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Citizens' perceptions of justice in international climate policy – An empirical analysis

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January 2014

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Abstract

Relying on a recent survey of more than 3300 participants from China, Germany and the US, this paper empirically analyzes citizens' perceptions of climate change and climate policy, focusing on key guiding principles for sharing mitigation costs across countries. The ranking of the main principles for burden-sharing is identical in China, Germany and the US: accountability followed by capability, egalitarianism, and sovereignty. Thus, on a general level, citizens across these countries seem to have a common understanding of fairness. We therefore find no evidence that citizens' (stated) fairness preferences are detrimental to future burden-sharing agreements. While there is heterogeneity in citizens' perceptions of climate change and climate policy within and across countries, a substantial portion of citizens in all countries perceive a lack of transparency, fairness, and trust in international climate agreements.

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Keywords

Climate change policies; climate change; burden sharing; equity; justice; distributive justice;

1 Introduction

The international community generally agrees that to prevent dangerous anthropogenic interference with the climate system, the increase in average global temperature needs to be limited to 2°C compared to its pre-industrial levels[1]. To achieve this target, immediate, substantial and sustained reductions of greenhouse gas emissions are required (e.g. IPCC 2013). Countries disagree, however, on how to allocate the efforts of doing so, and, to a large extent, this lack of consensus on the inter-generational burden-sharing (or effort-sharing) explains the lack of sufficient progress in international climate policy.[2,3] Allocating emission reduction efforts across countries may be regarded as a typical problem of distributive justice. In 1992, countries agreed on fundamental principles for such an effort-sharing in Article 3.1 of the United Nations Framework Convention on Climate Change (UNFCCC 1992):

"The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof" (UNFCCC 1992).

These principles of *equity* and *common but differentiated responsibilities and respective capabilities* (CBDR&RC) build the basis for all negotiations under the UNFCCC such as current negotiations under the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP), which is in charge of crafting a new global climate agreement for the period beyond when the second commitment period of the Kyoto Protocol expires in 2020. So far, however, in particular the principles of CBDR&RC have turned out to be difficult to apply in actual policy making. While equity is generally understood as distributive justice, there are numerous interpretations of what this actually means in the context of the UNFCCC. For example, the third assessment report of the IPCC lists 13 different approaches, and no common understanding has emerged (see UNFCCC 2012). Among others, Ringius et al. (2002) or Lange et al. (2010) categorize these approaches along four main principles. First, *accountability* (or responsibility) relates to

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1 The Copenhagen Accord adopts the 2°C target by recognizing "the scientific view that the increase in global temperature should be below 2°C" (UNFCCC 2009).

2 See for example, Morgan & Waskow (2014), Winkler & Rajamani (2014), Gupta, J. (2012), Okereke (2010), Klinsky & Dowlatabadi. (2009), Okereke et al. (2009), Heyward (2007), Lange et al. (2007, 2010), Ikeme (2003), or Ringius et al. (2002).

3 The recent UNEP "Gap-Report" estimates that global greenhouse gas emissions in 2020 will be at least 59 $GtCO_2e$, and hence 8-12 $GtCO_2e$ above emissions pathways deemed consistent with a likely chance of meeting a 2°C target (UNEP 2013).

past and current levels of greenhouse gas emissions (polluter pays principle). Second, *ability to pay* highlights countries' heterogeneous financial and technological *capabilities* to reduce emissions versus economic development needs.[4] The latter is also referred to as equitable access to sustainable development (*EASD*). Third, e*galitarian* approaches underline that all people should have equal initial rights to use the atmosphere. Finally, *sovereignty*-based rules stress countries' rights to govern their own climate policy targets which typically imply preserving the current pattern of countries' shares of global emissions (grandfathering). Of course, two or more of these principles may also be combined.[5] For example, the 'equal cumulative per capita emissions' approach derives emissions from a carbon budget and essentially combines the accountability and egalitarian principles (e.g. Kanitkar et al. 2010). Similarly, multiple principles may be employed, typically via an ad-hoc weighting scheme. Such burden-sharing approaches are likely to be politically more palatable, and may be seen as a compromise solution for aligning conflicting interests, since the different burden-sharing rules have very different distributive implications. For example, the US or the EU would be better off under a grandfathering principle than under an equal-per-capita rule. The reverse would be true for China. Incidentally, the US has for the longest time refused to discuss equity issues in the burden-sharing debate and essentially stressed the sovereignty principle. In contrast, Brazil, China or India consider equity to be central to any future climate agreement, stressing, in particular, the need to recognize cumulative historic emissions, i.e. the accountability principle. The EU, while acknowledging the need to consider accountability, stresses the importance to also factor in countries' capability to combat global warming. At the climate summit in Warsaw 2013 (COP 19), Brazil proposed that a reference methodology to quantify national historical contributions to climate change should be developed. The methodology should be based on countries' cumulative emission levels dating back to 1850 and help set national targets. This proposal was supported by 130 nations including China and India, but blocked by the EU, the US, Australia, and Canada.

