Which Way to Go in International Climate Negotiations - An Analysis of Different Policies*

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Abstract

Based on unique data from a world wide survey among participants of international climate conferences, we investigate the acceptance of the most discussed policies for an international climate agreement, namely: Global quantitative targets, sector targets, research and development, geoengineering, land use, and adaptation. Regional and economic differences as well as personal attitudes play an important role in the evaluation of the different policies. Global quantitative targets and adaptation are deemed to be most important in contrast to a low acceptance of geoengineering. People that are more affected by climate change and value fairness a lot care more about global and sector targets and research and development. Surprisingly, respondents from vulnerable countries are only slightly more likely to think that adaptation is more important. Furthermore, we analyze which countries or groups of countries are expected to play a leading role for each policy. The regional origin as well as the evaluation of the policies is an important factor for the assessment of the leadership role. The EU is seen as as a key player and not much is expected from the USA and China. We detect a normative bias that increases expectations on China, the EU, and the USA for some of the policies.

Key words: International agreements, climate change, climate change negotiations, climate policies.

JEL: F53, Q58

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1 Introduction

A large body of literature disputes which policy should be the main focus of an international climate agreement.

or

Opinions of scholars interested in environmental economics and climate change differ on what should be the main focus of an international climate agreement (ICE).

or

While scientific consensus demands actions against climate change, the dispute which policy should be the main focus of an international climate agreement has not been resolved.

The homepage of the Harvard Project on Climate Agreements[1] or two notable books by Aldy and Stavins (2007, 2010) furnish evidence for this. Considering the large complexity of the problem, it is instructive to explore the acceptance of different ways of addressing global climate change. Additionally, it has been argued by Keohane and Victor (2011) that a mixture of different policies would be better than focusing on just one policy that yields only little efforts due to a lack of acceptance. Therefore, we investigate which policies against climate change are the most accepted among stakeholders of international climate negotiations and which country or group of countries will play a leading role. We consider the following six different policies in current international climate negotiations:

- Comprehensive quantitative targets for a reduction in global greenhouse gas (GHG) emissions
- Quantitative GHG emission reduction targets for individual economic sectors
- Research and development and technology transfers (R&D)
- Geoengineering
- Land use change and reforestation
- Adaptation

Up to now, comprehensive quantitative targets dominated the agenda of negotiations seen in the formation of the Kyoto Protocol. The signatories of Kyoto surprisingly demonstrated that they could agree on differentiated national quantitative targets, possibly because the targets were mostly easy to comply with. Apparently, it was more feasible to agree on international quotas than taxes and let countries choose their instruments domestically (Frankel, 2007). On a similar scale, sector targets would focus on fewer participants and key sectors but still cover large amounts of emissions. The idea of knowledge diffusion via the Clean Development Mechanism (CDM) is also already a part of Kyoto and R&D is a key factor to prevent climate change. Recently, the idea of geoengineering has been discussed but has not yet made it onto the conference table. Land use and adaptation seem a natural part of international climate negotiations and have recently gained more attention.

Knowing more about the acceptance of these policies is important for negotiators to focus on the most accepted policies and to be able to address concerns or biases of other negotiators. Furthermore, we investigate which countries or groups of countries are expected to take a leading role in the presented policies. The set of possible

[1]Link to Harvard Project on Climate Agreements.

leading countries or groups of countries comprises the Alliance of Small Island States (AOSIS), the BASI group (Brazil, South Africa, and India)[2], China by itself, the European Union (EU), the United States of America (USA), and none of the above.

Thanks to our unique data set from a survey among the official participants of the Conference of Parties (COP), we asses how the participants of international climate negotiations asses the selected policies. To our knowledge, there are no other empirical studies of this kind in the literature and no comprehensive studies of the selected policies.

We consider five factors as determinants of the acceptance of the policies or the expected leadership role: Fairness, vulnerability, abatement costs & economic capacity, democracy & governance, and origin. The data shows that global targets and adaptation are the most accepted policies whereas geoengineering is less accepted. Respondents most often think that the EU will take a leading role and least often expect USA and China to do so. While we show the relevance of fairness and vulnerability, democracy and governance do not influence the acceptance of policies. The negative influence of abatement costs and economic capacity highlights the conflict and divergence between the developed and developing countries. We find evidence for a positive normative bias that leads people to expect a leading role of BASI, China, EU, and the USA for some policies. This is in contrast to anecdotal evidence that does not suggest corresponding leading roles.

The paper continues to discuss the six policies chosen for the survey in section 2. We outline the empirical agenda in section 3 and present the data and some descriptive tables in section 4. Section 5 presents the econometric techniques we use and we present the results in section 6. The last section concludes.

2 Policies in Climate Negotiations

In this section, we present the six policies analyzed in this paper and discuss the existing literature. In line with work by Aldy and Stavins (2007) and Olmstead and Stavins (2012), we select three broad criteria to classify the policies: Effectiveness & efficiency, participation & compliance, and risks.

2.1 Global Quantitative Targets

Global targets would be effective and efficient to prevent climate change, but including all countries and securing compliance proves a challenge. So far, the agreed targets of Kyoto lacked stringency to attract broad participation at reduced effectiveness and efficiency. That is why the total amount of reductions was rather symbolic than substantial (Posner and Weisbach, 2010; Keohane and Victor, 2011).

Frankel (2007) discusses the constraints and the criteria of an ICA based on global quantitative targets. He tries to formulate realistic targets taking account of participation and compliance, efficiency, dynamic consistency, equity, and uncertainty. The proposal is criticized by Bodansky (2007b) for two reasons. Firstly, the focus to include all countries is unnecessary when only 25 countries account for 80% of the emissions and ignoring the other countries would facilitate the process. Secondly, Frankel's proposal represents an ideal policy but not ideal politics and

[2]Including China this is rather known as the BASIC group, therefore including China. Due to its important role, we look at China and BASI as a separate players.

will not be feasible. Olmstead and Stavins (2012) agree that precise, numerical, and inflexible emissions targets for long time horizons are impractical due to uncertainty over future growth, technological change, and the science of climate change and its effects. Thus, long-term targets must retain some flexibility, but still be considerably stringent. In contrast, short-term targets shouldn't be too stringent. McKibbin and Wilcoxen (2008) note that a rigid system of targets and timetables for emissions reductions pushes participants into a zero sum game.

Furthermore, the redistribution of wealth implied by a Kyoto like architecture is not going to be accepted by the developed countries and might enrich the powerful and already rich in the poorer countries due to corruption and favoritism (Cooper, 2007). Lutter (2000) stresses the importance of uncertainties for countries when they grow faster (slower) and create excessive emissions (hot air) and targets are too strict (lose). This would reduce participation and compliance and therefore emission targets should be indexed on certain variables like lagged GDP or emissions in order to reduce that risk. In conclusion, global quantitative targets serve as a first best solution but in reality it is hard to agree on sufficiently stringent targets. Nevertheless, this way is the most discussed policy up to date.

2.2 Sector Targets

Given the stalemate in international negotiations, some argue that it would be better to regulate certain carbon intensive sectors, since it only concerns a smaller group of countries and firms, which would greatly reduce transaction costs. Or, some think that a sector approach was always meant to be a part of a more comprehensive agreement like Kyoto and has been successfully employed in other contexts, for instance the World Trade Organization (WTO). A sector approach could defuse competitiveness concerns, focus on critical technology dependent sectors, and take advantage of the fact that some sectors consist of a few key parties (Bodansky et al., 2004; Bodansky, 2007a; Pew Center for Global Climate Change, 2005). Since this would be less effective and efficient than global targets, concerns about leakage and lobbying have to be addressed.

Philibert and Pershing (2001) state that it might be easier for developing countries to accept sector targets which would increase environmental effectiveness. Additionally, sector targets offer a scope to satisfy concerns about flexibility or equity from yet not participating countries. Sawa (2008) explores the possibilities of a sector approach to engage developing countries despite the disadvantage in environmental and cost effectiveness. He argues that a sector approach will be complex due to data collection problems and should rather complement a Kyoto like agreement. In contrast, Barrett (2008b) argues that sector level agreements are more effective and flexible by avoiding the enforcement and negotiation problems of an aggregate approach. Bradley et al. (2007) believe that a sector agreement can help since it would increase participation, alleviate competitiveness policies, and target key areas. Nevertheless, it is only a second best solution for the problem and the risk of lobbying and creating counter effective exemptions for energy intensive sectors have to be taken care of.

In this regard, Schmidt et al. (2008) design a policy proposal for a sector agreement in which the top 10 developing country emitters would pledge to non binding emissions targets based on energy intensity benchmarks and their capabilities. There would be no penalties for non compliance but emission reductions beyond the target would earn emissions credits to be sold to the developed countries. One could see this as a bigger, more comprehensive sector Clean Development Mechanism (CDM) with the advantage of stronger incentives for technological transfers. Keeping in mind their drawbacks, sector targets play an important part for an ICA. Both, global and sector targets, should dynamically adapt to changes of economic or scientific factors to boost participation and compliance.

