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ON THE SELF-INTERESTED USE OF EQUITY IN INTERNATIONAL CLIMATE
NEGOTIATIONS

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ABSTRACT

We discuss self-interested uses of equity arguments in international climate negotiations. Using unique data from a world-wide survey of agents involved in international climate policy, we show that the perceived support of different equity rules by countries or groups of countries may be explained by their economic costs. Despite being self-interested, equity arguments may be perceived as being used for different reasons, for example, out of fairness considerations or in order to facilitate negotiations. Consistent with experimental and behavioral studies on fairness perceptions, we find that individuals are more likely to state reasons with positive attributes if they evaluate their own region or regions that support the individual's personally preferred equity rule. Negotiators perceive the use of equity by regions as less influenced by pressure from interest groups.

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“We talk on principle but we act on interest”

— William Savage Landor (1775-1864)

1 Introduction

Bargaining situations and negotiations frequently resemble a striving for fairness. While bargainers argue to receive their “fair share” when they feel disadvantaged, the meaning of “fair” is often heavily debated. Negotiations thus become more complicated when there is more than one justifiable fairness norm (Raiffa 1982). Here, negotiators could potentially choose those fairness principles which justify additional demands from their side. Equity criteria are also ubiquitously used in the international arena when it comes to negotiating multilateral agreements. However, their actual role in shaping negotiation processes has received only limited attention in the literature.

This paper attempts to fill this gap by studying the importance of equity criteria in the formulation of negotiating positions of major parties in the UNFCCC (UN Framework Convention on Climate Change) process. Based on data from a world-wide survey of agents involved in international climate policy, we provide evidence that the use of equity arguments is driven by material self-interest. As this may suggest that equity arguments are purely rhetoric, we additionally analyze the perceived reasons for the use of equity arguments. Our paper is thus the first empirical study on perceptions of equity in actual negotiating positions in international climate talks.

Equity criteria are discussed in the (primarily theoretical) literature in different ways. They are sometimes seen as guiding negotiations (“focal points”, Schelling 1960) and thereby as a means to reduce negotiation costs. Bosello et al. (2001) study the stability of international agreements if they are based on a single equity rule but do not find major improvements upon the relatively pessimistic predictions from traditional economic models of coalition formation (Barrett 1994, Carraro and Siniscalco 1993, Hoel 1993). Böhringer and Helm (2008) consider an axiomatic approach of fair division and calculate the burden resulting from such an allocation mechanism. Lange and Vogt (2003) and Lange (2006) take a different approach and model preferences which trade-off payoffs with equity concerns. Such equity preferences may potentially increase cooperation rates but are based on the assumption that countries evaluate their position based on a single given equity criterion.

In international negotiations on the mitigation of climate change, however, different criteria of equity have been proposed. The UNFCCC recognizes the principle of “common but differentiated responsibilities and respective capabilities”. Principles such as “equal per capita emissions”, “polluter-pays”, or “sovereignty” all show different interpretations of fairness. Referring to this variety of equity criteria, Ringius et al. (2002, p. 3) state that “notions of fairness can provide a basis for an international regime only if there is a certain minimum of consensus among its members about what is fair and what is unfair”.

The perception of fairness may, however, differ across parties. Several strands of economic as well as psychological literature indicate that the understanding of what is fair is – at least to a certain extent – driven by the economic costs of the respective equity rules: Babcock et al. (1995) consider a “self-serving bias in judgments of fairness” in an experimental bargaining situation. This notion of self-serving biases usually refers to *unconscious* distortions in perceptions of fairness. In contrast, our paper establishes a *self-interested use* of equity which includes potentially intentional distortions of equity beliefs. Babcock and Loewenstein (1997) review psychological and experimental evidence for this interaction between material payoffs and fairness perceptions. Self-serving social comparisons from teacher contract negotiations are discussed by Babcock et al. (1996). In a different approach, Hennig-Schmidt (2002) shows the self-interested use of equity arguments in a video-bargaining experiment. If conflicting principles of fairness are part of the negotiation process, a potential agreement requires weighing and reconciliation of the different proposed equity bases.

In this paper we start with the hypothesis that the use of equity criteria by the respective parties in order to influence the negotiation process is in their own (material) self-interest, i.e. purely tactical. We assume that due to the consensus-driven nature of international cooperation, parties back their proposals with some notion of equity in order to increase their acceptability in the negotiation process. Statements about fairness may thereby legitimate further demands in the bargaining process and permit “the pursuit of self-interest with minimal condemnation or other costs” (Albin 2001, p.19).

To provide empirical evidence for this self-interested use of equity criteria, we study international climate negotiations as an example.¹ We concentrate on four major parties involved in climate

¹ In a companion paper (Lange et al. 2007), we study the personal equity preferences of individuals while the current paper analyzes how negotiating positions of the different countries are perceived.

negotiations: the European Union (EU),² the Group of 77 including China (G77/China),³ Russia, and the United States of America (USA). We first use the POLES model (Criqui 2001) to project the costs for the respective countries or groups of countries when abatement burdens are allocated using different equity criteria. The implied cost rankings of the equity criteria inform our predictions for a self-interested use of equity.

We then perform an econometric analysis based on data from a world-wide survey of agents involved in international climate policy to assess the views of the negotiating positions of the respective countries or groups of countries. We find that the perceived incorporation of equity principles is in general consistent with material self-interest. Our study also sheds an interesting light on different perceptions of reasons for using equity arguments: for example, agents have a more positive view on regions that support an equity criterion which reflects the personal preference of the individual. Furthermore, negotiators state that the use of equity by regions is less due to pressure from interest groups. Together, these findings lend support to the hypothesis of self-interested use of equity in international negotiations as well as to the perception that views on fairness systematically differ.

The remainder of the paper is organized as follows: in section 2 we describe different equity principles in international climate policy. In section 3 we provide predictions on the use of equity arguments in negotiations based on behavioral findings. In section 4 we report economic costs implied by different equity criteria. Section 5 discusses our empirical findings based on the survey data. The final section concludes.

2 Equity principles in international climate policy

The nature of the climate change problem allows subdividing policy decisions into those on the climate target (i.e., the aggregate greenhouse gas emission reductions) and those on the distribution of cost burdens which is crucial in evaluating the equity consequences of any given proposal. While the strength of the climate target is certainly a major criterion for the acceptability of any future international climate agreement, negotiations in the past centered to a

² At the time of our survey, the EU included 25 member states.

³ The Group of 77 was established in 1964 and today comprises 130 developing including China (www.g77.org). Even though this group clearly shows large heterogeneities in terms of economic development and potential differences in their views on climate policies, it built one negotiation group within the climate negotiations. Therefore, and as we could only include a limited number of regions in our survey, we consider G77/China as a single player in our study.

large extent around the question of how the burdens of some global abatement efforts were to be distributed. In this paper, we concentrate on the issue of distributing a given burden or – equivalently – of distributing an exogenously given surplus from concluding the agreement.

While the economic literature usually assumes that agents are concerned exclusively with economic costs and benefits, equity arguments are frequently used in international environmental negotiations. They may become part of negotiating positions for various reasons (Ringius et al. 2002, Albin 2001): actors might dislike being treated or treating others unfairly, equity might serve as a constraint on the substantiation of bargaining positions, or equity criteria might serve as focal points. Consistent with payoff-maximizing behavior, in this paper we assume that the use of equity arguments by agents is driven by self-interest in order to influence the bargaining outcome to their own advantage.

For example, developing countries as well as environmental interest groups in industrialized countries claim that developed countries with high per capita greenhouse gas emissions are responsible for global warming and must take the lead in combating climate change. As a consequence, weaker obligations for developing countries may be based on equity arguments. Another dimension of equity issues is concerned with a fair distribution of burdens among countries with comparable per capita GDP and industry structure. Here, often similar emission reduction targets are seen as fair: some proposals during the international climate negotiations allocated reduction targets based on present or recent emission levels (Cazorla and Toman 2001, Raymond 2003).

Several studies identify different typologies of equity principles. We follow Ringius et al. (2002) and concentrate on the following equity principles which dominate the political and academic debate on international climate policy:⁴

- The egalitarian rule (EGA): this rule incorporates the principle of equal per capita emissions. It implies that a country whose population amounts to x% of the global population should receive x% of global entitlements for greenhouse gas emissions.

⁴ We concentrate on equity criteria which do not consider the benefits from abatement. Including the benefits from abatement would add new possible equity criteria. The share of costs could, for instance, be equalized with the share of benefits. However, for a fixed climate goal as assumed in this paper, the cost ranking of our considered equity criteria does not depend on the benefits from abatement. We are therefore comfortable with establishing the link between material self-interest and the use of equity arguments based on these criteria.