The thrust of the academic literature on distributive justice entails conceptual and quantitative analyses. Conceptual contributions include, among others: Rose et al. (1998), Aldy et al. (2003), Ringius et al. (2002), Ikeme (2003), Heyward (2007), Lange et al. (2007, 2010), Klinsky & Dowlatabadi. (2009), Okereke et al. (2009), Okereke (2010), Gupta (2012), Morgan & Waskow (2014), Winkler & Rajamani (2014), or Garibaldi

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4 Article 3.3 of UNFCCC (1992) demands "*full consideration of specific needs and special circumstances of developing country Parties*".

5 Quoting Adams (1965) and Deutsch (1975), Carlsson et al. (2013) point out that these effort- or burden-sharing rules can generally be traced back to the basic principles of distributive justice: equity, equality, and need.

(2014). The quantitative analyses may further be distinguished into those calculating the future emission budgets of countries and regions under particular burden-sharing rules and those focusing on the economic implications, i.e. in particular on mitigation costs.[6] The former include, for example, Chakravarty et al. (2009), Hof & den Elzen (2010), Mattoo & Subramanian (2010), den Elzen and Höhne (2010, or den Elzen et al. (2007, 2013). The latter include Böhringer & Welsch (2006), Jacoby et al. (2010), Lange et al. (2010), Bosetti & Frankel (2011), Van Ruijven et al. (2012), or Tian et al. (2012). The comprehensive literature survey by Höhne et al. (2014) points out that applying the accountability, capability and egalitarian principles (or combinations thereof), result in a rather high portion of the mitigation efforts for OECD countries.[7]

Only a few studies attempt to empirically elicit negotiators' or citizens' preferences for particular burden-sharing rules. The studies by Dannenberg et al. (2010) and Lange et al. (2010) rely on individuals who had been involved in international climate policy negotiations, while Carlsson et al. (2013) studies ordinary citizens in China and the US. The findings by Lange et al. (2010) in particular, suggest that negotiators at climate conferences prefer burden-sharing rules that are in their countries' economic interest. This general finding on the so called in-group or self-serving bias is also supported by Carlsson et al. (2013).[8] Relying on a discrete choice experiment, the authors find that citizens tend to favor the burden-sharing principle that is least costly to their home country. In a different context, Kals et al. (2007) found no difference in fairness evaluations among for solutions to environmental conflicts for individuals affected and non-affected in two field experiments involving German and Australian citizens. Also, individuals' fairness judgment was not only based on self-interest.

According to Lind and Tyler (1988) individuals are often as concerned about the justice of the process as with the outcome itself. Legitimacy and acceptance of the outcome depends on whether individuals perceive the process to be fair and transparent. Procedural justice, however, has attained considerably less attention than distributive justice (Okereke 2010). Among others, Klinsky & Dowlatabadi (2009) and Okereke (2010) point out that procedural justice in climate policy requires representation of the interests

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6 Note that ambitious emission targets do not necessarily translate into high mitigation costs for countries with a large potential of low-cost mitigation measures. Also, if trading of emission certificates or of credits from offsetting projects across countries is allowed, the distribution of costs does not necessarily correspond to the distribution of emission reduction efforts. The focus of our analysis is on citizens' fairness perceptions of the distribution of costs (rather than emission reductions).

7 Prominent proposals include the Greenhouse Development Rights Framework (Baer et al. 2008) and Winkler et al. (2009).

8 See Brekke & Johansson-Stenmann (2008) for an overview of the behavioural economics literature on the self-serving bias.

of all countries in the climate negotiations, in particular, of those countries that are most vulnerable to climate change. Similarly, following Furlong (2005), legitimacy and acceptance may depend on individuals' confidence in the structure or the process of international climate policy (procedural trust). While several studies analyze how individuals' perception of fairness and trust in politicians or governments affect their attitudes towards policy instruments (e.g. Hammar and Jagers, 2006; Jagers et al., 2010; Jagers and Hammar, 2009; Torgler and García-Valiñas, 2007), citizens' perceptions of procedural trust related to international climate negotiations have largely been unexplored.

International comparisons are typically limited to analyses of individuals' awareness of climate change. Awareness of climate change is generally high in Europe and the United States (e.g. European Commission, 2011; Leiserowitz et al., 2012), but is subject to fluctuations depending on media attention, recent events linked to climate change, or even current weather conditions (BBC, 2010; Pidgeon & Fischhoff, 2011). Further, awareness of climate has been declining recently (GlobeScan, 2012).

The main objective of this paper is to explore people's perceptions on distributive justice across countries with regard to the key burden-sharing rules. To do so, a survey was conducted simultaneously in China, Germany (i.e. the most populous EU Member State) and the US. Due to their respective greenhouse gas emissions, economic strength, and political clout, these countries are expected to play a key role in the success of future climate policy. Besides questions on distributive justice, the survey also addresses – in a rather explorative way – issues related to procedural justice and trust. Concurrently, we analyze basic questions on public perceptions of climate change, i.e. its existence, causes and consequences. Furthermore, we look at the justification of climate policy, e.g. beliefs whether mankind should take action and whether international climate negotiations have been successful.