2.3 Research and Development

Research and development (R&D) investments offer an alternative way to prevent climate change by using technical progress to reduce emissions. To quote Cao (2008): "R&D and technology development are the key solution for humanity to reverse the climate trend". While this could be very effective and efficient, free riding on the efforts of others has to be avoided and the diffusion of new developments should be facilitated. Without further reduction targets, technical progress alone might not be able to prevent climate change in the short run and the diffusion of technology to developing countries is especially problematic.

A recurring idea is to combine R&D investments with CDMs or other knowledge diffusing mechanisms. Among others, Hall et al. (2008), Cao (2008), and Teng et al. (2008) advice to improve the CDM to boost efforts in R&D. Furthermore, subsidies help to induce investments into R&D regardless of the stringency of the cap or the lack of enforcement (Datta and Somanathan, 2011).

Clarke et al. (2008) show that R&D and the diffusion of climate technology are most important, so that other ICA architecture considerations lose importance when more focus is put on R&D. This is especially true considering a lack of participation or compliance. Somanathan (2008) argues that an ICA should promote R&D and support the diffusion of new technologies as a necessary part, since R&D provides huge emission reductions. Newell (2008) proposes that the United Nations Framework Convention on Climate Change (UNFCCC), supported by the International Energy Agency, should develop a framework for coordinating and augmenting climate technology R&D. This should include the creation of public funds to foster joint collaboration and attract non-OECD countries. This policy would induce innovation and the diffusion of technologies which is essential to prevent global climate change due to the enormous economic and environmental benefits.

Contrasting the idea of global emission targets, an ICA could instead set technological standards which are easier to monitor and it would be in the interest of all participants to take care of the adoption and diffusion of these standards due to positive feedback. Unfortunately, this creates incentives to lock in existing technologies in contrast to price mechanisms that would create dynamic innovation. This trade-off between dynamic cost-effectiveness vs. compliance and participation ("high payoff with low probability" vs. "low payoff with high probability") is described by Barrett (2002, 2003) and Barrett and Stavins (2003). By its nature, R&D must be an essential part of preventing climate change, but an ICA can promote it indirectly or directly.

2.4 Geoengineering

In reference to Gardiner (2010) and Schelling (1996), we define geoengineering as "the intentional manipulation of the environment on a global scale". It promises an effective and efficient solution for climate change without the need to reduce emissions. At the same time, this conveys the downside of tampering further with the ongoing natural experiment of climate change. To prevent countries from conducting geoengineering unilaterally, an ICE should regulate its use.

By hosting a conference about geoengineering, the National Academy of Sciences (1992) put geoengineering on the map for the first time. Recently, it regained attention when Nobel laureate Paul Crutzen (Crutzen, 2006) published an editorial essay in favor of geoengineering as a last resort in the face of drastic climate change in the future. He and Cicerone (2006) are rather optimistic on the prospects of geoengineering and emphasize that research is needed to properly evaluate it. To this point, Victor et al. (2009) add the need of regulation due to moral hazards and unilateral action. They stress that geoengineering should only be a last resort and that it is vital to explore its cost and benefits.

MacCracken (2006) warrants caution since once geoengineering is chosen, it has to be continued virtually indefinitely due to the different decay rates of GHG gases and albedo particles. After all, reducing emissions would be the safer way to prevent climate change in the first place and geoengineering should not be used as an excuse to stop abatement efforts. In this sense, Wigley (2006) regards geoengineering as a means to buy time so that humanity can solve the initial problem by mitigation efforts.

A very skeptical view is presented by Gardiner (2010), who contests the notion that geoengineering is the "lesser evil" in the face of climate change with which we should arm the future by doing research in geoengineering. In short, he casts doubt that it will be less risky or politically more feasible than other options and that there are severe moral problems evoking emergency arguments to free the current generation from obligations. The moral thing would be to avoid climate change in the first place.

Schelling (1996) discusses the implications and possible forms of geoengineering and points out that it might reduce the complexity of international climate negotiation but that it could lead to more international tensions. Barrett (2008a) believes that we will not be able to stop climate change so that we will eventually need geoengineering. Geoengineering only serves as a band aid or a stop gap measure, but does not solve the cause of the problem and even substitutes for emission reductions. Due to the dangers of unilateral action, it should be part of an ICA.

The controversy about geoengineering is seen in the opposing results of Goes et al. (2011) and Bickel and Agrawal (2011). The former paper concludes with rather pessimistic results due to uncertainties and possible side effects. The latter explores different scenarios of the former paper to conclude with a positive cost benefit analysis.

Obviously, geoengineering offers great potential similar to R&D, but the downside risk is much bigger. Nevertheless, it should be accounted for in future climate negotiations if only to regulate or restrict its use.

2.5 Land Use and Reforestation

Land use and reforestation on its own are able to efficiently and effectively prevent climate change but significantly contribute to climate change as further emission reductions or increases. Only a few countries, like Brazil or Russia, are relevant for land use and reforestation which reduces transaction costs. Additionally, some of the benefits are more direct to the countries which might increase acceptance. The emissions changes attributed to land use change and reforestation have to be calculated carefully to avoid creating virtual emission reductions ("hot air").

According to Kalnay and Cai (2003), urbanization and land use increased the mean surface temperature by 0.27°C per century. Therefore, an agreement including land use and reforestation would have a sizable impact because of the huge potentials from emission sinks or sources. This was partly already considered in Kyoto as Russia was granted a lot of emission credits because of its large forests.

Additionally, it seems that negotiations on reforestation were less stalled in the past and making full use of the forest carbon sinks is appealing to both the developed, as low cost mitigation possibilities, and the developing world, as an additional income (Baldwin and Richards, 2010). Apparently, the negotiations in the latest COP in Warsaw progressed in this negotiation track by creating the "Warsaw Framework for REDD Plus".[3]

Plantinga and Richards (2008) stress the importance of forest carbon sequestration and the advantages of the national inventory approach. Sasaki and Putz (2009) state that it will be imperative to define the term "forest" to avoid further forest degradation which is equally responsible for CO_2 emissions than actual deforestation. Noss (2001) discusses different aspects of forest management and how to best prepare forests to dramatic climate change. Land use and reforestation is an essential part of an ICA and it is foremost important to set a regulatory framework.

2.6 Adaptation

Adaptation is defined as the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (McCarthy et al., 2001). In principle, countries could try to adjust (not prevent) to climate change, but it would be the least efficient way. Any country could adapt on its own but the most affected countries neither have the money nor the capability. That is why adaptation should be part of a more comprehensive ICA to transfer money from the least to the most affected countries. Unfortunately, some countries are not able to adjust to climate change because the consequences are too drastic. Given that some degree of climate change will most likely occur, adaptation will be necessary for some countries. Considering constraint resources, it makes sense to invest into adaptation to the point where its marginal benefit equals the benefit of emission reductions.

Adger and Barnett (2012) discuss four concerns about adaptation to climate change: 1. Climate change might be too drastic to adapt in time, 2. Some adaptation measures are not adequate to respond to climate change, 3. Some adaptation measures are unsustainable as they are polluting even more, and 4. Sometimes adaptation will not be possible due to high (psychological) costs, i.e. relocation of inhabitants of sinking islands. On the other hand, Adger et al. (2009) concludes that the limits to adaptation are contingent on ethics, knowledge, attitudes to risk and culture and not only technical considerations. Therefore these limits are mutable and can be overcome.

Although some effort is already put into adaptation, Adger et al. (2005) argue that in the future it will be necessary and more urgent to focus on it. Therefore, it is instructive to judge the efforts of adaptation according to effectiveness, efficiency, equity, and legitimacy which challenges the institutional processes on all levels. Barrett (2008b) agrees that adaptation as well as geoengineering are necessary no matter what we do so that it should be included in an ICA. Bouwer and Aerts (2006)

[3]UNFCCC press release.

propose to include adaptation into a future ICA either as a separate protocol or as an integrated part. The authors analyze different ways of funding adaptation and show that benefits of adaptation for both Annex I and II countries should be made more explicit. A clear funding commitment by the developed countries could be part of a new ICA to improve the situation. Despite the fact that preventing climate change in the first place would be a better solution, adaptation is an important topic, especially for the most affected countries.

From the extensive literature on the different policies, it is likely that not one policy alone will dominate a future ICA. The content of this section and further literature show the diverging opinions among researchers which might carry over to policymakers. The sections also reveals the diverging interest between developed (rich) and developing (poor) countries. Looking at the views of the actual stakeholders of the climate conferences helps to see which policies are most prominent and why they are preferred.

