Donor Accountability Reconsidered:
Aid Allocation in the Age of Global Public Goods

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Abstract

Development assistance is increasingly used to fund the provision of global public goods. However, in this case, the traditional classification of donor interests and recipient needs is not appropriate for analyzing donors' aid allocation decisions. Given the non-excludability characteristic of global public goods, aid targeting the provision of such goods should not flow to those places with the greatest needs – as assumed by the existing aid allocation literature – but to those where they can be provided most efficiently.

After explaining the theoretical rationale behind this claim, we empirically show its implication at the example of aid for climate change mitigation (a global public good): At first glance, aid for mitigation appears much more donor-interest driven than aid for adaptation (a private or local public good) or than general aid where the consideration of recipient need seems to play a greater role. The picture changes when including appropriate control variables for mitigation efficiency. As the latter is positively correlated with economic development, donors allocating their aid in line with mitigation efficiency may be wrongly accused of allocating aid in their own interest.

While the control for efficiency-related variables solves the attribution problem for individual public goods, it is difficult to conceive of appropriate controls at the aggregate level. This represents a major challenge for the aid allocation literature and implies that holding donors accountable for their overall aid portfolio will become difficult in the future.

Acknowledgements

1. Introduction

Decades of scholarly literature have held donor governments accountable by assessing whether the allocation of foreign aid followed recipient needs and merits, or rather the direct commercial or geopolitical interests of the donors themselves. In terms of the development impact, the former could be shown to be clearly more effective than the latter (Dreher and Kilby 2010, Dreher, Eichenauer and Gehring 2015). However, the increasing relevance of global public goods for development – as exemplified by the adoption of the Sustainable Development Goals (SDGs) in September 2015 – considerably challenges the traditional classifications as measures of accountability.

In this paper, we will show theoretically why this is the case: When development assistance addresses global public goods, the characteristics of the recipient, i.e. the country in which the funds are invested, can no more be considered as a relevant proxy for the needs orientation of the donor. Even if there are some local side-benefits, the primary effect is of global nature, and as a consequence, other countries may benefit much more than the recipient itself.

For example, to combat malaria in poor Sahel countries, it may be more effective to support an existing center of medical research in Thailand's capital Bangkok than to establish a new center in in rural Burkina Faso or Mali. These two countries will benefit most when a cure is developed fast, no matter where this is the case. Similarly, a country like Bangladesh that is in urgent need of climate change mitigation to preserve the most fertile and populated of its land will benefit most if available funding is invested efficiently (i.e., where it will achieve the greatest emission reductions), which may be in China rather than in Bangladesh itself. In short: Global public goods drive a wedge between the project location on the one hand, and the locations where the benefits accrue on the other hand. This challenges the very basis of the aid allocation literature.

The special characteristics of global public goods and the consequences for their funding by foreign aid have already been discussed since the late 1990s (Kaul et al. 1999; Jayaraman and Kanbur 1999; Kaul et al. 2003; te Velde, Morrissey, Hewitt 2002, 2006; Sandler and Arce 2007; Kaul 2014), but the aid allocation literature has not built on this knowledge so far. This may be due to the fact that empirically, until recently, the provision of global (as opposed to national) public goods through international development assistance has been a relatively limited phenomenon (Sandler an Arce 2007: 530f.), or due to the fact that available data were scarce (Cook and Sachs 1999: 442) and unreliable (Michaelowa and Michaelowa 2011: 2012).

Both factors are now about to change. The SDGs explicitly highlight the global connection between all countries. About half of the 17 goals directly address global or at least regional public goods in their specific targets (climate change, biodiversity, infectious diseases, peace and security, global macroeconomic stability, and the like).

If the SDGs become the new reference for development assistance – just as the Millennium Development Goals had been until 2015 – then future aid will increasingly be oriented towards transnational public goods, for which the traditional categories of the aid allocation literature do not make much sense.

We use the example of climate aid to illustrate our case. This is an area in which substantial aid has been invested even before the adoption of the SDGs. To identify donor contributions in this field, the Development Assistance Committee (DAC) of the Organisation for Economic Cooperation and Development (OECD) especially introduced so-called 'Rio markers' (referring to the United Nations Conference on Environment and Development in Rio – the 'Rio Summit' – in 1992). Climate aid comes in two different variants: assistance to developing countries to avoid or reduce greenhouse gas emissions (mitigation aid), and assistance to developing countries for the adaptation to the consequences of climate change (adaptation aid). While mitigation aid addresses a global public good, adaptation aid supports recipients locally. To be effective, they should follow different allocation criteria. In the empirical part of this paper, we hence compare the correlates of aid allocation for these different types of climate aid. In addition, we compare the results to the allocation of overall bilateral development assistance.

The remainder of the paper is structured as follows: Section 2 provides a brief overview of the extant aid allocation literature. Section 3 then explains why the conceptual idea this literature relies on cannot be extended to aid for global public goods. On the basis of this discussion, we derive the criteria that should drive effective aid allocation for mitigation as compared to adaptation or aid as a whole. This theoretical outcome is compared to the empirical evidence on donors' aid allocation in Section 4. Section 5 draws some conclusions for donor accountability, for the budgeting of financial support for global public goods, and for the future orientation of the aid allocation literature.

2. The aid allocation literature

The aid allocation literature has been a vast and fertile field of research questioning and assessing the motives of donors' contributions since the early 1970s (e.g., Abott, 1970: 1216). Holding donors accountable for their motives is relevant as these motives are crucial for the effectiveness of aid. When aid is allocated based on donor interest (e.g., for geopolitical or commercial reasons), rather than based on recipient need, this must be expected to reduce the effect aid could otherwise have on its generally supposed primary goal, namely economic development and the reduction of poverty in the world. Dreher and Kilby (2010) as well as Dreher et al. (2014) provide clear empirical evidence that indeed, aid allocated based on donor interest is less effective.