Above all, our findings provide insights into whether distributive justice principles discussed and endorsed by climate policy decision makers are in line with citizens' preferences in these countries, and to what extent these preferences are potentially countervailing across countries and, hence, detrimental to future burden-sharing agreements. More generally, since the decisions at the international level get executed at the domestic level, the findings on distributive justice and, more generally, on justification of climate policy indicate the level of domestic public support for these measures. Thus, analogous to Oberholzer et al. (1997), a higher acceptance of international climate policy may mean that citizens are more willing to take on financial burdens associated with national implementations of climate policies.

The remainder of the paper is organized as follows: Section 2 presents a description of the survey and sample demographics for the three countries. Section 3 then presents

the findings, distinguishing between citizens' perceptions on climate change and climate policy in general, as well as on distributive justice. The concluding Section 4 discusses the main findings and points to future research needs.

2 Survey

The data for our analysis was collected from three representative online surveys among a total of 3445 citizens aged 18 and older in Germany, the United States, and China. All surveys were carried out in May and June 2013 by the market research company GfK SE (Gesellschaft für Konsumforschung). In total, 1005 respondents in Germany, 1010 respondents in the US, and 1430 respondents in China completed the questionnaire. In Germany and the United States, the sample was drawn from representative GfK Online Panels. Respondents were invited via email to attend a self-administered interview in a web-based online environment. In China, respondents were recruited by employees of GfK China in eleven core regions, invited to centrally located test studios, and interviewed face-to-face. About one half of the respondents in China come from rural areas and the other half of the Chinese respondents live in metropolitan areas. The questions encompassed general personal assessments of climate change, specific attitudes towards international climate policy and negotiations, and individual engagement in climate-friendly behavior and CO_2 offsetting. To complete the survey, respondents in Germany took 31.8 minutes on average, in China 28.5 minutes and in the US 30.4 minutes.

Participants were asked to specify their level of agreement or disagreement with a particular statement or to subjectively assess the importance of a particular principle on a symmetric scale with five ordered response levels. Potential problems associated with this type of scale are: central tendency bias (especially in China) acquiescence bias, and social desirability bias (e.g. Chen et al. 1995). These issues were addressed by "don't know/no answer" options to distinguish true neutral from unsure responses, a scale design involving balanced keying, and closed ended and "neutral" wording of the items.

To draw reliable conclusions for the total population, the statistical analyses employed specific weights which were calculated by the survey institute to ensure offline representativeness of the results. Differences across countries or across items are assessed via z-tests. Rather than comparing the means of responses, we compare the shares of responses, typically adding up the shares for the two highest or two lowest response levels. For example, we first add the (shares of the) responses "strongly agree" and "agree" for a particular item and then conduct a standard z-test to compare findings

across countries. In this sense, our statistical analysis is conservative, since it does not assume the data to be interval data.

The sample demographics for all three countries appear in Appendix I. Appendix II reports those questions on climate change and climate policy which are not presented at full length in the paper.

3 Results

We first report the main descriptive statistics results on respondents' perceptions of climate change and climate policy in general, and on distributive justice, in particular. For all questions, differences in citizens' responses across countries are highlighted.

3.1 Existence, causes and consequences of climate change

In the survey, climate change was defined as a rise in the average global temperature over the past 150 years or in the future, resulting in weather and climate changes. The results suggest that a majority in all three countries considers climate change to be an important or very important challenge (Q1). This share is significantly higher in China (94%) than in Germany (85%).[9] Similarly, the shares in China and Germany are significantly higher than in the US (64%). In China and Germany (but not in the US), climate change is considered about as important as combating poverty, diseases, or stabilizing the financial system. Further, a large majority of citizens in all three countries believe that climate change is already happening (Q2). In China this share is highest (88%) and significantly higher than in Germany (78%) and in the US (68%). Another 10% in China and the US, and 13% in Germany, think that climate change is not happening now, but that it will occur in the future. Of those who believe that climate change is real, i.e. that it is already happening or will happen in the future, most respondents in China (54%), Germany (71%), and the US (59%) consider natural processes as well as human activities to be responsible for climate change (Q3). In China, over 40% think that climate change is caused by human activities only. This share is significantly higher than in Germany or in the US. In the US about 10% of the citizens believe that climate change is due to natural processes only - a significantly higher share than in China (3%) or Germany (2%). In all three countries, about half the citizens who believe that climate change is real consider climate change to have rather negative or very negative consequences for the *present* generation (Q4). For *future* generations, this share is

9 Unless noted otherwise, "significant" means statistically significant at the 1% significance level in a two-sided single z test.

about 60% in China and the US, and significantly higher in Germany (85%). Conversley, about one in four US Americans and Chinese think that the consequences of climate change for future generations will be rather positive or very positive.

3.2 Justification of climate policy

The questions in this subsection were only asked to those respondents who believe that climate change is real. A slight majority of Germans (54%) and US Americans (53%), but the vast majority of Chinese (83%) believe that climate change may still be effectively limited (Q5). Around 85% of the Chinese and more than 70% of the German population, but only 48% of the US citizens think that humans should act to limit climate change (Q6). These differences across countries are also statistically significant.

In each country about a third of the respondents agree strongly or very strongly with the statement that scientific findings are too uncertain to serve as the basis for climate negotiations (Q7). This share is highest in China (38%), followed by the US (33%) and Germany (31%), but differences are not significant.

