Responsibility, capacity, greenness or vulnerability? What explains the levels of climate aid provided by bilateral donors?

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Abstract:

At the 2009 Copenhagen Climate Summit, donors pledged to 'jointly mobilize' $100 billion/year for climate finance by 2020. The Copenhagen Accord and other agreements do not specify who should provide how much of this collective target beyond the general principle of common but differentiated responsibilities and respective capabilities (CBDR&RC), according to which the more responsible a country is for climate change and/or the more capable of paying, the more climate finance it should provide. Two additional burden-sharing mechanisms may explain how much climate finance donors provide: willingness to pay or 'greenness', and self-interest. These mechanisms are tested to determine which best explains current patterns in climate finance commitments by analysing bilateral climate aid. There is evidence for capability—richer countries provide more climate aid. In contrast, responsibility, greenness or self-interest do not induce more climate aid commitments. Better understanding the drivers of climate aid helps to mobilize more climate finance, and advances understanding of (sectoral) aid allocation.

Key words: climate aid, development and climate, aid allocation, adaptation and mitigation finance

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Introduction

Climate challenges are high on the international aid agenda. At the 2009 Copenhagen Summit, developed countries pledged to 'jointly mobilize' US$100 billion per year by 2020 to support adaptation and mitigation in developing countries (UNFCCC 2009), a goal the Paris Agreement confirmed (UNFCCC 2015). However, this collective pledge at the international level does not address how the funding burden should be shared between donor countries (Pickering *et al.* 2015a). Contribution volumes are thus decided upon domestically,

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which has led to large variations between donor countries. A growing body of research focuses on this comparative aspect of environmental politics and seeks to explain variation in environmental commitments, notably in terms of ratification behaviour and domestic mitigation efforts (e.g. Dolšak 2009; Harrison and McIntosh Sundstrom 2007; Leinaweaver and Thomson 2016; Page 2008; Roberts *et al.* 2004), though less so in terms of financial commitments (but see Halimanjaya and Papyrakis 2012, 2015; K. Michaelowa and Michaelowa 2012). We contribute to this comparative environmental politics literature by analysing bilateral aid committed to adaptation and/or mitigation projects in developing countries between 2010 and 2015, based on Organisation for Economic Co-operation and Development (OECD) data. Our analysis focuses on bilateral aid as most public contributions to climate finance to date have come from bilateral aid budgets (Betzold and Weiler 2018; Weikmans 2016).

From the literature, we identify three different factors—or rationales—which might explain climate aid allocation.

First, we would expect the polluters and the richer countries to contribute more toward the $100 billion target. This idea of 'common but differentiated responsibilities and respective capabilities' (CBDR&RC) is also enshrined in the 1992 United Nations Framework Convention on Climate Change (UNFCCC).

Second, some donors, regardless of responsibility or capability, might be more or less concerned about the environment including climate change. 'Green' countries care about the environment and thus believe that support to climate change projects in developing countries is important and 'right' and therefore allocate more funding to such projects.

Lastly, vulnerable donor countries might act in self-interested ways stemming from rational cost-benefit calculations rather than rule compliance or ideational considerations. Aid allocation studies have shown that by and large, domestic donor-interests trump recipient needs (e.g. Berthélemy 2006; Dreher *et al.*, 2011) and we argue that environmental aid might respond to the same logic (Figaj 2010; Hicks *et al.* 2008; Lewis 2003). Donor countries might be more willing to commit to more climate funding when there are domestic benefits, but in general, these benefits tend to be indirect. Governments of countries that are more vulnerable to climate change face domestic pressures to address local risks, and thus, while these countries might have an interest in investing in climate change adaptation and mitigation, including through climate finance, they may decide to do so domestically, where government action is more easily visible.

We test these three explanatory factors by examining data on bilateral climate finance as reported to the OECD from 2011 through 2015.[4] Our findings suggest that responsibility matters indeed, but not how we might expect according to the principle of CBDR: all else equal, countries that have a historical track-record of high pollution contribute *less* to climate aid despite their greater responsibility for climate change. In contrast, with respect to 'respective capabilities,' richer donor countries do provide more climate aid. Interestingly, greenness does not explain the variation in bilateral climate aid provision. Finally, vulnerability does explain low mitigation allocation, but it does not explain variation in adaptation aid.

The remainder of our discussion is structured as follows: in the next section, we give a very short overview of climate aid allocation between bi- and multilateral donors and show the large variety between bilateral donors. We then summarize what we know so far about (bilateral) climate aid allocation and formulate different hypotheses regarding the three mechanisms. The subsequent sections explain our empirical approach and present and discuss the results of our empirical analysis. Lastly, we summarize our conclusions and suggest some paths for future research.

Climate aid: bi- and multilateral funding

Comparable and reliable climate finance data are hard to come by (Roberts and Weikmans 2017; Weikmans and Roberts 2017). Our analysis relies on aid data from the OECD Development Assistance Committee Creditor Reporting System (OECD/DAC CRS), despite its limitations (see below). The OECD/DAC CRS provides project-level data on bilateral and some multilateral aid and includes, for every project, information on the environmental objectives through the so-called Rio Markers. These Rio Markers define climate aid as aid that either 'contribute[s] to the objective of stabilisation of greenhouse gas (GHG) concentrations […] by promoting efforts to reduce or limit GHG emissions or to enhance GHG sequestration' or 'aim[s] to reduce the vulnerability of human or natural systems to the impacts of climate change and climate-related risks, by maintaining or increasing adaptive capacity and resilience' (OECD 2011, p. 3f).

