Can *conditional* commitments break the climate change negotiations deadlock?

Arild Underdal*[1]

Jon Hovi*#

Steffen Kallbekken#

Tora Skodvin*#

*Department of Political Science, University of Oslo

#Center for International Climate and Environmental Research – Oslo (CICERO)

[1] *Corresponding author*. Postal address: Department of Political Science, University of Oslo, P.O.Box 1097 Blindern, 0317 Oslo, Norway. E-mail: arild.underdal@stv.uio.no.

Abstract

Can a conditional commitment by a major actor (e.g. the European Union) induce other major actors (such as the United States, China, India or Japan) to do more to mitigate global climate change? We analyse this question by first estimating the impact of emission reductions by one of these actors on the mitigation costs of the others, and second by exploring how domestic politics influence the willingness of the European Union and the United States to contribute. We find that an emission cut by any actor will reduce mitigation costs for all the others and thereby expand the settlement range. These cost reductions seem, however, insufficient to induce significant unilateral policy change. Emissions trading can cut aggregate costs further but also redistribute wealth. Domestic politics tend to add weight to the concerns of powerful actors that stand to lose from more ambitious mitigation policies.

Keywords

Climate-change, policy, mitigation, cooperation, contingencies

Purpose and scope

In a world characterized by complex interdependence, societies and governments often care about what others do (Keohane and Nye, 1977). More precisely, each of them cares about *major* decisions and actions of *important* others. What qualifies as 'major' and 'important' in this context may differ. Moreover, interdependence will often be an asymmetrical relationship, in which the weak are more sensitive and vulnerable than the strong. As a general rule-of-thumb, however, the tighter and more pervasive the international webs of interdependence, the more the instances wherein government policies and practices will be sensitive to those of one or more other states. When faced with global challenges too large for any single actor to cope with – such as climate change or financial market meltdowns – *all* states have sound reasons to care about what *some* others do.

Mutual concern sometimes generates cooperation. Cooperation involves an exchange of commitments, specifying each party's contribution to a joint effort. Many, possibly all, of these commitments will be *conditional*, meaning that they are made in exchange for corresponding commitments by others.[1] Parties will often have divergent interests concerning the exchange rate, and sometimes their conditions for contributing will be incompatible. A web of *divergent* contingencies can create powerful political gridlock. Worse, even when conditions are indeed compatible, a real risk exists that parties will fail to agree on the terms of cooperation (Johansen, 1979; Underdal, 1983).

Contingency webs may, however, also create opportunities for triggering change. In a setting where at least some parties adopt strategies of conditional cooperation, a move by one party to contribute (more) can, in fortunate circumstances, cause a chain of positive and mutually reinforcing responses. This positive triggering effect is of interest here. More specifically, given the EU's conditional commitment to raise its emission reduction target from 20 to 30 percent if other states raise their targets, we ask whether and to what extent that commitment can induce the United States, China, India or Japan to reciprocate.

We proceed in two steps. First, we present a series of simulations estimating the extent to which the *costs* of plausible mitigation measures for the other main actors will be affected by EU implementation of its enhanced policy. We also reverse the perspective and explore whether mitigation measures taken by one of the other states will strengthen EU incentives to contribute. For these simulations, we use a multi-sector and multi-region, intertemporal, general equilibrium model, known by the acronym DEEP (described in the Appendix). This model conceives of states (and the EU) as unitary rational actors, maximizing their economic welfare. Clearly, these assumptions leave out some important government policy determinants. We therefore also explore the likely impact of two of the missing factors – domestic politics and shared norms of distributional fairness – on a party's willingness to contribute. For reasons of space and data availability, the analysis of domestic politics will be confined to the EU and the United States.

In the next section, we turn to relevant research literature to seek studies helpful in identifying the main mechanisms of contingency and in understanding their functioning. Section three presents the results of our simulations and interprets these findings' political significance. In section four we explore whether and how domestic political processes and institutions in the EU and the United States are likely to modify or amplify contingency relationships. In section five we briefly explore how shared norms of distributional fairness may modify or amplify the conclusions from our simulation analysis. Section six summarizes our conclusions and offers suggestions for further research.

Previous research: Contingencies *can* make a difference

Here we first consider how one actor's emission reductions might affect other actors' economic welfare and, in the second part, review what four strands of research say about the role of contingencies in inducing cooperation.

The external effects of unilateral mitigation efforts

Because reduced global warming is a global public good, emission reductions in one country benefit other countries and may influence their incentives to abate. Assuming increasing marginal damage costs, Barrett and Stavins (2003: 350) argue that 'as others mitigate more, a country's incentive to mitigate at the margin falls'. Moreover, reduced global warming is equivalent to increased income for other countries; they get free something they value. This gain's effect on their mitigation efforts depends on the income elasticity of reduced global warming. If this elasticity is negative (i.e. if reduced global warming is an inferior good), other countries will *reduce* their mitigation efforts. If positive, other countries will *increase* their mitigation efforts by spending either *part* of their increased income (normal good) or even *more* than their increased income (luxury good) on increased greenhouse gas (GHG) mitigation.[2]

Unilaterally increased emission reductions by one country (A) also influence other countries' emissions through changes in competitiveness and general equilibrium effects. Many studies find that unilateral mitigation adversely influences the competitive edge of GHG-emitting companies located in A. Similarly, this adverse influence could benefit export-oriented and import-competing industries in other countries. Moreover, implementing a more ambitious emission reduction policy in country A will also reduce the demand for fossil fuels and, everything else constant, bring the price down. This price effect benefits countries that are net importers of fossil fuels, at the expense of net exporters. The joint effect of these two mechanisms is commonly defined as *carbon leakage*: the increase in carbon (or GHG) emissions in countries without a cap on emissions divided by the emission reductions undertaken by A. Carbon-leakage estimates typically range from 5 to 20 percent (Sijm et al., 2004). However, Babiker (2005) finds that carbon leakage may be as large as 50–130 percent. Others show that with endogenous technological change, carbon leakage could actually be *negative*, as technology diffusion reduces emissions (Golombek and Hoel, 2004; Di Maria and van der Werf, 2005). What drives this result is that directed technical change reduces the productivity of energy, thereby reducing the incentive to pollute for countries without a price on emissions. If relative energy demand is sufficiently elastic, such countries might even reduce their emissions.

As carbon leakage depends on the differential in carbon prices between countries (Kallbekken, 2007), a unilateral increase in emission reductions by country A will generally reduce other countries' costs of increasing their emission reductions, because they will suffer less leakage to A.

Unilaterally increased emission reductions by country A may also influence other countries' climate policies because of technological development and diffusion, network externalities, and potential standardization and coordination gains.

Finally, if country A participates in an international emission trading programme, unilaterally increased emission reductions by country A will increase the demand for – and hence the price of – emission permits. Such price increase may entail gains or losses for other countries, depending on whether they are net exporters or net importers of emission permits (Hagem and Westskog, 2005; Kallbekken and Hovi, 2007).