McKinley (1978) and McKinley and Little (1977, 1979) were the first to establish the theoretical distinction between a donor interest and a recipient need model of aid allocation, and to econometrically assess bilateral donors' aid allocation along these lines. Maizels and Nissanke (1984), Frey and Schneider (1986), Grilli and Riess (1992) and Neumayer (2003) extended the analysis to multilateral donors.

A comprehensive review of the aid allocation literature until the mid-2000s is provided by Doucouliagos and Paldam (2009) who find that across the different studies they assess, notably GDP per capita (the central indicator of recipient need) has a very robust effect, but this effect is small leaving ample room for a variety of other motives. Generally, most studies find evidence for both donor interest and recipient need, to varying extents depending on the donor and on the period observed (less geopolitical motives after the end of the Cold War).

More recent studies have confirmed the earlier findings using improved econometric estimation techniques that reflect the two-or even three-dimensional panel structure of the data as well as censoring (no negative aid can be observed) and selection effects (e.g., Gang and Lehmann 1990; Trumbull and Wall 1994; Berthélemy and Tichit, 2004; Berthélemy 2006).

Since the mid-2000s, a special strand of the literature has focused on aid allocation to reward or encourage donor-friendly voting in the United Nations General Assembly or during temporary membership in the United Nations Security Council (Voeten 2001; Lai and Morey 2006; Kuziemko and Werker 2006; Eldar 2008; Dreher et al. 2008, 2009; Dreher and Sturm 2012). Other scholars examined how multilateral donors' aid allocation was influenced by important member countries, notably board members (Barnebeck et al. 2006; Kilby and Fleck 2006a; Kilby 2006; Kaja and Werker 2010). Some studies also focus on the influence of domestic politics and lobbying in the donor country (Anwar and Michaelowa 2006; Kilby and Fleck 2006b; Tingley 2010; Dreher et al. 2015b), and the most recent strand of the literature analyzes the so-called "new donors" like China or India and examine how their aid allocation differs from the one of the more traditional donors (Dreher et al. 2011; Fuchs and Vadlamannati 2013; Dreher et al. 2015a; Dreher and Fuchs 2016).

The only major conceptual innovation regarding the basic donor interest versus recipient need model was introduced in the early 2000s. This is when aid allocation studies started to add a third conceptual category, namely recipient merit, meant to capture the quality of a recipient's economic and/or political governance and stability. Driven by Burnside and Dollar's (2000) plausible argument that aid should be more effective in countries with good politics, the traditional variables in the aid allocation equation did not seem sufficient any more. A well-meaning, purely development-oriented donor might, after all, not allocate aid to certain poor countries – simply because their bad governance or instability would not let the donor expect that any productive use could be made of his funds. Leaving out the relevant governance variable(s) may hence affect the coefficient estimates for the recipient need and donor

interest related variables and generate omitted variable bias. Alesina and Dollar (2000) provided one of the most widely cited aid allocation studies including indicators for governance; Chauvet (2003) is another example looking specifically at instability. Hoeffler and Outram (2011) estimate the relative importance of recipient merit (as compared to recipient need and donor interest) for the aid allocation by different donors.

Among the various developments of the aid allocation literature over time, the conceptual addition of recipient merit as a third category providing an additional motive in line with 'good donorship' is the most important one in the context of our own analysis. Our intention is similar in two ways: First, we believe that with the increasing emergence of aid for global public goods (GPG aid), yet another category is required in order not to misinterpret donors' motives for aid allocation. Second, just as for aid allocated in response to recipient merit, donors' intention to invest aid where it can be used most efficiently, could be misunderstood as a lack of orientation towards recipient needs if such a new category is not included in the models.

Unfortunately, however, as opposed to the existing categories recipient need, donor interest, and also recipient merit, it is difficult to conceive of any single (i.e., homogeneous) category that would capture the efficient aid allocation for global public goods. While it seems possible to find indicators for the efficient allocation of resources for the contribution to specific public goods, common indicators for the efficient provision of goods as diverse as climate change mitigation, curing and/or limiting the spread of Ebola, or establishing global macroeconomic stability, will be hard to find. This represents the key challenge that the aid allocation literature will have to face in the age of global public goods.

3. The theoretical problem
3.1. The significance of project location for GPG aid

By definition pure public goods fulfill two criteria: their benefits are non-excludable and their use is non-rival. Once the good is available, everyone can benefit from it, and the fact that additional persons benefit does not diminish the benefits for others. Sometimes these effects appear locally, such as in the case of a dam. Everyone living behind the dam is protected, and the protection of one family is not reduced due to the additional protection of others. When non-excludability and non-rivalry are global in nature, we speak of global public goods (GPGs).[1]

Whenever we have non-excludability across the borders of individual countries recording the benefits only for the country in which the good is produced is misleading. In fact, the neighboring country may benefit even more. Take the

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[1] See Kaul et al. (1999, 2003) and Morrissey et al. (2002) for an in-depth conceptual discussion of the definition of public goods, and Sandler and Arce (2007) for a detailed classification of public goods in terms of their geographical scope.

protection from infectious diseases as an example. Imagine a relatively well-off country in which the disease starts first, and a poor neighboring country to which it would spread sooner or later. The effects could be much worse in the second country than in the first due to bad hygienic conditions, and poor access to medication. If the first country develops a vaccine, this may hence have an even greater positive effect on the neighboring country than on itself. If the vaccination campaign was an aid project, the medical needs of the first country would obviously be an inappropriate indicator for recipient need despite the fact that this is where the intervention took place.