- The sovereignty rule (SOV): this rule incorporates the principle of equal percentage reduction of current emissions. It implies that a country whose greenhouse gas emissions amount to $x\%$ of global emissions should receive $x\%$ of global emissions entitlements.
- The polluter-pays rule (POL): this rule incorporates the principle of equal ratio between abatement costs and emissions. It implies that a country whose greenhouse gas emissions amount to $x\%$ of global emissions should bear $x\%$ of global abatement costs.
- The ability-to-pay rule (ABI): this rule incorporates the principle of equal ratio between abatement costs and GDP. It implies that a country whose GDP amounts to $x\%$ of gross world product should bear $x\%$ of global abatement costs.

3 On bargaining power and the self-interested use of equity rules

In Nash's (1950) seminal work on bargaining, all differences between the players were supposedly captured in the disagreement point and the shape of the bargaining set. Many other explanations for bargaining power have been suggested since then – not least differences in time or risk preference (Roth 1979). However, if one follows many negotiation processes, parties often refer to “fairness” arguments or natural entitlements in order to convince the other party to agree to their demands.

Chun and Thomson (1992) and Herrero (1998) extend the Nash bargaining framework to incorporate individual claims.⁵ Consistent with these approaches, most of the previous literature considers entitlements as “legal property rights” (e.g., Konow 1996, 2000, 2001). The payoff to a player in these (axiomatic) solutions increases in their legal claim. Recently, Gächter and Riedl (2005) studied the effects of “moral property rights” on bargaining. Here, individual views on fairness inform the bargaining situation and thereby influence the bargaining outcome. That is, the entitlements or individual claims are not given by some (incompatible) legal property rights but by what bargainers perceive as a fair agreement.

Similar to these approaches, the frequency of equity arguments in negotiations indicates that there is an interaction between bargaining power, i.e. the ability to influence the negotiation outcome favorably, and the availability of equity arguments: for example, if all equity criteria

⁵ A bargaining with claims environment adds to the bargaining set and the disagreement point, which form the Nash bargaining environment, a claims point. Chun and Thomson (1992) as well as Herrero (1998) provide axioms in which the bargaining solution is basically given by a linear combination of the claims and the disagreement point (or undisputed claims point).

required that a negotiating party receives a larger share of the surplus, this party would be likely to be able to influence the bargaining outcome in its favor. Conversely, the lack of an equity or fairness argument for one's position would, in our view, result in a reduction of bargaining power. The end result of negotiations may thus hardly be understood without analyzing the underlying equity principles and their use by the respective parties.

There is substantial evidence that individual perceptions of "what is fair" are correlated with the economic costs and benefits implied by the respective equity criteria (for instance, Babcock and Loewenstein 1997, Dahl and Ransom 1999). These differing perceptions are also apparent in the use of equity principles as arguments in bargaining processes (Hennig-Schmidt 2001).⁶ This could be the case for two reasons: (i) a self-serving bias, i.e. individuals might *subconsciously* interpret fairness in a way that benefits their interests, or (ii) a *conscious* decision on self-interested use of equity, i.e. individuals might use specific fairness notions to consciously pursue their own interest while exploiting the others' sense of justice (e.g., Dahl and Ransom 1999, Konow 2001). Evidence for the subconscious self-serving bias has been found by Messick and Sentis (1979), Thompson and Loewenstein (1979), and others while, for example, Dahl and Ransom (1999) and Gächter and Riedl (2005) find relatively little evidence. In either way, a self-interested perception and/or use of equity is essential in explaining bargaining outcomes if a party successfully influences the bargaining process in its favor by referring to equity arguments.

In this paper, we empirically examine parallels of these findings on individual behavior in a context of international negotiations. Using the example of international climate policy, we consider the four equity criteria egalitarian, sovereignty, polluter-pays, and ability-to-pay. Based on the arguments and empirical findings outlined above, each negotiating party may be predicted to use equity arguments which lead to lower costs compared to other equity criteria. Furthermore, the perceptions of reasons for using equity arguments (for instance, fairness vs. material self-interest) are predicted to be influenced by the personal background of individuals, for example, whether they evaluate their own or a different country or group of countries.

⁶ In general, equity rules require the equality of subjects with respect to a measure (see section 2 for the application to climate policy). The following example illustrates this idea: assume that \$30 have to be split between two subjects with initial endowment (\$0, \$0) and without any other observable differences. Then, (\$15, \$15) appears to be the only fair solution. If, however, the initial endowment is (\$10, \$0), then two "fair" solutions of splitting \$30 could be suggested: (\$15, \$15) as before, or (\$10, \$20). The former would equalize the share of the \$30, the latter would equalize the end allocation (\$20,\$20). The self-interested use of equity would suggest player 1 to argue with the former and player 2 to use the latter equity argument in the bargaining process.

4 The economic costs of different equity principles

As a first step, we generate predictions on which equity criteria the respective parties would prefer in their own material self-interest by comparing the costs implied by distributing the burdens of abating carbon emissions according to the respective equity rules. We assume that the aggregate emissions target is exogenous and an emissions trading system equalizes marginal abatement costs across all countries or groups of countries. For any given overall target (or equivalently, any given marginal abatement costs), the different equity criteria therefore imply a specific distribution of surplus. In order to assess the distributions implied by the egalitarian, sovereignty, polluter-pays, and ability-to-pay rules, we use information on abatement costs in the respective countries or groups of countries, population data, baseline carbon emissions, and GDP.⁷

Our projections for GDP, emissions and populations for 2020 are based on DOE (2005). The mapping of the International Energy Outlook regions is described in Table A.1. The GDP, population, and carbon emissions in the reference case for 1990 and 2002 as well as the projections for 2020 are summarized in Table A.2. Table A.2 also states an accumulated measure of emissions between 1860 and 2002, which are taken from the Climate Analysis Indicators Tool (WRI 2005) and updated to 2020 using DOE (2005). Marginal abatement cost curves for 2020 are generated based on data from the POLES model, which embodies a detailed bottom-up description of regional energy markets and world-energy trade (Criqui 2001).⁸ Table A.3 summarizes the abatement cost information for 2020 from POLES. Tables A.2 and A.3 contain all relevant data which we use to calculate allowance allocations, total costs and costs per capita for the different global abatement scenarios (permit prices) in 2020.

⁷ Note again that we concentrate on the analysis of abatement costs and do not consider benefits from abatement. By fixing the total abatement level and only considering different burden allocations, benefits from abatement are kept constant. The cost ranking of the equity criteria we study is therefore meaningful.

⁸ A potential drawback of this partial equilibrium marginal abatement cost approach is the neglect of market interaction and spillover effects. The crucial question regarding the robustness of partial equilibrium results based on marginal abatement cost curves is whether terms-of-trade effects are sufficiently small. On the one hand, several articles illustrate the importance of such indirect effects (Böhringer and Rutherford 2002, Klepper and Peterson 2006). On the other hand, Eyckmans et al. (2005) showed, using the computable general equilibrium (CGE) model GEM-E3, that terms-of-trade effects might be rather small. The allocation of abatement efforts across countries does not significantly alter the marginal abatement cost functions. These curves might come either from computable general equilibrium models (Eyckmans et al. 2005, Böhringer et al. 2004) or partial equilibrium models (Criqui et al. 1999).

The formulas for the allocation of allowances under the different equity rules are implemented as follows: for each country or group of countries $j \in \{EU, G77/China, Russia, USA\}$, we denote for 2020 the business as usual (BAU) emissions as e_j^{2020} , the GDP as GDP_j^{2020} , and the population level as POP_j^{2020} . As we assume that any abatement scenario is implemented at minimal costs, i.e. with identical marginal abatement costs, the resulting permit price p defines the optimal allocation of abatement $a_j(p)$ for each j with resulting abatement costs $AC_j(p)$. The aggregate levels of all variables are denoted as E^{2020} , GDP^{2020} , POP^{2020} , $A(p)$, and $AC(p)$, respectively. With this we calculate the permit allocation $\bar{e}_j(p)$ which is induced by the respective equity criteria. This allocation solves for all $j \in \{EU, G77/China, Russia, USA\}$:⁹

$$\begin{aligned}
\text{EGA:} \quad & \frac{\bar{e}_j(p)}{POP_j^{2020}} = \frac{E^{2020} - A(p)}{POP^{2020}} \\
\text{SOV:} \quad & \frac{\bar{e}_j(p)}{e_j^{2020}} = \frac{E^{2020} - A(p)}{E^{2020}} \\
\text{POL:} \quad & \frac{AC_j(p) + p[e_j^{2020} - a_j(p) - \bar{e}_j(p)]}{e_j^{2020}} = \frac{AC(p)}{E^{2020}} \\
\text{ABI:} \quad & \frac{AC_j(p) + p[e_j^{2020} - a_j(p) - \bar{e}_j(p)]}{GDP_j^{2020}} = \frac{AC(p)}{GDP^{2020}}
\end{aligned} \tag{1}$$

Furthermore, we discuss a version of the polluter-pays principle based on the accumulated (historical and future) carbon emissions between 1860 and 2020. The corresponding formula for $POL^{(1860-2020)}$ may be obtained from (1) by replacing the denominators of the POL equation by cumulated emissions.¹⁰

The resulting economic costs of strictly applying the equity criteria for the respective countries or groups of countries may be seen in Table A.4. We report the projected costs for 2020 in percent of GDP for an assumed emission reduction goal which corresponds to equalized marginal

⁹ Note that the total burden to a country or group of countries is given by its abatement costs plus the payments for emission permit in excess of its allocation: $AC_j(p) + p[e_j^{2020} - a_j(p) - \bar{e}_j(p)]$.