This brief overview shows that unilateral action may change other countries' incentives to act. Bréchet et al. (2010) analyze the conditional commitment by the EU and find that it is not sufficient to induce the USA to participate with a comparable commitment. It is, however, possible to reshape the EU commitment "so as to stabilize a larger and more ambitious climate coalition than the Kyoto Protocol in its first commitment period".[3] ~~However, a~~A unilateral increase in GHG emission reductions will not, however, necessarily induce others to follow suit; it may actually lead them to *increase* their emissions (Hoel, 1991; Buchholz et al., 1998). Such prospects may discourage unilateral action, and motivate parties to initiate some kind of cooperation instead.

Contingencies in cooperation

Cooperation is, by definition, a *joint* undertaking, involving explicit coordination of policies or practices. Extant research on cooperation strongly indicates the importance of *reciprocity*, which includes two components. One is *contingency*; 'actors behaving in a reciprocal fashion respond to cooperation with cooperation and to defection with defection' (Keohane, 1986: 5). The other is *equivalence*; the actors' relationship 'entails at least rough equivalence of benefits' (Keohane, 1986: 6).[4]

Four strands of research seem particularly relevant to determining the role of conditional commitments in global climate-change mitigation.

The first strand uses repeated games such as the infinitely repeated Prisoners' Dilemma (PD) to study the conditions for cooperation under anarchy. It has proposed various strategies that might induce others to cooperate in such games, including 'Tit-for-tat' (Axelrod, 1984),[5] 'Grim Trigger' (Taylor, 1987),[6] and 'Penance' or 'Getting Even' (Asheim et al., 2006; Barrett, 2003).[7] All these strategies prescribe that cooperation be based on (mutual) reciprocity; indeed, only contingent strategies *can* sustain cooperation as an equilibrium in the infinitely repeated PD (Patchen, 1987).

The second strand, experimental research in behavioural economics and social psychology, confirms reciprocity's significance. More specifically, this strand suggests (1) that cooperation in social dilemma situations is significantly higher than predicted by theories that assume purely self-interested actors, and (2) that this result is due mainly to people's being 'conditional cooperators', that is, inclined to respond more cooperatively when others make a cooperative move. Proposed explanations for this general pattern include reciprocity, strategic incentives, and reputation building. For example, Fischbacher et al. (2001: 398) find that 'roughly 50 percent of the subjects show conditional behavior such that the own contribution increases in the other group members' average contribution', and Frey and Meier (2004: 1717) conclude that charitable giving increases, on average, 'if people know that many others contribute'. Other factors promoting cooperative behaviour include the fact that many cooperators punish free riders even when punishing is costly (Fehr and Gächter, 2000: 993) and anticipation of prolonged interaction with other group members (Keser and van Winden, 2000). These and other findings show '…how individuals achieve results that are "better than rational" by building conditions where reciprocity, reputation, and trust can help overcome the strong temptations of short-run self-interest' (Ostrom, 1998: 1).

Focusing on *states* rather than individuals, a third strand speaks more directly to the question addressed here. *International regimes* may be defined as sets of rules, norms, and procedures established jointly by states to regulate a certain domain of human activities (for a more elaborate definition, see Krasner, 1982: 186). A typical regime fits Ostrom's description, establishing a more or less precise and firm exchange of commitments, often based on some notion of reciprocity. The more credible the member countries' commitments, including the conditions attached to their commitments, the stronger a nonmember's incentive to join the regime.[8]

Many findings in this mainstream regime tradition are largely consistent with the first strand in pointing to, inter alia, repeated interaction and differentiated and credible sanctioning mechanisms as important determinants of effectiveness (e.g. Keohane, 1984; Krasner, 1982; Barrett, 2003). Analysed within this framework, climate-change mitigation stands out as a very demanding challenge, involving a politically malignant problem, an unfavourable power distribution, and limited institutional capacity at both the global and the national levels (Hovi et al., 2009).

However, the international-regimes literature offers at least three other general conclusions relevant for our purposes (see Hasenclever et al., 1997). First, state behaviour is (to varying degrees) premised also on norms, values, and notions of collective identities that generate more cooperative behaviour than one would expect based solely on actors' material self-interest (Katzenstein, 1996; Young, 1999). Second, even a small move might, via evolutionary mechanisms, make a big difference later; in particular, norms sometimes spread or even 'cascade' through strategic adaptation and genuine internalization (Axelrod, 1986; Risse et al., 1999). Third, states are *complex* actors, and domestic policymaking and implementation processes tend to produce outcomes that deviate systematically from what would maximize national income (Victor, 2011). One fairly robust finding is that the policy measures hardest to adopt and implement tend to be those where costs are concentrated to specific sectors or groups, while benefits are widely dispersed or indeterminate (Wilson, 1973; Buchanan and Tullock, 1975). Unfortunately, most emission-control measures have these characteristics.

Finally, focusing on linkages between the international and national levels, a fourth strand considers so-called two-level games. Putnam (1988) argues that in international negotiations each country's chief negotiator must negotiate with his international counterparts (level I) and his domestic constituents (level II) *simultaneously*, because implementation of any level I agreement requires level II ratification. Thus, level I bargaining behaviour is not simply a function of what maximizes national welfare; it also reflects the interests of powerful level II constituents. Poliheuristic theory reinforces this point by arguing that '…policy-makers are likely to reject outright any alternative that poses potentially very high political costs, even if the same alternative also yields potentially high benefits on other dimensions…' (Mintz, 2004: 7).

The two-level game perspective has significant implications for the conditions under which unilaterally increased emission reductions might trigger a positive response. Level II constituents' interests determine not only whether a state can act as leader, but also whether states can *follow* someone's lead. A crucial factor is the societal distribution of costs and benefits triggered by leading or by following another country's lead. To succeed, leadership behaviour must alter the incentives of other countries' level II constituents that enjoy veto positions. If a (prospective) leader's actions fail to significantly alter these incentives, the leadership effort will likely fail even if it may increase other countries' national welfare (Skodvin and Andresen, 2009a; Victor, 2011).

This brief review leaves us with a complex picture of '…a world of *possibility* rather than of *necessity*' (Ostrom, 1998: 16); it shows that unilaterally increased emission reductions *may* generate a positive response, but *only* if certain conditions are met. Our review thus indicates a need for research that might help decision-makers and stakeholders identify those conditions and determine whether they are present in a given setting. This paper aims to contribute in identifying such conditions and determining their presence.

Contingencies in international climate policy

Here we present a series of simulations exploring contingencies within a small group of important actors: China, India, Japan, the EU and the United States. Together, these actors account for about three-fifths of global GHG emissions. Our main question is whether and to what extent commitments made by one actor reduce other actors' costs of cutting (further) their own emissions. We also estimate potential efficiency gains from policy coordination. Such gains may expand the scope for emission reductions.