3 Determinants of Acceptance of Climate Policies

We consider the following four factors as determinants of the acceptance of different policies and leadership roles in international climate negotiations:

- Fairness
- Vulnerability
- Abatement cost and economic capacity
- Democracy and governance
- Origin

We phrase a specific hypothesis for each of the factors after the corresponding discussion.

Since fairness has become a recognized topic for international climate conferences and has been considered in other empirical surveys (Lange et al., 2007, 2010), we test if the attitude towards fairness for an international climate agreement matters for the acceptance of the policies. We expect that people who are more sensitive about fairness generally are prone to find the policies more important than others. Although the impact of fairness on the leadership roles is less obvious, there might be a positive normative bias or expectation on some countries since they are seen as morally obliged to act. On the other hand, "fair" people might have lower expectation as some countries have failed to meet their moral obligations before which disappointed them. The influence of fairness on social welfare analysis has also been proposed by Johansson-Stenman and Konow (2010).

Hypothesis 1. *The attitude towards fairness as a part of an international climate agreement influences* ***a)*** *the acceptance of policies of an international climate agreement and* ***b)*** *the expected leadership role of countries or groups of countries for different policies.*

Hypothesis 2. *The attitude towards fairness as a part of an international climate agreement influences the acceptance of policies of an international climate agreement.*

Hypothesis 3. *The attitude towards fairness as a part of an international climate agreement influences the expected leadership role of countries or groups of countries for different policies.*

A case study on the Montreal and Helsinki protocol by Sprinz and Vaahtoranta (1998) proposes two factors to explain countries' preferences: Vulnerability and abatement costs or economic capacity. Adapting this to the preferences about different policies in ICAs, we check if concerns about one's own vulnerability increases the acceptance of the policies, especially for adaptation and global targets. Vice versa, respondents expecting positive impacts for their country could be less positive about the policies. Concerning the leadership role, respondents from countries for which climate change is negative or positive might have higher or lower expectations about countries pushing policies.

Hypothesis 4. *The vulnerability of one's home country influences the acceptance of policies of an international climate agreement.*

Hypothesis 5. *The vulnerability of one's home country influences the expected leadership role of countries or groups of countries for different policies.*

Checking the postulated connection between abatement costs and acceptance of policies poses some problems. Getting data on country specific abatement costs for such a widespread sample as ours (around 128 countries) is near impossible and estimates on abatement costs differ substantially (Kuik et al., 2009; Fischer and Morgenstern, 2006). Therefore, we resort to per capita emissions as a proxy of abatement cost which is readily available and more reliable. Countries with high per capita emissions have higher abatement costs than low per capita emission countries, since it is easier to avoid emissions when a country is still building up its industry. It could also be an indicator that countries with high emissions are more reluctant to endorse the policies because they depend on high emission levels.

Looking at the economic capacity, respondents from rich countries might perceive the policies differently and be more reluctant about them. In that regard both emissions and GDP are expected to negatively influence the preference on the policies.

Hypothesis 6. *Macro economic indicators like per capita GHG emissions or GDP influence the acceptance of policies of an international climate agreement.*

Inspired by the Environmental Kuznets Curve (EKC) literature[4] we test for quadratic effects to see if there is U-shaped relation of higher acceptance among very rich or polluting countries.

Hypothesis 7. *The relationship between the macro economic indicators and the acceptance of policies of an international climate agreement is quadratic.*

[4]We refer to Panayotou (2003) for an overview.

The economic capacity and emissions might impact expectations on the leading roles, but we restrict the analysis to per capita GDP due to the large amount of models to be tested. Most probably, richer respondents have lower expectations on countries taking a leading role.

Hypothesis 8. *GDP per capita influence the expected leadership role of countries or groups of countries for different policies.*

Furthermore, we test if the institutional circumstance of a respondents home country influences the acceptance of the policies, an connection which has been analyzed in the past. Though technically outdated, an early work by Congleton (1992b) establishes that democratic and free countries are more likely to sign two international environmental agreements on Chlorofluorocarbon and methane emissions. Among others, Barrett and Graddy (2000) find that institutionally advanced countries have lower pollution levels. In a theoretical model Lange and Vogt (2003) argue that voter preferences can increase cooperation in international environmental negotiations. More to our interest is a paper by Neumayer (2002) that assumes a connection between political freedom or democracy and environmental commitment. Regarding our respondents statements as a proxy for their commitment to the policies, indicators of political freedom or governance should have a positive impact on the acceptance of the policies.

Hypothesis 9. *The attitude towards freedom and democracy influences the acceptance of policies of an international climate agreement.*

Finally, we consider the country of origin of the respondents. We explore the effect of regional indicators of the more prominent players in international climate negotiations of which enough respondents participated in the survey, namely: AOSIS, BASIC, and EU.

Hypothesis 10. *The country or region of origin influences the acceptance of policies of an international climate agreement.*

Hypothesis 11. *The country or region of origin influences the expected leadership role of countries or groups of countries for different policies.*

4 Data

This section introduces the data originating from a worldwide on-line survey conducted in spring 2012 and already shows some descriptive results.

4.1 Sample

The subject group comprises the official participants of the Conferences of Parties (COP). We focus on representatives of countries in international climate negotiations, specifically participants of COPs, since they conduct the negotiations. Thanks to the official lists of participants published by the UNFCCC, we were able to contact every official participant of the COPs of 2010 and 2011 supplying a potentially large sample. Although work by Lange and Vogt (2003) suggests that voters preferences can influence negotiators,[5] most of the participating countries do not have democratically elected governments. Therefore, we focus on the most important subject group of international climate negotiations: The official participants as released by the UNFCCC.

The data was collected in a worldwide on-line survey conducted in spring 2012. Our project partner from the Center of European Economic Research (ZEW) gathered all possible email contacts from the official UNFCCC list of participants and other sources. Trying to include all the participants from COP 16 in Durban and COP 17 in Cancun, they harvested around 7500 addresses. After designing the questionnaire, every contact was sent an email with a personalized link to a standardized on-line platform to complete the questionnaire. On request, a printable PDF version was also provided to be sent back by email or post. After up to three follow-ups, 500 persons participated in the survey, of which approximately 350 completely filled out the questionnaire. The participation rate of $5-6\%$ is rather low but still fairly typical for on-line surveys. There is some evidence that negotiators from poor and less polluting countries are more prone to answer, as well as Europeans. Yet, sensitivity analyses using different weightings did not significantly change the results.[6]

4.2 Dependent Variables

The econometric analysis focuses on two sets of categorical variables about the importance of the policies and the leadership roles of certain countries for those policies. The first set is based on a question about the importance of the six different policies for international climate change negotiations. We derive six ordinal variables "policy importance" with values 1 for "Not important", 2 "Moderately important", 3 "Important", 4 "Very important". The following table shows the relative frequencies of the four categories, the mean, the standard deviation (S.D.), and the number of observations (N) of all six ordinal variables used in the econometric analysis.

[5]For a more detailed discussion see, Böhringer and Vogt (2004), Vogt (2002), or Congleton (1992a).

[6]We cannot rule out problems of self-selection, but since most biases depend on differences between developing and developed countries we think that it is not problematic that we have less participants from developed countries, as long as their views don't differ from their non responding compatriots.

Table 1: Relative frequencies of importance of different policies in climate change negotiations.

	Very imp.	**Imp.**	**Mod. imp.**	**Not imp.**	**Mean**	**S.D.**	**N**
Global	74.6	21.2	3.5	0.7	3.70	0.57	429
Sector	46.1	34.1	14.1	5.6	3.21	0.89	425
R&D	56.5	31.3	10.7	1.4	3.43	0.74	428
Geoeng.	17.5	33.3	28.2	20.9	2.47	1.01	411
Land	54.0	35.6	10.0	0.5	3.43	0.69	430
Adaptation	68.6	22.3	8.6	0.5	3.59	0.67	430

According to the respondents, global targets and adaptation are the most important policies for international climate change negotiations. Sector targets, R&D, and land use follow somewhat behind but still achieve rates of around 50% for the highest category "very important". The perceived importance of geoengineering is much weaker, although roughly 50% still see it as "very important" or "important". Comparing measures of dispersion underlines that geoengineering is the most controversial topic. Usually, the mean or the standard deviation of an ordinal variable has no real interpretation as the choice of values for each category is arbitrary. Nevertheless, using the same category values for all six variables shows that the standard deviation of geoengineering is the highest and has the lowest mean. Good (1982) proposed the squared sum of category probabilities $\rho = \sum_{i=1}^{4} p_i^2$ as a measure of homogeneity, which results in the same ranking as the standard deviations displayed in the sixth column of table 1. This measure yields 0.60 for global targets, the highest or most homogeneous, and 0.26 for geoengineering, the lowest and least homogeneous.[7]

The second set of dependent variables describes the expected leading roles of AOSIS, BASI, China, EU, USA or None for each policy. In this regard, we obtain a six by six matrix of binary indicators that take on the value 1 if the respondent thinks a country or group of countries plays a leading role for a certain policy, or 0 if not. Table 2 summarizes theses 36 items. We choose to keep the policies on the vertical axis and depict the regions on the horizontal axis. Each cell gives the percentage of respondents that think that a country will take a leading role for this policy.