The Rio Markers distinguish between principal and significant climate interventions. A project is classified as having a principal mitigation (adaptation) objective if the project

[4] While OECD CRS data on support for adaptation and/or mitigation is available as of 2010, some of our co-variates are only available from 2011 onwards. We thus exclude 2010 from our analysis.

mainly targets mitigation (adaptation)—it would not have taken place if it was not for the mitigation (adaptation) component. In contrast, a project is categorized having a significant mitigation (adaptation) objective if it would have taken place even without the mitigation (adaptation) component, but still has considerable mitigation (adaptation) benefits (OECD 2011). The Rio Markers are not mutually exclusive; a project may thus be marked as relevant for both, adaptation and mitigation. We account for these projects that have both an adaptation and a mitigation marker, and thus avoid double counting when constructing the total climate finance variables. The OECD CRS includes both grants and loans, and our analysis does not distinguish between these types of flows.

Donors further have to report their bilateral and multilateral climate finance contributions to the UNFCCC in so-called Biennial Reports. Most donors base their Biennial Reports on the data they report to the OECD (AdaptationWatch 2015), which is why our empirical data uses OECD data. Both data sources are similar, as Figure 1 shows.

Figure 1 displays all climate-related flows (mitigation and/or adaptation projects) reported in the OECD/DAC CRS (panel a)[5] and the Biennial Reports (panel b) between 2011 and 2015. Clearly, most climate aid is provided by bilateral donors. Multilaterals (like UN, World Bank, Regional Development Banks, etc.) and EU play a minor role in overall climate funding and together account for less than 15% of all climate aid.

*** *Figure 1 about here* ***

When taking a closer look at bilateral climate flows (OECD data), we note a quite large difference, in terms of both absolute volumes and per capita climate aid (Figure 2). In absolute volumes, the largest climate donors by far are Japan, Germany, and France, with an average of $5.6, $3.6 and $2.9 billion in the years from 2011 to 2015 respectively (see panel a) of Figure 2). Together, they are responsible for about 70% of all bilateral climate aid. When we calculate climate aid on a per capita basis however (panel b) of Figure 2), Norway moves into the first position, becoming by far the largest climate donor, and spending not less than $165 per capita and per year (on average over the time frame of the study). Norway is followed by Germany, Japan (both around $44) and France ($43). Other Nordic countries also provide quite high levels of climate aid per capita annually: Denmark $42 and Sweden $40. In

[5] Both figures 1 and 2 as well as parts of our statistical analysis consider projects with principal climate objectives at 100% of their value but discount projects with significant climate objectives at 50%. This is line with the reporting of many donors (AdaptationWatch 2015).

contrast, other countries, including some Central and Southern European countries, allocate very little to climate projects, both in absolute terms and per capita.

**** Figure 2 about here ****

What explains these differences between bilateral donors? In the next section we review the literature in order to formulate our hypotheses.

Bilateral climate aid allocation: what we know so far?

Financial support for developing countries has been an element of the climate negotiations since their inception (AdaptationWatch 2016), but it was at the 2009 Copenhagen Summit that climate finance took the centre-stage. The Copenhagen Accord stipulates that 'scaled up, new and additional, predictable and adequate funding as well as improved access shall be provided to developing countries'. Specifically, the Accord contains 'the collective commitment by developed countries […] to provide new and additional resources […] approaching USD 30 billion for the period 2010–2012 with balanced allocation between adaptation and mitigation'—the so-called 'fast-start finance'—as well as 'a goal of mobilizing jointly USD 100 billion dollars a year by 2020 […] from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance' (UNFCCC 2009: Decision 2/CP.15, para. 8).

The Paris Agreement confirms the $100 billion target, but does not provide any specifications (UNFCCC 2015). It remains therefore unclear what counts toward the $100 billion target, how this funding should be allocated, or where it should come from. In particular, the former questions of definition and allocation have been contested in academic and policy debates (Brown *et al.* 2010; Dasgupta and Climate Finance Unit 2015; Lyster 2017; OECD and CPI 2015; Stadelmann *et al.* 2011). In contrast, the latter question of sources has received relatively little attention. Several studies examine the role of private finance, including how it can be mobilised (in particular for adaptation) and tracked (Pauw 2015, 2017; Stadelmann *et al.* 2013; Urpelainen 2012), while others explore 'alternative' or 'innovative' sources of finance, such as taxes or bonds (Buchner and Wilkinson 2015; Pillay *et al.* 2017; Stewart *et al.* 2009). Yet, despite calls for new and additional resources, in practice, a considerable portion of climate finance is paid from public aid budgets of (mainly bilateral) donors (e.g. Weikmans 2016).

How the collective commitment should be, or is, shared among developed countries is highly relevant, and speaks to broader questions of climate justice but also fairness in terms of financial burden sharing. These questions have mostly been discussed with regard to greenhouse gas emissions. A large body of research examines principles of fairness and equity, mainly with regard to mitigation (for an overview, see Ringius *et al.* 2002; Underdal and Wei 2015). Empirical studies mainly focus on *individuals'* perceptions and attitudes. Based on survey and experimental research, they indicate that burden sharing mechanisms and perceptions of fairness are linked and affect the likelihood of negotiating success: countries are more likely to agree to outcomes that are seen as fair (Dannenberg *et al.* 2010; Winkler and Rajamani 2014). Fairness perceptions also influence participants' willingness to pay for mitigation and/or adaptation (Anderson *et al.* 2017; Gampfer 2014; Gampfer *et al.* 2014).

A much smaller body of research examines fairness and burden sharing with regard to climate finance at the national level, with a focus on how clear criteria such as historical responsibilities (measured as greenhouse gas emissions), ability to pay (measured as GDP per capita), or contributions to other institutions such as the UN would influence the distribution of funding. Dellink et al. (2009) assess what such a 'fair' distribution of costs would be for adaptation, while Cui and Gui (2015) and Cui and Huang (2018) compare different scenarios for filling the Green Climate Fund. Pickering *et al.* (2015a) also focus on the fairness of climate finance contributions, and specifically examine whether, and if so, how a coordination mechanism would help ensure that collective climate finance commitments are met. The analysis suggests that clear criteria would raise more climate finance.