For these simulations we use a multi-sector and multi-region, intertemporal, computable general equilibrium model, known by the acronym DEEP (Kallbekken, 2004). The model uses the GTAP6 database (Dimaranan, 2006). The appendix contains further details.[9]

Policy assumptions and scenarios

We assume that all five main actors are already committed to mitigation targets of some kind for 2020. These targets constitute our *baseline* policies. We then conduct simulations for different what-if scenarios for *enhanced* policies. As a starting point, we use as enhanced policies the pledges made under the Copenhagen Accord (Copenhagen, hereafter). To ensure that all enhanced policies are more ambitious than the business-as-usual (BAU) trajectory, we use external demands as enhanced policy options for China and India.

Our policy assumptions are summarized below:

- The US baseline policy is to reduce its emissions by 1 percent from the 2005 level by 2020, per the least ambitious emission reductions proposed in the 111th Congress (the Cantwell-Collins bill, see Larsen, 2009). This baseline is also close to the range of emissions reductions that can be implemented under the Clean Air Act (Richardson et al., 2010). The US enhanced policy is to reduce its emissions by 17 percent by 2020, per the US pledge under Copenhagen.
- China's baseline policy is to reduce the emissions *intensity* of its economy by 45 percent from the 2005 level by 2020, per China's pledge under Copenhagen. China's enhanced policy is to reduce its emissions by 15 percent from the BAU level for 2020, as demanded by the EU for developing countries as a group (Council of the European Union, 2009).
- India's baseline policy is to reduce the emissions intensity of its economy by 25 percent from the 2005 level by 2020, per India's pledge under Copenhagen. India's enhanced policy is the same as China's.
- The EU baseline policy is to reduce its emissions by 20 percent from the 1990 level by 2020. The EU enhanced policy is to reduce emissions by 30 percent by 2020.
- Japan's baseline policy is to reduce emissions by 4.4 percent from the 2005-level by 2020, a linear extrapolation of the 2002–2008 decarbonization trend. Japan's enhanced policy is to reduce its emissions by 25 percent from the 1990 level by 2020, as pledged under Copenhagen.
- The *Rest of Annex B* countries copy the EU's policies.
- The *Rest of the World* (ROW) baseline policy is not to reduce emissions. The ROW's enhanced policy is to establish a shadow price on emissions at the same level as in China's enhanced policy (equivalent to a carbon tax of around US$2/ton).

We assume that each country or region implements its policy cost effectively, using emissions trading, a carbon tax, or some combination of measures that equalize marginal abatement costs within the country or region.

We use these scenarios to assess the welfare impacts of various climate policies, focusing particularly on interdependencies. Note that only *mitigation costs* are included in the model. Total welfare costs would have been lower, probably negative in some instances, had we been able to estimate the value of damage avoided and to include that estimate in the model.

Contingent climate policy costs

Table 1 shows the change in welfare for the five main actors if one actor *unilaterally* moves from its baseline policy to its enhanced policy. It also shows the changes in welfare if all five main actors – and, in one scenario, all countries – adopt their enhanced policies. The welfare change is always compared to the baseline policy scenario.

Table 1 about here

Unsurprisingly, Table 1 shows that an actor always suffers a welfare loss by *unilaterally* implementing its enhanced mitigation policy. The absolute size of this welfare loss depends on how much the enhanced policy reduces emissions beyond the baseline level, on abatement costs, and on the structure of production and trade. More interesting here are the effects on *other* actors' welfare. In all cases, enhanced action by one actor benefits all other main actors because tougher emission reductions will increase production costs, thus improving the relative competitiveness of producers in other countries.[10]

These effects' political significance can be assessed using a crude three-level scale. At the lowest level, we have enhanced policies that reduce mitigation costs for another party, but not sufficiently to bring a certain enhanced policy option into the settlement range or to change that party’s ranking of alternative options. With two exceptions, all effects reported in Table 1 belong to this category. At the intermediate level, we have measures that reduce mitigation costs for another party sufficiently to make the latter’s enhanced policy more attractive than its baseline policy. Two of the results reported for China seem to fall into this category. Given our assumptions, China would be better off adopting its enhanced policy *if* this were to induce all other main actors, or all other states, to adopt their enhanced policies. Such a deal would, however, be inferior to the baseline options of all other main actors. At the highest level, the preference order is changed so that a more ambitious policy emerges as the most attractive option. A wider range of policies would have to be examined to determine whether such instances exist. In Table 1 the (hypothetical) option of free riding is always the dominant strategy, except for China where the ‘all actors’ enhanced policies’ yields the highest payoff (followed by the ‘all main actors’ enhanced policies’ scenario). The reason is that China’s enhanced policy is not particularly stringent (the shadow price is less than US$ 2 per ton CO_2), while China at the same time is one of the countries that gain the most when other actors adopt their enhanced policies.

Simulated gains from coordination

The results reported in Table 1 assume there is no policy coordination. We now discuss the potential gains from such coordination.

To determine *potential* gains, we explore what would happen under a regime of ‘perfect’ coordination – more precisely, one in which the enhanced policies of China, India, Japan, the EU and the United States are supplemented by an international emissions trading scheme. We realize that such a scheme is not presently a politically feasible option. One obstacle is that China is unlikely to accept a binding emission limit; another is that the United States is equally unlikely to accept an arrangement that leads to a large transfer of wealth to China. Yet, for determining *potential* gains, ‘perfect’ coordination is the appropriate standard.

Table 2 about here

Table 2 shows that emissions trading significantly reduces the costs of meeting a given climate policy target, mainly because of the efficiency gain that comes from equalizing marginal abatement costs across actors. The results indicate that all actors are better off with emissions trading than without (assuming constant emission reduction targets). However, India and China benefit most. The gains estimated for China and India are due to the large wealth transfers that would occur in the emissions trading market from actors with more stringent policies.

Table 2 also indicates that the EU would gain by increasing its emission reduction target from 20 percent to 30 percent *provided* (1) that doing so would induce other main actors to adopt their enhanced climate policy targets, and (2) that there would be international emissions trading under the enhanced policy scenario.

To understand the effect for each actor, consider the marginal abatement costs under the relevant scenarios. Table 3 shows how global emissions trading would equalize marginal abatement costs across all actors. The EU gains relative to its baseline scenario because its marginal abatement cost is almost halved. For the United States, the small welfare loss is equally easy to understand: even with global emissions trading, marginal abatement costs in the United States increase, partly because the US emission reduction target would be more stringent. Likewise for Japan, although the magnitude is larger because Japan's enhanced policy is more stringent than that of the United States (marginal abatement costs of US$55 in Japan versus US$20 per ton CO_2 in the Unites States).

The large welfare gains for China and India are not equally obvious initially. Marginal abatement costs for both countries increase substantially with joint emissions trading. However, remember that all actors have the same emission reduction target in the two scenarios compared in Table 2. Marginal abatement costs are much lower in China and India than in Japan, the EU and the United States. With global emissions trading, China and India will therefore be net sellers of permits. Moving to global emissions trading essentially means that the value of their permits increases from US$1.6 and US$3.8, respectively, to almost US$10 per ton CO_2. The large welfare gains for China and India are thus the result of a wealth transfer from the EU, the United States and Japan, through emissions permit purchases.

