tax policy, 2004

Country	A. Tax deduction?	B. Marginal income tax rate, 2004[1] (%)	C. Tax credit (%)	D. Deduction or credit capped?	Price incentive[2] (%)
Australia	Yes	48.5	0.0	No	48.5
Austria	No	31.7	0.0	No	0.0
Belgium	Yes	45.1	0.0	No	45.1
Canada	No	35.4	29.0	No	29.0
Denmark	Yes	54.9	0.0	Yes	27.5
Finland	No	43.7	0.0	No	0.0
France	No	24.9	60.0	No	60.0
Germany	Yes	47.5	0.0	No	47.5
Greece	Yes	25.2	0.0	No	20.2
Ireland	Yes	42.0	0.0	No	42.0
Italy	No	36.4	19.0	No	19.0
Japan	Yes	20.4	0.0	No	20.4
Netherlands	Yes	52.0	0.0	No	52.0
New Zealand	No	39.0	33.3	Yes	16.7
Norway	Yes	41.5	0.0	Yes	20.7
Portugal	No	24.0	25.0	No	25.0
Spain	No	26.2	25.0	No	25.0
Sweden	No	51.5	0.0	No	0.0
Switzerland	Yes	25.1	0.0	No	25.1
United Kingdom	Yes	22.0	0.0	No	22.0
United States	Yes	31.4	0.0	No	31.4

[1]Marginal income tax rate for single individual at 167% income level of the average production worker. [2]Formula is: Column B or C as appropriate, divided by 2 if there is a cap. Uniquely, Greece gives full deductibility up to a certain amount (2,950 euros) and imposes a low tax (10%) on contributions above the threshold. The tax incentive is therefore computed as the average of the below- and above-threshold incentives.

Table 10. Calculation of policy-induced charitable giving, 2004

Country	A. Marginal price effect (%)[1]	B. Increase in giving with incentive (%)	C. Tax revenue/GDP, 2003 (%)	D. Giving increase because of smaller gov't (%)	E. Combined increase	F. Grants by NGOs, 2004[2]	G. Giving in absence of favorable tax policies	Giving attributed to tax policies
	---------- (%) ----------					---------- (million $) ----------		
Formula:		(1–A)^price elasticity–1[3]		((1–C)/(1–53.8%))^ income elasticity–1[4]	(1+B)× (1+D)–1		E/(1+F)	G–F
Australia	48.5	39.3	31.6	54.0	114.6	489	228	261
Austria	0.0	0.0	43.1	25.8	25.8	101	80	21
Belgium	45.1	35.0	45.4	20.2	62.2	181	111	69
Canada	29.0	18.7	33.8	48.5	76.3	639	362	276
Denmark	27.5	17.4	48.3	13.2	32.9	64	48	16
Finland	0.0	0.0	44.8	21.6	21.6	14	11	2
France	60.0	58.1	43.4	25.0	97.7	280	142	138
Germany	47.5	38.0	35.5	44.3	99.2	1,148	576	572
Greece	20.2	11.9	35.7	43.9	61.0	19	12	7
Ireland	42.0	31.3	29.7	58.7	108.4	234	112	122
Italy	19.0	11.1	43.1	25.8	39.7	49	35	14
Japan	20.4	12.1	25.3	69.6	90.1	425	223	201
Netherlands	52.0	44.3	38.8	36.2	96.7	412	209	202
N. Zealand	16.7	9.5	34.9	45.8	59.7	29	18	11
Norway	20.7	12.3	43.4	25.0	40.4	452	322	130
Portugal	25.0	15.5	37.1	40.4	62.1	3	2	1
Spain	25.0	15.5	34.9	45.8	68.4	133	79	54
Sweden	0.0	0.0	50.6	7.6	7.6	31	28	2
Switzerland	25.1	15.6	29.5	59.2	83.9	329	179	150
U.K.	22.0	13.2	35.6	44.1	63.2	394	242	153
U.S.	31.4	20.8	25.6	68.9	104.0	10,369	5,084	5,285

[1]From previous table. [2]Data for latest available year. [3]Price elasticity of giving taken to be –0.5. [4]Income elasticity of giving taken to be 1.1.