More than half and over 70% of the respondents think that AOSIS plays a leading role for global targets and adaptation respectively. The number drops to around 30% for the other policies and only very few respondents see a leading role of AOSIS for geoengineering. The BASI group is rather expected to play a leading role for R&D, land-use or adaptation. The pattern is similar for China with a much lower rate for land use. Respondents expect the EU to play a very important role. Across policies the ratio of a EU leading role is 61% and a staggering 82% expect the EU to take

[7]The Hirschman-Herfindahl index of concentration would also be applicable and provide the same ranking.

Table 2: Relative frequencies of a leading role for different policies in climate change negotiations.

	AOSIS	**BASI**	**China**	**EU**	**USA**	**Mean**	**None**
Global	54.0	28.7	32.7	81.9	28.0	45.1	1.7
Sector	29.7	25.8	33.1	72.3	33.9	39.5	7.0
R&D	29.7	45.6	53.6	58.0	43.9	46.2	3.9
Geoeng.	12.0	18.3	27.7	51.1	58.4	33.5	14.6
Land-Use	33.1	59.1	24.4	58.0	26.0	40.1	6.6
Adaptation	73.2	55.0	33.3	44.0	24.7	46.0	6.3
Mean	40.2	39.8	34.5	61.4	34.7	/	6.2

a leading role for global targets.

Looking at the averages one has to keep in mind that the averages across policies for each region are a weighted average since the numbers of observations differ. For the average across regions we exclude "None". The mean leading percentage of 35% for both the USA and China shows that respondents do not expect much from them, although they are pivotal players in climate change negotiations. Usually, respondents rarely think that none of the countries takes a leading role but it is most often the case for geoengineering. In comparison to the average leading role of a country there is less variability about the policies. The picture is somewhat similar to the general importance of the policies in table 1, so that respondents mostly expect a leading role of countries for global targets, R&D, and adaptation and least often for geoengineering.

Since respondents could select multiple countries or groups of countries for a leading role in a policy, we check if some permutations come up more frequently. Indeed, 27% of respondents simultaneously see leading roles for AOSIS and EU for global targets, 13% for EU and USA for R&D, and 10% for all countries for adaptation. Due to missing observations across policies for each region we only give absolute frequencies of the permutations. Around 40-65 respondents do not see any leading role of any country for any of the policies with the exception of the EU, where roughly 50 respondents see a EU leading role for all policies.

4.3 Explanatory Variables

To test the hypotheses of section 3, we collected data to construct explanatory variables used in the econometric analysis.

To analyze the role of fairness and vulnerability, we create binary indicators based on two questions of the survey. One question asks how important fairness is for distributing GHG emission reduction targets between countries in an international climate agreement. We obtain a binary indicator, "Fairness", with the value 1 for the highest category "Very important" and 0 for the less important categories. In another question, participants assess the consequences of climate change for their

Table 3: Means and standard deviations of exogenouse variables

Variable	Mean	Standard Deviation	N
Fairness	0.50	-	403
Very neg. conseq.	0.30	-	383
Positive conseq.	0.05	-	383
AOSIS	0.08	-	429
BASIC	0.10	-	429
EU	0.23	-	429
GDP capita	1.66	1.63	429
GDP total	1.07	2.49	429
CO_2 capita	5.20	5.85	429
Partly Free	0.30	-	424
Free	0.58	-	424
Democracy Index	6.45	2.00	390
Governance Index	0.27	0.92	426

home country on a scale from "positive" to "very negative". We establish one binary indicator, "Very neg. conseq.", with 1 for "Very negative consequences" and 0 for less negative consequences. Another binary indicator, "Positive conseq.", takes on the value 1 for "Positive consequences" and 0 for less positive consequences.

Based on the nationality and the represented country, which in all but some cases matches the information from the official UNFCCC participation lists, we are able to create indicators for the most important players from which we have enough respondents: AOSIS, BASIC[8], and EU.

Furthermore, we include three aggregate socio-economic variables: Per capita and total GDP (in ten thousand \$ and in one trillion \$) from the Penn World Table (Heston et al., 2012) and per capita CO_2 emissions in GT CO_2 (EIA 2010).

As proxies for democracy and governance, we use three different sources: Freedom House (2013), Economist Intelligence Unit (2013), and Kaufmann et al. (2012). All three indexes are aggregations of expert surveys or classifications, which we do not explore in this paper. The Freedom House index provides two binary indicators that differentiate between partly free and free countries. The democracy index ranges from 0 (authoritarian regimes) to 10 (full democracies) and the governance index of the World Bank ranges from -2.5 for weak to 2.5 strong governance performance. Further information are given by the sources or the corresponding homepages.

To avoid an omitted variables bias for the leadership roles, we derive binary indicators from the dependent variables of the policy importance. They take on the value 1 when a policy is viewed as "very important" or 0 for the lesser categories. This variables are referred to as "Policy very imp" in the models explaining the leadership roles.

An overview including the mean and the standard deviation of all explanatory

[8]It should be noted that we do not have any observations from India in our sample, so that our results do not include the Indian position within the group.

variables but the policy importance is given in table 3. We do not include further socio economic variables on gender, education, or others as this did not provide any further insight at a considerable loss of observations.

5 Results

Following the agenda set in section 3, we use multivariate ordinal and binary probit models to analyze the importance of the different policies of climate change and the leadership structure within those policies.

5.1 Policy Importance

Based on the ordinal scale of the first set of variables, this section relies on multivariate ordered probit models. We use multivariate models to take account of correlation among the items as this is likely to be the case. To stress the different determinants, we present four regression tables that focus on fairness (table 4), vulnerability (table 5), the macro indicators for abatement costs and economic capacity (table 6), and all exogenous variables together (table 7). The omission of a table focusing on democracy and governance already forecloses that we are not able to validate hypothesis 9. For completeness, we include three models in the appendix (tables 14-16) that do not show any meaningful effect. In view of the existing literature (Neumayer, 2002), this contradicts previous results that have found a correlation between democracy, freedom, and governance and environmental commitments. Consequently, these variables are dropped and not included in the estimation of the other models of this section. All models include regional dummies to account for heterogeneity among the participants and the regional effects.

Both tables 4 and 7 demonstrate that more fairness prone respondents are much more likely to consider global targets to be important ($p < 0.01$) but also sector targets and R&D ($p < 0.05$). One reason for this positive impact might be the

Table 4: Multivariate ordered probit model focusing on **fairness** as an explanatory variable, determinants of importance of policies, dependent variables: "Degree of Importance".

	Global	Sector	R&D	Geoeng	Land-Use	Adaptation
Equity IEA	0.583***	0.290**	0.273**	0.041	0.152	0.222*
	(4.28)	(2.54)	(2.29)	(0.37)	(1.29)	(1.73)
GDP capita	-0.034	-0.037	-0.116**	-0.234***	-0.003	-0.168***
	(-0.54)	(-0.67)	(-2.07)	(-4.17)	(-0.05)	(-2.89)
GDP total	-0.050**	-0.016	-0.010	-0.082***	-0.067***	0.017
	(-1.97)	(-0.67)	(-0.41)	(-3.04)	(-2.83)	(0.63)
CO_2 capita	-0.013	-0.026**	-0.015	0.015	-0.037***	-0.021
	(-0.87)	(-2.08)	(-1.15)	(1.18)	(-2.84)	(-1.51)
AOSIS	0.207	0.444*	-0.057	0.041	0.231	0.877**
	(0.72)	(1.77)	(-0.24)	(0.19)	(0.94)	(2.40)
BASIC	-0.011	-0.033	0.539**	0.004	0.258	0.212
	(-0.05)	(-0.17)	(2.28)	(0.02)	(1.22)	(0.88)
EU	0.280	-0.107	-0.399**	-0.550***	0.186	-0.001
	(1.48)	(-0.65)	(-2.42)	(-3.24)	(1.10)	(-0.01)
Observations	404					
chi2	211.346					

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. z-statistics in parentheses.

Table 5: Multivariate ordered probit model focusing on **vulnerability** as explanatory variables, determinants of importance of policies, dependent variables: "Degree of Importance".