The example demonstrates the problem, although it does not even discuss a pure public good: The neighbor of a vaccinated person is not as fully protected as the vaccinated person him- or herself, and hence we would rather speak of positive externalities or spillover effects. However, when externalities are substantial, the situation is essentially the same. To simplify, we will hence use the term "public good" in all such cases (and the term "global public good" whenever these externalities are of a broad international dimension). Pure public goods are rare, but there are numerous goods with substantial regional or global externalities, and many of them have been already mentioned above in the context of the SDGs.

Effective mitigation of climate change is an example of the provision of a public good that is truly global in nature. A given amount of emission reductions will have the same effect on, say, agricultural production in Uganda, no matter where the mitigation takes place. Different countries benefit to different extents, depending on their vulnerability, which is in turn related to topographical as well as economic characteristics (e.g., the elevation above sea level or the dependency on agricultural production). But these benefits do not depend on where mitigation takes place.

Yet, the locality matters. Donors funding the provision of GPGs in any random developing countries would not allocate their aid efficiently. This is because the volume of GPGs that can be provided at a given cost varies substantially between localities. A good donor should hence pick a location that maximizes the volume of GPGs produced. Only in rare cases this locality will correspond to the locality that will reap the greatest benefits.

As a consequence, good donorship cannot be measured in terms of whether the aid flows to those recipients who are in greatest need. It should be measured in terms of whether the recipient can be expected to be an efficient provider of the GPG. As mentioned above, this measure will typically depend on the specific GPG concerned. This prevents an easy fix for the general aid allocation literature and will thus make it more difficult to use this approach to hold donors accountable.[2]

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[2] It may be worthwhile to note that the non-excludable character of the benefits of GPGs affects the measurement of donor accountability in yet another way. It prevents state-of-the-art evaluations because, by definition, there is no control group that has not been contaminated by the effects of the intervention (Jimenez and Chomniz 2015).

What is possible, however, is to introduce criteria for the efficient provision of individual GPGs. In the following section, we will focus on climate aid to derive appropriate criteria.
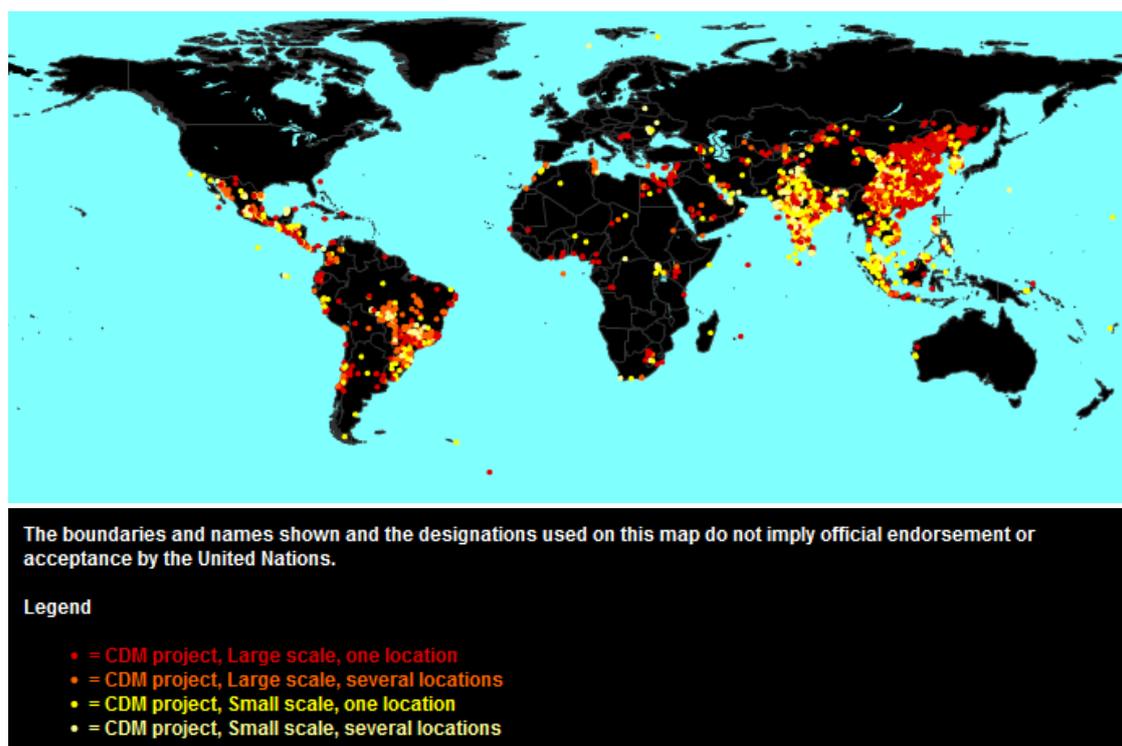
3.2. *Implications for the case of climate aid*

In the context of climate aid, we can distinguish between two types: aid for climate change mitigation (mitigation aid), and aid for the adaptation to climate change (adaptation aid). The former contributes to the provision of a global public good while the latter addresses needs at the very location at which it is disbursed (i.e., it is a private or a local public good like the dam described above). Hence, from a development perspective, donors should ideally spend adaptation aid in line with recipient need and merit as identified in the traditional aid allocation literature, in a similar way as they should ideally spend most other aid. The central criterion for need is poverty (measured by a low GDP per capita in most of the aid allocation literature) and this should demonstrate a clear relationship to where adaptation aid is allocated. The problems created by global climate change are particularly acute where people lack the means to adjust at the necessary speed (due to lack of knowledge and resources, or because they depend on subsistence agriculture and have no other income opportunities). All of this is correlated with GDP per capita. Some more specific vulnerability criteria, notably regarding topography, might help to define the needy locations in more detail.