The majority of citizens in China (54%) perceive previous international agreements to have been rather successful or very successful in combating climate change (Q8). This share is significantly lower in the US (22%) and in Germany (8%).

About four out of five Germans (83%), three out of four Chinese (74%) and two out of three US Americans (64%) consider future international agreements rater important or very important for combating climate change (Q9). The differences between China and Germany compared to the US are significant.

Next, the majority of citizens in China (63%), Germany (64%) and the US (57%) agree rather strongly or strongly with the statement that all countries can benefit from international climate agreements, but differences across countries are not significant (Q10).

There is rather high support in China, Germany, and the US for the main issues discussed at international climate conferences (Q11). In Germany and China about 85% of the citizens consider both, “measures to reduce greenhouse gas emissions” and “comprehensive quantitative targets” to be rather important or very important issues for future climate negotiations. In the US, the respective “approval rates” are significantly lower – 72% for mitigation measures and 68% for comprehensive targets. In comparison, the “approval rates” for “adaptation measures to the consequences of climate change (e.g. dams for flood protection” are 73% for China, 78% for Germany and 67% for the US, and hence significantly lower than for mitigation measures and comprehensive targets.

3.3 Information and representation

The share of respondents who feel well, or very-well informed about international climate conferences is highest in China (35%) and significantly lower in the US (24%) and Germany (21%) (Q12). Almost one out of two Germans (45%) feels poorly informed about international climate conferences, i.e. responded with “badly” or “rather badly.” This share is significantly higher in Germany than in China (26%) or in the US (33%). The difference between China and the US is also significant. A significantly higher share of Chinese (44%) feel their own position to be well or very well represented than US Americans (21%) or Germans (11%).

The survey further asked respondents about their perceptions of the representation of countries and whether they are believed to pursue particular interests at international climate negotiations and agreements (Q13). The countries were distinguished in industrialized and developing countries. About 42% of the US Americans and 35% of the Germans believe (strongly and very strongly) that all countries have the same opportunities to represent their interests at international climate conferences – in China this share is significantly higher (70%).

Around 55% of the Germans and Chinese agree (strongly and very strongly) that industrialized countries use international climate negotiations to push through their own economic interests vis-a-vis other countries (Q14). This share is significantly lower in the US (41%). In comparison, only about 30% of the Germans and US American citizens, but a significantly higher share of Chinese citizens (46%) think (strongly or very strongly) that the (developing) countries use international climate negotiations to push through their own economic interests vis-a-vis other countries.

3.4 Distributive justice

The questionnaire informed participants that to mitigate climate change and its consequences, international climate policy had attempted for some time to reach internationally binding regulations on CO_2 and other greenhouse gas emissions at several world climate conferences (e.g. Rio de Janeiro, Kyoto or Copenhagen). They were then asked to assess the relevance of four key principles underlying potential rules to allocate mitigation costs across countries (burden-sharing):

- *Accountability* (polluter pays): ‘Every country has to bear costs according to the emissions it causes (hence countries causing higher emissions have a higher share of the costs)‘;
- *Capability* (ability to pay): ‘Every country has to bear costs according to its economic strength (hence richer countries have a higher share of the costs)’;

- *Egalitarian* (equal right to pollute): ‘Every country is allowed to produce the same amount of emissions per capita (hence countries with currently high emissions per capita have higher costs)’;
- *Sovereignty* (status quo): ‘Every country is allowed to produce the same share of global emissions as in the past (hence the proportional reduction of emissions is the same for every country)’;

The respondents’ assessments of these principles are displayed in Figure 1. First, we analyze citizens’ preferences for particular burden-sharing rules within countries. Figure 1 shows that the ranking of the distributive justice principles considered in the survey is identical in all three countries. Using the initials of the principles as abbreviations, we get the following orderings:

China: $A \succ^{*} C \succ^{*} E \succ^{*} S$

Germany: $A \succ^{*} C \succ^{*} E \succ^{*} S$

US: $A \succ^{*} C \succ E \succ^{*} S$

where ‘*’ means statistically significant at the 1% significance level (based on z tests on the shares of responses in the categories ‘consider rather strongly’ and ‘consider very strongly’). Thus, apart from the ranking between the capability principle and the egalitarian principle in the US, all components of “ACES” are significantly different from each other.

Next, we analyze differences in preferences for distributive justice across countries. The preference for the *accountability* principle is highest in Germany, where almost 77% think this principle should be considered strongly or very strongly when deciding on how to split up mitigation costs across countries. This portion is significantly lower in China (69%) and in the US (62%).

Respondents’ preferences for the *capability* principle are highest in China, where about 64% feel this principle should feature strongly or very strongly in the burden-sharing. In China and Germany (56%) this share is significantly higher than in the US (46%). The difference between China and Germany is statistically significant at the 5% significance level.

Citizens’ preference for the *egalitarian* principle is highest in China, where 51% believe this principle should weigh strongly or very strongly in allocating the mitigation costs across countries. This share is lower in Germany and in the US (45% each), but the differences are not statistically significant.