Table 11. Incorporating private giving attributable to public policy, 2004

Country	A. Quality-adjusted official aid[1]	B. Charitable giving credited to policy[1]	C. Quality-adjusted charitable giving credited to policy (B × (1–64%))	**Adjusted (aid+charitable giving)/GNI** ((A + C)/GNI, %)
Australia	448	595,630	0.08	**31**
Austria	272	290,943	0.09	**36**
Belgium	633	357,207	0.18	**44**
Canada	1,060	970,536	0.11	**41**
Denmark	854	240,474	0.35	**40**
Finland	259	185,126	0.14	**35**
France	3,004	2,058,806	0.15	**35**
Germany	3,028	2,729,147	0.11	**38**
Greece	196	204,300	0.10	**33**
Ireland	287	156,186	0.18	**47**
Italy	959	1,669,301	0.06	**32**
Japan	1,822	4,759,022	0.04	**28**
Netherlands	1,665	573,127	0.29	**40**
New Zealand	69	90,623	0.08	**32**
Norway	795	251,528	0.32	**35**
Portugal	136	164,404	0.08	**35**
Spain	901	1,018,232	0.09	**39**
Sweden	1,231	350,192	0.35	**44**
Switzerland	600	376,621	0.16	**37**
United Kingdom	3,527	2,179,558	0.16	**44**
United States	7,418	11,656,110	0.06	**36**

[1]From previous tables.

Appendix. Size weighting formula

This appendix derives the formula used to compute size-weighted aid for each donor-recipient pair. It first derives a general formula for the integral of the product of two lognormal curves. In the application in this paper, one curve represents the distribution of aid activities by size and the other the weights applied to them based on size. This appendix then shows how the parameters of the size weighting curve are mathematically determined.

Suppose we have two lognormal curves of the form:

$$h_1(x) = \frac{N_1}{\sqrt{2\pi}\sigma_1 x} e^{-\frac{1}{2}\left(\frac{\ln x - \mu_1}{\sigma_1}\right)^2}$$

$$h_2(x) = \frac{N_2}{\sqrt{2\pi}\sigma_2 x} e^{-\frac{1}{2}\left(\frac{\ln x - \mu_2}{\sigma_2}\right)^2}$$

If $u = \ln x$, then $x = e^u$, $du = dx/x$, and the total integral of the product of the two curves is

$$\int_0^\infty \frac{N_1}{\sqrt{2\pi}\sigma_1 x} e^{-\frac{1}{2}\left(\frac{\ln x - \mu_1}{\sigma_1}\right)^2} \frac{N_2}{\sqrt{2\pi}\sigma_2 x} e^{-\frac{1}{2}\left(\frac{\ln x - \mu_2}{\sigma_2}\right)^2} dx$$

$$= \frac{N_1 N_2}{2\pi\sigma_1\sigma_2} \int_{-\infty}^\infty \frac{1}{e^u} e^{-\frac{1}{2}\left(\frac{u-\mu_1}{\sigma_1}\right)^2 - \frac{1}{2}\left(\frac{u-\mu_2}{\sigma_2}\right)^2} du$$

$$= \frac{N_1 N_2}{2\pi\sigma_1\sigma_2} \int_{-\infty}^\infty \frac{1}{e^u} e^{-\frac{1}{2}\left(u^2\left(\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}\right) - 2u\left(\frac{\mu_1}{\sigma_1^2}+\frac{\mu_2}{\sigma_2^2}\right) + \frac{\mu_1^2}{\sigma_1^2}+\frac{\mu_2^2}{\sigma_2^2}\right)} du$$

$$= \frac{N_1 N_2}{2\pi\sigma_1\sigma_2} \int_{-\infty}^\infty e^{-\frac{1}{2}\left(u^2\left(\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}\right) - 2u\left(\frac{\mu_1}{\sigma_1^2}+\frac{\mu_2}{\sigma_2^2}-1\right) + \frac{\mu_1^2}{\sigma_1^2}+\frac{\mu_2^2}{\sigma_2^2}\right)} du.$$

This arranges the exponent as a quadratic expression in u. Completing the square in that expression gives

$$\frac{N_1 N_2}{2\pi\sigma_1\sigma_2}\int_{-\infty}^{\infty} e^{-\frac{1}{2}\left(\left(u\sqrt{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}-\frac{\frac{\mu_1}{\sigma_1^2}+\frac{\mu_2}{\sigma_2^2}-1}{\sqrt{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}}\right)^2-\frac{\left(\frac{\mu_1}{\sigma_1^2}+\frac{\mu_2}{\sigma_2^2}-1\right)^2}{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}+\frac{\mu_1^2}{\sigma_1^2}+\frac{\mu_2^2}{\sigma_2^2}\right)}du$$

$$=\frac{N_1 N_2}{2\pi\sigma_1\sigma_2}e^{-\frac{1}{2}\left(-\frac{\left(\frac{\mu_1}{\sigma_1^2}+\frac{\mu_2}{\sigma_2^2}-1\right)^2}{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}+\frac{\mu_1^2}{\sigma_1^2}+\frac{\mu_2^2}{\sigma_2^2}\right)}\int_{-\infty}^{\infty} e^{-\frac{1}{2}\left(u\sqrt{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}-\frac{\frac{\mu_1}{\sigma_1^2}+\frac{\mu_2}{\sigma_2^2}-1}{\sqrt{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}}\right)^2}du.$$

