

Bachelor Thesis Research Proposal, Tim Dass

Motivation and Research Question

Climate change threatens human wellbeing through a variety of channels, including an increase in extreme weather events, increasing temperatures and rising sea levels. Many of these effects disproportionately affect low-income, marginalized, and indigenous communities. Low-income nations often face significant financing constraints when it comes to climate mitigation and adaptation. GHG emissions have historically been mostly emitted by developed western nations and those nations still tend to have very high per capita emissions. Due to this it can be argued that those nations have some responsibilities in aiding other countries to adapt to the consequences of climate change. This motivates the following research question:

Do the countries that are the most vulnerable also receive the most adaptation funding to cope with climate change?

Literature Review

Today, climate change related aid makes up a significant part of overall flows and this aid is not necessarily only distributed to the poorest countries. Reasons for this are a changing distribution of absolutely poor individuals living more and more in middle-income countries, and the mitigation potentials of middle-income countries (Arndt & Tarp, 2017). At the same time, the largest chunk of climate related aid goes to mitigation and not adaptation (IPCC, 2023b). Low-income countries facing high risks in the face of climate change encounter serious financing constraints in adapting to it adequately.

Vulnerability is an important term in the debate around the allocation of development finance, and there exist conflicting definitions of how vulnerability should be defined (Brooks, 2003). Vulnerability can be described as an outcome state after exposure to a hazard. In this view, it is a function of hazard, exposure, sensitivity and adaptive capacity. An alternative view is vulnerability as the state of structural factors that determine how a society can cope with risks. Brooks uses the term “biophysical vulnerability” for the first definition, whereas the second one he calls “social vulnerability”. For this work, an IPCC definition will be used that closely follows the concept of “biophysical vulnerability”. According to the IPCC, vulnerability is:

“The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.” (IPCC, 2023a, p. 14)

Going by this definition, vulnerability must be characterized both in terms of the physical risk a system is exposed to, as well as its adaptive capacity. Both aspects will be approximated by appropriate indicators. Adaptive capacity in particular is difficult to define and to find appropriate measures for. Yohe & Tol (2002) mention among the determinants of adaptive capacity the structure of critical institutions and the stocks of human and social capital, including education, and properly defined property rights. Overall, there seems to be a relative consensus that indicators on health, literacy and governance are important determinants of adaptive capacity (Brooks et al., 2005; Weiler et al., 2018). The impact of wealth and inequality on adaptive capacity is less clear.

Existing literature on the impact of vulnerability on adaptation funding generally finds that vulnerability has a strong correlation on the amount of funding received (Donner et al., 2016; Weiler et al., 2018). Additionally, there seems to be a recurring effect of smaller states receiving more funding per capita than larger states. Measures of physical risk seem to have a clear relation to adaptation funding, whereas the connection becomes less clear for some measures of adaptive

capacity. This might be because more developed countries with higher adaptive capacity are sometimes able to utilize resources more effectively than more vulnerable countries with lower adaptive capacity. This becomes especially pronounced when one looks at indicators for good governance and GDP per capita. Donor countries might have a preference to give more funding to countries with good governance, even though this means sidelining more vulnerable countries with worse institutions.

Data Sources

Vulnerability can be measured by:

- Measures of overall vulnerability:
 - ND-GAIN vulnerability score
- Measures of physical risk
 - ND-GAIN exposure and sensitivity scores
 - CRI, Germanwatch climate risk index
- Measures of adaptive capacity
 - ND-GAIN adaptive capacity score
 - GDP per capita
 - Measures of good governance
 - ND-GAIN governance score
 - World Bank worldwide governance indicators (WGI)
 - Indicators on education and health quality

Other confounding factors include:

- Distance between countries
- Colonial ties (from Quality of Government institute)
- Population size
- Total recipient exports

Adaptation funding is tracked by the UNFCCC and can be found for the period of 2015 to 2020. Their data serves as the dependent variable of the regression problems solved in this work. Taking only their bilaterally disbursed adaptation funding one compiles a dataset of roughly 10'000 observations. This data consists of a set of donors of 25 countries and a set of recipients of 140 countries. When the data is expanded for all connections between donors and recipients where no funding flows (coded as a contribution of 0), this results in a total dataset of roughly 30'000 observations.

The data collected is of dyadic nature, meaning that one observation describes the flow from one donor to one recipient country each year. The variables GDP per capita, distance, population size, total aid received, and total recipient exports will be log-transformed, so that the final regression results can be interpreted in terms of percentage increases. GDP per capita will furthermore be modelled using a quadratic term following Alesina & Dollar (2000).

Methods

To answer the research question, a two stage Cragg model will be used (Cragg, 1971; Weiler et al., 2018). This means that two separate regressions will be run for each of the variables used to measure vulnerability. The first regression consists of a logit model, where the target variable is coded as one, when funding was given, and zero, when no funding was given during a single year. In the second regression, the target variable is the amount of funding given for the subset of all observations where funding was given. This approach is used because the decision to allocate funding can differ from the decision of how much funding is appropriate. With a Cragg-model, both effects can be looked at separately. Given that 9 different measures of vulnerability will be used, this results in 18 total

regressions being run. If the different measures approximate different aspects of vulnerability closely, one expects that they would yield similar regression results. For example, if both the ND-Gain governance score and gdp per capita are good measures of adaptive capacity, they should yield similar results in the regressions.

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