Insert Figure 1 here

Finally, preferences for the *sovereignty* principle are highest in China, where 42% of the participants think this principle should be strongly or very strongly considered in the burden sharing. The corresponding shares for the US and Germany are 32% and 17%, respectively. Almost all differences are statistically significant at the 1% level, the difference between US and China is significant at a significance level which is slightly higher than 1%.

Additional calculations show that in all three countries a large portion of the citizens simultaneously rate several principles highly. For China, for example, about 55% of the respondents believe that accountability and capability should both be considered strongly or very strongly. Similarly, 38% think that accountability, capability and the egalitarian principle should all be considered strongly or very strongly. Qualitatively similar findings hold for Germany and the US.

3.5 Trust in climate policy

The questionnaire contained several questions which capture aspects of trust in international climate policy and its outcomes in a rather exploratory way. Respondents were asked how strongly they agreed with the following statements

- 'Commitments made at international climate negotiations will not be kept anyhow' (*broken promises*);
- 'The richer (industrialized) countries should show they can successfully reduce emissions first before the poorer (developing) countries have to do so' (*lead by example*);
- 'Climate negotiations are used to publicly denounce the industrialized countries' (*pillory rich countries*);
- 'Governments use international climate negotiations to pacify their citizens instead of reducing global greenhouse gas emissions' (*pacify citizens*);

As displayed in Figure 2, almost two out of three Germans (62%) believe (strongly or very strongly) that commitments made at international climate negotiations will not be kept. The corresponding shares for the US (41%) and China (30%) are significantly lower.

Citizens in China, in particular, think that industrialized countries should show they can successfully reduce emissions first before the developing countries have to do so. The share of those which strongly or very strongly support the corresponding statement is around 72% in China, and significantly higher than in Germany (45%) and the US (43%).

Almost one out of two Chinese participants (48%) strongly or very strongly agrees with the notion that climate negotiations are used to publicly denounce the industrialized

countries. This share is significantly higher than in Germany (30%) or in the US (35%). The difference between Germany and the US is also significant.

Finally, 61% of the German citizens strongly or very strongly believe that governments use international climate negotiations to pacify their citizens instead of reducing global greenhouse gas emissions. The difference between Germany and China (51%) and Germany and the US (42%) is significant.

Insert Figure 2 here

4 Conclusions

In this section we summarize and discuss the main empirical findings, relate them to the literature and highlight policy implications.

Existence, causes and consequences of climate change

Our findings suggest that citizens in China, Germany and, to a lesser extent, in the US consider climate change as a serious challenge which is comparable to other issues like fighting poverty or diseases. For China, the stated high relevance of climate change is consistent with the findings (mainly for Beijing) by Yu et al. (2013) and may partly be driven by recent concerns over (local) pollution. Unlike US citizens, Germans have traditionally attributed a relatively high relevance to climate change (e.g. Lorenzoni & Pidgeon 2006, European Commission 2011). The majority of respondent in all three countries are aware of the causes and consequences of climate change, but there are differences across countries. In the US in particular, a fairly large share does not believe in climate change or that it is man-made. For comparable questions, the study for the US by Leiserowitz et al. (2012) finds almost the same shares as our study, and also points out that these shares have declined over the recent years (cp. GlobeScan, 2012). In a sense, though, our findings rationalize the view that in the US, domestic policy measures are strongly justified towards the general public via their alleged positive effects on employment and security of supply. In comparison, in Germany climate policy targets are portrayed as the main objective for national policy such as the “Energiewende”, while other aspects are rather seen as co-benefits.

Citizens in all three countries perceive climate change mostly as a threat. This reflects the outcomes of previous studies, including (a few) cross-country analyses (e.g. Lorenzoni et al. 2006, European Commission 2011). Germans appear to have particularly negative expectations for the consequences of climate change in the future. The disparate distribution of the costs of climate change against future generation is consistent with the scientific literature (e.g. Parry et al. 2007). To some extent, the relatively high

share of citizens in China and the US who expect positive consequences in the long-run may be rationalized by possible benefits of global warming on agricultural productivity in some regions in these countries (e.g. Parry et al. 2007).

Justification of climate policy

We further find that a majority of those citizens who believe that climate change is real considers climate policy to be justified. In general, "approval rates" tend to be substantially higher in China and Germany than in the US, although there are strong concerns about the scientific basis for climate policy in all three countries. Given that climate change is a highly complex issue entailing a substantial degree of uncertainty (e.g. IPCC 2013), this finding is little surprising. At the same time, policy design is not based on scientific evidence alone, but the outcome of a socio-political process also involving value judgments (e.g. Oppenheimer 2005). In our survey, the Chinese citizens appear to be generally more optimistic than German or US citizens about the effectiveness of past and future climate accords. Similarly, Yu et al. (2013) find that Chinese citizens tend to have high confidence in their government's ability to effectively combat climate change.

