

Commitments through Financial Options

A Way to Facilitate Compliance with Climate Change Obligations

Roland Ismer and Karsten Neuhoff¹

Governments willing to commit themselves to maintain carbon prices at or above a certain level face the challenge that their commitments need to be credible both towards investors in low carbon technology and towards foreign governments. The present paper argues that governments can make such commitments by issuing long-term put option contracts on the price of CO₂ allowances. It also explains the contract structure that protects against government interference, which potentially threatens the credibility of commitments.

I. Introduction

The formidable challenge of mitigating the effects of climate change requires long-term action by the government. This involves policies to advance low carbon technologies, to internalize carbon dioxide prices and to remove institutional barriers for a low-carbon economy (Neuhoff 2006). This paper focuses on price internalization, which is arguably politically the most challenging task as adjustment of relative prices can imply large rent transfers and unilateral implementation might create competitive disadvantages. Long-term government commitments to stringent price internalization have two objectives. On the domestic level, a stable regulatory regime facilitates investment decisions. On the international level, such commitments bridge the lag between negotiations and subsequent implementation.

The first of these two objectives may be called the *internal commitment problem* and relates to difficulties in the domestic legal order concerning relations between the government and investors. It has been shown that governments may be tempted to adopt time-inconsistent policies regarding environmental taxation (Abrego/Perroni 2002; Helm/Cameron/Mash 2005, p. 314; Marsiliani/Renström 2000), an analysis that can be extended to CO₂ allowances. Of

¹ Roland Ismer (roland.ismer@jura.uni-muenchen.de) is a lecturer at the law faculty of the Ludwig-Maximilians-University of Munich, Germany and practices law in Munich. Karsten Neuhoff (karsten.neuhoff@econ.cam.ac.uk) is a Senior Research Associate at the Faculty of Economics of the University of Cambridge and a research affiliate at the German Institute for Economic Research, Berlin. We are grateful to Angus Johnston, Christoph Holtwisch, Nina Jenke and David Newbery for helpful comments and to the UK research council for financial support under the TSEC grant.

particular concern from a climate change perspective would be situations in which the government could later on reduce the price for carbon emissions: if investors are aware of that risk they are likely to under-invest in energy efficiency and low carbon technologies. To avoid such insecurity, there have been repeated calls for long-term contracts regarding carbon pricing (Newbery 2003, Helm and Hepburn 2005).

The second represents the *external commitment problem*: the global public good character of climate change abatement² implies that individual countries face the much-discussed incentive to "free-ride" on other countries' efforts – countries that do not reduce their emissions nevertheless enjoy the benefits of the emissions reductions by others. Even where countries, by way of an international agreement or less formally so by way of a unilateral announcement or a series of such announcements, have assumed obligations to reduce greenhouse gas emissions, incentives remain for the signatories to later renege on the obligations. To make negotiations meaningful any obligations taken on by a state would therefore have to be credible. Absent a world power adjudicating and policing the obligations, this requires the design of a mechanism to which all parties can assent at the time of concluding the agreement (*ex ante*, i.e. at the end of the bargaining phase) and which effectively ensures *ex post compliance*, i.e. behavior in adherence to and conformity with the prescriptions and proscriptions of the behavioral regime established in respect of a particular issue area (Young 1979; Ehrmann 2002, p. 432) in the phase after taking on the obligation.³ A fairly large literature has confirmed that Henkin's famous aphorism ("[i]t is probably the case that almost all nations observe almost all principles of international law and almost all of their obligations almost all of the time" (Henkin 1979, 47; critical of this view e.g. Weiss 1999) is true even without effective enforcement mechanisms (Bradford 2004; Holtwisch 2006, 265 ff.). Nevertheless, influential contributors to the literature (e.g. Bodansky 2003, p. 39) have voiced doubts whether that would still be true for "deep cooperation" where implementation would require significant departure from what would have been done in absence of the agreement (Downs et al. 1996, 383). Some scholars have even rejected international agreements for lack of enforceability (Barrett 2003, p. 389 and Barrett 1999, p. 133).

² I.e. the fact that emissions reductions by one state promises advantage of the other state, regardless of whether or not that second state engages in emissions reductions itself. For a more rigorous definition of public goods see e.g. Atkinson/Stiglitz (1980), 483 ff.

³ For an overview of theories on why states comply with international law see Bradford (2004) and the collected articles in Zaelke/Kaniaru/Kružíková (2005).

The present paper proposes a "two obligations" approach – combining domestic obligations to investors with international obligations – that provides a direct solution to the internal commitment problem. It starts out from the insight that in liberal democracies, natural and legal persons have strong, inalienable property rights against their governments. The governments cannot simply take away these property rights, but must abide by a set of restrictions. Thus, natural and legal persons can conclude options contracts with the government, the obligations under which are enforceable. We therefore propose that the government issues put options on the price of allowances to private, corporate or financial investors. The put options give investors the right, but not the obligation, to sell allowances to the government at the strike price. Towards the investors, the government is therefore fully committed to a price floor for future allowances. This protection of investors by domestic law can be complemented, or in some cases substituted, by an appropriate international mechanism. Disputes arising from the option contracts can be made subject to international arbitration, e.g. by the International Chamber of Commerce.