	Global	Sector	R&D	Geoeng	Land-Use	Adaptation
Very neg. conseq.	0.576***	0.267*	0.397**	0.247*	0.203	0.320*
	(3.20)	(1.85)	(2.57)	(1.80)	(1.36)	(1.86)
Positive conseq.	-0.720**	0.133	0.446	0.756***	-0.071	-0.451
	(-2.55)	(0.49)	(1.47)	(2.78)	(-0.25)	(-1.57)
GDP capita	-0.025	-0.025	-0.101*	-0.208***	0.000	-0.148**
	(-0.38)	(-0.45)	(-1.75)	(-3.67)	(0.00)	(-2.46)
GDP total	-0.043	-0.011	0.007	-0.064**	-0.074***	0.012
	(-1.60)	(-0.48)	(0.28)	(-2.41)	(-3.03)	(0.45)
CO_2 capita	-0.007	-0.025**	-0.014	0.016	-0.038***	-0.027**
	(-0.42)	(-2.06)	(-1.10)	(1.25)	(-2.96)	(-1.97)
AOSIS	-0.188	0.503*	-0.258	-0.070	0.111	0.764**
	(-0.65)	(1.89)	(-1.02)	(-0.31)	(0.44)	(2.01)
BASIC	-0.148	-0.087	0.431*	0.154	0.387*	0.105
	(-0.63)	(-0.42)	(1.79)	(0.76)	(1.74)	(0.43)
EU	0.209	-0.129	-0.447***	-0.599***	0.170	-0.041
	(1.10)	(-0.79)	(-2.69)	(-3.53)	(1.01)	(-0.24)
Observations	384					
chi2	226.732					

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

stronger spillover nature of these policies implying larger global benefits, which would represent efficiency concerns among those respondents. The effect is very robust for the different sample sizes of 404 and 359 In line with Lange et al. (2007, 2010), we supply further evidence for the importance of fairness in international climate negotiations and validate hypothesis 2.

Looking at the estimates for both indicators of vulnerability, we see that the impact of vulnerability is at times twofold. The expectation of very negative consequences for ones' home country has a strong, significantly positive effect on global targets across models and specifications. There are weaker effects on the other policies except on R&D, which is more robust than on the others. Surprisingly, the effect on adaptation is rather weak and only $p < 0.10$ significant. In contrast, positive

Table 6: Multivariate ordered probit model focusing on **macro indicators** as explanatory variables, determinants of importance of policies, dependent variables: "Degree of Importance".

	Global	Sector	R&D	Geoeng	Land-Use	Adaptation
GDP capita	-0.045	-0.043	-0.137**	-0.232***	-0.005	-0.165***
	(-0.72)	(-0.81)	(-2.50)	(-4.27)	(-0.10)	(-2.92)
GDP total	-0.048*	-0.022	-0.005	-0.074***	-0.061***	0.018
	(-1.94)	(-0.99)	(-0.19)	(-2.87)	(-2.64)	(0.71)
CO_2 capita	-0.010	-0.025**	-0.016	0.014	-0.036***	-0.023*
	(-0.70)	(-2.09)	(-1.20)	(1.16)	(-2.87)	(-1.65)
AOSIS	0.156	0.444*	-0.021	0.158	0.305	0.977***
	(0.60)	(1.93)	(-0.09)	(0.78)	(1.32)	(2.74)
BASIC	-0.080	-0.030	0.388*	0.024	0.317	0.151
	(-0.36)	(-0.15)	(1.72)	(0.12)	(1.53)	(0.65)
EU	0.152	-0.118	-0.406**	-0.594***	0.121	-0.044
	(0.83)	(-0.73)	(-2.52)	(-3.59)	(0.74)	(-0.27)
Observations	431					
chi2	197.070					

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

Table 7: Multivariate ordered probit model with **all explanatory variables**, determinants of importance of policies, dependent variables: "Degree of Importance".

	Global	Sector	Research	Geoeng	Land-Use	Adaptation
Equity IEA	0.550***	0.301**	0.265**	0.034	0.163	0.184
	(3.73)	(2.47)	(2.09)	(0.29)	(1.29)	(1.34)
Very neg. conseq.	0.519***	0.195	0.359**	0.263*	0.265*	0.262
	(2.76)	(1.30)	(2.26)	(1.84)	(1.71)	(1.49)
Positive conseq.	-0.624**	0.161	0.504*	0.756***	-0.043	-0.434
	(-2.15)	(0.59)	(1.66)	(2.77)	(-0.15)	(-1.49)
GDP capita	-0.022	-0.030	-0.078	-0.199***	0.010	-0.153**
	(-0.33)	(-0.51)	(-1.32)	(-3.43)	(0.17)	(-2.49)
GDP total	-0.049*	-0.004	0.001	-0.072***	-0.082***	0.007
	(-1.77)	(-0.17)	(0.05)	(-2.62)	(-3.28)	(0.27)
CO_2 capita	-0.008	-0.026**	-0.014	0.017	-0.038***	-0.025*
	(-0.50)	(-2.09)	(-1.02)	(1.31)	(-2.92)	(-1.78)
AOSIS	-0.140	0.495*	-0.224	-0.112	0.069	0.708*
	(-0.45)	(1.74)	(-0.85)	(-0.47)	(0.26)	(1.83)
BASIC	-0.070	-0.106	0.598**	0.144	0.337	0.167
	(-0.28)	(-0.50)	(2.37)	(0.69)	(1.48)	(0.66)
EU	0.334*	-0.118	-0.454***	-0.571***	0.237	-0.011
	(1.70)	(-0.70)	(-2.65)	(-3.29)	(1.36)	(-0.06)
Observations	359					
chi2	232.986					

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

expectations about the consequences of climate change decrease the acceptance of global targets and strongly increase the acceptance of geoengineering. The negative bias on global targets can be explained with self interest but the positive bias on geoengineering is rather puzzling since geoengineering would prevent the "positive consequences" of climate change. The contrary effects on global targets are worrying as they show the conflict between countries loosing and gaining from climate change. In this regard hypothesis 4 is validated though the effects are not very strong.

The three variables as proxies for abatement costs and economic capacity are by and large negatively correlated with the importance of the policies, which is shown by the dominance of negative estimates in all tables and no significant positive effect at all. Given the col-linearity among the macro indicators, some persistent effects remain that are mostly explainable by self interest. For instance, one sees a very strong negative effect of per capita emissions on sector targets. Since sector targets would probably focus on high emitters a negative attitude towards sector targets would be in those countries' self interest. Similarly, funds for adaptation would have to be supported mainly by rich countries so the negative effect of GDP can again be explained by self interest. The negative effect of emissions on land use is more persistent than the effect of total GDP and might reflect the unwillingness to finance land use and reforestation projects in developing countries. The negative effect on geoengineering, which is less strong in the probit specification, is harder to explain and possibly shows a risk aversion of rich countries towards the risky prospects of geoengineering. Generally, the negative correlation of the macro indicators seems to resonate the reluctance of the developed (rich) countries to pay for the policies in question, showing a huge divide between the developed and developing countries.Therefore, hypothesis 6 holds.

Testing for a quadratic relationship between GDP or per capita emissions and the importance of the policies, we include quadratic effects for each macro indicator in the base line models. Guided by these estimations, we estimate new models with the quadratic effects that turned out to be most significant. The base line models are the one using the macro-indicators as in table 6 and the comprehensive one as in table 7. We then test the Null-hypothesis of no quadratic effect in the base line model against the augmented models. We find positive quadratic effects for both models for per capita GDP on Adaptation and for per capita emissions on global and sector target as well as R&D.

The joint inclusion of these quadratic effects is statistically significant at $p < 0.01$ compared to the macro-indicator model and at $p < 0.05$ compared to the comprehensive model. Due to the large number of permutations of quadratic effects, the results are ambiguous as there are many different specifications. The positive signs of the quadratic estimates of per capita GDP on adaptation and per capita emissions for global and sector targets and R&D does indicate a possible quadratic relationship. This means that very rich and polluting states do in fact consider some of the policies more important than the middle income countries which are striving for more economic growth. In line with the EKC idea more polluting countries consider some of the policies more important, while we would not recognize this if we only looked at the linear specifications and therefore we partly validate hypothesis 7.

The regional indicators show a strong rejection of R&D and geoengineering by the European Union. The strong rejection of R&D by the EU highlights the problematic nature of knowledge diffusion in the context of climate change and the reluctance or inability of the EU to force European companies to give up their patents. Respondents from AOSIS are more likely to think that sector targets ($p < 0.05$ and $p < 0.10$) and adaptation (mostly $p < 0.01$) are very important. There is a changing positive effect of BASIC on R&D and geoengineering which is not very robust. Notably, there are neither positive nor negative biases against global targets and land use, which can be seen as an indication for the prevalence of global target and the recent advances in land use in climate negotiations. This validates hypothesis 10 for some of the policies.