Table 3 about here

For reasons indicated above, unrestricted emissions trading is not a politically feasible short-term option. However, several less demanding modes of policy coordination exist, such as technical standards, technology transfer, joint systems for international aviation and shipping, and offset systems such as the Clean Development Mechanism. Any coordination mechanism reducing differences in marginal abatement costs between countries will somewhat reduce total welfare costs.

The most interesting observations arising from these simulations are the following six: First, *unilaterally* enhancing one's climate-change mitigation policy is costly even for the world's largest economies. Second, all main actors stand to gain from (more stringent) emission control measures taken by any of the others. Since we have been unable to estimate damage avoided by mitigation, these gains will tend to be higher than shown in our estimates. This is good news, implying, in principle, a certain willingness to contribute *if* doing so will induce others to do more. Our simulations indicate that for each of the five main actors, some cooperative arrangement can be found that will leave the actor better off than its baseline policy does. Third, the latter statement does *not* warrant the conclusion that any one arrangement will be accepted by *all.* Preferences concerning the exchange rate for contributions diverge and – as discussed below – even shared norms of equity need not expand the settlement range. Fourth, the contingency component of current EU climate-change policy makes good sense from an economic viewpoint. *Given* (1) that reducing emissions by 30 percent would induce other main actors to adopt their enhanced policies, and (2) that some international device will be introduced to equalize marginal abatement costs, the EU would actually benefit by raising its emission reduction target from 20 percent to 30 percent. Fifth, for the EU contingency to work, it must be *credible*. Well-intentioned politicians and environmentalists urging the EU to make an *un*conditional commitment to a more ambitious target might, inadvertently, undermine a linkage that could induce other actors to contribute more (see below). Finally, the potential welfare gains from an effective international mechanism for equalizing abatement costs are far larger than the indirect welfare gains from increased mitigation efforts by any single actor. The distribution of these gains is, however, skewed in a way that will most likely be unacceptable to some pivotal actors.

Contingent climate policies in the European Union and the United States

Above we estimated effects in terms of aggregate national or (in the EU case) regional welfare. International negotiations are, however, two-level games in which outcomes depend also on what meets the demands of powerful domestic constituents. Domestic constituents' interests determine both whether a state can act as a leader and whether it can follow another's lead. Here, consequently, we focus on how domestic politics may affect the *credibility* of the EU's conditional commitment and a positive US response.

Is the European Union's conditional commitment credible?

Our simulations indicate that the EU would gain by raising its emission reduction target from 20 to 30 percent by 2020 provided (1) that its policies are reciprocated by other main actors, and (2) that marginal abatement costs are equalized through emissions trading or some other mechanism. For such a conditional commitment to trigger a positive response from the United States, it would have to be credible. Is it?

In the simulation analysis we assumed that each country or region implements its baseline policies cost-effectively, equalizing marginal abatement costs across sectors. Due to distributional effects at the domestic level, however, such policies are often politically infeasible in industrialized countries (Daugbjerg and Svendsen, 2001 and 2003; Skodvin et al., 2010; Gullberg and Skodvin, forthcoming). Different sectors face different regulatory requirements and different mitigation costs. These differences play out in domestic politics and may affect a state's sensitivity to other states' policies and practices.

Assume that a country implements its baseline policy through an emissions trading system that includes only some economic sectors. Assume furthermore that the sectors included in the emissions trading system pay US$20 (per ton CO_2) for emission permits whereas the sectors exempted from the trading system bear no cost at all. Compare this to a scenario where (1) all main actors implement their enhanced policies, (2) the implementation is coordinated through a cost-effective global emissions trading system, and (3) the marginal abatement cost is US$10. The shift from the first to the second scenario would *reduce* emission costs for the sectors that were included in the first emissions trading scheme by 50 percent, but would increase emission costs from US$0 to US$10 (per ton CO_2) for all other sectors. These sectors may well be capable of blocking the shift despite prospects for aggregate gains in *national* welfare.

The EU adopted the 20 percent reduction target in the climate and energy legislative package of April 2009. Although EU legislation establishes auctioning as a basic principle for allocating emission permits, significant exemptions were granted (Council of the European Union, 2009). Notably, permits allocated to energy-intensive industries will initially be free of charge. The EU aims to auction 70 percent of the permits by 2020. Eastern European member countries whose power production depends heavily on fossil fuels have been granted exemptions from this auctioning target. In the legislation process, energy producers and power-intensive industries successfully prevented economy-wide GHG reduction measures (Skodvin et al. 2010). Can these producers and industries also block implementation of the EU's conditional commitment, thereby jeopardizing its credibility?

Implementation of this commitment will depend on an assessment of the new climate agreement's provisions (if any) and internal negotiations among member states (Directive 2009/29/EC, Article 28.1(b); see also Article 28.1(a–h); European Council, 2009: 9). If a new climate agreement meets the EU's conditions, implementing the 30 percent commitment will be subject to the co-decision procedure (Directive 2009/29/EC, Article 28.2). This procedure has two collective veto players: the European Parliament and the Council of Ministers. For simplicity, we focus on the Council, the institution most directly representing the member states.

The Nice Treaty (2001) established a triple-majority requirement for decision-making in the Council: 'a qualified majority of the weighted votes of its members [255/345]; a majority of the EU members; and a qualified majority of the population (62 percent)' (Tsebelis, 2002: 1). Thus, a minority controlling at least 90 votes in the Council acquires blocking power. Council votes are distributed in rough proportion to population size, but weighted in favour of smaller member countries. Particularly contentious decisions are moved to the European Council. This body consists of heads of government plus the president of the European Commission, meets four times yearly, and makes decisions by consensus (Consolidated version of the Treaty of the European Union, Article 15(4)).

Interest groups cannot *make* policy decisions. Governments, however, often represent their interests. Germany and Italy, for instance, have large energy-intensive industries, and argued in favour of exemptions for this sector when the EU adopted its 20 percent reduction target. Similarly, Eastern European member states opposed full auctioning for the power sector due to the potentially adverse effects it could have for this industry and the economy as a whole. Germany, Italy and Poland together control 85 votes in the Council. With the support of one (large) or two (small) additional member states, this coalition has blocking power. The Eastern European block also controls 85 votes in the Council.[11] When the 20 percent target was adopted, the Eastern European block was supported by Cyprus and Malta (who also were eligible for exemptions) and controlled 92 votes in the Council (Skodvin et al., 2010).

Prior to the 2009 Copenhagen meeting, EU and EU member-state officials expressed concern that the 30 percent commitment was 'set to divide EU member states'.[12] For instance, a 'senior diplomat from one of the EU's large member countries', speaking off the record, said the 30 percent commitment 'is being questioned by some EU member states'.[13] Whereas the UK, Belgium, Sweden, Denmark and the Netherlands were 'in favour of raising the EU's target "almost unilaterally"… a majority of EU countries including France, Germany, Italy and most of the newer member states from Central Europe are in favour of a more cautious approach' *(ibid.).* Some member states proposed 2030 as a target date instead of 2020.