¹⁰ Burden sharing based on the polluter-pays principle depends crucially on the assumed growth of emissions in the respective regions as well as on the considered time horizon. Rive et al. (2006) provide a detailed discussion and simulations on burden sharing based on historical responsibility (HR) in a dynamic setting. In particular, they show how sensitive HR burden sharing is to the choice of the start and the end year for considering emissions as well as to the selection of the indicator used to attribute responsibility to the respective countries or groups of countries (e.g., contributions to temperature change vs. cumulative emissions).

abatement costs at 80 USD2000/tC, corresponding to a worldwide reduction from BAU emissions by 15%. The ranking is stable for changes in the overall reduction target.

Hypotheses on the EU

Table A.4 shows clearly that a strict application of the egalitarian principle would be most cost-intensive for the EU. Given the large amount of emissions between 1860 and 2020 in the EU, the polluter-pays principle based on the cumulated carbon emissions would be also very costly for the EU. The EU would therefore prefer the polluter-pays based on current emissions since it has a relatively low share in global emissions or, secondly, the ability-to-pay principle. The total ranking of equity principles – according to the projected economic costs – for the EU is given as follows:

$$\text{POL} \succ \text{ABI} \succ \text{SOV} \succ \text{POL}^{(1860-2020)} \succ \text{EGA}$$

Hypotheses on G77/China

We now discuss the costs which are implied by the different equity rules for G77/China. The ranking of equity criteria – given by the cost projections as reported in Table A.4 – is as follows:

$$\text{EGA} \succ \text{POL}^{(1860-2020)} \succ \text{SOV} \succ \text{ABI} \approx \text{POL}$$

It is evident that G77/China with its large share in global population would profit most from a strict application of the egalitarian principle. In contrast, G77/China would oppose a support of the polluter-pays and ability-to-pay principles on the basis of the respective costs. The latter principle refers to the predicted high economic growth of G77/China until 2020 which would raise the costs associated with the ability-to-pay rule. The polluter-pays principle is based on the predicted large increase in emissions from G77/China over the next decades so that the costs of the polluter-pays rule would be increased. Developing countries might, however, support $\text{POL}^{(1860-2020)}$.

Hypotheses on Russia

Table A.4 indicates that Russia would, similar to the EU, oppose the application of the egalitarian principle based on the underlying costs. Russia has lowest costs if the sovereignty or, secondly, the ability-to-pay criterion is applied. The complete ranking of equity rules – given by the cost projections – is as follows:

$$\text{SOV} \succ \text{ABI} \succ \text{POL} \succ \text{POL}^{(1860-2020)} \succ \text{EGA}$$

When using equity rules according to their implied costs, Russia is therefore predicted to prefer the sovereignty or ability-to-pay principle and to oppose the egalitarian principle.

Hypotheses on the USA

Table A.4 shows that the USA is predicted to oppose the egalitarian principle on the basis of the respective costs. The total ranking of equity rules – according to the projected economic costs – is given as follows:

$$\text{ABI} \succ \text{POL} \succ \text{SOV} \succ \text{POL}^{(1860-2020)} \succ \text{EGA}$$

It should be noted that the preference for the ability-to-pay principle clearly depends on the assumed economic growth of the specific countries in the world. If this criterion were applied based on today's comparisons in GDP, the burden implied for the USA would be substantially larger.

5 Empirical analysis

In this section, we provide empirical evidence on self-interested uses of equity criteria. Our analysis is based on data from an international survey on the perceptions of the negotiating positions of the EU, G77/China, Russia, and the USA.¹¹

Description of survey

Our data stem from a world-wide survey carried out by means of a standardized questionnaire, which was sent via e-mail to about 1500 agents involved in climate policy in 2004.¹² The e-mail addresses were taken from official UN documents available on the internet (for instance, from IPCC workshops). Participants received an individual login and password for the internet questionnaire. This procedure of sending out passwords allowed us to control access to the survey and, in particular, ensured that each respondent could fill out the questionnaire only once.

¹¹ For the success and the acceptance of international agreements, it is important how negotiating positions are perceived by agents in negotiations. This includes perceptions on which equity criteria are supported by the respective parties and the perceived motivations for this support. We therefore chose to survey the perceptions of the positions of countries or groups of countries regarding equity instead of directly assessing proposals made by the respective parties (see Reiner and Jacoby 1997).

¹² The number of 1694 participants stated in Lange et al. (2007) included some individuals with multiple e-mail addresses.

Alternatively, participants could fill out a word- or PDF-document and send it back via e-mail or postal mail.

After explaining the equity rules (see section 2), the questionnaire consisted of three parts: while the first part addressed individual views on equity (see Lange et al. 2007), the second part elicited the individuals' perceptions of the negotiating positions of *each* of the four major players in international climate negotiations as discussed above: the EU, G77/China, Russia, and the USA. That is, the position of each country or group of countries was assessed by *all* participants.

For each of the equity rules egalitarian, sovereignty, polluter-pays, and ability-to-pay, we first asked to which degree the respective countries or groups of countries are expected to support incorporating the specified equity rule in international climate agreements. We concentrated on a time horizon of no more than 20 years. We differentiated between “a very high degree”, “a high degree”, “a moderate degree”, “a low degree”, and “no degree”. Second, we asked which of the equity rules is expected to be most important for the respective regions. Third, we asked whether the following five reasons are expected to play an important role for the respective countries or groups of countries in determining their position on the incorporation of this most important equity rule in international climate agreements: material self-interest, fairness considerations of the public, facilitation of international climate negotiations, pressure from industry, pressure from environmental NGOs. Finally, the third part of the questionnaire comprised some questions about the participants' individual background such as gender, nationality, or participation and role in a Conference of Parties (COP).

Out of approximately 1500 persons contacted, 230 participated in the survey.¹³ Table B.1 reports corresponding relative frequencies regarding the personal background of the respondents as well as the mean and standard deviation of their age. Our participation rate is fairly typical of surveys with individuals who are not interviewed face-to-face. While we naturally cannot rule out the issue of self-selection completely, we have no evidence that our sample is not representative of the group of individuals contacted: a non-response analysis on the basis of living addresses¹⁴ shows that relative frequencies for the 230 respondents are almost identical to those for all contacted persons. While 36.1% of the survey participants live in the EU, 34.3% in G77/China,

¹³ Several of these 230 participants did not answer all questions and some only completed the first part of the questionnaire. As a consequence, the numbers of individuals in the empirical analysis are smaller.

¹⁴ These addresses are the only available information on both the participants in the survey and those who did not participate.

0.9% in Russia, and 4.3% in the USA, the respective frequencies for all contacted persons are 36.1%, 32.4%, 0.7%, and 4.9%. Therefore, self-selection problems are unlikely to affect the robustness of our estimation results.

We use our data in order to first establish that the countries or groups of countries are seen as pushing for different equity criteria in international climate negotiations and that the perceived negotiating positions are highly affected by the induced costs. We then turn to the perceived reasons for regions to support the most important equity rule. The differences in perceptions across the agents involved in international climate policy will establish support for versions of self-interested biases.

5.1 Support of equity rules: evidence for self-interest

Descriptive statistics

For the assessment of each country or group of countries, Table B.2 reports the relative frequencies that the respective equity principles should be reflected in the distribution of entitlements for greenhouse gas emissions to “a very high degree” or “a high degree”. Even at first glance, noticeable differences in the perceived support of the equity criteria by the respective countries or groups of countries are revealed.

The position of the EU is largely perceived as being driven by the polluter-pays principle (78.2% of all respondents). This coincides with the prominent position this criterion was predicted to have according to the cost projections in the previous section. The relative frequencies for the sovereignty and the ability-to-pay rule are rather similar (50.9% vs. 55.7%), while the support of the egalitarian rule is smaller (40.1%). Thus, the ranking of perceived support of the equity rules is fully consistent with the ranking according to the implied economic costs in the previous section.

G77/China is seen as supporting the incorporation of the egalitarian, the polluter-pays, and the ability-to-pay rules to a similar extent (59.5%, 61.0%, 65.5%). The sovereignty notion receives clearly less support (29.1%). This ranking deviates from the predictions based on our cost projections since both the polluter-pays as well as the ability-to-pay rules are seen as receiving large support although they imply relatively large costs compared to the egalitarian principle. This result could only be consistent with economic self-interest of G77/China if the polluter-pays

principle is based on a cumulated emissions measure (POL⁽¹⁸⁶⁰⁻²⁰²⁰⁾) and/or if agents do not take into account the economic changes over the next decades.