Finally, a considerable body of research seeks to explain differences in ratification of and compliance with climate change agreements, notably mitigation commitments (e.g. Dolšak 2001, 2009; Roberts *et al.* 2004). A small subset of this research also examines variation in climate finance commitments. Government ideology is one factor that may influence how generously countries contribute to climate finance, although empirical results are inconclusive. Left-leaning governments tend to provide more development aid in general (Brech and Potrafke 2014; Tingley 2010), commit more climate finance in Australia (Pickering and Mitchell 2017) as well as report this finance more accurately (A. Michaelowa and Michaelowa 2011). In contrast, others do not find a relationship between government ideology and the level of mitigation finance (Halimanjaya and Papyrakis 2015) or environmental aid (Hicks et al., 2008), or even find that conservative governments provide

more adaptation aid (K. Michaelowa and Michaelowa 2012). Halimanjaya and Papyrakis (2015) examine a number of additional domestic factors beyond government ideology for mitigation aid. While ratification of the Kyoto Protocol increases the level of mitigation finance, domestic environmental expenditure reduces it. Responsibility—measured as per capita greenhouse gas emissions—and capability—measured as GDP per capita—did not affect mitigation finance. This is line with the US and Australia's position as reported by Pickering *et al.* (2015b, p. 155), although the authors also find that European countries favour 'objective criteria such as emissions and national income' as a basis for burden-sharing. Finally, K. Michaelowa and Michaelowa (2012) report a general increase in adaptation aid. Their analysis does not find a clear link between adaptation aid levels and public concern for the environment, in line with the findings of Pickering and Mitchell (2017) for Australian climate finance.

In sum, academic and policy debates agree that responsibility and capacity should influence countries' contributions to the collective target of $100 billion for climate action in developing countries. While actual climate finance contributions do vary considerably, only few studies have empirically examined this variation, for specific donors (Pickering and Mitchell, 2017) or for mitigation (Halimanjaya and Papyrakis 2012, 2015) or adaptation (K. Michaelowa and Michaelowa 2012) flows only, with inconclusive results. To our knowledge, our analysis is thus the first comprehensive empirical investigation of climate finance contributions (both for mitigation and adaptation) as indicated by the Rio Markers.

Hypotheses

As mentioned in the introduction we build our different hypothesis using three different explanatory mechanisms. First, the internationally agreed principle promoted by the UNFCCC of CBDR&RC. Second, we consider that some donor countries are 'greener' than others. Third, climate aid allocation might be different for donor countries that are vulnerable to climate change. We explain the build-up of our hypotheses in more detail below.

First, the internationally agreed UNFCCC principle of CBDR&RC indicates that polluters should (ideally) pay more. Richer countries are also expected to contribute more (see also e.g. Jagers and Duus-Otterström 2008; Page 2008). This would lead to the following hypotheses:

H1a (responsibility): The higher a donor country's greenhouse gas emissions, the more climate finance it is expected to provide.

H1b (capability): The richer a donor country, the more climate finance it expected to provide.

Second, some donors might want to contribute more (or less) than what their responsibility and/or capability would predict. Countries that are more concerned about the environment—including climate change—are likely to invest more in environmental protection, at home as well as abroad, regardless of their responsibility and capability. They are thus in general 'greener'. The comparative environmental politics literature has shown that countries are quicker in ratifying and complying with climate change agreements when voters care for the environment (Dolšak 2001, 2009; Harrison & McIntosh Sundstrom 2007). Such countries are also likely to find it important to support developing countries reduce their emissions and/or deal with climate change impacts. Climate finance provision in this case relates to ideas, or a logic of appropriateness (March and Olsen 2004).

H2 ('greenness'): The 'greener' a donor country—that is, the higher its concern for climate change—the more climate finance it is expected to provide.

Finally, the aid allocation literature has shown that donor interests largely dominate the allocation of aid in general (Berthélemy 2006; Dreher *et al.* 2011; Younas 2008) as well as environmental aid in particular (Figaj 2010; Hicks *et al.* 2008; Lewis 2003). Some studies on mitigation commitments have highlighted the role of domestic benefits of mitigation: countries may be more willing to reduce emissions when mitigation measures are associated with local environmental benefits such as reduced air pollution (Dolšak 2009). Such domestic benefits of climate finance provision accrue to donor countries which are themselves vulnerable to climate change and therefore have a clear interest in mitigation as well as adaptation. Yet, although mitigation may be cheaper in developing countries, governments of vulnerable countries more likely face pressures to address climate change at home, and thus are likely to invest scarce resources in mitigation and adaptation domestically rather than provide climate finance internationally. Vulnerability thus is associated with lower levels of climate finance, based on a logic of consequence.

H3 (vulnerability): The more vulnerable a donor country to climate change, the less climate finance it is expected to provide.

Before testing which of these different mechanisms—responsibility and capability, greenness, or vulnerability—can best explain variation in climate finance provision, we introduce our empirical approach.

Empirical approach

We test our expectations on the determinants of climate aid allocation using random effect regression models. We have repeated yearly observations—from 2011 to 2015—for all 30 donor countries in our dataset, and therefore we risk violating the assumption of observations being independent and identically distributed. To correct for this potential correlation of observations, we use country random effects. Below, we describe our dependent, independent and control variables.

The dependent variable

We are interested in how much climate aid donors provide. Unfortunately, there are no universally agreed definitions of climate aid or climate finance, and both the OECD/DAC CRS and Biennial Reports under the UNFCCC rely entirely on donors' own classification of their aid as climate-relevant (e.g. Roberts and Weikmans 2017; Weikmans and Roberts 2017). Several studies found that donors over-report and mislabel funds (Donner *et al.* 2016; Junghans and Harmeling 2012; A. Michaelowa and Michaelowa 2011; Weikmans *et al.* 2017). While all donors are likely to over-report, some report their climate finance more accurately than others, including for strategic reasons (Junghans and Harmeling 2012; A. Michaelowa and Michaelowa 2011). However, even if the OECD/DAC CRS is flawed, at present it provides the most comprehensive and comparable data source for public climate-related aid flows. In line with previous studies, we thus use climate aid as reported in the OECD/DAC CRS as a *proxy* for actual climate finance (Roberts and Weikmans 2017).