Issuing the put options helps to solve the external commitment problem through two channels: first, *ex ante*, the government affects the price of the emissions rights by deciding on the amount and modalities of issuing, banking and transferring emission rights. If put options for allowances have been issued, the government must observe the minimum carbon price or face the financial consequences. A rational government will generally adjust its issuance in order to avoid the large financial liability that would be triggered if the carbon price fell below the strike price of the options. The level of commitment in international agreements on climate change can thus be enhanced if the parties issue put options on the carbon price. Once the options are issued the government must observe the minimum carbon price or face the financial consequences. Alternatively, the states may unilaterally promise to maintain the carbon price above a certain threshold. Such unilateral commitments could lead to an informal repetition by states successively entering into ever more stringent obligations (at least initially) without any formal international agreement. In essence, the scheme allows that the obligations both under the international agreement and under the unilateral promise (hereinafter referred to as *International Obligations*) can become enforceable. Second, issuing the options introduces an automatic *ex post* stabilizer: if the carbon price were to fall below the strike price of the options, then market participants would exercise their options and sell back allowances. If the volume of outstanding options is sufficiently large, then this will

retain the price at the strike price level.⁴ To ensure that this amount of outstanding options is sufficiently large, it may not suffice to issue options only to investors in low carbon technology. In this case options have to be designed such that they are also attractive also to, for example, financial investors.

We were inspired by the idea of long-term carbon contracts, which are also referred to as long-term contracts for difference (Newbery 2003, Helm/Hepburn 2005). If the government promises in such a contract to buy back allowances in the future or pay the price difference relative to a strike price, this would increase the motivation for governments to implement a more stringent policy. However, in contrast to the suggested option contracts, the counter party to future contracts bears the downside risk if allowance prices exceed the contract price. Only persons that use the forward contract to hedge risks created from uncertain carbon prices are interested in signing such contracts. This reduces the contract volume and thus the level of government commitment. Moreover, although investors in low carbon power stations might benefit from such long-term contracts as their returns are driven by electricity prices that are linked to carbon prices, the forward contracts may create additional risks for them. This would in particular be the case where increases in carbon prices do not result in corresponding increases in the electricity price, e.g. because other low carbon technologies are marginal. Likewise, if plant operation is interrupted because of technical difficulties or high price increases of input factors, the obligations under the long-term carbon contract continue, thus possibly increasing risk exposure and reducing the real option value of physical assets. These risks can result in a combination of the following two adverse effects: first, they reduce demand for long-term carbon contracts and, second, they reduce net revenues for future governments because they are reflected in a risk premium pushing up the contract price of the long-term carbon contracts.

The option contract does not share these difficulties. Buyers of these option contracts are not exposed to liabilities. With sufficient outstanding option contracts the commitment is sufficiently strong, the likelihood of low carbon prices is low and thus the value and price of the contracts is close to zero, which makes the contracts easily accessible as a risk-hedging device under many circumstances.

⁴ The options can ensure a price floor, if there are more options issued than could be the maximum excess supply of allowances, e.g. caused by technology and demand uncertainty.

Our proposal differs from international agreements that directly create obligations for individuals, e.g. the provisions of international criminal law, and from work on attempts to advance a substantive environmental human right,⁵ since in our proposal – in contrast to the suggestions in the literature (Yang 2006, p. 35) – both the obligor and the obligee of the international agreement are states. At the same time, it is also structurally different from conventions entitling the individual to pursue legal actions or to start arbitration procedures against states, such as the ICSID Convention,⁶ because these conventions directly give benefits to individuals, whereas in our proposal, only the option contract, but not the international obligation, gives rights to the individuals. Neither does the approach advocated in this paper strictly present a case of entrepreneurial enforcement, where non-governmental entities and private citizens can trigger or participate in enforcement action (Yang 2006, p. 34; Vázquez 1992): the approach developed here does not give the individuals any means directly to end government non-compliance, but merely alters the incentives the government faces when not complying. In its aims, the mechanism proposed here is somewhat similar to the proposal by Helm, Hepburn and Mash (2005) advocating an independent authority that monitors the observance of carbon emissions targets. Independent central banks have successfully illustrated how such institutional independence creates credibility for time frames relevant for inflation targeting. Yet investment decisions in low carbon technologies face longer time frames, over which governments can change institutions, and thus we think our additional commitment mechanism is beneficial.

II. The Two-Obligations Approach

1. Envisaged Context

Before we describe the proposal in more detail, we specify the assumptions under which we discuss the economic viability of the scheme. We did not investigate to what extent these can be relaxed without jeopardizing the scheme. We assume a quantity-based approach specifying emissions targets rather than a price-based approach through a tax. The countries seek to contribute to emission reductions through the implementation of a national – or, in the case of the European Union, regional – emissions trading system. Such a market is sufficiently liquid

⁵ See Bell/McGillivray (2006), 175; DeMerieux (2001); Kiss (1992); Lee (2000). On problems regarding the burden of proof, see Filho (2005), 6.