We now turn to the views on the position of Russia. The expected strong support for the ability-to-pay criterion (52.8% of the respondents) and the sovereignty rule (54.3% of the respondents) reported in Table B.2 is consistent with the hypothesis of self-interest driven use of equity criteria. Overall, the ranking regarding the perceived support of the respective equity rules by Russia is in line with the prediction given by our cost projections.

The USA is primarily seen as supporting the incorporation of the sovereignty principle (60.8% of the respondents). It is thus perceived as pushing for similar emission reduction efforts from all regions. In fact, this is consistent with a major official reason for not ratifying the Kyoto protocol as the USA demanded meaningful participation of key developing countries. The polluter-pays principle is seen as receiving much less support (41.0%) than the sovereignty criterion, also when compared to the EU. This cannot be sufficiently explained by self-interested equity principles unless agents interpreted POL as being based on emissions accumulated over time. The egalitarian criterion is to a lesser extent seen as being supported by the USA (35.7%) which is in line with the cost estimates in the previous section. In contrast, the weak perceived support of the ability-to-pay principle (29.8%) is surprising since in the long run this criterion would potentially benefit the USA if the predicted economic growth of developing countries materializes. We summarize these findings as follows:

Result 1: *The importance of incorporating the specific equity rules in international climate negotiations is perceived to strongly differ between the countries or groups of countries.*

Support of different equity rules by the respective parties is a prerequisite for finding a self-interested use of equity: since countries differ in their cost rankings of equity criteria, a self-interested use requires that countries support the respective equity rules to a different degree.

Table B.2 also reports the decomposed relative frequencies separately for individuals from the EU and from G77/China which differ with respect to some equity criteria.¹⁵ For example, the position of G77/China on all equity criteria is assessed differently by agents involved in climate

¹⁵ The small numbers of respondents from Russia and the USA in line with the corresponding small ratios in the population do not allow a meaningful decomposition.

policy that come from G77/China compared with those from other regions.¹⁶ This indicates that individual characteristics are important in the assessment of the use of equity by the respective countries or groups of countries. Hence, instead of relying on the descriptive statistics quoted, we perform a systematic econometric analysis to study whether the underlying economic costs have significant effects on the perceived incorporation of the specific equity rules or whether the effect of the costs is covered by other personal factors.

Description of econometric analysis and variables

The dependent variables in our econometric analysis are dummies which take the value one if the respective country or group of countries $j \in \{EU, G77/China, Russia, USA\}$ is seen by agent $i = 1, \dots, n$ as supporting the incorporation of equity rules to “a very high degree” or “a high degree”. In order to examine the effect of the specifically assessed equity criteria, we stack the data over all equity rules $k \in \{EGA, SOV, POL, ABI\}$. The unobservable latent variable for each region j is therefore:

$$U_{ijk} = \beta_j' x_{ijk} + \varepsilon_{ijk} \tag{2}$$

The vectors x_{ijk} comprise a series of explanatory variables (described below) with corresponding unknown parameter vectors β_j . We consider binary probit models, i.e. the stochastic components ε_{ijk} are normally distributed. Based on this, the aforementioned dummy variables Y_{ijk} take the value one if $U_{ijk} > 0$. $P(Y_{ijk} = 1)$ denotes the probability that the respective country or group of countries j is seen by individual i as supporting the incorporation of equity rule k to “a very high degree” or “a high degree”. In order to account for unobserved heterogeneity over the different equity rules, we estimate random effects (binary) probit models (separately for each country or group of countries).¹⁷ Unobserved heterogeneity is incorporated by decomposing the stochastic components (e.g., Hajivassiliou 1994, Mühleisen and Zimmermann 1994)

¹⁶ The chi-squared tests in Table B.2 examine whether the distribution of the expected degree of incorporation of the respective equity rules (with parameter values “a very high degree”, “a high degree”, “a moderate degree”, “a low degree”, and “no degree”) differs between the agents involved in climate policy coming from the EU (G77/China) and the corresponding agents from outside the EU (outside G77/China).

¹⁷ The corresponding maximum likelihood estimations (in the same way as all further estimations and also the descriptive statistics discussed above) have been performed with STATA. We always consider robust estimations of the standard deviation of the parameter estimates (White 1982).

$$\varepsilon_{ijk} = \alpha_{ij} + \eta_{ijk} \quad (3)$$

where α_{ij} represent individual-specific random effects with $\alpha_{ij} \sim N(0, \sigma_{\alpha_j}^2)$. The correlation coefficients σ_{α_j} are estimated besides the parameters in β_j .

The described stacking of individuals' answers over equity criteria allows us to use the assessed equity criterion as an explanatory variable. The corresponding dummy variables “*Assessment EGA*”, “*Assessment SOV*”, “*Assessment POL*”, and “*Assessment ABF*” take the value one if the respective equity rule is assessed and allow us to examine the differences in the support of the respective equity criteria.¹⁸

We include the following control variables in the vectors x_{ijk} : first, a personal preference for specific equity rules as well as personal views on the general importance of equity in international climate negotiations may influence assessments of equity principles for regions. We thus include a dummy variable “*Personal consistency equity rules*” which takes the value one if the respective assessed equity rule coincides with the individual's personal definition of equity in international climate negotiations. In addition, we consider a dummy variable “*Equity importance*” which takes the value one if the agent stated that equity issues in general are of “very high importance” or “high importance”. Both variables are derived from the first part of the questionnaire as discussed above (see also Lange et al. 2007).

Second, the role of participants in international climate negotiations could potentially influence their perceptions of the use of equity principles by regions. We include an explanatory dummy variable “*COP negotiator*” which takes the value one if an individual participated in a COP as a negotiator (and not only as an observer of a COP, a member of a delegation, a participating expert, or advising delegations) in the past.

Third, we consider additional individual control variables: the dummy “*NGO*” takes the value one if the agent works for an environmental or non-environmental NGO and the dummy “*Social science*” takes the value one if the agent's highest degree or training is in political sciences, economic/business administration, or law. The variable “*Age*” denotes the natural logarithm of the individual's age (in years) and the dummy variable “*Gender*” takes the value one if the agent

¹⁸ The omitted dummy always refers to the equity rule with the smallest relative frequency according to Table B.2 for the respective country or group of countries. Therefore, the estimation results support the descriptive analysis if all parameters are positively estimated (or at least not significantly negative).

is female. Furthermore, we control for the economic performance of the individual's country: "*GDP per capita*" denotes the per capita GDP (in ten thousand \$) of the respective country of origin from the Penn World Table (Heston et al., 2002).¹⁹ Reflecting the findings of Table B.2, we incorporate interaction variables between the assessment of each of the four equity rules and provenience EU or G77/China: for example, the dummy variable "*EU*EGA*" takes the value one if an individual from the EU assesses the egalitarian rule.

Econometric results

Table B.3 reports the estimation results for the parameters of the explanatory variables in the four separate random effects probit models for each country or group of countries.²⁰ The results support the descriptive statistics in Table B.2 and therefore Result 1: the EU is seen as supporting the incorporation of the polluter-pays rule to a higher degree than the egalitarian criterion (1% significance level). G77/China is perceived as supporting the ability-to-pay principle more than the sovereignty criterion (1% significance level). Furthermore, the estimated parameters of "*Assessment SOV*" for Russia and the USA are larger than those of the other assessment dummies.

Table B.3 further shows that personal characteristics of individuals matter. In particular, the variable "*GDP per capita*" is important: the economic performance of the individual's country has a negative effect on the perceived incorporation of the equity rules in the EU and Russia (1% significance level) as well as the USA (5% significance level), but no significant effect for G77/China. Furthermore, the coefficient of "*Personal consistency equity rules*" is positive (1% significance level) for the EU, G77/China, and Russia. Hence, a personal equity rule preference of the agents involved in climate policy also shifts the perception of support of the equity rule by the assessed countries or groups of countries. Finally, compared with other individuals, negotiators in a COP perceive the incorporation of equity rules to be less important for G77/China and more important for the USA (5% and 10% significance levels, respectively).²¹

¹⁹ For each country, we use the last available data point since 1995. Most data stem from 2000.

²⁰ The random effects correlation coefficients are different from zero at the 5% significance level for the EU and the USA, and at the 10% significance level for G77/China. However, traditional binary probit models without taking into account unobserved heterogeneity generate qualitatively nearly identical estimation results. The main results are furthermore robust in different model specifications regarding the inclusion of control variables.

²¹ In order to test the robustness of the estimation results, we additionally analyzed multivariate (binary) probit models (Greene 2003) which connect the four single equations for each country or group of countries according to (2) and (3). The estimation of these models required the inclusion of simulators in the maximum likelihood method. We applied the simulated maximum likelihood estimation incorporating the so-called GHK simulator (Geweke et al.

Result 2: *The views on how important the incorporation of the specific equity rules are for the respective countries or groups of countries depend on personal characteristics such as personal equity views and the economic performance of the agent's country.*

While Result 1 indicated that different countries or groups of countries are seen as supporting the equity criteria to a different degree, Result 2 shows that personal characteristics matter for forming these perceptions.