For mitigation aid, on which we will focus here, the situation is drastically different. Since mitigation aid is a form of GPG aid, as discussed above, funding should go where it can be used most efficiently, i.e., where a given amount of finance can produce the greatest emission reductions (independently of the locations that benefit most from the reductions since they will benefit anyway, no matter where the reduction takes place). Unfortunately, efficiency in terms of climate change mitigation is negatively, rather than positively correlated to poverty in developing countries. Indeed the greatest potential for relatively low-cost emission reductions lies in emerging economies. Very poor countries usually have very few emissions as they do not have much industry and no emission-intensive consumption. Hence there are little opportunities for large-scale reductions. When countries experience economic growth and a broader middle class starts to develop in the population, things usually change. The population's life style becomes much more emission-intensive, there are large infrastructure development projects, and transportation in private cars becomes an issue. At the same time, industrial production and energy provision are often still very inefficient (see Michaelowa and Michaelowa 2009 for a more detailed discussion of such emissions paths). This provides ample opportunities for emission reduction projects.

These opportunities have also become apparent from the development of the market for tradable 'certified emission reductions' (CERs) under the 'Clean Development Mechanism' (CDM) of the Kyoto Protocol. This market allowed project developers in developing countries to sell emission reduction credits to firms and governments of developed countries who could then make use of these CERs to comply with their commitments in the framework of the Kyoto Protocol. Figure 1 provides a snapshot of the distribution of these CDM projects. The figure clearly confirms that the most efficient locations for emission reductions have been in the more advanced developing or emerging economies, notably in China, India and Brazil, rather than in the poorest countries.

Figure 1: Distribution of registered CDM projects

The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Legend

- = CDM project, Large scale, one location
- = CDM project, Large scale, several locations
- = CDM project, Small scale, one location
- = CDM project, Small scale, several locations

Source: UNFCCC (2016).

As a consequence – already hinted at in the introduction – a need-oriented donor should indeed prefer to direct mitigation aid to China, rather than to Bangladesh, because the opportunities for efficient emissions reductions are much greater in the former (see also Jayaraman and Kanbur 1999: 429). For a given volume of aid, the investment in China will lead to higher emission reductions and hence, eventually, to greater benefits for Bangladesh – one of the countries most vulnerable to climate change. Obviously, the same need-oriented donor will allocate adaptation aid directly to Bangladesh.

Donors have started considering the specific efficiency criteria for mitigation projects. Buchner et al. (2012) describe their different monitoring and evaluation frameworks

that frequently include considerations of projects' emissions reduction potential and cost-effectiveness.

In sum, a purely development-oriented donor should provide mitigation aid and adaptation aid to quite different places. While for adaptation aid, the traditional recipient need criteria should hold, they would be completely misleading for mitigation aid. In fact, if a donor allocates mitigation aid in line with the traditional understanding of recipient need (i.e., to poor countries), his aid will be rather inefficient, because these countries do not generally offer cost-effective emission reduction opportunities.

Yet, in the traditional framework of the aid allocation literature, all aid flows to better-off countries tend to be interpreted as an expression of donor interest. To avoid this premature conclusion, we must find appropriate indicators to control for the effectiveness of GPG provision. In the case of mitigation aid, such indicators should reflect CO_2 emissions, the predominance of dirty industries, and the like. Alternatively, we can follow the above argument that the private market tends to find the efficient opportunities most easily so that the CERs issued in the context of the CDM (or other CDM-related variables) could provide us with a second measure for countries with a high emission reduction potential.

In the following section, we will examine to what extent donors actually differentiate between mitigation and adaptation aid when they make their allocation decisions. We will run separate estimation models for mitigation aid, adaptation aid, and overall aid and compare the donors' allocation behavior, both from the perspective of the traditional aid allocation literature and from a perspective that takes into account the specificities of GPG aid.

Even though we do not intend to analyze individual donors and to compare their allocation decisions, we follow the literature by defining ideal donor types depending on their motives. These motives are not mutually exclusive. Depending on the predominant type, we expect different relationships between aid commitments and our explanatory variables:

- Need- and efficiency-oriented donors should show the above-mentioned differences in their allocation behavior, and notably a positive, rather than negative correlation between mitigation aid and the recipients' GDP per capita. This positive relationship should disappear if mitigation efficiency is appropriately controlled for. A similar effect should be expected with respect to variables typically intended to reflect donor interest (such as trade and investment relationships).
- Donors motivated by donor interest rather than efficiency concerns should also show a positive correlation (or the lack of a negative correlation) between mitigation aid and GDP per capita and a positive correlation between

mitigation aid and donor interest variables, but this correlation should not change when mitigation efficiency is controlled for.

- The third category is what we could call the careless donors. They do not differentiate their aid allocation depending on the purpose and may not have spent much effort in considering where mitigation would be most effective. Their aid allocation should hence follow very similar criteria no matter whether we look at mitigation, adaptation, or overall aid.

It should be noted, however, that even if mitigation (i.e., the provision of a GPG) is the main purpose of a project, there are usually some local co-benefits. A country receiving financial flows from mitigation aid may benefit for example through the creation of additional jobs, or through increased energy efficiency that will make its industry more competitive. This may dilute the analysis to some extent.

4. Re-interpreting the empirical evidence
4.1. Data

We will use the available OECD/DAC data on official development assistance (ODA) for our dependent variables. In line with the aid allocation literature in general, we use commitments rather than disbursements because commitments better reflect the donors' intent (while eventual disbursements can depend, e.g., on absorption problems on the recipient side). The 'Rio markers' introduced in 1998 for mitigation aid, and in 2010 for adaptation aid allow us to differentiate between these different dimensions within an overall dataset including 25 bilateral donors, over 130 recipients, and a period of 12 years (from 2002 to 2013) for mitigation and 4 years for adaptation aid. The Rio markers are available for projects with a main focus on the respective activities (mitigation or adaptation as the 'principal objective'), and for projects within which these are just significant activities (among others). We only selected projects that were coded as having mitigation or adaptation as their main focus in order not to enhance the difficulties that arise due to local co-benefits of mitigation that dilute the GPG character of the project.