The Germans seem particularly skeptical about the chances to limit climate change, and largely consider past policy efforts to be a failure. Nevertheless, they overwhelmingly consider future international agreements important for combating climate change. A fairly large share (40%) of respondents from China, Germany and the US does not believe that all countries can benefit from climate negotiations. Thus, a large part of the population may not be aware that international cooperation in climate policy can produce a global public good.[10] Our findings on the relevance of negotiation topics suggest that people in all three countries associate international climate agreements somewhat stronger with emission targets and mitigation measures, i.e. the likely causes of climate change, rather than with adaptation issues, i.e. the symptoms of climate change. In the US, the portion of citizens which do not consider adaptation measures to be a relevant topic for international climate negotiations is particularly high. Incidentally, unlike several European countries (including Germany) or Australia, the US has not yet contributed or pledged to contribute to the UNFCCC Adaptation Fund. In sum, our findings suggest that in all three countries a majority of citizens considers

10 A prime justification for international cooperation in climate policy is the public goods character of mitigation efforts, i.e. all countries benefit from lower risk of climate damage as a result of a country's mitigation efforts. When countries decide on their mitigation efforts, without taking into account the benefits of these efforts on other countries' wellbeing, global mitigation efforts will be too low. In principle then, all countries may benefit from well-designed international climate agreements, providing an economic rationale and justification for such agreements.

international climate policy to be justified. This view is shared by a larger portion in China and Germany than in the US.

Information and representation

In all three countries, and in particular in Germany, a substantial part of the population feels badly informed and finds their own position poorly represented at international climate negotiations. This finding is consistent with the relatively critical perception of Germans on the success of previous climate conferences. In Germany and the US (but not in China), only a minority of citizens believe that all countries have the same chances to represent their interests at international climate conferences. In all three countries, though, a higher share of citizens thinks that industrialized countries - rather than developing countries - push through their own interests at international conferences. These findings indicate that citizens in China, Germany and the US question whether decision processes in international climate policy are fair and transparent. Notably, the climate summit in Copenhagen in 2009 has been criticized for lack of transparency and democratic decision making, especially since the final outcome of COP 15 had essentially been forged by only a few countries (e.g. IISD 2009). In essence, these criteria reflect aspects of procedural justice

Distributive justice

Our main finding suggests that, on average, citizens in all countries prefer the following ranking of the key guiding principles for the burden-sharing of mitigation costs: accountability ahead of capability, egalitarianism, and sovereignty. Thus, in communicating and justifying costly domestic climate policies to the electorate, governments in all three countries should point out a country's responsibility for climate change. In other words, we obtain no difference in the ranking of citizens' (stated) average fairness preferences across the three countries. Thus, on a general level, we find no evidence that citizens' (stated) fairness preferences are countervailing across countries and hence detrimental to future burden-sharing agreements. Also, in particular for the US, the government's strong focus on the sovereignty principle in climate negotiations appears to reflect citizens' fairness perception incompletely. Likewise, we find only limited support for a potential self-serving bias, which had been identified in the studies by Lange et al. (2010) for delegation members ("negotiators") and Carlsson et al. (2013) for ordinary citizens. Neither German nor US citizens appear to clearly favor burden-sharing principles that are in their countries' best economic interest. Unlike Germany or the US, China, may benefit from the accountability principle because historic emissions were relatively low. Since 2006, however, China is believed to be the largest annual emitter of greenhouse gases, and cumulative emissions are expected to soon pass those of the EU. That is, depending on the actual implementation, China would not

benefit from using the accountability principle for the burden sharing of mitigation efforts. Comparing findings across studies, is problematic, however, since methodologies differ. In particular, Carlsson et al. (2013) rely on a choice experiment designed to elicit citizens' preferences for a particular principle. Compared to our study, in Lange et al. (2010), conference delegates were presented with more complex decision tasks and more complicated burden-sharing options. Arguably, conference delegates may also have better knowledge than ordinary citizens when assessing the country-specific economic consequences of different burden-sharing principles.

Trust in climate policy

Finally, our survey results indicate that international climate agreements suffer from a lack of trust among a large portion of citizens in all countries, but the extent differs substantially across countries and issues. In all countries (in particular in Germany), a substantial part of the population believes that commitments made at international climate negotiations will not be kept. Most prominently, these responses may reflect the well publicized fact that the US never ratified the Kyoto Protocol, or that Canada formally withdrew from it in 2011. More recently, and after our survey was conducted, Japan weakened its reduction commitment under the Copenhagen Pledges/Cancun Agreements at the climate summit in Warsaw, thus further undermining trust in international climate agreements. Possibly also motivated by the lack of trust in developed countries' sincerity, a large part of the population in all three countries believe that industrialized countries should first show they successfully reduce emissions before the developing countries have to do so. Likewise, this claim may reflect the distributive justice principal 'capability', which essentially echoes Article 3.1 of the climate convention (UNFCCC 1992), and requires developed countries to take the lead in combating climate change. In any case, these findings are in line with large developing countries' ongoing requests for steeper emissions cuts from the US and other developed countries as a precondition for taking on their own targets. Many developing and emerging countries fear that a cap on emissions implies a cap on development. Finally, a large share of citizens in all countries believes that climate negotiations are used for purposes other than intended, i.e. to publicly denounce the industrialized countries or by national governments to pacify their citizens. In this sense, national governments are perceived to abuse international climate policy to push their own domestic political agenda.