The econometric analysis so far does not explicitly account for the economic costs associated with the four different equity rules. In order to provide deeper insights into the hypothesis that countries or groups of countries support equity criteria to serve material self-interest, we introduce the variables “*Costs equity rules EU*”, “*Costs equity rules G77/China*”, “*Costs equity rules Russia*”, and “*Costs equity rules USA*”. They measure the costs (in % of the GDP) which would be implied by the respective equity criterion for the assessed country or group of countries when the marginal abatement costs in 2020 are equalized at 80 USD2000/tC, i.e. approximately 22 USD2000/tCO₂, which is in the range of current estimates for carbon prices (see Table A.4). These variables are incorporated as main explanatory factors and substitute the assessment variables as discussed above according to Table B.3.

Table B.4 reports the estimation results for the parameters of the explanatory variables in the random effects probit models. It shows that the costs implied by the respective equity criterion have a strong negative effect on the perceived support of the equity rules by the EU, Russia, and the USA (1% significance level). For the assessment of G77/China, the impact is not significant (even when the corresponding parameter estimate is negative).²² These findings therefore strongly support the hypothesis that economic costs are a major determinant of the (relative) use of equity criteria by the respective countries or groups of countries.

Result 3: *Consistent with a self-interested use of equity criteria, the economic costs implied by the respective equity rules explain their perceived support by the EU, Russia, and the USA. In*

1994, Börsch-Supan and Hajivassiliou 1993, Keane 1994). The corresponding estimation results are qualitatively nearly identical to the discussed results and not reported for brevity, but are available upon request.

²² The corresponding results in the multivariate probit models are qualitatively almost identical and therefore again not reported for brevity, but are available upon request. The findings are also robust across various specifications regarding the inclusion of control variables and the estimation in traditional univariate probit models without taking into account unobserved heterogeneity or also ordered probit models (including ordinal dependent variables regarding the degree of supporting the incorporation of the equity rules instead of including dummies which take the value one for “a very high degree” or “a high degree” as discussed above).

contrast, a link between the perceived position of G77/China and the underlying costs cannot be established.

The missing link between economic costs of equity criteria and their support for G77/China might (apart from a possible type II error) be influenced by our measures of cost projections for ABI and POL. They crucially depend on the economic growth rates and emissions of this group of countries (until 2020) and on the attribution of historical responsibility.²³ We can only speculate that another reason might be the heterogeneity of G77/China. While China and India are predicted to have sustained high economic growth, other developing countries in this group face less positive prospects and might thus push largely for ABI and POL. As we had to restrict our survey to a few large negotiation blocks, we cannot disentangle these effects.

5.2 Reasons for supporting equity rules: differences due to self-interest

Result 3 establishes that the perceived positions of the countries or groups of countries are largely consistent with material self-interest: the larger the costs implied by the equity criterion, the weaker the support of an equity rule by a region. As discussed in section 3, this finding is consistent with both an unconscious self-serving bias or a conscious self-interested use of equity. It is therefore interesting to see whether the equity position of the respective regions is identified as self-interested by the agents involved in international climate policy and if this perception varies across specific groups of agents.²⁴

Descriptive statistics

We study different reasons which might influence the position of a country or group of countries: material self-interest, fairness considerations of the public, facilitation of international climate negotiations, pressure from industry, and pressure from environmental NGOs. Table B.5 reports the relative frequencies that the respective reasons are perceived as playing an important role in determining the position of a country or group of countries on its most important equity rule.

The expected main driving force for using the most important equity rule for Russia, for the USA, and for G77/China is material self-interest (88.9%, 93.5%, and 86.1% of all respondents).

²³ The interested reader is again referred to Rive et al. (2006) who demonstrate the sensitivity of burden sharing based on historical responsibility.

²⁴ In individual decision-making, individuals may be expected to state that they acted fairly while others assess them as acting driven by self-interest. Similarly, the assessment of the position of a country or group of countries in our study might depend on whether it is assessed by agents from these regions or by foreigners.

Regarding G77/China, this result shows that even though we could not establish cost considerations as a main driving force behind the use of equity arguments in the previous section, G77/China is seen as using the criteria out of material self-interest. In contrast, the position of the EU is to a lesser extent seen to be motivated by material self-interest (62.7%), although the relative support of equity criteria by the EU fully corresponds to the cost ranking.

For the USA and Russia, pressure from industry is perceived as playing an important role for the incorporation of the most important equity rule (83.9% and 69.7% of all respondents). For the EU, 87.9% of all respondents expect that fairness considerations of the public play an important role and 78.9% expect that pressure from environmental NGOs is important. Corresponding to the perception of the EU as a primary driving force in international climate negotiations, the reason for its use of the most important equity rule is seen as facilitation of international climate negotiations to a high extent (83.1%). We summarize these findings as follows:

Result 4: *The countries or groups of countries are perceived to strongly differ in the reasons which determine their positions on the incorporation of the most important equity rule. Importantly, G77/China, Russia, and the USA are seen as using this equity principle primarily out of material self-interest.*

First evidence that perceptions of motivations for using equity are self-interested is obtained from decomposing the relative frequencies for agents from the EU and from G77/China.²⁵ According to Table B.5, 75.3% of the respondents from G77/China state that material self-interest plays an important role for the use of the most important equity criteria by G77/China, while 96.8% of the respondents from the EU perceive material self-interest playing an important role in the position of G77/China.²⁶ The corresponding EU position is seen as material self-interest driven by 51.9% of the respondents from the EU while 70.8% of the respondents from G77/China see the EU as using equity arguments out of self-interest. These results are preliminary since only descriptive statistics are considered. Hence, we again perform an econometric analysis to consider the determinants of agents' stating that the reasons mentioned play an important role in supporting the most important equity rule.

²⁵ As discussed above, the numbers of respondents from Russia and the USA (according to the corresponding small ratios in the population) are too small for a meaningful decomposition for these two countries.

²⁶ The corresponding chi-squared tests also show that the relative frequencies for agents from the EU (G77/China) significantly differ from the relative frequencies for agents from outside the EU (outside G77/China).

Description of econometric analysis and variables

In the same way as in section 5.1, the dependent variables are dummies which, however, now take the value one if agent $i = 1, \dots, n$ states that the respective reason plays an important role for the position of the assessed country or group of countries. We therefore consider again binary probit models. Each individual provided an assessment for all four countries or groups of countries (i.e., EU, G77/China, Russia, USA) and for all five reasons (i.e., material self-interest, fairness considerations of the public, facilitation of international climate negotiations, pressure from industry, pressure from environmental NGOs) which might play an important role for the support of the most important equity rule. In order to examine the effect of the assessed region on the importance of a specific reason, we stack the data over the four countries and groups of countries. According to this, $j \in \{\text{material self-interest, fairness considerations of the public, facilitation of international climate negotiations, pressure from industry, pressure from environmental NGOs}\}$ now denote the different reasons and $k \in \{\text{EU, G77/China, Russia, USA}\}$ denote the different regions in the several probit models which are in line with (2) and (3).

Regarding the effect of the assessed country or group of country on the importance of a specific reason, we include the corresponding dummy variables in the econometric analysis as control factors: “*Assessment EU*”, “*Assessment G77/China*”, “*Assessment Russia*”, and “*Assessment USA*” take the value one if the respective regions are assessed.²⁷

In assessing the importance of the respective reasons, it should be noted that the agents consider the equity principle which they identified as being most important for the respective country or group of countries. As a consequence, the assessment might be distorted: assume that regions are seen as favoring different equity criteria and agents involved in climate policy perceive the use of a specific equity rule as, for example, more self-interested than other equity rules. In order to account for these assessed different equity criteria, we include the explanatory dummy variables “*EGA most important*”, “*SOV most important*”, and “*POL most important*” which take the value one if the respective equity rules are expected to be most important for the assessed country and group of countries.²⁸

²⁷ In the different estimations, we define the omitted category as the dummy that refers to the region with the smallest relative frequency according to Table B.5. As a consequence, the estimation results would support the descriptive analysis if all corresponding parameters were positively estimated (or at least not significantly negative).

²⁸ The dummy for the ability-to-pay principle is used as omitted category.

We test different versions of self-interested biases in the perception of the use of equity arguments: while experimental evidence indicates that agents might see their own position as less self-interested, our study addresses the assessment of regions' positions. We therefore hypothesize that the view on the policy of an agent's own region might be more favorable than the view on other countries or groups of countries. Similarly, individuals might be positively biased in their assessment of a region which is supporting an equity criterion the individual personally prefers. In order to test these versions of a self-interested bias hypothesis, we include the variables “*Own region*” and “*Personal consistency equity rules*”. “*Own region*” takes the value one if an agent involved in climate policy assesses their own country or group of countries. “*Personal consistency equity rules*” takes the value one if a specific equity rule is expected to be most important for a country or group of countries and – simultaneously – this equity rule coincides with the individual's personal definition of equity. For both explanatory variables we can expect negative coefficients for reasons with negative attributes (material self-interest and pressure from industry) and positive coefficients for reasons with positive attributes (fairness considerations of the public, facilitation of international climate negotiations, and – to a smaller extent – pressure from environmental NGOs). Finally, it may be possible that individuals who are responsible for decisions are less likely to state that their decisions are influenced by lobby groups (industry as well as environmental NGOs). To investigate this modified version of a self-interested bias, we include the explanatory variable “*COP negotiator*” which is defined as in section 5.1.