As the reliability of the Rio markers was questionable in the initial years of their introduction (Michaelowa and Michaelowa 2011), we first invested in an assessment of data quality. Our random draw and independent coding of 1000 aid projects now shows that the share of false positives was reduced to about 10%. While some noise remains, we consider that this is an acceptable basis for our empirical analysis.

Our explanatory variables can be divided in three categories. All of them are explained in detail in the Appendix, Table A1, where we also provide an overview of the different sources. The first group of variables comprises the typical variables used in the aid allocation literature. As mentioned before, we use GDP per capita as our main variable for recipient need. In addition, we include a measure for population since, ceteris paribus, larger countries require more support. For recipient merit, we

use a combined measure of the Freedom House indicators for political rights and civil liberties (with higher values indicating greater freedom) as well as an indicator of government stability. For donor interest, we include donor exports, foreign direct investment and UN voting in line with the United States.

The second group of variables pertains to the measurement of mitigation efficiency. It contains electricity production from coal sources (% total) and CO_2 emissions per unit of production as direct measures of the scope for emission reductions. In addition, we consider variables related to the CDM, namely the CERs issued to projects in a given country (relative to CERs issued in all countries during the relevant year), a variable averaging this ratio across all years (to avoid noise related to the strong annual variation in these data), a dummy for the existence of a so-called 'designated national authority' (DNA) that enables developing countries to benefit from the CDM and thereby signals the countries' own interest in hosting corresponding emission reduction projects. When using the CER variables, we further introduce a control for the period in which the Kyoto Protocol was operational (from 2005 onwards) because CDM projects could not be registered before this date.

The third group of variables relates to special adaptation needs that may help to increase the precision of the estimation of general needs in the case of adaptation aid (for a detailed analysis, see Betzold and Weiler 2016). While we considered various other measures,[3] we finally included only a single variable, namely the share of land under 5m of elevation. This is because these other measures are either almost identical to the variable we use, or they are strongly related to GDP per capita thereby creating problems of multicollinearity.

4.2.   Estimation strategy

Our estimation strategy closely follows the established standard approach in the aid allocation literature. We use panel estimation methods for a simple two-dimensional panel across recipients and years. Donors are considered jointly as in this article, we do not intend to compare different donors. The censored nature of our data is taken into account by the use of a tobit model. Tobit can be easily combined with a random effects specification. Using recipient fixed effects would have been a relevant alternative, but due to the small number of observations per recipient, a tobit model with recipient fixed effects is likely to be biased. In addition, we expect that some of

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[3] First, we considered the percentage of the population living below 5m of sea level (World Bank, 2015), which, just as the variable finally selected, reflects the exposure of recipient countries to sea level rise. Second, we considered the vulnerability component (to assess adaptation needs) of the ND-Gain country index (ND-ECI, 2015), which measures a country's exposure, sensitivity and ability to adapt to the adverse impacts of climate change and has the advantage of varying over time. Third, we considered measures of the relevance of agriculture for the economy as agriculture is more easily affected by climate change than other sectors of production. Related indicators are available from the World Bank's (2015) World Development Indicators.

the relevant variation that we want to measure is cross-country and could not be assessed if we used recipient fixed effects (see also Dreher et al. 2011). However, year fixed effects are systematically included. They are essential as both climate aid and GDP per capita show a significant upward trend over the years, which would lead to a spurious correlation if year fixed effects were omitted.

With tobit models, the question always arises whether to present coefficients or marginal effects for the observed outcome variable. Coefficients can be interpreted as the marginal effects with respect to the underlying latent variable, which is unobserved when aid commitments are zero. We believe that there is a useful interpretation of the latent variable as the donors' willingness to spend (which can also be negative). This willingness is precisely what we are interested in when assessing donor motives. We thus directly present the estimated coefficients.

4.3. Empirical results

Table 1 shows the results for our estimations regarding mitigation aid. Equation 1 includes only the variables of the standard aid allocation model. GDP per capita is negatively related to the allocation of mitigation aid just as it usually is in the standard model. An increase in GDP per capita by 1% leads to a decrease of mitigation aid by equally 1%. An increase of the population by 1% leads to an increase in mitigation aid by about 3.5%. In the standard aid allocation framework, this would be interpreted as a clear donor orientation at recipient needs.

The recipient merit variables are equally significant and point in the usual direction: Countries with better governance and political stability obtain more mitigation aid. In addition, there is some evidence for donor interest with aid being positively related to donor exports and to UN voting alignment. The effect of the latter is unexpectedly strong: A 10-percentage point increase in voting alignment leads to a doubling of aid. Foreign direct investment (FDI) is insignificant. Otherwise all outcomes resemble those of a typical aid allocation regression based on mixed donor motives combining the considerations of need, merit and interest.

However, as we deal with GPG aid, donors interested in the effective use of their resources should not care so much for the poverty of the recipient, but about how efficiently this recipient would produce the public good. We expected this efficiency to be positively correlated with GDP per capita and also with donor interest indicators such as exports and FDI. Therefore – as long as the specific mitigation efficiency variables are not included as controls – donor interest variables should have a greater positive effect than for other aid, and the effect of GDP per capita should be positive rather than negative.