Our dependent variable is per capita climate aid per donor and year, in constant 2013 US$ as reported in the OECD/DAC CRS (OECD 2016). To construct our dependent variable, we distinguish between different types of climate aid: first, we sum up support for *all* climate-related projects; support for *mitigation* projects only; and support for *adaptation* projects only. For each type of climate aid, we first consider all projects that have *principal or significant* climate objectives, but we discount the latter at 50%. We use a discount factor of 50% for significant aid flows, as many donors do when reporting their climate aid. This discount factor takes into account that some projects have a different main objective, with adaptation and/or mitigation only co-benefits. In a second step, we consider projects with *principal only* climate objectives. This alternative specification also helps to deal with over-reporting, as over-reporting has been found to be less prevalent in flows with principal

climate objectives (Junghans and Harmeling 2012). Finally, we transform all sums into per capita climate aid provisions by dividing by the total population of the donor in question.

Independent and control variables

As we describe in more detail above, we test which factors can explain varying levels of climate aid: rule-adherence (responsibility and capability), greenness, or self-interest (related to vulnerability). We further control for the general importance that development aid plays in a donor country, for governmental quality, and for multilateral climate aid.

Responsibility: To quantify a country's responsibility for climate change, we use two measures of the country's greenhouse gas emissions. First, we use annual greenhouse gas emissions per capita, a measure which allows for country comparisons independent of country size. Second, because smaller countries, despite potentially high per capita emissions, are less important from a global emissions point of view, and therefore less scrutinized by the international community or NGOs, we also include a measure of annual total emissions. Both these variables are taken from the World Development Indicators dataset (World Bank 2016).[6]

Capability: A country's capability to contribute to the $100 billion target is best measured by its economic wealth. We therefore use GDP per capita to operationalize capability, an indicator again taken from the World Bank (World Bank 2016).

'Greenness': We rely on two specific variables to measure how green, or concerned about the environment, countries are. First, we use the share of the population with tertiary education as a proxy for greenness because higher levels of education tend to correlate with environmental concern and climate change awareness (e.g. Fransson and Gärling 1999; Van Liere and Dunlap 1980; Wolf and Moser 2011). Data come from the OECD (OECD, 2016). Second, we include the share of representatives of Green parties in parliament in a given year, following previous research (K. Michaelowa and Michaelowa 2012). Data is from the ParlGov database (Döring and Manow 2016).[7]

[6] As an alternative to annual total emissions, we also use countries' total historic emissions as a second measure of overall responsibility (World Resource Institute 2017). As we obtain very similar results when switching between the two measures we here only report the models including annual total emissions.

[7] We used a range of alternative measures to capture 'greenness' as alternatives to those reported here. These alternative variables are the left-right measure from ParlGov (Döring and Manow 2016), the share of renewable resources reported by the World Bank (World Bank, 2016), and the share of environmental spending of the national

Vulnerability: We seek to capture both direct and indirect effects of climate change and therefore use two different indices of vulnerability: First, the Notre Dame Global Adaptation Index measures direct vulnerability (ND-GAIN n.d.). Since the overall index is a mix between various vulnerability and readiness measures, we focus on one sub-measure, which purely captures the physical exposure to climate change impacts: the ND-GAIN exposure index (ND-GAIN 2013). Our second vulnerability index is the Transnational Climate Impacts Index (TCI). Consequences of climate change in one country or region may have spill-over effects to other countries, and the TCI captures this international dimension of climate risk using various factors (Benzie *et al.* 2016).

Control variables: Finally, we include three control variables. First, we control for total development aid, as previous studies have indicated a close link between climate aid and development aid (Robertsen *et al.* 2015; Weiler *et al.* 2018). Second, we control for governmental quality and effectiveness as better governed countries report their climate aid more accurately (A. Michaelowa and Michaelowa 2011). We use the sum of all six indicators of the Worldwide Governance Indicators (WGIs) as a measure of how well-governed they are (Kaufmann *et al.* 2014). Lastly, we control for contributions to multilateral climate aid, as some donors may provide climate finance multilaterally rather than bilaterally; low levels of bilateral climate finance might not mean low levels of climate finance in total. Data on multilateral contributions are taken from the Biennial Reports (UNFCCC n.d.).

Findings

All results of our statistical analysis are shown in Table 1. Models 1 and 2 show the results for all climate-related aid (adaptation and/or mitigation), with model 1 using principal and (discounted) significant flows, and model 2 principal flows only. Models 3 and 4 consider only mitigation aid, again with model 3 using principal and (discounted) significant flows, and model 4 principal flows only. Finally, models 5 and 6 focus on adaptation aid, with model 5 using principal and (discounted) significant flows, and model 6 principal flows only (see section 3.1 for more details).[8] In light of the regression results, we will now discuss our hypotheses in turn.

budget (OECD 2016). When using these alternative measures, we obtain very similar results to those reported below, but more observations are lost. Thus, we selected the current model specification.

[8] As a robustness check, we also tried different model specifications. First, we run the same models without the control variable Multilateral Aid. The reason to include this variable is that countries giving little bilateral aid might instead use multilateral channels. Thus, we would expect a negative effect for this variable. However, we observe a positive and significant correlation between CRS bilateral aid and multilateral aid taken from the biennial reports

**** Table 1 about here ****

Donor responsibility and capability

In line with the CBDR&RC principle we expect those countries most responsible for climate change to also contribute most to the joint climate aid target (H1a). Yet, despite our theoretical expectations, we see across the models that both larger per capita emitters and larger total emitters tend to provide lower levels of climate aid. The effect of per capita emissions is statistically significant (if only at the 10% level) in all but the mitigation aid only models. This indicates that higher per capita emissions reduces the provision of adaptation aid, while having little effect on mitigation aid. In contrast, the effect of total emissions is negative and highly statistically significant ($p<.01$) in all models.