Additionally, we again include personal characteristics (“*Equity importance*”, “*NGO*”, “*Social science*”, “*Age*”, “*Gender*”, and “*GDP per capita*”) as control variables.

Econometric results

Table B.6 reports the estimation results for the parameters of the explanatory variables in the random effects probit models which address the respective reasons separately.²⁹ The results support the descriptive statistics in Table B.5 and therefore Result 4:³⁰ compared to the EU, the

²⁹ The random effects correlation coefficients are always different from zero at the 1% significance level. However, the corresponding estimations in binary probit models without unobserved heterogeneity lead to qualitatively nearly identical results.

³⁰ While we concentrate the discussion on potential self-interested biases, personal characteristics again have significant effects. For example, social scientists perceive material self-interest more than other agents as being the reason to support the most important equity rule (5% significance level). Furthermore, the economic performance of agent's countries (measured by “*GDP per capita*”) influences their assessments.

other countries or groups of countries are to a greater extent seen as supporting the most important equity rule out of material self-interest (1% significance level). Fairness considerations of the public and facilitation of international climate negotiations are expected to play a more important role for the EU (1% significance level). In the same way, the facilitation reason is expected to play a more important role for Russia than for the USA (1% significance level). Furthermore, the USA is to a greater extent assessed as supporting the most important equity rule due to pressure from industry (1% significance level).

Table B.6 further shows that the perception of why a country or group of country chooses its equity position depends on the identity of its most important equity rule: the parameter of “*POL most important*” is negative for the material self-interest reason, but positive for pressure from environmental NGOs (5% significance level). The coefficient of “*SOV most important*” is positive for the importance of material self-interest and pressure from industry (10% and 1% significance level, respectively). The coefficient of “*EGA most important*” is positive for the importance of fairness considerations of the public and pressure from environmental NGOs (5% and 10% significance level, respectively).³¹ We summarize these findings as follows:

Result 5: *Material self-interest is perceived as less important for determining the position of countries or groups of countries on their most important equity rule if this coincides with the polluter-pays principle. If a region is perceived as primarily supporting the sovereignty rule, pressure from industry is seen as more important for forming this equity position.*

Result 5 thus points to important differences in the perception of equity rules: supporting the polluter-pays criterion is seen as less materially self-interested. This indicates that the polluter-pays principle might potentially play a constructive role in future negotiations. In contrast, the sovereignty rule is perceived as being pushed by industry groups. The latter corresponds to

³¹ Perceptions of the reasons why regions support the most important equity criteria are highly correlated. For example, the correlation coefficients between material self-interest, on the one hand, and fairness considerations of the public, facilitation of international climate negotiations, pressure from industry, and pressure from environmental NGOs, on the other hand, amount to -0.32, -0.39, 0.38, -0.25, respectively. This points to opposing views of reasons with negative attributes (material self-interest, pressure from industry) vs. reasons with positive attributes (fairness considerations of the public, facilitation of international climate negotiations, pressure from environmental NGOs). In order to test the robustness of the estimation results, we therefore again analyzed multivariate probit models which here connect the five single equations for each specific reason. While the estimations are mostly consistent with those in the random effects probit models, the significance levels for several parameters differ. However, the reliability of the estimation results in the multivariate probit models might be limited: while the number of observations is lower than in the separate random effect probit models, their simulated maximum likelihood estimation generally needs large numbers of observations to provide robust estimation results. These estimation results are available upon request.

concerns that without similar reduction obligations across regions, countries or groups of countries with stricter abatement targets might experience a loss in competitiveness of their industries.

We finally discuss the estimation results for the main variables which correspond to different versions of the self-interested bias hypothesis: “*Own region*”, “*Personal consistency equity rules*”, and “*COP negotiator*”. According to Table B.6, the parameters of “*Own region*” are different from zero with signs consistent with this hypothesis for the reasons material self-interest, fairness considerations of the public, and facilitation of international climate negotiations (5% significance level).³² Table B.6 also shows that the coefficients of “*Personal consistency equity rules*” are positive for the importance of the facilitation of international climate negotiations (1% significance level) and the pressure from environmental NGOs (10% significance level). Furthermore, the parameters are negative for the importance of the pressure from industry (5% significance level). Finally, negotiators in a COP are less likely to state pressure from industry as an important reason since the corresponding coefficient is negative (1% significance level). In combination, these findings provide evidence for different versions of the self-interested bias in perceiving the motivations to employ equity arguments:

Result 6: *Differences in expectations of agents involved in climate policy with respect to the reasons for why different regions take different positions on equity criteria are consistent with different versions of self-interested biases: there is evidence that agents are more (less) likely to state that reasons with positive (negative) attributes are of importance if they assess a country or group of countries which supports the equity rule they prefer themselves and if they assess their own region. Negotiators in a COP are less likely to see the negotiating position of regions as driven by industry.*

Result 6 puts an interesting twist to ideas of self-serving biases which have been stated in the literature (see section 3). While we cannot infer that the biases are unconscious, we find evidence that self-interest shapes fairness perceptions. The literature usually considers biased views on the fairness of one’s own individual decisions. This most closely corresponds to a more favorable view on the own region for which we find weak evidence. In addition, however, agents are also more likely to state favorable reasons for other countries or groups of countries that support the

³² We should note that these coefficients become insignificant in the (less reliable) multivariate probit models.

equity principle which the individual prefers. This is consistent with a modified interpretation of a self-interested bias: if a person is more likely to label their own preferred action as fair or less self-interested, the person should also be more likely to put these labels on other persons (here, regions) who choose the same action. Similarly, negotiators might be less inclined to state that negotiations are influenced by industry if they want to see their actions as being welfare-oriented and impartial.

6 Conclusions

In this paper we put forward equity as an important element to understanding negotiating positions, using the example of international climate negotiations. Taking a traditional economic standpoint, we argued that the use of equity criteria might be driven by cost consideration of the parties. Our econometric analysis based on data from an international survey of agents involved in climate policy largely supported our predictions based on a cost-ranking of the respective equity criteria for the different countries or groups of countries: the perceived support of equity criteria is the stronger, the less costly this criterion is compared to alternatives.

Our study shed interesting light on differences in identifying this self-interested use of equity arguments in international negotiations. While previous experimental studies have considered a bias in the perception of fairness or equity criteria in individual decision-making environments, our study lent support to a generalized notion of self-interested biases: even subjects that do not negotiate themselves considered the use of their personally preferred equity criterion by negotiating parties as less self-interested. Furthermore, negotiators themselves stated that the use of equity arguments by regions is less due to pressure from industry. We are not aware of any other empirical study which considers this self-interested use of equity in non-individualistic bargaining situations.

While the findings in this study indicate that equity principles in international negotiations are mostly correlated with the self-interest of the negotiating parties, the question remains how exactly their use influences the negotiation process. We believe that this potentially strategic role of using equity criteria will be essential in generating a better understanding of negotiation processes – not only in international climate policy.

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Appendix A – Abatement costs and predictions

Table A.1: *International Energy Outlook regions and mapping to survey countries or groups of countries*

International Energy Outlook regions	Survey countries or groups of countries
United States of America	USA
Other North America	Rest of world (ROW)
Western Europe	EU
Mature market Asia	ROW
Russia	Russia
Other former Soviet Union	ROW
Eastern Europe	EU
Emerging Asia	G77/China
Middle East	G77/China
Africa	G77/China
Central and south America	G77/China

Source: DOE (2005)

Table A.2: *GDP, population, and carbon emissions for survey countries or groups of countries*

	Year	EU	G77/China	Russia	USA	ROW	World
GDP (Billion USD2000)	1990	8160	9871	2241	7113	5688	33073
	2002	10484	18449	1657	10075	6562	47227
	2020	15816	46555	3571	17634	11006	94582
Population (Million)	1990	498	3965	148	253	396	5260
	2002	513	4891	144	289	429	6266
	2020	514	6092	129	337	460	7532
Carbon Emissions (MtC)	1990	1229	1664	640	1361	959	5853
	2002	1166	2566	415	1568	942	6658
	2020	1299	4767	538	2035	1186	9825
Accumulated Carbon Emissions (GtC)	1860-2020	98	115	32	117	75	438

Source: Own calculations based on DOE (2005) and WRI (2005)