Table 1: Determinants of mitigation aid

VARIABLES	(1) Mitigation aid (log)	(2) Mitigation aid (log)	(3) Mitigation aid (log)	(4) Mitigation aid (log)	(5) Mitigation aid (log)
GDP pc (log)	-1.01*	0.29	-0.33	0.31	0.32
	(0.57)	(0.51)	(0.63)	(0.68)	(0.68)
Population (log)	3.48***	2.55***	2.30***	2.43***	2.55***
	(0.35)	(0.37)	(0.43)	(0.45)	(0.50)
Bilateral ODA (log)		1.21***	1.05**	0.79*	0.77*
		(0.38)	(0.42)	(0.45)	(0.46)
Civil liberties and political rights	1.27***	1.23***	1.20***	1.07***	1.06***
	(0.35)	(0.30)	(0.33)	(0.34)	(0.34)
Political stability	1.34*	1.26**	0.98	0.96	1.03
	(0.70)	(0.61)	(0.65)	(0.66)	(0.67)
Exports (log)	0.17*	0.18**	0.13	0.13	0.13
	(0.09)	(0.07)	(0.08)	(0.08)	(0.08)
FDI (% GDP)	0.00	-0.00	0.08	0.10	0.10
	(0.02)	(0.02)	(0.07)	(0.07)	(0.07)
UN voting with USA	10.33***	7.94***	5.16*	5.63*	5.69*
	(2.83)	(2.67)	(2.85)	(3.05)	(3.05)
DNA dummy			3.37***	3.44***	3.47***
			(0.95)	(0.99)	(0.99)
Electricity from coal			0.03*	0.05**	0.05**
			(0.02)	(0.02)	(0.02)
Kyoto operational				7.46***	7.42***
				(1.70)	(1.70)
CERs				-2.64	
				(5.21)	
CO_2 emissions per GDP				-0.09	0.04
				(2.57)	(2.57)
CO_2 emissions pc				-0.27	-0.28
				(0.17)	(0.17)
CERs (mean)					-7.44
					(10.85)
Log likelihood	-3995.961	-3953.901	-2660.515	-2410.045	-2409.938
Observations	1,443	1,408	888	809	809
Number of left censored observations	473	438	198	188	188
Number of uncensored observations	970	970	690	621	621
Number of recipient countries	134	134	85	85	85

Standard errors in parentheses; constant and year fixed effects included, but not shown. Note that differences between regression 2 and 3 are not driven by the reduction in the number of observations.

*** p<0.01, ** p<0.05, * p<0.1

However, given the local co-benefits, the negative coefficient of GDP per capita does not exclude that donors also care for mitigation efficiency. What we should observe in this case is a coefficient that is at least less negative than for other development assistance. To analyze the difference with respect to other aid, we rerun the model

including a further control for other ODA. If mitigation aid is driven more towards better-off countries than other ODA, this should become evident through a significantly positive coefficient on GDP per capita, and significantly positive donor interest variables in Equation 2.

We find only very limited evidence for this. Mitigation aid seems to closely follow other aid in its allocation. Controlling for other aid, the coefficient of GDP per capita is not significant any more suggesting that mitigation aid is neither more nor less directed into poor countries than any other type of aid. However, exports and also UN voting alignment remain clearly significant. Within the traditional framework of aid allocation this would be interpreted as mitigation aid being somehow more strongly driven by donor interests than other aid.

We assess whether this interpretation is correct by adding the specific indicators for mitigation effectiveness in the following equations. In Equation 3 we add the dummy for the existence of a designated national authority in the recipient country. As explained above, this DNA had to be set up by all countries that intended to participate in the generation and trade of CERs. Moreover, we include the percentage of electricity produced from coal. Both are significantly related to mitigation aid. Having a DNA leads to an increase in mitigation aid by a factor of almost 3.5, and an additional percentage point of electricity produced from coal leads to a rise in mitigation aid by 3%. The consistently positive and substantive effect of having a DNA can be explained by the fact that a government will incur the cost of setting up and running a DNA only if it perceives that the country can offer attractive opportunities for the CDM. The existence of a DNA can therefore be interpreted as a signal of efficient mitigation options. DNAs may also directly support the identification of efficient mitigation projects in the respective countries, which can then be funded either through the carbon market or through more traditional aid (Figueres 2004: 11).

The additional mitigation-related variables considered in Equations 4 and 5 do not turn out to be significant, except for our control variable for the Kyoto Protocol being operational. This is also the case if we introduce these variables individually, and instead of the two variables discussed above (not shown). As the generation of CERs could have provided a rather easy orientation for donors to figure out where efficiency would be high – almost as easy and, in fact, more informative than the mere existence of a DNA – the results suggest that donors have not yet given full consideration to the specific efficiency criteria of mitigation aid.

Yet, to some extent, they have, and this is enough to explain the previous result for export-related donor interests. Indeed the inclusion of the mitigation-related variables in Equation 3-5 leads to a drop in the coefficient of donor exports by about one third, and this coefficient is no more significant.

We conclude that the traditional aid allocation model led to a misinterpretation of the initial equation: Once we appropriately control for mitigation efficiency concerns, mitigation aid does not appear to be driven by donors' export interests any more.

Regarding donor interest, only the coefficient on voting alignment still remains high and significant. It is outside the scope of this study to explain why the relationship with UN voting is so much stronger for mitigation aid than for other aid.

We now turn to a more direct comparison of mitigation aid, adaptation aid and general aid. Table 2 first replicates Equation 1 from the previous table, and then uses exactly the same set of traditional aid allocation variables for an estimation of adaptation aid (Equation 2) and general ODA (Equation 3). Equations 4 and 5 are again for mitigation and adaptation aid, but they add some specific variables. In the case of Equation 4, these are exactly the variables from the third regression of the previous table. (However, Equation 4 does not include other ODA as a control, since the comparison between mitigation aid and general ODA in Table 2 is possible directly through the comparison across equations.) In Equation 5 we include the percentage of the land area with an elevation of 5m or less above sea level as a special indicator for adaptation needs.

In line with the previous results, the comparison of the standard model for mitigation aid and the standard model for general ODA shows that the effect of GDP per capita is virtually identical. Differences appear in the stronger role of recipient merit and donor interest. However, as before, the significance of donor exports vanishes when the special variables for mitigation efficiency are taken into account. Moreover, the coefficient of GDP per capita drops substantially for mitigation aid when the special mitigation-related variables are added in Equation 4, i.e., the positive correlation between aid and poverty becomes stronger. It should be noted, however, that the latter is primarily driven by the different set of observations as the number of observations drops substantially when adding the additional controls.