Summing up, there are some considerable biases in our data. From an optimistic perspective, global targets are generally the most accepted policy and endorsed by fairness prone and vulnerable participants but disliked by unaffected participants. Some evidence suggests a quadratic influence of some of the macro indicators, most likely per capita emissions. Pessimistically, the divergence between the developed

Table 8: Multivariate binary probit model across policies for **AOSIS**, determinants of leadership roles, dependent variables: "Leadership role".

	Global	Sector	Research	Geoeng	Land-Use	Adaptation
Equity IEA	0.080 (0.58)	-0.005 (-0.03)	0.178 (1.27)	-0.091 (-0.43)	0.117 (0.83)	-0.011 (-0.07)
Policy very imp.	0.352** (2.50)	0.443*** (3.27)	0.230 (1.62)	0.619*** (2.96)	0.396*** (2.95)	0.096 (0.63)
GDP capita	0.143*** (2.78)	0.015 (0.27)	-0.069 (-1.20)	-0.236* (-1.72)	-0.108* (-1.92)	0.009 (0.16)
AOSIS	2.247*** (4.70)	1.394*** (4.63)	0.994*** (3.60)	0.920*** (2.64)	1.014*** (3.69)	0.000 (.)
BASIC	0.190 (0.83)	-0.044 (-0.16)	0.001 (0.00)	-0.165 (-0.44)	-0.466* (-1.75)	0.068 (0.29)
EU	0.571*** (2.90)	0.345 (1.59)	0.177 (0.82)	-0.158 (-0.28)	0.103 (0.47)	0.734*** (3.31)
Observations	397					
chi2	165.455					

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. z-statistics in parentheses.

and developing countries and the further rejection of R&D by the EU stick out. Further climate negotiations will have to overcome those problems.

5.2 Leadership Role

In the following, we analyze the determinants of the expected leading roles of countries for different policies. Since the 36 endogenous variables are binary, we use multivariate binary probit models to analyze these factors. We estimate across regions and policies to take account of correlations among the items in both ways, but already note that results remain very similar in both specifications.

We present six tables of models where we estimate across policies for each region in this section and refer to 6 similar tables of models across regions for each policy in the appendix (tables 17-22). The models include the fairness indicator, the policy importance, per capita GDP, and the three regional indicators as regressors. We exclude the vulnerability indicators as they show almost no significant effect at all. The lack of noteworthy results and the loss of 45 observations do not justify the inclusion, so we drop this variable and cannot validate hypothesis 5.

It is rather intuitive that respondents that find a policy very important also expect countries to take a leading role in this policy. We include this to avoid an omitted variables bias, but do not see it as a separate hypothesis and did not include it in section 3. The effect is strongest for the role of AOSIS, but is also visible for BASI, China, and EU, where this effect come ups for sector targets and geoengineering and for the EU in land use. It seems that these respondents do not particularly expect anything from the USA and otherwise rarely expect that no country takes a leading role.

The importance of fairness for an ICA increases expectations on a leading role for global targets and R&D. The increased likelihood to expect a leading role especially from BASI and USA ($p < 0.01$) and China ($p < 0.05$) for global targets shows a form of positive normative bias (see table 9, 10, and 12). The fact that there is no effect on a leading role of the EU seems justified as the EU has been pushing this policy a lot which does not warrant a positive normative bias. On the other side, table 11 shows that fairness prone respondents expect to see more responsibility by the EU for R&D. Our results are a sign of unreasonable expectations about

Table 9: Multivariate binary probit model across policies for **BASI**, determinants of leadership roles, dependent variables: "Leadership role".

	Global	Sector	Research	Geoeng	Land-Use	Adaptation
Equity IEA	0.448***	0.297*	0.237*	0.252	0.135	0.070
	(3.13)	(1.95)	(1.77)	(1.30)	(1.00)	(0.52)
Policy very imp.	0.013	0.409***	-0.031	0.841***	-0.093	-0.056
	(0.09)	(2.84)	(-0.22)	(3.79)	(-0.72)	(-0.39)
GDP capita	-0.225***	-0.116*	-0.045	-0.101	-0.110**	-0.128**
	(-3.31)	(-1.75)	(-0.89)	(-1.07)	(-2.16)	(-2.34)
AOSIS	-0.264	-0.064	-0.225	-0.262	-0.045	-0.167
	(-0.97)	(-0.23)	(-0.83)	(-0.65)	(-0.17)	(-0.66)
BASIC	0.546**	0.534**	0.280	0.226	0.614**	0.276
	(2.49)	(2.27)	(1.23)	(0.76)	(2.39)	(1.19)
EU	-0.031	0.001	0.686***	-0.120	0.443**	0.371*
	(-0.12)	(0.01)	(3.48)	(-0.33)	(2.26)	(1.86)
Observations	397					
chi2	113.333					

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. z-statistics in parentheses.

Table 10: Multivariate binary probit model across policies for **China**, determinants of leadership roles, dependent variables: "Leadership role".

	Global	Sector	Research	Geoeng	Land-Use	Adaptation
Equity IEA	0.341**	0.212	0.207	0.196	-0.077	0.134
	(2.44)	(1.51)	(1.55)	(1.21)	(-0.54)	(0.98)
Policy very imp.	-0.050	0.136	0.004	0.545***	0.163	0.280**
	(-0.38)	(1.17)	(0.03)	(2.84)	(1.27)	(1.99)
GDP capita	-0.156***	-0.067	-0.024	0.058	-0.077	-0.037
	(-2.77)	(-1.26)	(-0.48)	(0.96)	(-1.37)	(-0.68)
AOSIS	-0.768***	-0.290	-0.378	-0.367	-0.289	-0.673**
	(-2.74)	(-1.05)	(-1.37)	(-1.00)	(-1.01)	(-2.28)
BASIC	-0.282	-0.021	-0.029	-0.347	-0.292	-0.184
	(-1.26)	(-0.09)	(-0.13)	(-1.19)	(-1.17)	(-0.77)
EU	-0.642***	-0.258	0.651***	-0.419	-0.254	0.013
	(-2.83)	(-1.19)	(3.31)	(-1.62)	(-1.15)	(0.06)
Observations	397					
chi2	104.080					

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. z-statistics in parentheses.

certain countries. It would become problematic if those expectations held up an agreement when "fair" negotiators feel that the big players do not live up to their moral obligation. We therefore validate hypothesis 3.

Similar to the divide on the importance of the policies, respondents from rich countries tend to expect that no country will take a leading role for sector targets, R&D, geoengineering. They do, however, expect AOSIS to take a leading role in global targets, but do not expect BASI or China to do so. The mostly negative relation is also shown by the negative impact on the leading role of BASI in adaptation, of USA in land use, and of EU in geoengineering. Therefore we validate 11 for certain leading roles.

The regional indicators show that respondents from AOSIS tend to see themselves taking a leading role in all policies but geoengineering (table 8). It even goes to the point that all respondents from AOSIS think that AOSIS will take a leading role in adaptation, so that we had to omit this regressor. This seems a bit over-optimistic and driven by the necessity of progress in all policies especially adaptation. On the other hand, they do not particularly expect BASI to take any leading

Table 11: Multivariate binary probit model across policies for **EU**, determinants of leadership roles, dependent variables: "Leadership role".

	Global	Sector	Research	Geoeng	Land-Use	Adaptation
Equity IEA	0.099	-0.070	0.304**	0.036	0.019	0.031
	(0.63)	(-0.48)	(2.27)	(0.22)	(0.14)	(0.24)
Policy very imp.	0.230	0.379***	-0.008	0.360*	0.293**	0.051
	(1.45)	(2.82)	(-0.06)	(1.80)	(2.29)	(0.36)
GDP capita	0.110*	0.001	-0.067	-0.158**	-0.024	0.036
	(1.78)	(0.02)	(-1.33)	(-2.50)	(-0.48)	(0.67)
AOSIS	-0.288	-0.776***	-0.341	-0.354	-0.780***	0.211
	(-1.06)	(-2.82)	(-1.25)	(-1.02)	(-2.91)	(0.82)
BASIC	0.096	-0.056	-0.132	-0.344	-0.199	0.150
	(0.38)	(-0.23)	(-0.57)	(-1.30)	(-0.87)	(0.66)
EU	0.320	-0.094	-0.311	-0.408	0.296	0.015
	(1.30)	(-0.44)	(-1.60)	(-1.60)	(1.48)	(0.08)
Observations	397					
chi2	101.004					

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. z-statistics in parentheses.

Table 12: Multivariate binary probit model across policies for **USA**, determinants of leadership roles, dependent variables: "Leadership role".