After Copenhagen, the issue was raised again. While the Copenhagen Accord did not satisfy the conditions for the 30 percent commitment to take effect, some member states and the Commission nevertheless argued that the economic recession made the 30 percent target achievable at significantly lower costs.[14] Key-member-state positions and the debate's focus had changed. First, the issue was no longer whether to implement the 30 percent target if other major actors reciprocated. Rather, the debate focused on whether to make an *un*conditional commitment to the 30 percent target despite the international community's failure to adopt a (more stringent) climate treaty. Second, France and Germany now supported an unconditional increase to 30 percent. The new Eastern European member states, however, were still 'dead set against the EU raising its 2020 reduction goal to 30%'.[15]

These states can probably block an unconditional increase to 30 percent. However, if other main actors were to reciprocate, their main argument against the enhanced policy – that such a policy would jeopardize EU competitiveness – would be weakened. Moreover, other measures could compensate Eastern European member states for the increased costs, and such measures have been proposed. Given the aggregate EU welfare gains from mutually enhanced policies with international emissions trading, generous compensation might be feasible. Therefore, if other major actors were to reciprocate, the EU would likely be capable of delivering. That the EU-15 seems on track to honour its Kyoto commitment may add credibility (European Environment Agency, 2009).

The question then becomes: will other main actors respond by enhancing *their* policies?

Will the United States reciprocate?

Over the past 15 years or so, conditional climate commitments have been a central topic also on the US side. The most conspicuous example is the Byrd-Hagel Resolution (Byrd-Hagel, hereafter), adopted unanimously by the US Senate in July 1997. This resolution declares that

> ...the United States should not be a signatory to any protocol […] which would (A) mandate new commitments to limit or reduce greenhouse gas emissions for the Annex I Parties, unless the protocol…also mandates new specific scheduled commitments… for Developing Country Parties within the same compliance period, or (B) result in serious harm to the economy of the United States.[16]

By adopting this resolution, the Senate made US participation in Kyoto contingent on whether major developing countries, such as China and India, would accept 'new specific scheduled commitments'. Some senators continue to insist that the United States should not commit to binding emission reductions unless major developing countries also do so.

Yet, of the major economies included in our simulations, the US economy seems the least sensitive to changes in other actors' behaviour. In all our scenarios, the United States seems better off sticking to its baseline policy. Further simulation analysis indicates that, with global emissions trading, the EU would have to increase its emission cuts to about 65 percent (rather than 30) by 2020 for the United States to break even. The EU would suffer a welfare loss from such a deal. Alternatively, China would have to cut its emissions by about 34 percent (instead of

15) from the BAU trajectory. For China, this deal would be significantly less attractive but still above its break-even point.

Nevertheless, assume that the EU (or China) were to implement mitigation policies that would meet these enhanced requirements. Would this move be sufficient to induce the United States to enhance its policy? Again, important clues can be found in domestic politics.

Whereas domestic mitigation costs tend to be concentrated to one or a few sectors of the US economy, gains tend to be widely dispersed across societal activities and groups (Buchanan and Tullock, 1975; Daugbjerg and Svendsen, 2001). Consequently, gains in aggregate national welfare may have to be redistributed to build a coalition that can pass the legislation required. And since the prospects of a given loss tend to generate more political energy than do the prospects of an equally large gain (Kahneman and Tversky, 1979), the deal may have to be 'on the generous side'.

Other things equal, building such a coalition will be more difficult the more restrictive the legislature's majority requirements. In the United States, treaty ratification requires that 'two-thirds of the Senators present concur' with the treaty provisions (US Constitution, Article II, section 2) (e.g. Skodvin and Andresen, 2009b). In climate change policy, this requirement is a very real hurdle.

Once a treaty is ratified, however, treaty regulations acquire the status of federal legislation; they are incorporated into 'the supreme Law of the Land' (US Constitution, Article VI). Since US law enforcement provisions offer vast opportunities for using the judicial system to ensure implementation of treaty commitments (Lowi and Ginsberg, 1998), ratification makes the United States a reliable treaty partner. On the other hand, since ratification can be so consequential, the Senate often hesitates to ratify a treaty unless the commitments involved are *already* established as federal law (e.g. Fisher, 2004; Simmons, 2009).[17] The Senate's supermajority procedures raise the hurdle (Bang, 2010). In particular, the filibuster procedure implies that new federal legislation normally requires support from three-fifths of the senators.

The costs associated with US climate-mitigation measures will likely be paid mainly by the states most dependent on fossil-fuel resources. Whereas 80 percent of petroleum resources are concentrated in only four states (Texas, Alaska, California and Louisiana), 26 states share the country's vast coal resources (Fisher, 2004). In addition, states whose electricity production or energy consumption depends heavily on coal will also likely bear a significant share of the costs associated with emission cuts. Previous research has shown that the energy production and energy consumption of a state significantly influence the climate policy voting behaviour of its senators (Bang, 2010; Fisher, 2004; 2006; Skodvin, 2010). An alliance consisting of Republican and Democratic senators representing fossil-energy-dependent states can likely block US climate legislation. Feasible enhancements of other main actors' mitigation policies seem insufficient to break the gridlock in US domestic politics.

Norm-based behaviour

Governments and societies to some extent consider policy options also in terms of 'the logic of appropriateness' (March and Olsen, 1995) . Before concluding, we therefore briefly explore whether and how the findings from the simulation analysis will have to be changed if we allow for norm-based behaviour.

To answer that question requires identifying salient norms and determining how these norms guide the climate change policies of the actors involved. These are complex tasks that call for a more extensive and elaborate analysis than possible here. A few observations may nevertheless help indicate in which directions such an analysis would likely lead.

The kind of norms most directly linked to issues of conditional cooperation pertains to *distributional fairness*.[18] The challenge of climate change is intrinsically linked to huge gaps in material welfare and human development conditions. Briefly, while affluence is positively correlated with GHG emissions and with mitigation and adaptation capacities, poverty is positively correlated with vulnerability to many of the likely consequences of climate change (see e.g. Stanton, 2009; Yohe et al., 2006). This stark asymmetry has important implications regarding distributional fairness. A cursory reading of climate policy statements indicates that two principles of equity are frequently invoked and rarely disputed. One holds that the costs of collective action be distributed in proportion to *guilt* in having caused the problem. The other calls for costs to be distributed in proportion to *capacity* to shoulder the burden (Ringius et al., 2002). In the climate change case, both guilt and capacity are linked to affluence. The main policy implication of these principles is therefore straightforward and clear: the responsibility for mitigation falls largely on the rich North.