Adaptation aid also shows a stronger recipient merit orientation than overall aid, but primarily, there is a striking difference in the effect of GDP per capita – with a coefficient more than three times as high in absolute terms as for mitigation aid (which makes sense when considering that mitigation efficiency is not positively related to poverty), but also for overall aid (which makes less sense since both should, in principle, be equally poverty oriented). This does not change when adding the additional indicator for adaptation needs in Equation 5. These results suggest that for adaptation aid, donors take recipient need much more seriously than for general aid. At the same time, there is no whatsoever indication of an effect of donor interest. FDI is significant, but not in the direction in line with a donor interest orientation: The greater the FDI inflows, the lower adaptation aid. If anything, this provides additional evidence for the role of recipient need. Generally, our results for adaptation aid are in line with those by Betzold and Weiler (2016) who focus on this particular topic.

Table 2: Comparing aid types

VARIABLES	(1) Mitigation aid (log)	(2) Adaptation aid (log)	(3) Bilateral ODA (log)	(4) Mitigation aid (log)	(5) Adaptation aid (log)
GDP pc (log)	-1.01*	-3.66***	-0.93***	-2.02***	-3.68***
	(0.57)	(0.72)	(0.27)	(0.73)	(0.71)
Population (log)	3.48***	2.21***	0.85***	3.41***	2.50***
	(0.35)	(0.45)	(0.15)	(0.48)	(0.47)
Civil liberties and political rights	1.27***	1.23**	0.14	1.25***	1.18**
	(0.35)	(0.49)	(0.14)	(0.41)	(0.48)
Political stability	1.34*	1.26	0.32	1.27	1.25
	(0.70)	(1.10)	(0.24)	(0.79)	(1.09)
Exports (log)	0.17*	0.08	-0.03	0.12	0.09
	(0.09)	(0.11)	(0.04)	(0.11)	(0.11)
FDI (% GDP)	0.00	-0.07*	-0.00	0.07	-0.07*
	(0.02)	(0.04)	(0.01)	(0.07)	(0.04)
UN voting with USA	10.33***	0.51	0.94	6.94**	0.28
	(2.83)	(4.13)	(0.88)	(3.18)	(4.09)
DNA dummy				2.47**	
				(1.01)	
Electricity from coal				0.04*	
				(0.02)	
Land area<5m					0.09*
					(0.05)
Log likelihood	-3995.96	-1218.08	-3627.56	-2699.10	-1216.25
Observations	1443	395	1443	921	395
Number of left censored observations	473	85	35	231	85
Number of uncensored observations	970	310	1408	690	310
Number of recipient countries	134	132	134	85	132

Standard errors in parentheses; constant and year fixed effects included, but not shown. Here, the drop in the sample size in Regression 4 makes up for most of the difference with Regression 1.

*** p<0.01, ** p<0.05, * p<0.1

Unfortunately, however, the available data for adaptation aid cover only four years. Some of the insignificant results may thus be driven by the relatively small number of observations and / or by a generally stronger need-orientation in recent years. Table A2 in the Appendix confirms this suspicion. It replicates Table 2 but with all time-series starting only in 2010. Exports lose significance throughout, and the negative relationship between GDP per capita and aid flows is stronger than before for mitigation aid and total ODA. Yet, the absolute value of the coefficient for GDP per capita is still substantially higher for adaptation aid.

When comparing mitigation and adaptation aid once mitigation specific efficiency variables are controlled for, there is no apparent difference with respect to recipient merit and donor interest, apart from the surprisingly strong and robust effect of UN voting alignment for mitigation aid. The main effect remains in the role of GDP per capita. This difference is in line with the different character of the two goods: mitigation as a GPG for which the neediness of the project location should only matter with respect to local co-benefits, and adaptation as a private or local public good where the neediness of the location directly drives the relevance and the efficiency of the intervention.

5. Conclusion

This paper has demonstrated the conceptual and empirical problems that the traditional aid allocation literature will face when aid is increasingly spent for global public goods. Non-excludability drives a wedge between the location where the project is implemented, and the location where the benefits arise. Hence, to be effective, aid related to global public goods should not flow to places with the greatest needs, but to places where these needs can be served best through an efficient provision of the global public good. This creates a fundamental conceptual problem for the aid allocation literature and the related effort to hold donors accountable for their motives and, eventually, for the effectiveness of their aid.

The empirical problem can be solved when disaggregating aid and looking at specific global public goods for which concrete controls for effective aid allocation can be identified. We do so for the case of mitigation aid and obtain the following results:

So far, donors do not very clearly differentiate their mitigation related aid allocation criteria from the criteria for general ODA. This leads to reduced efficiency. However, some differences are there and they suffice to cause misleading interpretations with respect to donor interest. Donors allocating their aid in line with criteria suggesting the efficiency of mitigation projects will be wrongly accused of allocating aid in their own interest, specifically with respect to donor exports (which are positively correlated to the criteria of efficient mitigation). The misunderstanding is based on an omitted variable bias that disappears when variables accounting for mitigation efficiency are included in the model.

Unfortunately, there are no homogeneous controls for the efficient location of projects providing global public goods. Aid for global public goods does not follow the logic of the traditional aid allocation literature and unless there are convincing control variables, this logic cannot be applied.

One could argue that as a consequence, the aid allocation literature should simply become more disaggregated. However, one might also ask whether financing global public goods should at all be accounted for as aid (see also Kaul 2014). Aid was

initially conceived as a contribution that should benefit a specific recipient, not the world as a whole. If aid focuses on the provision of global public goods, apart from certain co-benefits, recipients should also have only very limited incentives to accept such aid. There are some global public goods that are most efficiently provided in developed rather than in developing countries. Will their provision be accounted for as development assistance when they are (ineffectively) produced in developing countries instead? Should the definition of development assistance perhaps rather depend on who benefits most than on where the project is implemented? Or should the funding for global public goods generally not be considered as aid, but come out of a separate budget (as widely requested for climate finance, notably by developing countries)?