Figure 3 shows the results for our responsibility variables graphically, all sub-plots are based on the first two models of Table 1. Panel a) of the figure shows that the donors with the lowest per capita emissions are predicted, all else being equal, to provide the most (principal and discounted significant) climate aid at over $13 per capita per year. This predicted climate aid level then steadily decreases, and reaches around $7 for countries at emission levels of around 16 tons CO_2 per capita (such as the US or Australia). When we look at principal aid only, panel c) shows that the countries with the lowest levels of per capita emissions in the data are predicted to provide around $8.5 per capita, while the largest emitters give less than $4 per capita according to the model. The two panels a) and c) also allow for a direct comparison between the provision of principal and (discounted) significant climate aid, and principal climate aid only. On average, when we also consider discounted significant aid, donors provide approximately $4 in climate aid per year more than when we focus only on principal climate aid.

In panel b) of Figure 3 we see the stronger negative effect of total emissions on the provision of climate aid. Again, we see that the countries that have in total contributed the least to global CO_2 emissions are nevertheless those providing the highest levels of (principal and

(r=0.32), and the results reported in Table 1 indicate a positive association as well. Thus, as we lose 32 observations when including this variable, in Appendix Table A1 we show that when omitting it, the remaining results do not change much. In addition, we also check whether our results hold when we use bilateral aid data from the biennial reports as dependent variables (we use specifications with all data, bilateral data only, and multilateral data only). For the first two models including bilateral aid (see Appendix Table A2), the results are very similar to those of our main findings.

discounted significant) climate aid per capita, at approximately $12 per capita and year. Those countries most responsible for increased atmospheric concentrations of greenhouse gases, in contrast, are predicted to provide the lowest levels of climate aid, and the largest emitters are predicted to give close to nothing (on a per capita basis). This picture is again similar when we turn to principal climate aid only. Panel d) of the figure shows that the predicted values again are lower than when we also consider discounted significant aid (as should be expected), but that the smallest emitters are expected to provide over $7 per capita and year, while the largest emitters again contribute amounts close to zero.

Collectively, these findings provide compelling evidence *against* our hypothesis that countries with a higher responsibility for climate change adhere to the principle of CBDR by providing more climate aid. On the contrary, we have to conclude that higher emissions lead to lower climate finance contributions. Thus, the repeatedly invoked principle of 'common but differentiated responsibility' seems to be a hollow token expression in the negotiations, particularly for those most responsible for climate change. H1a must therefore be outright rejected.

*** *Figure 3 about here* ***

If countries more responsible for climate change do not provide more aid, do donor capabilities, measured by GPD per capita, play a role for how much climate aid they provide, as the second part of the principle of CBDR&*RC* suggests (H1b)? The coefficient of GDP per capita is positive and statistically highly significant across all models ($p<.01$), which indicates the validity of H1b.

In Figure 4 we graphically represent the effects of GDP per capita on the provision on climate aid for Model 1 and 2 as above—i.e. the former focusing on principal and discounted significant climate aid, and the latter on principal climate aid only. We can see that at lower GDP per capita levels both the total amount of principal and discounted significant climate aid (panel a), and of principal climate aid only (panel b) are relatively low. As countries grow richer, they are predicted to provide ever higher amounts of climate aid per capita. The richest countries in our panel are thus predicted to spend well over $20 per capita on climate projects, compared to less than $3 per capita for the poorest countries (for principal and discounted significant aid). For principal climate aid only these figures are more than $10 for the richest, and less than $2 for the poorest countries. As these findings are very strong, and are similar in

magnitude and significance across all the models reported in this paper, we conclude that H1b is substantiated.

*** *Figure 4 about here* ***

'Greenness'

What about 'greener' donor countries? We have two measures of countries' 'greenness': the share of a country's population with tertiary education and the share of seats for green parties in parliament. As can be seen in all models reported in Table 1, tertiary education has no effect on climate aid, potentially because tertiary education is admittedly a rather rough proxy for the prevalence of environmental concerns in the population. The presence of Green parties in parliament, in contrast, does appear to be correlated with climate aid provision, but contrary to our expectations, the coefficient is consistently negative and statistically significant in all but one model (Model 5). In other words, the more Green party representatives in parliament, the *less* climate aid a country provides.

These counterintuitive results merit further research; we here can only speculate about the drivers of our negative findings. On the one hand, Green parties are often in opposition. Even if they would like to spend more on climate-related development projects, they may be unable to do so, and we therefore do not find the expected link between Green parties and levels of climate aid.[9] On the other hand, A. Michaelowa and Michaelowa (2011) find that countries with more Green parliamentarians over-report more, which would lead to higher levels of climate aid in the OECD/DAC CRS. That we nonetheless find a negative effect is surprising. In sum, our findings contradict the expectation of H2, which therefore must be rejected.

Vulnerability

Finally, our two variables capturing vulnerability—the ND-GAIN exposure index and the TCI—do not fare much better. Countries more exposed to the risks of climate change, whether domestically or transnationally, provide neither more nor less climate aid, according to almost all models of Table 1. Only in two specifications (Models 2 and 4) do we find a

[9] We also tested whether green party participation in government had an effect on climate aid provision. The results were insignificant across all models, possibly because green parties tend to be junior partners in coalition governments and may hence be unable to achieve higher levels of climate aid. Other potential measures for greenness we tried (see FN 4) all exhibit non-significant results, when used instead of the variables reported here.

significant, but negative effect for the TCI: countries that are more exposed to spill-over effects of climate change seem to provide less aid for mitigation. This finding is in line with our theoretical argument that donors more exposed to transnational climate impacts might make the decision to invest more funds domestically, instead of providing them as climate aid. In other word, spill-over effects from other countries lead donors to become more self-interested and they provide less funds. If anything, we find only weak evidence for H3.