	Global	Sector	Research	Geoeng	Land-Use	Adaptation
Equity IEA	0.416***	0.266*	0.078	0.146	0.142	0.144
	(2.89)	(1.86)	(0.59)	(0.93)	(0.99)	(1.01)
Policy very imp.	-0.057	0.161	0.095	-0.123	-0.202	0.102
	(-0.47)	(1.45)	(0.77)	(-0.61)	(-1.50)	(0.68)
GDP capita	-0.047	-0.079	0.027	-0.039	-0.125**	-0.002
	(-0.85)	(-1.42)	(0.54)	(-0.65)	(-2.02)	(-0.03)
AOSIS	-0.809**	-0.434	-0.386	-0.283	-0.092	-0.336
	(-2.51)	(-1.51)	(-1.42)	(-0.80)	(-0.33)	(-1.17)
BASIC	-0.231	-0.076	-0.360	-0.008	-0.189	0.138
	(-1.00)	(-0.33)	(-1.58)	(-0.03)	(-0.72)	(0.57)
EU	-0.756***	-0.652***	-0.495**	0.328	0.225	-0.338
	(-3.33)	(-2.85)	(-2.54)	(1.37)	(1.00)	(-1.51)
Observations	397					
chi2	68.349					

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. z-statistics in parentheses.

role and they are even less likely to think that China takes a leading role in global targets. They do not expect the EU to take a leading role in sector targets or land use and do not think that the USA will take a leading role in global targets. None of the AOSIS representatives thinks that no country will take a leading role, as this perfectly predicts failure in the models. For this reason and due to computational problems we have to drop the regional variables for region "None".

The BASIC representatives also show some self-centered bias as they expect them self to take a leading role in global and sector targets. Besides this, there is no real bias for BASIC representatives and they do not show any special focus on policies or countries.

EU respondents think that AOSIS will play a leading role for global targets and land use and also expect BASI and China to take a leading role in R&D but do not see a leading role for China in global and sector targets nor geoengineering. Considering their own position, they do not expect a leading role in sector targets or geoengineering while they expect very little of the USA as the strong negative effects on global and sector targets and R&D shows. Relying on univariate probit models, we see a negative estimate for EU on land use and adaptation for "None". Despite the lack of a full set of regional indicators, hypothesis 11 holds, but further investigation of this angle should be undertaken in future surveys.

Table 13: Multivariate binary probit model across policies for **None**, determinants of leadership roles, dependent variables: "Leadership role".

	Global	Sector	Research	Geoeng	Land-Use	Adaptation
Equity IEA	-0.046	0.154	-0.329	0.167	-0.056	0.012
	(-0.14)	(0.69)	(-1.18)	(0.82)	(-0.27)	(0.06)
Policy very imp.	-0.161	-0.679***	0.147	-0.759**	-0.349*	-0.150
	(-0.48)	(-2.70)	(0.53)	(-2.16)	(-1.70)	(-0.68)
GDP capita	0.046	0.216***	0.229***	0.149***	0.052	0.066
	(0.51)	(3.51)	(3.25)	(2.60)	(0.86)	(1.07)
Observations	385					
chi2	46.979					

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. z-statistics in parentheses.

Note: We omit AOSIS as it is a perfect predictor of failure and for computational reasons BASIC and EU as well.

In conclusion, the normative bias shows how fairness matters for international climate conferences. We expected a bigger impact of the regional indicators and maybe some contradictions, but unfortunately we do not have regional indicators of all five players. GDP does matter but mostly in a negative way. Respondents from rich countries are usually less likely to expect a leading role and more likely to expect none of the five players to play a leading role.

6 Conclusion

The intention of this paper is to identify the determinants of the acceptance of different environmental policies in international climate change negotiations. Based on data of an international on-line survey we are able to analyze five different factors: Fairness, vulnerability, abatement costs & economic capacity, freedom & governance, and origin.

The focus of current negotiations on global targets appears justified since it is the most accepted and undisputed policy according to our sample. This is shown by the highest acceptance rate and second highest average expected leading role. There is no direct negative impact of economic indicators and rather a U-shaped relation of emissions. Adaptation seems to be the second most popular policy with a much stronger negative economic bias. The disagreement of participants on the importance of geoengineering should motivate further inquiries as its use might be inevitable.

Our results underline that fairness plays an important role for international climate negotiations. Not only do fairness concerns increase the acceptance of global and sector targets and R&D, they also raise expectations that important players take a leading role. This normative bias is shown by the increased likelihood to expect BASI, China, and USA to play a leading role for global targets and less strongly for sector targets. Additionally, the EU should take a leading role for R&D, although EU representatives dislike this policy.

Looking at the opposing effect of vulnerability on global targets, contrasting expectations about future damages of climate change could complicate finding an agreement based on this policy. The stark economic divide between rich and poor countries is troublesome, although some evidence of a U-shaped relation indicates that very polluting countries do in fact find some policies more important than less polluting countries.

The descriptive results of the leadership role show that the EU is seen as a leader for most policies while only little is expected from China and the USA. While we find some distinctive regional effects, per capita GDP does not play a big role and vulnerability matters even less. Unfortunately, the exploration of regional effects lacked enough participants from China and USA to get a more elaborate picture. More assessments about negotiators' motives and attitudes could be helpful to further explain their preferences.

The hypothesis that more democratic or free countries are more keen on environmental policies could not be substantiated, as we almost find no evidence for this. One could explore further how cultural factors might influence the preference on environmental policies. Future research could also explore the trade-offs of the different policies and how stakeholders rank them.

This empirical analysis of the six most discussed policies helps to clarify the different viewpoints of stakeholders in international climate negotiations.

A Democracy and Governance

Table 14: Multivariate ordered probit model focusing on **democracy score** as an explanatory variable, determinants of importance of policies, dependent variables: "Degree of Importance".

	Global	Sector	R&D	Geoeng	Land-Use	Adaptation
Democracy Index	-0.098	0.010	-0.018	0.043	-0.054	-0.051
	(-1.61)	(0.20)	(-0.33)	(0.89)	(-1.03)	(-0.88)
GDP capita	0.069	-0.042	-0.133	-0.321***	0.051	-0.118
	(0.71)	(-0.51)	(-1.59)	(-3.94)	(0.61)	(-1.36)
GDP total	-0.098***	-0.071**	-0.020	-0.096***	-0.103***	-0.015
	(-2.82)	(-2.21)	(-0.60)	(-2.69)	(-3.11)	(-0.45)
CO_2 capita	-0.008	-0.014	-0.010	0.034**	-0.035**	-0.026*
	(-0.40)	(-0.99)	(-0.66)	(2.30)	(-2.34)	(-1.67)
AOSIS	4.972	0.451	0.178	0.282	5.592	-0.234
	(0.01)	(0.68)	(0.25)	(0.49)	(0.01)	(-0.35)
BASIC	0.151	0.024	0.426*	-0.043	0.469**	0.249
	(0.61)	(0.11)	(1.71)	(-0.20)	(2.01)	(0.97)
EU	0.140	-0.223	-0.390**	-0.615***	0.116	-0.057
	(0.74)	(-1.34)	(-2.34)	(-3.59)	(0.68)	(-0.34)
Observations	392					
chi2	187.662					

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

Table 15: Multivariate ordered probit model focusing on **governance index** as an explanatory variable, determinants of importance of policies, dependent variables: "Degree of Importance".

	Global	Sector	R&D	Geoeng	Land-Use	Adaptation
Governance Index	-0.062	0.187*	-0.009	0.038	0.018	0.087
	(-0.47)	(1.67)	(-0.07)	(0.35)	(0.15)	(0.66)
GDP Capita	-0.010	-0.136*	-0.133*	-0.250***	-0.015	-0.210**
	(-0.11)	(-1.77)	(-1.66)	(-3.26)	(-0.19)	(-2.45)
GDP Total	-0.051**	-0.015	-0.004	-0.073***	-0.060**	0.021
	(-2.01)	(-0.63)	(-0.18)	(-2.77)	(-2.57)	(0.78)
GHG Capita	-0.012	-0.019	-0.016	0.016	-0.036***	-0.020
	(-0.77)	(-1.49)	(-1.17)	(1.21)	(-2.70)	(-1.41)
AOSIS	0.203	0.306	-0.016	0.130	0.285	0.900**
	(0.73)	(1.25)	(-0.06)	(0.59)	(1.15)	(2.44)
EU	0.179	-0.213	-0.402**	-0.611***	0.110	-0.091
	(0.93)	(-1.25)	(-2.35)	(-3.51)	(0.63)	(-0.51)
BASIC	-0.037	-0.156	0.391	0.001	0.300	0.078
	(-0.16)	(-0.75)	(1.64)	(0.01)	(1.36)	(0.32)
Observations	428					
chi2	200.149					

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

Table 16: Multivariate ordered probit model focusing on **freedom house indicators** as explanatory variables, determinants of importance of policies, dependent variables: "Degree of Importance".