These questions highlight the challenges that arise for the statistical registration of development assistance at the level of the OECD/DAC. Meeting these challenges in an appropriate way will represent an important contribution to donor accountability and the effective allocation of finance in the age of global public goods.

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Table A1: Variable description and sources

Categories	Variable	Definition	Mean	Std. Dev.	Min	Max	Source
Aid commitments	Mitigation aid (log)	Log of climate change related ODA for the primary purpose of mitigation (2012 constant prices, USD millions)	14.00	10.12	0.00	28.71	OECD (2015)
	Adaptation aid (log)	Log of climate change related ODA for the primary purpose of adaptation (2012 constant prices, USD millions)	4.54	8.75	0.00	26.59	OECD (2015)
	Bilateral ODA (log)	Bilateral ODA, total commitments. When this variable is used as a control in the estimations for mitigation and adaptation aid, the aid flows in the specific areas (for mitigation or adaptation respectively) are subtracted.	5.65	1.44	-0.75	10.05	OECD (2015)
Recipient need	GDP pc (log)	Log of GDP per capita (PPP, constant 2011 international $)	8.51	1.02	6.20	10.77	World Bank (2015)
	Population (log)	Log of total population of the recipient countries	15.48	2.14	9.89	21.02	World Bank (2015)
Recipient merit	Civil liberties & political rights	Average of Freedom House index of civil liberties and political rights, reversed scale (7= greatest freedom)	4.26	1.71	1.00	7.00	Quality of Government Institute (2015)
	Political stability estimate	Measures perceptions of the likelihood that a government will be overthrown by unconstitutional and/or violent means	-0.33	0.92	-3.18	1.54	Quality of Government Institute (2015)
Donor interest	Exports (log)	Exports made by donors to the recipient countries (values in '000 USD)	10.73	6.58	0.00	20.35	OECD (2015)
	FDI (% GDP)	Net inflows of foreign direct investment to the recipient county measured as % of GDP	6.07	16.22	-82.93	366.36	World Bank (2015)
	UN voting with USA	Measurement of whether a recipient country votes in agreement with the United States on important UN votes	0.38	0.18	0.00	1.00	Kilby (2011)
Mitigation efficiency	Electricity from coal	Electricity produced in recipient countries from coal sources (% of total electricity produced)	13.21	25.43	0.00	100.00	World Bank (2015)
	DNA dummy	Dummy for whether a country has a designated national authority (DNA) - which is the organization granted responsibility to authorize and approve participation in CDM projects	0.64	0.48	0.00	1.00	UNFCCC (2015)
	CERs	Author's calculation of the proportion of the recipient country's certified emission reductions in relation to the total number of certified emission reductions generated in that year	0.01	0.07	0.00	0.80	CDM pipeline (2015)
	CERs (mean)	Author's calculation of the mean of the proportion of the recipient country's certified emission reductions in relation to the total number of certified emission reductions generated in that year	0.01	0.05	0.00	0.40	CDM pipeline (2015)
	CO_2 emissions per GDP	CO_2 emissions (kg per PPP $ of GDP)	0.30	0.26	0.04	1.94	World Bank (2015)
	CO_2 emissions pc	CO_2 emissions per capita (in metric tons)	2.90	4.30	0.03	38.34	World Bank (2015)
	Kyoto operational	Dummy for year≥2005 when the Kyoto Protocol entered into force	0.71	0.46	0.00	1.00	
Adaptation needs	Land area<5m	Land area below 5m as the percentage of total land in the recipient countries, where the elevation is 5 meters or less.	7.04	15.91	0.00	100.00	World Bank (2015)

Table A2: Comparing aid types, 2010-2013

VARIABLES	(1) Mitigation aid (log)	(2) Adaptation aid (log)	(3) Bilateral ODA (log)	(4) Mitigation aid (log)	(5) Adaptation aid (log)
GDP pc (log)	-1.90***	-3.66***	-1.69***	-2.21***	-3.68***
	(0.65)	(0.72)	(0.39)	(0.85)	(0.71)
Population (log)	2.37***	2.21***	0.90***	2.24***	2.50***
	(0.41)	(0.45)	(0.24)	(0.56)	(0.47)
Civil liberties and political rights	1.49***	1.23**	0.17	1.56***	1.18**
	(0.44)	(0.49)	(0.24)	(0.50)	(0.48)
Political stability	0.64	1.26	-0.08	-0.75	1.25
	(1.00)	(1.10)	(0.54)	(1.10)	(1.09)
Exports (log)	0.04	0.08	-0.05	-0.00	0.09
	(0.10)	(0.11)	(0.06)	(0.12)	(0.11)
FDI (% GDP)	-0.09***	-0.07*	-0.01	0.06	-0.07*
	(0.04)	(0.04)	(0.01)	(0.10)	(0.04)
UN voting with USA	1.65	0.51	0.25	-1.27	0.29
	(3.62)	(4.13)	(1.63)	(4.20)	(4.09)
DNA dummy				4.14**	
				(1.97)	
Electricity from coal				0.06**	
				(0.03)	
Land area<5m					0.09*
					(0.05)
Log likelihood	-1227.76	-1218.08	-1028.88	-772.52	-1216.25
Observations	395	395	395	252	395
Number of left censored observations	65	85	14	34	85
Number of uncensored observations	330	310	381	218	310
Number of recipient countries	132	132	132	84	132

Standard errors in parentheses; constant and year fixed effects included, but not shown.

*** p<0.01, ** p<0.05, * p<0.1