If we are right that both of these principles reflect widely *shared* norms of distributional fairness, a first hunch would be that incorporating them into our analysis would expand the settlement range. In this particular case, however, several effects can be distinguished: (1) At the level of policy *goals and doctrines*, the willingness of the EU, the United States and Japan to contribute will be (marginally) higher; (2) For China and India, a (small) gain in national welfare will not be sufficient; only agreements that also clearly reflect the principles of guilt and capacity will be acceptable;[19] (3) At the level of policy *practices*, domestic politics in the North will likely add weight to the interests of potential veto players at the expense of, inter alia, concerns with global equity; (4) In the South, domestic politics will likely strengthen demands for the rich North to shoulder the burden. The relative strength of these effects will determine the net impact on the settlement range. In this case, the aggregate impact of effects (2) + (4) may well offset that of (1) - (3). A more general and counter-intuitive lesson seems to be that in highly asymmetrical relationships, shared norms of equity need not expand the settlement range.

Concluding remarks

Can the EU's conditional commitment to cut emissions by 30 percent induce other main actors to do more to mitigate their emissions of greenhouse gases? Our analysis concludes that an additional reduction by *any one* of these actors will reduce mitigation costs for *all* the others. However, *none* of the measures examined here would be *sufficient* to induce any of the other parties to unilaterally shift from their baseline to their enhanced policies. The impact of the EU conditional commitment very much hinges on (1) the exchange rate offered and (2) the credibility of the conditionality clause itself. Our analysis strongly indicates that for each of the five actors, some cooperative arrangement can be found that would leave it better off than its baseline policy would. Moreover, an international regime including efficiency-enhancing mechanisms can help by reducing total mitigation costs significantly. This is all essentially good news, but does not imply that any of the specific arrangements preferred by one actor will be acceptable to *all*. Preferences concerning the exchange rates for contributions diverge, and domestic politics can in most instances be expected to move resistance points 'upwards'. Welfare gains from international emissions trading are unevenly distributed, in effect transferring wealth to China and India. In such a setting, even shared norms of equity may fail to break the deadlock.

To better understand how this challenge may be tackled, we need a more fine-grained and complex analysis than we could offer here. Four extensions seem particularly important. One is to incorporate into welfare calculations reliable estimates of the value of the damage avoided through mitigation measures. A second is to specify further to what extent and how actors are guided by values, norms or other notions of appropriateness. A third extension is to move from a static to a dynamic mode of analysis that would enable us to better grasp the role of feedback mechanisms (in generating patterns such as momentum) and to better determine the location and impact of critical thresholds ('tipping points'). Finally, we see a need to develop further analytical frameworks for deriving policy and institutional design implications from important conclusions. All these extensions call for a combination of theory refinement, model development and empirical research.

Acknowledgement

We would like to thank three anonymous reviewers and the editor of *International Political Science Review* for comments and suggestions that have helped us improve this article. We are grateful to Frank Azevedo for excellent language editing.

Tables

Table 1. Change in welfare (equivalent variation) under alternative scenarios, 2001–2019

	Change in welfare (percent)				
Scenario	**EU**	**USA**	**China**	**Japan**	**India**
EU's enhanced policy	-0.411	0.051	0.114	0.059	0.124
USA's enhanced policy	0.117	-0.176	0.123	0.105	0.107
China's enhanced policy	0.006	0.004	-0.059	0.004	0.005
Japan's enhanced policy	0.062	0.043	0.101	-0.727	0.091
India's enhanced policy	0.024	0.012	0.022	0.021	-0.451
Main actors' enhanced policies	-0.202	-0.063	0.301	-0.537	-0.121
All actors' enhanced policies	-0.195	-0.043	0.344	-0.514	-0.069

Table 2. Change in welfare (equivalent variation) with and without joint emissions trading

Scenario	**Change in welfare (percent)**

	EU	USA	China	Japan	India
Main actors' enhanced policies	-0.202	-0.063	0.301	-0.537	-0.121
Main actors' enhanced policies with joint emissions trading	0.192	-0.053	1.609	-0.355	1.276

Table 3. Marginal abatement costs in US$ 2001 per ton CO_2 for alternative scenarios

	Marginal abatement cost				
Scenario	**EU**	**USA**	**China**	**Japan**	**India**
Baseline policy	21.3	8.6	1.1	7.6	0.8
Main actors' enhanced policies	35.0	20.2	1.6	55.4	3.8
Main actors' enhanced policies with joint emissions trading	9.9	9.9	9.9	9.9	9.9

Appendix: The DEEP model

The DEEP model consists of five main elements: Production sectors, emissions trading, an Armington aggregation of domestic and imported goods, a capital and an investment sector, and a representative agent.

The structure of production and demand has been adopted, with some modifications, from the GTAP-EG model by Rutherford and Paltsev (2000). Production is described using two production functions, one for fossil fuel production, and one for non–fossil fuel production.

Fossil fuel production is a CES function that includes crude oil, gas and coal. Fossil fuels are produced as an aggregate of a resource and a non-resource input. Non–fossil fuel goods are produced with fixed-coefficient (Leontief) inputs of intermediate non-energy goods and an energy–primary factor composite.

Emissions are modelled as a fixed-share input of permits in both production and final demand (implemented as a Leontief technology composite of fossil fuel inputs and permits).

The regions are linked though bilateral trade flows. All goods, except the primary factors (labour and capital) and the investment good, can be traded among the regions. The model assumes that goods produced in different countries are not identical (the Armington assumption'). The importing of goods takes place in a separate 'Armington' sector. The elasticity of substitution between domestic and imported goods is four, while the elasticity of substitution among imports from different regions is eight. Each bilateral trade flow requires its own transportation service (with the exception of emission permits). This relationship is modelled as a Leontief technology between the imported good and the transportation good. The transportation margins are proportional to quantities traded.

The representative agent, who is both consumer and government, demands only the consumption good. This good is a constant elasticity aggregate of non-energy goods and energy goods. To pay for this good, the agent is endowed with labour and capital. The labour endowment grows for each year – at the same rate as the growth parameter, while capital is given as an initial capital stock. The representative agent collects all taxes and tariffs specified in the model. The agent is also endowed with emission permits – if the region is assumed to be taking part in a climate agreement. The agent uses the tax revenue and income from endowments to purchase the consumption good – or to pay for investment. While the agent gets utility only from the consumption good, investment is driven by the returns to capital generated in the next period, and by a terminal capital constraint.

The structures of the capital and investment sectors are straightforward. The capital sector converts the initial capital stock into returns to capital, and into next-period capital stock. The return to capital is determined by the interest rate, while the next-period capital stock is equal to the initial capital stock less depreciation. Investment takes place through the production of an investment good (with the same production structure as other non–fossil fuel goods). The output from the investment is next-period capital stock.

The model is an intertemporal model with a utility-maximising representative agent. Investment (growth) is endogenous, but investment is not determined, as in many other models, through a time preference rate or savings rate. Instead, the time preference rate is implied through an equilibrium growth parameter that defines a growth rate that is optimal for the original equilibrium (baseline). Investment (and thus growth) will vary between the scenarios as the representative agent seeks to maximise utility under the new conditions (the intertemporal elasticity of substitution is 0.5). The equilibrium growth parameter is differentiated between regions and time periods.