	Global	Sector	R&D	Geoeng	Land-Use	Adaptation
Partly Free	0.109	-0.034	0.110	-0.115	-0.282	0.584***
	(0.49)	(-0.18)	(0.54)	(-0.63)	(-1.41)	(2.71)
Free	-0.187	0.288	0.166	0.129	0.022	0.285
	(-0.76)	(1.34)	(0.72)	(0.61)	(0.10)	(1.19)
GDP Capita	-0.006	-0.117*	-0.154**	-0.287***	-0.042	-0.162**
	(-0.08)	(-1.81)	(-2.33)	(-4.39)	(-0.62)	(-2.35)
GDP Total	-0.050**	-0.019	-0.003	-0.074***	-0.063***	0.022
	(-2.00)	(-0.85)	(-0.15)	(-2.82)	(-2.68)	(0.86)
GHG Capita	-0.008	-0.017	-0.014	0.021	-0.036***	-0.019
	(-0.48)	(-1.30)	(-1.01)	(1.55)	(-2.59)	(-1.32)
AOSIS	0.535	0.499*	-0.108	0.137	0.269	0.861**
	(1.64)	(1.81)	(-0.41)	(0.58)	(0.99)	(2.31)
EU	0.229	-0.209	-0.432**	-0.655***	0.047	-0.014
	(1.21)	(-1.24)	(-2.55)	(-3.77)	(0.27)	(-0.08)
BASIC	0.070	-0.238	0.340	-0.129	0.158	0.237
	(0.28)	(-1.07)	(1.35)	(-0.58)	(0.67)	(0.91)
Observations	426					
chi2	220.148					

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

B Leadership Role

The following tables are models estimated across regions for each policy. We omit the equation for region "none" as its error term would be too highly correlated with the others which would lead to computational problems during the estimation.

Table 17: Multivariate binary probit model across regions for **global targets**, determinants of leadership roles, dependent variables: "Leadership role".

	Aosis	BASI	China	EU	USA
Equity IEA	0.126	0.417***	0.342**	0.197	0.385***
	(0.91)	(2.89)	(2.40)	(1.25)	(2.66)
Policy very imp.	0.349**	0.083	-0.093	0.120	-0.163
	(2.21)	(0.49)	(-0.57)	(0.67)	(-0.99)
GDP capita	0.130**	-0.236***	-0.172***	0.109*	-0.072
	(2.54)	(-3.35)	(-2.99)	(1.70)	(-1.32)
AOSIS	2.171***	-0.235	-0.792***	-0.318	-0.764**
	(4.56)	(-0.87)	(-2.80)	(-1.19)	(-2.45)
BASIC	0.189	0.581**	-0.279	0.094	-0.249
	(0.84)	(2.57)	(-1.26)	(0.37)	(-1.09)
EU	0.618***	-0.028	-0.745***	0.390	-0.896***
	(3.12)	(-0.11)	(-3.12)	(1.50)	(-3.69)
Observations	383				
chi2	174.571				

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

Table 18: Multivariate binary probit model across regions for **sector targets**, determinants of leadership roles, dependent variables: "Leadership role".

	Aosis	BASI	China	EU	USA
Equity IEA	-0.041	0.275*	0.231	-0.015	0.304**
	(-0.27)	(1.78)	(1.59)	(-0.10)	(2.09)
Policy very imp.	0.512***	0.621***	0.312**	0.284*	0.151
	(3.33)	(3.95)	(2.12)	(1.87)	(1.02)
GDP capita	0.016	-0.118*	-0.076	0.004	-0.093*
	(0.29)	(-1.78)	(-1.32)	(0.06)	(-1.65)
AOSIS	1.394***	-0.086	-0.400	-0.694**	-0.458
	(4.63)	(-0.29)	(-1.37)	(-2.54)	(-1.58)
BASIC	0.041	0.587**	0.042	-0.103	-0.019
	(0.16)	(2.45)	(0.18)	(-0.42)	(-0.09)
EU	0.296	-0.035	-0.293	-0.122	-0.703***
	(1.34)	(-0.13)	(-1.28)	(-0.55)	(-2.94)
Observations	340				
chi2	112.653				

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

Table 19: Multivariate binary probit model across regions for **R&D**, determinants of leadership roles, dependent variables: "Leadership role".

	Aosis	BASI	China	EU	USA
Equity IEA	0.195	0.230*	0.225*	0.315**	0.022
	(1.38)	(1.72)	(1.67)	(2.34)	(0.16)
Policy very imp.	0.243	0.028	0.065	0.086	0.206
	(1.59)	(0.19)	(0.46)	(0.60)	(1.46)
GDP capita	-0.085	-0.045	-0.017	-0.061	0.028
	(-1.45)	(-0.86)	(-0.34)	(-1.21)	(0.56)
AOSIS	0.923***	-0.092	-0.321	-0.343	-0.313
	(3.49)	(-0.36)	(-1.20)	(-1.32)	(-1.18)
BASIC	-0.026	0.200	-0.026	-0.140	-0.352
	(-0.11)	(0.85)	(-0.12)	(-0.62)	(-1.57)
EU	0.227	0.718***	0.701***	-0.290	-0.462**
	(1.04)	(3.56)	(3.46)	(-1.50)	(-2.38)
Observations	374				
chi2	89.124				

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

Table 20: Multivariate binary probit model across regions for **geoengineering**, determinants of leadership roles, dependent variables: "Leadership role".

	Aosis	BASI	China	EU	USA
Equity IEA	-0.109	0.256	0.225	0.048	0.184
	(-0.48)	(1.33)	(1.31)	(0.29)	(1.15)
Policy very imp.	0.899***	0.830***	0.509**	0.353*	-0.233
	(3.82)	(3.79)	(2.42)	(1.65)	(-1.12)
GDP capita	-0.246	-0.091	0.078	-0.172***	-0.021
	(-1.56)	(-1.00)	(1.16)	(-2.65)	(-0.32)
AOSIS	0.916***	0.037	-0.237	-0.314	-0.255
	(2.70)	(0.11)	(-0.63)	(-0.90)	(-0.71)
BASIC	-0.112	0.262	-0.336	-0.291	-0.009
	(-0.30)	(0.84)	(-1.10)	(-1.07)	(-0.03)
EU	-0.270	-0.273	-0.610**	-0.525**	0.211
	(-0.44)	(-0.74)	(-2.19)	(-1.99)	(0.84)
Observations	256				
chi2	102.870				

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. z-statistics in parentheses.

Table 21: Multivariate binary probit model across regions for **land use**, determinants of leadership roles, dependent variables: "Leadership role".

	Aosis	BASI	China	EU	USA
Equity IEA	0.091	0.114	-0.062	0.035	0.090
	(0.64)	(0.84)	(-0.42)	(0.26)	(0.62)
Policy very imp.	0.442***	-0.062	0.158	0.318**	-0.167
	(3.05)	(-0.45)	(1.07)	(2.33)	(-1.16)
GDP capita	-0.113**	-0.117**	-0.102*	-0.019	-0.118**
	(-1.98)	(-2.25)	(-1.69)	(-0.38)	(-2.01)
AOSIS	0.961***	-0.054	-0.219	-0.779***	-0.123
	(3.58)	(-0.21)	(-0.80)	(-2.91)	(-0.43)
BASIC	-0.397	0.667**	-0.272	-0.189	-0.169
	(-1.53)	(2.58)	(-1.06)	(-0.81)	(-0.67)
EU	0.105	0.460**	-0.226	0.292	0.153
	(0.48)	(2.31)	(-0.98)	(1.48)	(0.71)
Observations	363				
chi2	95.369				

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. z-statistics in parentheses.

Table 22: Multivariate binary probit model across regions for **adaptation**, determinants of leadership roles, dependent variables: "Leadership role".

	Aosis	BASI	China	EU	USA
Equity IEA	0.069	0.073	0.118	0.027	0.112
	(0.47)	(0.55)	(0.86)	(0.20)	(0.78)
Policy very imp.	0.179	0.015	0.189	0.111	0.064
	(1.06)	(0.10)	(1.21)	(0.73)	(0.39)
GDP capita	0.009	-0.129**	-0.059	0.043	-0.002
	(0.16)	(-2.25)	(-1.07)	(0.82)	(-0.03)
AOSIS	0.000	-0.198	-0.813***	0.197	-0.445
	(.)	(-0.77)	(-2.60)	(0.76)	(-1.46)
BASIC	0.057	0.336	-0.190	0.160	0.194
	(0.24)	(1.44)	(-0.82)	(0.70)	(0.84)
EU	0.774***	0.413**	-0.043	0.006	-0.377*
	(3.46)	(2.00)	(-0.20)	(0.03)	(-1.76)
Observations	366				
chi2	54.610				

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. z-statistics in parentheses.

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