Control variables

Finally, we turn to our control variables. First, we find a positive and significant (p<0.01) relationship between total aid and climate aid; in other words, countries that more generously allocate funds toward development projects also allocate more funds to climate-specific development projects. The results further suggest a positive and significant (p<0.01) relationship between government effectiveness and climate aid. Since well-governed countries report their climate aid more accurately (A. Michaelowa and Michaelowa, 2011), this positive effect increases confidence in our results. Finally, multilateral and bilateral climate aid are positively related, at least for mitigation aid: countries that provide more climate aid multilaterally also tend to allocate more bilateral aid to climate, or more precisely: mitigation projects.

Conclusion

Although we have an internationally agreed goal of $100 billion annually (by 2020) for climate action in the developing world, there is no agreement on how this burden should be shared. Our descriptive statistics show that most climate aid is provided by bilateral aid, and that there is substantial variation between donors in how much they contribute toward the collective goal. We have explored how three factors might explain such large differences between donors: first, the internationally agreed principle of 'common but differentiated responsibilities and respective capabilities'; second, donor's 'greenness'; and, third, self-interested behaviour, where vulnerable countries invest in mitigation and adaptation at home rather than abroad. In order to test these different factors, we examined bilateral official development assistance targeting climate objectives, both adaptation and mitigation as reported in the OECD/DAC CRS (Rio Markers) for the period 2011 – 2015.

Our research found that countries only partially respect the principle of CBDR&RC. First, the largest polluters do not pick up the bill; quite the contrary. Thus, the first element of 'common but differentiated responsibilities' is not realized, which points to the need of developing clear accompanying measures in order to end the free-riding behaviour of some countries. The second element of 'respective capabilities' shows more encouraging results: all else equal, richer countries do allocate more aid to climate projects, which is in line with international agreements. To our surprise, greenness does not play a role. We even find a negative correlation with the presence of Green parliamentarians. This finding requires more and deeper research. In particular, the idea that a higher share of Green party representatives in parliament leads to lower climate aid allocation is surprising and needs further analysis, and could also be an indication that the measure is a poor proxy for greenness. Of course, one possible explanation may reside in the reporting problem mentioned earlier. These results might thus need to be scrutinized taking into account the problem of over- and under-reporting. The third element, self-interest, understood as vulnerability, also has little explanatory power; by and large, our models find no evidence that vulnerable countries provide less (or more) climate aid.

The partly counterintuitive results not only merit further attention and require further and more detailed analyses, they also highlight the shortcomings of our analysis here. We have focused on bilateral aid only and thus omit multilateral climate aid, although we do control for multilateral contributions as reported in Biennial Reports. A second shortcoming is that we have omitted the recipient side from this story. It is plausible that the level of climate vulnerability or mitigation potential of the partner countries will influence the allocation of climate aid. If donors are active in countries particularly vulnerable to climate change, they likely devote significant parts of their funding to assist these recipients to deal with climate change impacts. A higher share of their aid will hence have climate (adaptation) objectives. A similar logic applies to partners that have high mitigation potential. Future research might want to look into this. Finally, a third shortcoming that we already outlined relates to reporting. The OECD data rely entirely on donors' own classification of their development projects as climate-relevant and are thus prone to over-reporting, with variations in the extent of mis-labelling and over-coding.

This research is a modest first step towards a better understanding of the donor characteristics linked to more or less climate aid. It contributes to the literature on aid allocation, on climate finance and comparative environmental politics. The aid allocation literature needs to deal

with the heterogeneity of aid, and this thus calls for more in-depth insight into sectoral and/or goal-specific or thematic aid allocations, such as climate aid. With regard to the policy relevant climate debate, it seems important to acknowledge that donor characteristics may enable but also constrain the realization of climate finance pledges. Finally, with regard to comparative environmental politics, the large differences between donors in allocating climate aid point to the need to carry out more comparative and in-depth research on how climate aid allocation happens in different countries, and how (and which) domestic factors influence these decisions. Given the counterintuitive findings linking ideology, allocation and the problem of over/under-reporting, more research is needed on the politics of climate aid reporting.

References

AdaptationWatch, 2015. *Toward Mutual Accountability: The 2015 Adaptation Finance Transparency Gap Report*. Retrieved from http://www.adaptationwatch.org

AdaptationWatch, 2016. *Towards Transparency: The 2016 Adaptation Finance Transparency Gap Report*. Retrieved from http://www.adaptationwatch.org

Anderson, B., Bernauer, T., and Balietti, S., 2017. Effects of Fairness Principles on Willingness to Pay for Climate Change Mitigation. *Climatic Change,* 142, 447–461.

Benzie, M., Hedlund, J., and Carlsen, H., 2016. Introducing the Transnational Climate Impacts Index: Indicators of Country-level Exposure – Methodology Report, *Working Paper 2016–07*. Stockholm: Stockholm Environment Institute.

Berthélemy, J. C., 2006. Bilateral donors' interest vs. recipients' development motives in aid allocation: do all donors behave the same? *Review of Development Economics*, 10 (2), 179–194.

Betzold, C., and Weiler, F., 2018. *Development Aid and Adaptation to Climate Change in Developing Countries*: Palgrave Macmillan.

Brech, V., and Potrafke, N., 2014. Donor Ideology and Types of Foreign Aid. *Journal of Comparative Economics*, 42 (1), 61–75.

Brown, J., Bird, N., and Schalatek, L., 2010. Climate Finance Additionality: Emerging Definitions and their Implications, *Climate Finance Policy Brief No. 2*: ODI and Heinrich Böll Stiftung North America.

Buchner, B., and Wilkinson, J., 2015. Pros and Cons of Alternative Sources of Climate Change Financing and Prospects for 'Unconventional Finance'. In S. Barrett, C. Carraro, and J. de Melo, eds. *Towards a Workable and Effective Climate Regime.* London and Clermont-Ferrand: CEPR and Ferdi, 483–496.