Limitations and future research

As is typical for surveys relying on self-assessments, the validity of our findings may suffer from respondents' propensity to answer the survey questions in a way that will be perceived favorably by others. We tried to address this *social desirability bias* by choosing "neutral" wording, closed ended items and granting anonymity. Nevertheless,

social desirability bias cannot be excluded, since climate change is a topic that may be particularly subject to this kind of bias. In addition, for China, implementing a self-administered on-line survey turned out to be infeasible.

Our findings suggest that a large portion of the citizens rates several burden-sharing principles equally high. However, our survey did not allow exploring potential tradeoffs between these principles. For example, individuals' preferences may be convex in these principles, i.e. people may prefer averages to extremes. In this case a mix of burden-sharing of principles would gather higher support among citizens than relying on a single criterion.

While our research provides some empirical evidence that international climate negotiations are perceived as lacking procedural fairness and trust, these findings would have to be further explored in depth with a richer set of items. Previous research has focused on the impact of perceived fairness and trust in politicians or governments on people's attitudes towards public policy and environmental policy instruments. Future research could explore the effects of citizens' perceptions of procedural justice and trust in climate negotiations on their attitudes towards such policies, their willingness to accept costly national climate policies or their voluntary efforts to reduce greenhouse gases. In addition, while our analysis focuses on differences between citizens' perceptions of various principles of distributive justice within and across countries, future research could explore the determinants of these perceptions, e.g. via multivariate analyses. A better understanding of citizens' justice perceptions may help gather domestic support for international policy towards the burden sharing of mitigation costs, but also towards financing adaptation or technology transfer. These latter issues are about to take center stage at international climate negotiations.

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Appendix I: Sample Demographics

Table A1: Sample Demographics for China

Total	N=1430 (unweighted)	% (weigthed)
Gender		
female	713	50
male	717	50
Age		
18-29	379	23
30-47	684	47
48-66	349	28
67+	18	1
Education		
below secondary	333	25
secondary and higher	1078	75
Household income in Yuan*		
<4000	124	10
4000 - < 5000	105	8
5000 - < 10000	363	28
10000 - < 15000	326	24
15000 - < 25000	247	16
>25000	195	15
Region		
Beijing	220	3
Shanghai	234	3
Guangzhou	182	19
Shenyang	112	9
Wuhan	109	11
Chengdu	89	16
Shijiazhuang	89	13
Hefei	87	11
Lanzhou	141	5
Yinchuan	86	1
Quanzhou	81	7

* net income after tax and social security contributions

Table A2: Sample Demographics for Germany

Total	N=1005 (unweighted)	% (weigthed)
Gender		
female	494	51
male	511	49
Age		
18-29	192	18
30-47	478	31
48-66	306	39
67+	29	12
Education		
below secondary	452	50
secondary and higher	548	50
Household income in €*		
<1500	164	22
1500 - < 3000	323	42
3000 - < 6000	287	32
6000 - < 10000	40	4
> 10000	8	1
Region		
East	215	21
West	790	79

* net income after tax and social security contributions

Table A3: Sample Demographics for the US

Total	N=1010 (unweighted)	% (weigthed)
Gender		
female	476	52
male	534	48
Age		
18-29	100	19
30-47	385	33
48-66	412	34
67+	113	14
Education		
below secondary	321	32
secondary and higher	685	68
Household income in US$*		
<2000	124	10
2000 - <4000	468	35
4000 - <7500	61	38
7500 - < 12500	121	8
> 12500	109	9
Region		
Northwest	204	21
Midwest	230	20
South	354	37
West	222	22

* net income after tax and social security contributions

Appendix II: Survey Questions

Question 1:
Q1: How important do you consider the following global challenges to be?
a) Combating climate change
b) Combating poverty
c) Combating disease
d) Stabilization of the financial systems
e) Combating terrorism
□ Very unimportant □ Rather unimportant □ Neither important nor unimportant
□ Rather important □ Very important □ Don't know / no answer

Q2: Which of the following statements about global climate change are you most likely to agree with?
□ Global climate change is already occurring
□ Global climate change is not happening now, but it will occur in the future
□ Global climate change is not going to occur at all
□ Don't know / no answer

Q3: What, in your opinion, is the main cause of climate change?
□ Natural processes □ Human activities □ Natural processes as well as human activities
□ Don't know / no answer

Q4: In your opinion, what consequences does climate change have for
a) present day generation?
b) future generation?
□ Very negative consequences □ Rather negative consequences
□ Roughly equally positive and negative consequences □ Very positive consequences
□ Rather positive consequences □ Don't know / no answer

Q5: Do you think that we can still effectively limit climate change by climate protection measures? □ No □ Yes □ Don't know / no answer

Q6: In your opinion, should climate change be limited by human activities?
□ No □ Yes □ Don't know / no answer

Q7: The scientific findings are too uncertain to serve as the basis for climate negotiations

Q8: How successful do you think the international agreements reached so far are in combating climate change?
□ Very unsuccessful □ Rather unsuccessful □ Neither successful nor unsuccessful
□ Rather successful □ Very successful □ Don't know / no answer

Q9: How important do you consider future international agreements are for combating climate change?
□ Very unimportant □ Rather unimportant □ Neither important nor unimportant
□ Rather important □ Very important □ Don't know / no answer