The economic data used is the GTAP 6 database (Dimaranan, 2006) – which provides input-output data for each region, bilateral trade data, and information on taxes and tariffs. These taxes and tariffs are used in the DEEP model. The emissions data is from the GTAP/EPA Project 'Towards an Integrated Data Base for Assessing the Potential for Greenhouse Gas Mitigation'.

Further details can be found in Kallbekken (2004).

Notes

[1] Depending on the type of good to be provided and on the structure of interdependence relationships, a party may focus (primarily) on the *sum total* of contributions by others or on contributions by *specific* other parties.

[2] Estimating the income elasticity of environmental improvements for a number of European data sets, Kriström and Riera (1996) consistently found the income elasticity of environmental goods to be less than one.

[3] The paper by Bréchet et al. (2010) was published after we submitted our paper. Their results are broadly consistent with our findings.

[4] ‘Equivalence’ need not imply equality measured in absolute terms. *Equity* is a widely recognized notion of fairness, involving *differentiation* according to certain criteria.

[5] Tit-for-tat cooperates in the first period and thereafter simply replicates the opponent’s move in the previous round.

[6] Grim Trigger cooperates until a defection occurs, and then defects indefinitely.

[7] Penance plays ‘cooperate’ unless another player j has been the sole defector in the previous round, in which case ‘defect’ is played (Asheim et al., 2006).

[8] In some policy domains, however (human rights being a prominent example), international regimes cannot be well understood in terms of an exchange of conditional commitments (Simmons, 2009). By signing the UN Convention Against Torture, a government is clearly *not* saying to another ‘we shall refrain from torturing our prisoners *if, and only if*, you refrain from torturing yours’.

[9] For the purposes of this paper, we set up the model with the following regions: China, India, Japan, the United States, the EU, the Rest of Annex B (RAB) countries – that is, non-EU countries that have quantified emission control commitments under the Kyoto Protocol – and the Rest of the World (ROW). The sectoral aggregation in the model is coal, refined oil, oil, gas, electricity, capital goods, and 'other manufactures and services'. The model was run with two-year intervals from 2001 (base year) to 2019. The scenarios have used economic growth scenarios from the Energy Information Administration (2008). Note that the scenarios include CO_2 emissions only.

[10] This effect will not be found for all countries, though; for example, the situation may well be different for an oil exporting country.

[11] Including Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Romania.

[12] Cited in *EurActiv*, 27 February 2009: 'EU debates emission cuts for rich nations'. Retrieved 9 December 2009 from http://www.euractiv.com/.

[13] Cited in *EurActiv*, 14 October 2009: 'EU countries get cold feet on raising climate goals'. Retrieved 10 January 2011 from http://www.euractiv.com/.

[14] *EurActiv*, 16 July 2010: 'EU's "big three" issue joint call for 30% CO_2 cuts'. Retrieved 10 January 2011 from http://www.euractiv.com/.

[15] Cited in *EurActiv*, 26 July 2010: 'Pay Eastern Europe to cut emissions and move to 30%'. Retrieved 10 January 2011 from http://euroactiv.com/.

[16] Senate Resolution 98. Congressional Record, Report No. 105-5412, 25 July 1997.

[17] Paradoxically, if US commitments are already established as federal law, US ratification will be less significant, since the United States will then implement their treaty commitments anyway.

[18] For the climate change problem broadly defined, other types of norms may be more important. A broader and deeper discussion of the role of norms is, however, beyond the scope of this article.

[19] ' Reflect' should not be interpreted as requiring strict proportionality, though.

References

Asheim GB, Froyn CB, Hovi J, and Menz F (2006) Regional versus Global Cooperation for Climate Control. *Journal of Environmental Economics and Management* 51(1): 93–109.

Axelrod R (1984) *The Evolution of Cooperation*. New York: Basic Books.

Axelrod R (1986) An Evolutionary Approach to Norms. *American Political Science Review* 80(4): 1095–1111.

Babiker MH (2005) Climate change policy, market structure, and carbon leakage. *Journal of International Economics* 65(2): 421–445.

Bang G (2010) Supermajority Procedures and Limits to U.S. Participation in International Environmental Negotiations. Oslo: CICERO, unpublished paper.

Barrett S (2003) *Environment & Statecraft: The Strategy of Environmental Treaty-Making*. Oxford: Oxford University Press.

Barrett S and Stavins R (2003) Increasing Participation and Compliance in International Climate Change Agreements. *International Environmental Agreements* 3(4): 349–376.

Bréchet T, Eyckmans J, Gérard F, Marbaix P, Tulkens H and van Ypersele JP (2010) The impact of the unilateral EU commitment on the stability of international climate agreements. *Climate Policy* 10(2): 148-166.

Buchanan JM and Tullock G (1975) Profits and Political Response: Direct Control versus Taxes. *American Economic Review* 65 (1): 139–147.

Buchholz W, Haslbeck C, and Sandler T (1998) When Does Partial Cooperation Pay? *Finanzarchiv* 55(1): 1–20.

Council of the European Union (2009) EU position for the Copenhagen Climate Conference (7–18 December 2009) – Council conclusions (14790/09). General Secretariat of the Council, Brussels.

Council of the European Union (2009) 'Council adopts climate-energy legislative package, 8434/09 (Presses 77)'. *Council of European Union*, Brussels, 6 April 2009.

Daugbjerg C and Svendsen GT (2001) *Green Taxation in Question: Politics and Economic Efficiency in Environmental Regulation*. Houndmills: Palgrave.

Daugbjerg C and Svendsen GT (2003) Designing green taxes in a political context: From optimal to feasible environmental regulation. *Environmental Politics* 12(4): 76–95.

Dimaranan BV (ed.) (2006) *Global trade, assistance, and production: The GTAP 6 data base*. Center for global trade analysis, Purdue University, West Lafayette, USA.

Di Maria C and van der Werf E (2008) Carbon Leakage Revisited: Unilateral Climate Policy with Directed Technical Change. *Environmental and Resource Economics* 39(2): 55–74.

Energy Information Administration (2008) *Annual Energy Outlook 2008 with Projections to 2030*. U.S. Department of Energy, Washington, DC. Available at: http://www.eia.doe.gov/oiaf/aeo/.

European Environment Agency (EEA) (2009). Non-industrial emissions key for meeting Kyoto targets. Press release, 12 November, 2009.

EU Commission (2008) '20 20 by 2020', Communication From the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008DC0030:EN:HTML:NOT

Fehr E and Gächter S (2000) Cooperation and punishment in public goods experiments. *American Economic Review* 90(4): 908–994.

Fischbacher U, Gächter S, and Fehr E (2001) Are people conditionally cooperative? Evidence from a public goods experiment. *Economics Letters* 71(3): 397–404.

Fisher D (2004) *National governance and the global climate change regime*. Lanham: Rowman & Littlefield.