Cui, L., and Gui, H., 2015. Sharing the Burden of Financing the Green Climate Fund in the Post-Kyoto Era. *International Journal of Climate Change Strategies and Management,* 7 (2), 206–221.

Cui, L., and Huang, Y., 2018. Exploring the Schemes for Green Climate Fund Financing: International Lessons. *World Development,* 101, 173–187.

Dannenberg, A., Sturm, B., and Vogt, C., 2010. Do Equity Preferences Matter for Climate Negotiators? An Experimental Investigation. *Environmental Resource Economics*, 47, 91–109.

Dasgupta, D., and Climate Finance Unit, 2015. *Climate Change Finance, Analysis of a Recent OECD Report: Some Credible Facts Needed*, Climate Change Finance Unit, Department of Economic Affairs, Ministry of Finance, Government of India.

Dellink, R., *et al.,* 2009. Sharing the Burden of Financing Adaptation to Climate Change. *Global Environmental Change,* 19, 411–42.

Dolšak, N., 2001. Mitigating Global Climate Change: Why Are Some Countries More Committed Than Others? *Policy Studies Journal*, 29 (3), 414–436.

Dolšak, N., 2009. Climate Change Policy Implementation: A Cross-Sectional Analysis. *Review of Policy Research*, 26 (*5*), 551–570.

Donner, S. D., Kandlikar, M., and Webber, S., 2016. Measuring and Tracking the Flow of Climate Change Adaptation Aid to the Developing World. *Environmental Research Letters,* 11, 054006.

Dreher, A., Nunnenkamp, P., and Thiele, R., 2011. Are 'New' Donors Different? Comparing the Allocation of Bilateral Aid between non-DAC and DAC Donor Countries. *World Development*, 39 (11), 1950–1968.

Döring, H., and Manow, P., 2016. *Parliaments and Governments Database (ParlGov): Information on Parties, Elections and Cabinets in Modern Democracies.* Retrieved from http://www.parlgov.org/

Fransson, N. and Gärling, T., 1999. Environmental Concern: Conceptual Definitions, Measurement Methods, and Research Findings. *Journal of Environmental Psychology* 19, 369–382.

Figaj, M., 2010. Who Gets Environmental Aid? The Characteristics of Global Environmental Aid Distribution. *Environmental Economics and Policy Studies,* 12 (3), 97–114.

Gampfer, R., 2014. Do Individuals Care About Fairness in Burden Sharing for Climate Change Mitigation? Evidence from a Lab Experiment. *Climatic Change,* 124, 65–77.

Gampfer, R., Bernauer, T., and Kachi, A., 2014. Obtaining Public Support for North-South Climate Funding: Evidence from Conjoint Experiments in Donor Countries. *Global Environmental Change,* 29, 118–126.

Halimanjaya, A., and Papyrakis, E., 2012. Donor Characteristics and the Supply of Climate Change Aid, *DEV Working Paper,* 42. University of East Anglia, Norwich.

Halimanjaya, A., and Papyrakis, E., 2015. Donor Characteristics and the Allocation of Aid to Mitigation Finance. *Climate Change Economics,* 6 (3), 1550014.

Harrison, K., and McIntosh Sundstrom, L., 2007. The Comparative Politics of Climate Change. *Global Environmental Politics,* 7 (4), 1–18.

Hicks, R. L., Parks, B. C., Roberts, J. T., and Tierney, M. J., 2008. *Greening Aid? Understanding the Environmental Impact of Development Assistance.* Oxford: Oxford University Press.

Jagers, S. C. and Duus-Otterström, G., 2008. Dual Climate Change Responsibility: On Moral Divergences between Mitigation and Adaptation. *Environmental Politics*, 17 (4), 576–591.

Junghans, L., and Harmeling, S., 2012. Different Tales from Different Countries: A First Assessment of the OECD 'Adaptation Marker', *Germanwatch Briefing Paper.*

Kaufmann, D., Kraay, A., and Mastruzzi, M., 2014. *Worldwide Governance Indicators.* Retrieved from http://info.worldbank.org/governance/wgi/index.aspx - home

Leinaweaver, J., and Thomson, R., 2016. Greener Governments: Partisan Ideologies, Executive Institutions, and Environmental Policies. *Environmental Politics*, 25 (4), 633–660.

Lewis, T. L., 2003. Environmental Aid: Driven by Recipient Need or Donor Interests? *Social Science Quarterly*, 84 (1), 144–161.

Lyster, R., 2017. Climate Justice, Adaptation and the Paris Agreement: A Recipe for Disasters? *Environmental Politics,* 26 (3), 438–458.

March, J. G., and Olsen, J. P. 2004. The Logic of Appropriateness, *ARENA Working Paper 04/09*. Centre for European Studies, University of Oslo.

Michaelowa, A., and Michaelowa, K., 2011. Coding Error or Statistical Embellishment? The Political Economy of Reporting Climate Aid. *World Development,* 39 (11), 2010-2020.

Michaelowa, K., and Michaelowa, A., 2012. Development Cooperation and Climate Change: Political-economic Determinants of Adaptation Aid. In A. Michaelowa (Ed.), *Carbon Markets or Climate Finance? Low Carbon and Adaptation Investment Choices for the Developing World*. London and New York: Routledge, 39–52.

ND-GAIN., 2013. *University of Notre Dame Global Adaptation Index Detailed Methodology Report.* Retrieved from http://www3.nd.edu/~nchawla/methodology.pdf

ND-GAIN., n.d. *ND-GAIN: Notre Dame Global Adaptation Index.* Retrieved from http://index.gain.org/

OECD, 2011. *Handbook on the OECD-DAC Climate Markers.* Retrieved from http://www.oecd.org/dac/stats/48785310.pdf

OECD, 2016. *OECD. Stat Extracts.* Retrieved from http://stats.oecd.org/

OECD, and CPI, 2015. *Climate finance in 2013-14 and the USD 100 billion goal*. Retrieved from http://www.oecd.org/environment/cc/OECD-CPI-Climate-Finance-Report.pdf

Page, E.A., 2008. Distributing the Burdens of Climate Change. *Environmental Politics,* 17 (4), 556–575,

Pauw, P., 2015. Not a Panacea: Private-Sector Engagement in Adaptation and Adaptation Finance in Developing Countries. *Climate Policy,* 15 (5), 583–603.