Table A.3: Summary of abatement cost assumptions in 2020

	Marginal Abatement Costs (USD2000/tC)									
	40	80	120	160	200	40	80	120	160	200
Countries or groups of countries	Abatement (MtC)					Total abatement costs (Bn USD2000)				
EU	72	128	175	216	250	1.4	4.7	9.4	15.0	21.2
G77/China	502	860	1137	1365	1558	9.5	30.7	58.2	89.9	124.7
Russia	63	109	142	167	190	1.2	3.9	7.1	10.7	14.7
USA	155	270	362	437	502	2.9	9.8	18.9	29.4	41.0
ROW	64	112	151	181	209	1.2	4.0	7.9	12.1	17.0
WORLD	856	1480	1967	2366	2709	16.2	53.1	101.5	157.2	218.7

Source: Own calculations based on POLES (Criqui 2001)

Table A.4: Projected costs for 2020 implied by the respective equity criteria for the respective countries or groups of countries (in % of GDP) when marginal abatement costs are equalized at 80 USD2000/tC, corresponding to a worldwide reduction from BAU emissions by 15%

	EU	G77/China	RUS	USA
EGA	0.334	-0.423	0.749	0.687
SOV	0.064	0.042	0.047	0.072
ABI	0.056	0.056	0.056	0.056
POL	0.044	0.055	0.081	0.062
POL ⁽¹⁸⁶⁰⁻²⁰²⁰⁾	0.075	0.030	0.110	0.081

Appendix B – Empirical results

Table B.1: *Relative frequencies or mean and standard deviation regarding the personal background of agents involved in international climate policy*

	Relative frequency	Number of survey participants
Nationality: EU	36.1%	194
Nationality: G77/China	45.9%	194
Nationality: Russia	1.0%	194
Nationality: USA	5.2%	194
Negotiator in a COP	18.0%	178
Working for environmental or non-environmental NGO	6.9%	189
Highest degree or training: social sciences	18.2%	181
Gender: female	19.6%	194
Age (in years)	Mean: 45.70 Standard Deviation: 10.44	183

Note: The entries in the column “Number of survey participants” vary as some questions were not answered by all respondents.

Table B.2: *Relative frequencies that the respective equity rules should be reflected in the distribution of entitlements for greenhouse gas emissions to “a very high degree” or “a high degree”*

	Assessment of EGA	Assessment of SOV	Assessment of POL	Assessment of ABI
Expected position of the EU				
All respondents	40.1% (n=167)	50.9% (n=167)	78.2% (n=174)	55.7% (n=174)
Respondents from the EU	36.5%*** (n=63)	42.9% (n=63)	79.1% (n=67)	54.5%** (n=66)
Respondents from G77/China	46.0%** (n=74)	50.7% (n=73)	76.6% (n=77)	60.3%** (n=78)
Expected position of G77/China				
All respondents	59.5% (n=173)	29.1% (n=172)	61.0% (n=177)	65.5% (n=174)
Respondents from the EU	61.9% (n=63)	17.2%*** (n=64)	61.2%** (n=67)	75.4%** (n=65)
Respondents from G77/China	50.6%** (n=79)	34.6%*** (n=78)	62.0%*** (n=79)	55.1%*** (n=78)
Expected position of Russia				
All respondents	31.4% (n=159)	54.3% (n=162)	42.7% (n=164)	52.8% (n=163)
Respondents from the EU	19.7%** (n=61)	54.8% (n=62)	29.5%* (n=61)	57.4% (n=61)
Respondents from G77/China	42.0%*** (n=69)	46.4% (n=69)	54.2%* (n=72)	47.9% (n=71)
Expected position of the USA				
All respondents	35.7% (n=171)	60.8% (n=171)	41.0% (n=173)	29.8% (n=171)
Respondents from the EU	26.6%* (n=64)	58.7% (n=63)	29.2%** (n=65)	17.5%** (n=63)
Respondents from G77/China	49.3%** (n=75)	60.5% (n=76)	47.4% (n=76)	39.5%* (n=76)

*Note: *** (**, *) denotes that the distribution of the expected degree of incorporation of the respective equity rules (with parameter values “a very high degree”, “a high degree”, “a moderate degree”, “a low degree”, and “no degree”, irrespective of the relative frequencies) differs between the agents from the EU (G77/ China) and the corresponding agents from outside the EU (outside G77/China) at the 1% (5%, 10%) significance level according to the appropriate chi-squared test.*

Corresponding ranking regarding the expected incorporation of the equity rules:

EU: POL > ABI > SOV > EGA
G77/China: ABI > POL > EGA > SOV
Russia: SOV > ABI > POL > EGA
USA: SOV > POL > EGA > ABI

Table B.3: Maximum likelihood estimates (z-statistics) in random effects probit models, determinants of the expected position of countries and groups of countries that the equity rules should be reflected in the distribution of entitlements for greenhouse gas emissions to “a very high degree” or “a high degree” (analysis of assessed equity rules)

Explanatory variables	(1) Expected position of the EU	(2) Expected position of G77/China	(3) Expected position of Russia	(4) Expected position of the USA
<i>Assessment EGA</i>	-- (--)	1.05** (2.50)	-- (--)	-0.54 (-1.20)
<i>Assessment SOV</i>	1.28*** (2.95)	-- (--)	1.77*** (3.67)	0.92** (2.25)
<i>Assessment POL</i>	1.49*** (3.16)	0.44 (1.08)	0.83* (1.74)	0.63 (1.52)
<i>Assessment ABI</i>	0.80* (1.85)	1.26*** (2.97)	1.38*** (2.91)	-- (--)
<i>Personal consistency equity rules</i>	0.78*** (4.61)	0.81*** (5.00)	0.46*** (2.91)	0.15 (0.98)
<i>Equity importance</i>	0.10 (0.55)	-0.04 (-0.23)	0.30* (1.80)	0.30* (1.68)
<i>COP negotiator</i>	0.07 (0.33)	-0.39** (-2.06)	-0.08 (-0.42)	0.38* (1.89)
<i>NGO</i>	-0.07 (-0.23)	0.49 (1.59)	-0.14 (-0.51)	-0.09 (-0.28)
<i>Social science</i>	-0.12 (-0.56)	0.15 (0.75)	-0.08 (-0.43)	-0.23 (-1.09)
<i>Age</i>	-0.18 (-0.50)	0.42 (1.32)	-0.27 (-0.83)	-0.01 (-0.04)
<i>Gender</i>	-0.00 (-0.01)	0.53*** (2.89)	0.31* (1.75)	-0.03 (-0.17)
<i>EU * assessment EGA</i>	0.22 (0.56)	-0.40 (-1.06)	0.39 (0.91)	0.57 (1.37)
<i>EU * assessment SOV</i>	-0.44 (-1.20)	-0.60 (-1.56)	-0.36 (-1.01)	0.05 (0.14)
<i>EU* assessment POL</i>	0.08 (0.20)	0.13 (0.36)	-0.31 (-0.84)	-0.50 (-1.38)
<i>EU * assessment ABI</i>	0.22 (0.59)	-0.30 (-0.80)	-0.05 (-0.13)	-0.49 (-1.23)
<i>G77/China * assessment EGA</i>	-0.09 (-0.21)	-0.68* (-1.66)	0.07 (0.15)	0.46 (1.04)
<i>G77/China * assessment SOV</i>	-1.21*** (-2.82)	-0.23 (-0.57)	-1.60*** (-3.73)	-0.57 (-1.39)
<i>G77/China * assessment POL</i>	-0.51 (-1.05)	-0.12 (-0.31)	-0.49 (-1.16)	-0.66 (-1.59)
<i>G77/China * assessment ABI</i>	-0.25 (-0.60)	-0.83** (-1.99)	-1.11*** (-2.69)	-0.25 (-0.62)
<i>GDP per capita</i>	-0.32*** (-2.69)	-0.05 (-0.46)	-0.41*** (-3.76)	-0.28** (-2.51)
<i>Constant</i>	0.38 (0.27)	-2.08 (-1.61)	0.44 (0.34)	-0.20 (-0.15)

Notes: *** (**, *) means that the appropriate parameter is different from zero at the 1% (5%, 10%) significance level. Number of observations = 482 (n=127) in (1), number of observations = 495 (n=129) in (2), number of observations = 460 (n=120) in (3), number of observations = 485 (n=125) in (4).