Fisher D (2006) Bringing the Materials Back In: Understanding the U.S. Position on Climate Change. *Sociological Forum* 21(3): 467–494.

Frey BS and Meier S (2004) Social comparison and pro-social behavior: Testing "conditional cooperation' in a field experiment. *American Economic Review* 94(5): 1717–1722.

Golombek R and Hoel M (2004) Unilateral emission reductions and cross-country technology spillovers. *Advances in Economic Analysis and Policy* 4(2): article 3.

Gullberg AT and Skodvin T (forthcoming) Cost effectiveness and target group influence in Norwegian climate policy. *Scandinavian Political Studies*.

Hagem C and Westskog H (2005) Effective Enforcement and Double-edged Deterrents: How the Impact of Sanctions also Affect Complying Parties. In: Stokke OS et al., (eds) *Implementing the Climate Regime: International Compliance*. London: Earthscan, 107–125.

Hasenclever A, Mayer P, and Rittberger V (1997) *Theories of International Regimes*. Cambridge: Cambridge University Press.

Hoel M (1991) Global Environmental Problems: The Effects of Unilateral Actions Taken by One Country. *Journal of Environmental Economics and Mangement* 20(1): 55–70.

Hovi J, Sprinz DF, and Underdal A (2009) Implementing Long-term Climate Policy: Time Inconsistency, Domestic Politics, International Anarchy. *Global Environmental Politics* 9(3): 20–39.

Johansen L (1979) The Bargaining Society and the Inefficiency of Bargaining. *Kyklos* 32(2): 497–522.

Kahneman D and Tversky A (1979) Prospect theory: An analysis of decisions under risk. *Econometrica* 47(2): 263–291.

Kallbekken S (2007) Why the CDM will reduce carbon leakage. *Climate Poli*cy 7(3): 197-211.

Kallbekken S (2004) A description of the dynamic analysis of economics of environmental policy (DEEP) model. Oslo: CICERO, CICERO Report 2004:1.

Kallbekken S and Hovi J (2007) The Price of Non-compliance with the Kyoto Protocol: The Remarkable Case of Norway. *International Environmental Agreements* 7(1): 1-15.

Katzenstein PJ (ed) (1996) *The Culture of National Security: Norms and Identity in World Politics*. New York: Columbia University Press.

Keohane RO (1984) *After Hegemony: Cooperation and Discord in the World Political Economy*. Princeton, NJ: Princeton University Press.

Keohane RO (1986) Reciprocity in International Relations. *International Organization* 40(1): 1–27.

Keohane RO and Nye JS (1977) *Power and Interdependence: World Politics in Transition.* Boston: Little, Brown & Co.

Keser C and van Winden F (2000) Conditional cooperation and voluntary contributions to public goods. *Scandinavian Journal of Economics* 102(1): 23–39.

Krasner SD (1982) Structural causes and regime consequences: Regimes as intervening variables. *International Organization* 36(2): 185–205.

Kriström B and Riera P (1996) Is the Income Elasticity of Environmental Improvements Less than One? *Environmental and Resource Economics* 7(1): 45–55.

Larsen J (2009) Emission reductions under cap-and-trade proposals in the 111th Congress. Washington, DC: World Resources Institute. www.wri.org/publication/usclimatetargets.

Lovi TJ and Ginsberg B (1998) *American Government: Freedom and Power.* New York: W. H. Norton & Company.

March JG and Olsen JP (1995) *Democratic Governance*. New York: The Free Press.

Mintz A (2004) How Do Leaders Make Decisions? A Poliheuristic Perspective. *Journal of Conflict Resolution* 48(1): 3–13.

Ostrom E (1998) A Behavioral Approach to the Rational Choice Theory of Collective Action. Presidential Address, American Political Science Association 1997. *American Political Science Review* 98(1): 1–22.

Patchen M (1987) Strategies for Eliciting Cooperation from an Adversary. Laboratory and Internation Findings. *Journal of Conflict Resolution* 31(1): 164–185.

Putnam RD (1988) Diplomacy and Domestic Politics: The Logic of Two-Level Games. *International Organization* 42(3): 427–460.

Richardson N, Fraas AG, Burtraw D (2010). Greenhouse Gas Regulation under the Clean Air Act: Structure, Effects, and Implications of a Knowable Pathway. RFF Discussion Paper 10–23. Washington DC: Resources for the Future.

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

Risse T, Ropp SC, and Sikkink K (eds) (1999) *The Power of Human Rights*. Cambridge: Cambridge University Press.

Rutherford TF and Paltsev SV (2000). GTAP-Energy in GAMS: The Dataset and Static Model. Working Paper No. 00-2. Department of Economics. University of Colorado, Boulder, CO.

Sijm JPM, Kuik OJ, Patel M, Oikonomou V, Worrell E, Lako P, Annevelink E, Nabuurs GJ, Elbersen HW (2004). Spillovers of climate policy: An assessment of the incidence of carbon leakage and induced technological change due to CO_2 abatement measures. Scientific Assessment and Policy Analysis. Netherlands Research Programme on Climate Change, Amsterdam.

Simmons BA (2009) *Mobilizing for Human Rights: International Law in Domestic Politics*. Cambridge: Cambridge University Press.

Skodvin T (2010) 'Pivotal politics' in U.S. energy and climate legislation. *Energy Policy* 38: 4214-4223.

Skodvin T and Andresen S (2009a) Domestic constraints on leadership performance in international climate negotiations. Paper presented at the 2009 Amsterdam Conference on the Human Dimensions of Global Change, 1–4 December, 2009.

Skodvin T and Andresen S (2009b) An agenda for change in U.S. climate policies? Presidential ambitions and congressional powers. *International Environmental Agreements* 9(3): 263–280.

Skodvin T, Gullberg AT, and Aakre S (2010) Target group influence and political feasibility: The case of climate policy design in Europe. *Journal of European Public Policy* 17(6): 854-873.

Stanton EA (2009) Greenhouse Gases and Human Well-Being: China in a Global Perspective. Stockholm Environment Institute: Working Paper WP-US-0907.

Taylor M (1987) *The Possibility of Cooperation*. Cambridge: Cambridge University Press.

Underdal A (1983) Causes of Negotiation 'Failure'. *European Journal of Political Research* 11(2): 183-195.

Underdal A and Hanf K (eds) (2000) *International Environmental Regimes and Domestic Politics: The Case of Acid Rain.* Aldershot: Ashgate.

Victor DG (2011) *Global Warming Gridlock: Creating More Effective Strategies for Protecting the Planet*. Cambridge: Cambridge University Press.

Wilson JQ (1973) *Political Organizations*. New York: Basic Books.

Yohe G, Malone E, Brenkert A, Schlesinger M, Mej H, and Xing X (2006) Global Distribution of Vulnerability to Climate Change. *Integrated Assessment Journal* 6(3): 35–44.

Young OR (1999) *Governance in World Affairs*. Ithaca, NY: Cornell University Press.