Pauw, P., 2017. Mobilising Private Adaptation Finance: Developed Country Perspectives. *International Environmental Agreements: Politics, Law and Economics,* 17 (1), 55–71.

Pickering, J., Jotzo, F., and Wood, P. J., 2015a. Sharing the Global Climate Finance Effort Fairly with Limited Coordination. *Global Environmental Politics,* 15 (4), 39–62.

Pickering, J., *et al.*, 2015b. Acting on Climate Finance Pledges: Inter-Agency Dynamics and Relationships with Aid in Contributor States. *World Development,* 68, 149–162.

Pickering, J., and Mitchell, P. 2017. What Drives National Support for Multilateral Climate Finance? International and Domestic Influences on Australia's Shifting Stance. *International Environmental Agreements: Politics, Law and Economics,* 17 (1), 107–125.

Pillay, K., Aakre, S., and Torvanger, A., 2017. *Mobilizing Adaptation Finance in Developing Countries*, *CICERO Center for International Climate and Environmental Research Report.* Retrieved from http://hdl.handle.net/11250/2435614

PWC., 2013. International Threats and Opportunities of Climate Change for the UK. *Report prepared for the UK Department for Environment, Food and Rural Affairs (Defra).* Retrieved from http://pwc.blogs.com/files/international-threats-and-opportunities-of-climate-change-to-the-uk.pdf.

Ringius, L., Torvanger, A., and Underdal, A., 2002. Burden Sharing and Fairness Principles in International Climate Policy. *International Environmental Agreements: Politics, Law and Economics,* 2 (1), 1–22.

Roberts, J. T., Parks, B. C., and Vásquez, A. A., 2004. Who Ratifies Environmental Treaties and Why? Institutionalism, Structuralism and Participation by 192 Nations in 22 Treaties. *Global Environmental Politics,* 4 (3), 22–64.

Roberts, J. T., and Weikmans, R., 2017. Postface: fragmentation, failing trust and enduring tensions over what counts as climate finance. *International Environmental Agreements: Politics, Law and Economics,* 17 (1), 129–137.

Robertsen, J., Francken, N., and Molenaers, N., 2015. Determinants Of The Flow Of Bilateral Adaptation-Related Climate Change Financing To Sub-Saharan African Countries, *LICOS Discussion Paper 373/2015.* Catholic University Leuven.

Stadelmann, M., Michaelowa, A., and Roberts, J. T., 2013. Difficulties in accounting for private finance in international climate policy. *Climate Policy,* 13 (6), 718-737.

Stadelmann, M., Roberts, J. T., and Michaelowa, A., 2011. New and Additional to What? Assessing Options for Baselines to Assess Climate Finance Pledges. *Climate and Development,* 3 (3), 175–192.

Stewart, R. B., Kingsbury, B., and Rudyk, B. eds., 2009. *Climate Finance: Regulatory and Funding Strategies for Climate Change and Global Development*. New York and London: New York University Press.

Tingley, D., 2010. Donors and domestic politics: Political influences on foreign aid effort. *The Quarterly Review of Economics and Finance,* 50 (1), 40–49.

Underdal, A., and Wei, T. 2015. Distributive Fairness: A Mutual Recognition Approach. *Environmental Science & Policy, 51,* 35–44.

UNFCCC, 2009. *Copenhagen Accord,* Document number FCCC/CP/2009/11/Add.1.

UNFCCC, 2015. *Paris Agreement*, Document number FCCC/CP/2015/L.9/Rev.1.

UNFCCC, n.d. *Biennial Reports.*

Urpelainen, J., 2012. Strategic Problems in North–South Climate Finance: Creating Joint Gains for Donors and Recipients. *Environmental Science & Policy,* 21, 14–23.

Van Liere, K. D. and Dunlap, R. E., 1980. The Social Bases of Environmental Concern : A Review of Hypotheses, Explanations and Empirical Evidence. Public Opinion Quarterly, 44, 181–197.

Weikmans, R., 2016. Le rôle de la coopération au développement dans le financement international de l'adaptation au changement climatique. In A. Zacharie, ed, *La nouvelle géographie du développement. Coopérer dans un monde en mutation*. Bruxelles: Le Bord de l'Eau, 175–185.

Weikmans, R., and Roberts, J. T., *forthcoming*. The International Climate Finance Accounting Muddle: Is There Hope on the Horizon? *Climate and Development*, Early View.

Weikmans, R., *et al.,* 2017. Assessing the Credibility of How Climate Adaptation Aid Projects are Categorised. *Development in Practice,* 27 (4), 458–471.

Weiler, F., Klöck, C., and Dornan, M., 2018. Vulnerability, Good Governance, or Donor Interests? The Allocation of Aid for Climate Change Adaptation. *World Development,* 104, 65–77.

Winkler, H., and Rajamani, L., 2014. CBDR&RC in a Regime Applicable to All. *Climate Policy,* 14 (1), 102-–121.

Wolf, J., and Moser, S. C., 2011. Individual Understandings, Perceptions, and Engagement with Climate Change: Insights from In-depth Studies across the World. *WIREs Climate Change*, 2 (4), 547–569.

World Bank, 2016. *World Development Indicators.* Retrieved from http://databank.worldbank.org/Data/Home.aspx

World Resource Institute, 2017. *CAIT Climate Data Explorer.* Retrieved from http://cait.wri.org

Younas, J., 2008. Motivation for bilateral aid allocation: Altruism or trade benefits? *European Journal of Political Economy,* 24 (3), 661–674.

Appendix - insert here

List of figure and table captions