Table B.4: Maximum likelihood estimates (z-statistics) in random effects probit models, determinants of the expected position of countries and groups of countries that the equity rules should be reflected in the distribution of entitlements for greenhouse gas emissions to “a very high degree” or “a high degree (analysis of economic costs associated with the equity rules)

Explanatory variables	(1) Expected position of the EU	(2) Expected position of G77/China	(3) Expected position of Russia	(4) Expected position of the USA
<i>Costs equity rules EU</i>	-4.21*** (-3.21)	-- (--)	-- (--)	-- (--)
<i>Costs equity rules G77/China</i>	-- (--)	-0.99 (-1.37)	-- (--)	-- (--)
<i>Costs equity rules Russia</i>	-- (--)	-- (--)	-1.98*** (-3.30)	-- (--)
<i>Costs equity rules USA</i>	-- (--)	-- (--)	-- (--)	-1.67*** (-2.77)
<i>Personal consistency equity rules</i>	0.79*** (4.73)	0.78*** (4.95)	0.42*** (2.74)	0.16 (1.07)
<i>Equity importance</i>	0.10 (0.56)	-0.03 (-0.19)	0.29* (1.79)	0.30* (1.66)
<i>COP negotiator</i>	0.07 (0.35)	-0.39** (-2.11)	-0.08 (-0.42)	0.37* (1.88)
<i>NGO</i>	-0.08 (-0.24)	0.47 (1.58)	-0.15 (-0.52)	-0.10 (-0.31)
<i>Social science</i>	-0.12 (-0.54)	0.16 (0.83)	-0.08 (-0.41)	-0.22 (-1.07)
<i>Age</i>	-0.18 (-0.50)	0.43 (1.38)	-0.26 (-0.83)	-0.01 (-0.04)
<i>Gender</i>	-0.01 (-0.03)	0.53*** (2.92)	0.31* (1.74)	-0.04 (-0.19)
<i>EU * assessment EGA</i>	0.23 (0.57)	-0.38 (-1.03)	0.42 (0.96)	0.54 (1.32)
<i>EU * assessment SOV</i>	-0.29 (-1.03)	-1.16*** (-3.97)	0.03 (0.10)	0.45* (1.65)
<i>EU* assessment POL</i>	0.36 (1.17)	0.01 (0.04)	-0.78*** (-2.86)	-0.40 (-1.45)
<i>EU * assessment ABI</i>	-0.15 (-0.51)	0.39 (1.43)	-0.02 (-0.08)	-1.03*** (-3.29)
<i>G77/China * assessment EGA</i>	-0.07 (-0.17)	-0.66 (-1.62)	0.09 (0.21)	0.46 (1.05)
<i>G77/China * assessment SOV</i>	-1.05*** (-2.95)	-0.79** (-2.44)	-1.20*** (-3.45)	-0.14 (-0.42)
<i>G77/China * assessment POL</i>	-0.22 (-0.59)	-0.23 (-0.70)	-0.94*** (-2.74)	-0.54 (-1.59)
<i>G77/China * assessment ABI</i>	-0.60* (-1.70)	-0.12 (-0.37)	-1.08*** (-3.15)	-0.77** (-2.28)
<i>GDP per capita</i>	-0.31*** (-2.65)	-0.04 (-0.43)	-0.40*** (-3.76)	-0.27** (-2.46)
<i>Constant</i>	1.76 (1.24)	-1.51 (-1.22)	1.89 (1.49)	0.41 (0.31)

Notes: *** (**, *) means that the appropriate parameter is different from zero at the 1% (5%, 10%) significance level. Number of observations = 482 (n=127) in (1), number of observations = 495 (n=129) in (2), number of observations = 460 (n=120) in (3), number of observations = 485 (n=125) in (4).

Table B.5: *Relative frequencies that some reasons play an important role for countries and groups of countries for the incorporation of the most important equity rule in international climate negotiations*

	Assessment of the EU	Assessment of G77/China	Assessment of Russia	Assessment of the USA
Reason: Material self-interest				
All respondents	62.7% (n=153)	86.1% (n=166)	88.9% (n=162)	93.5% (n=168)
Respondents from the EU	51.9%** (n=54)	96.8%*** (n=63)	93.5% (n=62)	96.9% (n=64)
Respondents from G77/China	70.8%* (n=72)	75.3%*** (n=73)	81.7%*** (n=71)	90.8% (n=76)
Reason: Fairness considerations of the public				
All respondents	87.9% (n=157)	58.9% (n=158)	41.3% (n=150)	44.4% (n=151)
Respondents from the EU	87.9% (n=58)	44.8%*** (n=58)	20.0%*** (n=55)	35.1%* (n=57)
Respondents from G77/China	88.9% (n=72)	67.1%** (n=73)	54.5%*** (n=66)	43.9% (n=66)
Reason: Facilitation of international climate negotiations				
All respondents	83.1% (n=160)	46.9% (n=160)	49.3% (n=142)	30.8% (n=159)
Respondents from the EU	80.7% (n=57)	28.1%*** (n=57)	32.7%*** (n=52)	18.3%*** (n=60)
Respondents from G77/China	83.3% (n=72)	63.5%*** (n=74)	67.7%*** (n=62)	32.4% (n=68)
Reason: Pressure from industry				
All respondents	52.9% (n=153)	45.0% (n=151)	69.7% (n=145)	83.9% (n=168)
Respondents from the EU	49.1% (n=61)	61.1%*** (n=54)	77.8% (n=54)	85.7% (n=63)
Respondents from G77/China	54.5% (n=66)	32.9%*** (n=70)	61.9%* (n=63)	80.8% (n=73)
Reason: Pressure from environmental NGOs				
All respondents	78.9% (n=166)	31.3% (n=144)	29.7% (n=138)	47.4% (n=154)
Respondents from the EU	76.7% (n=60)	19.2%** (n=52)	13.5%*** (n=52)	33.9%** (n=56)
Respondents from G77/China	85.7%** (n=77)	43.5%*** (n=69)	46.7%*** (n=60)	60.6%*** (n=66)

Note: *** (**, *) denotes that the relative frequency differs between the agents from the EU (G77/China) and the agents from outside the EU (outside G77/China) at the 1% (5%, 10%) significance level according to the appropriate chi-squared test.

Table B.6: Maximum likelihood estimates (z-statistics) in random effects probit models, determinants of several reasons playing an important role for the countries or groups of countries concerning the incorporation of the corresponding most important equity rule

Explanatory variables	(1) Reason: Material self- interest	(2) Reason: Fairness consi- derations of the public	(3) Reason: Facilita- tion of climate negotia- tions	(4) Reason: Pressure from industry	(5) Reason: Pressure from envi- ronmental NGOs
<i>Own region</i>	-0.66** (-2.57)	0.48** (2.05)	0.54** (2.25)	-0.36 (-1.57)	0.07 (0.23)
<i>Personal consistency equity rules</i>	-0.18 (-0.85)	0.03 (0.14)	0.54** (2.58)	-0.46** (-2.38)	0.45* (1.70)
<i>COP negotiator</i>	-0.32 (-1.08)	0.32 (0.97)	-0.12 (-0.34)	-1.02*** (-2.76)	-0.15 (-0.31)
<i>Equity importance</i>	0.19 (0.70)	0.36 (1.24)	0.20 (0.66)	-0.04 (-0.12)	0.30 (0.71)
<i>NGO</i>	-0.09 (-0.20)	0.13 (0.25)	0.05 (0.09)	-0.20 (-0.36)	-0.43 (-0.54)
<i>Social science</i>	0.72** (1.98)	-0.43 (-1.30)	-0.69* (-1.83)	0.45 (1.19)	0.21 (0.43)
<i>Age</i>	-0.43 (-0.80)	-0.19 (-0.34)	0.28 (0.46)	-0.53 (-0.89)	0.11 (0.13)
<i>Gender</i>	0.20 (0.64)	-0.25 (-0.79)	-0.20 (-0.58)	0.17 (0.48)	1.06** (2.18)
<i>GDP per capita</i>	0.19* (1.79)	-0.11 (-1.03)	-0.31*** (-2.62)	0.02 (0.16)	-0.65*** (-3.85)
<i>Assessment EU</i>	-- (--)	1.61*** (5.76)	2.03*** (6.78)	0.08 (0.32)	2.55*** (6.41)
<i>Assessment G77/China</i>	1.32*** (4.58)	0.13 (0.50)	0.39 (1.41)	-- (--)	-0.08 (-0.21)
<i>Assessment Russia</i>	0.71*** (2.66)	-- (--)	0.76*** (3.10)	0.13 (0.47)	-- (--)
<i>Assessment USA</i>	1.15*** (3.89)	0.05 (0.22)	-- (--)	1.07*** (3.59)	1.26*** (3.97)
<i>EGA most important</i>	0.23 (0.67)	0.55** (2.00)	-0.18 (-0.64)	0.13 (0.48)	0.73* (1.92)
<i>SOV most important</i>	0.58* (1.71)	-0.21 (-0.75)	-0.10 (-0.36)	0.93*** (3.07)	-0.02 (-0.06)
<i>POL most important</i>	-0.60** (-2.26)	0.31 (1.16)	0.25 (0.90)	-0.31 (-1.17)	0.95** (2.52)
<i>Constant</i>	1.88 (0.91)	0.25 (0.12)	-1.74 (-0.74)	2.39 (1.02)	-1.81 (-0.56)

Notes: *** (**, *) means that the appropriate parameter is different from zero at the 1% (5%, 10%) significance level. Number of observations = 448 (n=127) in (1), number of observations = 424 (n=126) in (2), number of observations = 429 (n=125) in (3), number of observations = 428 (n=127) in (4), number of observations = 415 (n=128) in (5).