The integral has been transformed into that of a normal curve, and evaluates to

$$\frac{\sqrt{2\pi}}{\sqrt{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}}.$$

The whole expression is therefore

$$\frac{N_1 N_2}{2\pi\sigma_1\sigma_2}\frac{\sqrt{2\pi}}{\sqrt{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}}e^{-\frac{1}{2}\left(-\frac{\left(\frac{\mu_1}{\sigma_1^2}+\frac{\mu_2}{\sigma_2^2}-1\right)^2}{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}+\frac{\mu_1^2}{\sigma_1^2}+\frac{\mu_2^2}{\sigma_2^2}\right)}$$

$$=\frac{N_1 N_2}{\sqrt{2\pi}\sqrt{\sigma_1^2+\sigma_2^2}}e^{-\frac{1}{2}\left(\frac{\mu_1^2}{\sigma_1^2}+\frac{\mu_2^2}{\sigma_2^2}-\frac{\left(\frac{\mu_1}{\sigma_1^2}+\frac{\mu_2}{\sigma_2^2}-1\right)^2}{\frac{1}{\sigma_1^2}+\frac{1}{\sigma_2^2}}\right)}.$$

Letting $\eta_1 = \mu_1/\sigma_1$, $\eta_2 = \mu_2/\sigma_2$, and $\hat{\sigma} = \sqrt{\sigma_1^2+\sigma_2^2}$, this can be rewritten as

$$\int_0^{\infty} h_1(x)h_2(x)dx = \frac{N_1 N_2}{\sqrt{2\pi}\hat{\sigma}}e^{-\frac{1}{2}\left(\eta_1^2+\eta_2^2-\frac{\sigma_1^2\sigma_2^2}{\hat{\sigma}^2}\left(\frac{\eta_1}{\sigma_1}+\frac{\eta_2}{\sigma_2}-1\right)^2\right)}. \qquad (1)$$

In the present case, h_1 is the distribution of aid activities by size, so N_1, the number of aid activities, is known, and μ_1 and σ_1 can be estimated from the data. To fix the three parameters of h_2, the size weighting function, we impose three constraints. First, we require that the peak value of the weighting function is 1. In general, the mode of h_2 is $e^{\mu_2-\sigma_2^2}$ (Aitchison and Brown 1963), at which it takes the value

$$h_2\left(e^{\mu_2-\sigma_2^2}\right)=\frac{N_2}{\sqrt{2\pi}\sigma_2 e^{\mu_2-\sigma_2^2}}e^{-\frac{1}{2\sigma_2^2}\left(\mu_2-\sigma^2-\mu_2\right)^2}=\frac{N_2}{\sqrt{2\pi}\sigma_2 e^{\mu_2-\frac{\sigma_2^2}{2}}}.$$

This is 1 when

$$N_2=\sqrt{2\pi}\sigma_2 e^{\mu_2-\frac{\sigma_2^2}{2}}.$$

As discussed in the main text, we next require that h_2 peaks at $2^{KK}e^{\mu_1+\sigma_1^2/2}$, where *KK* is the recipient's Kaufmann-Kraay governance score. And we require that h_2 is twice as wide as h_1, that is, $\sigma_2=2\sigma_1$. Since the mode of h_2 occurs at $e^{\mu_2-\sigma_2^2}$, we have $2^{KK}e^{\mu_1+\sigma_1^2/2}=e^{\mu_2-\sigma_2^2}$. Ergo

$$\mu_2=\ln\left(2^{KK}e^{\mu_1+\sigma_1^2/2}\right)+\sigma_2^2=\mu_1+\sigma_1^2/2+KK\ln 2+4\sigma_1^2=\mu_1+9\sigma_1^2/2+KK\ln 2.$$

Having expressed N_2, μ_2, and σ_2 as functions of N_1, μ_1, σ_1, and *KK*, we can then apply (1) to estimate total size-weighted aid for a given project distribution.

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