Q10: How important do you consider the following issues to be for international climate negotiations?
a) Comprehensive quantitative targets to reduce global greenhouse gas emissions?
b) Measures to reduce global greenhouse gas emissions?
c) Adaptation measures to the consequences of climate change (e.g. dams for flood protection)
□ Very unimportant □ Rather unimportant □ Neither important nor unimportant
□ Rather important □ Very important □ Don't know / no answer

Q11: How strongly do you agree with the following statement?
All countries can benefit from international climate agreements.
□ Very weakly □ Rather weakly □ Neither weakly nor strongly
□ Rather strongly □ Very strongly □ Don't know / no answer

Q12: How well informed do you feel about these climate conferences?
□ Very badly □ Rather badly□ Neither well nor badly □ Rather well
□ Very well □ Don't know / no answer
Q13: How well do you think your personal position is represented at international climate negotiations?
□ Very badly □ Rather badly□ Neither well nor badly □ Rather well □ Very well
□ Don't know / no answer

Q14: How strongly do you agree with the following statements?
a) All countries have the same opportunities to represent their interests at international climate conferences.
b) The richer (industrialized) countries use international climate negotiations to push through their own economic interests yis-a-vis other countries.
c) The poorer (developing) countries use international climate negotiations to push through their own economic interests vis-a-vis other countries.
□ Very weakly □ Rather weakly □ Neither weakly nor strongly
□ Rather strongly □ Very strongly □ Don't know / no answer

Figures

Figure 1: Perceptions of distributive justice principles across countries (responses per answer category in % of total)

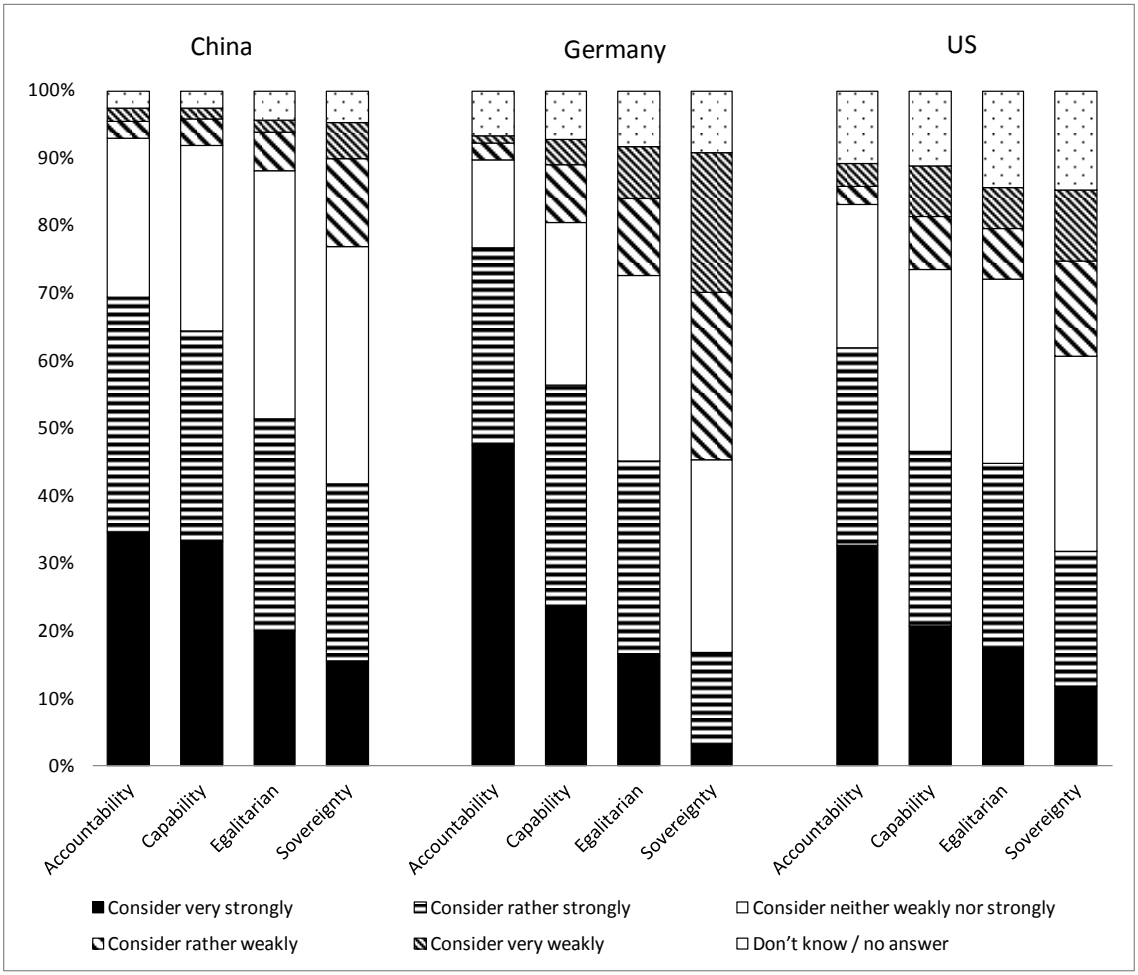

Figure 2: Trust in international climate agreements