⁶ The ICSID Convention allows for the settlement of investment disputes between states and nationals of other states. It is, however, not applicable to our case for lack of an "investment", see Bishop/Crawford/Reisman (2005), 9.

so as to provide reliable price signals. Emitters cannot buy allowances issued outside their trading system or otherwise procure them, i.e. through joint implementation or clean development mechanisms (cf. Jamin/Depledge 2004, 159 ff. and 187 ff.). We do not discuss the merits or means of implementing a price ceiling for the allowances price ("safety valve").⁷

2. The Mechanics of the Scheme

The following scheme should be used to secure internal and external commitment: The states should agree among themselves, or unilaterally undertake, to sell put options to third parties, i.e. options which give the third party the right to sell an allowance of that state for a certain fixed strike price. A holder of such an option who was willing to exercise it would hold or purchase an allowance in the market and sells the allowance to the government for the strike price upon exercising the option. Three variables can be used by the states to fine-tune their credible commitment: strike price, the number of options and the duration of options. The strike price can be freely negotiated between the states, or, in case of unilateral measures, freely set by the state assuming the obligation. Higher strike prices, more outstanding options or options with longer duration increase the commitment by the government. The maximum amount of the government's liability can easily be calculated as strike price multiplied by the number of put options handed in; the profit made by the third party per put option would then be the strike price minus the allowance price.

The options should be sold to private individuals or corporate sector investors. In particular, the put options allow investors in abatement technology and in renewable energy to hedge against the risk that lower carbon prices reduce production costs of competing products. This would reduce demand for low carbon technologies and thus sales revenue. Financial investors do not acquire the options to hedge a position but as an investment opportunity. If they were to own a large fraction of outstanding options, they might be tempted to seek influence over government policy. To reduce that opportunity, the direct or indirect ownership of the options above a threshold level could be published. The incentive to manipulate the allowance market price can also be reduced by requiring a physical settlement rather than a cash settlement of the options. This means that an option holder has to hand over

⁷ According to contributions in the literature, affording the government this safety valve may bring about results that essentially replicate the desired properties of a carbon tax rather than an emissions trading scheme, see McKibben/Wilcoxon (2002); Pizer (1999); Pizer (2002).

an allowance when he exercises the option. The payment is not affected by the carbon price and thus the incentive to manipulate the carbon price is reduced.

The scheme can be illustrated by the following example: the government of the US promises to maintain the price of carbon emissions at or above USD 20. In order to do that, the government issues one hundred million put options on allowances with a strike price of USD 20 and duration of five years. If the price of carbon falls to USD 11 at the end of the five-year period and assuming infinitely elastic supply of allowances at such price, option holders not selling the option on would buy an allowance on the market for USD 11 and sell it on, using the put option, for a price of USD 20. The government would then have to spend the maximum of USD 2 billion (one hundred million times USD 20). Assuming that the government initially auctioned the allowances these costs are balanced against auction revenue of USD 1.1 billion. Thus the net exposure of the government, and net gain for the option contract holders, would be USD 0.9 billion. Anticipating this outcome, the government will *ex ante* sell fewer allowances. In addition, where the assumption of infinitely elastic supply does not hold, there will be a second effect: *ex post* (i.e. after the government has issued the allowances), holders of the put option will, through their purchase of the allowances, drive up the carbon price thus automatically stabilizing prices. If the amount of option contracts issued is sufficiently large, then the scheme effectively creates a floor of USD 20 for the allowance-price. The policy objective is satisfied without triggering a financial penalty for the government auctioning allowances.

Two security mechanisms should be introduced further to protect investors: first, there should be a fictitious price of zero for the allowances should the state in question choose to disband the emissions trading scheme altogether. In this case owners of put options would receive the strike price of the options. Second, the parties to the option contract should agree on an arbitration clause that subjects disputes under the options contract to arbitration by a pre-defined arbitrator. For example, the arbitration may take place under the auspices of the Paris-based International Chamber of Commerce for disputes that do not involve Member States of the European Union. Such arbitral awards are more easily enforceable in third states.

What interest would a state have in subjecting itself to such a mechanism? Where the international obligation is incorporated in an international agreement, the answer to this question becomes apparent when one looks at the underlying problem: at the time of concluding an international agreement, the states prefer agreement to non-agreement and they

would generally like the agreement to be implemented as agreed. Only later does a situation arise which is akin to the prisoner's dilemma: each state individually does better if it cheats upon the other and does not abide by its obligations, even though globally, co-operation would be the best outcome. In contrast, after such a mechanism has been implemented, the situation is changed: the state has a strong incentive to keep the price of allowances higher than the strike price because then no put option would be exercised. Otherwise, the state would have to make a potentially very large payment to third party investors. This means that the state will – under normal circumstances – choose to keep the carbon price high and thus abide by its obligations. If the other state likewise were to issue options, then states would tend to comply with international agreements because at the time when the decision whether or not to comply is being made, it is in the state's best interest to comply. Or in other words: issuing the options makes non-compliance far less attractive and thus induces the state as a rational actor to choose compliance.

Similarly, a unilateral obligation may be incurred in expectation of reciprocity, i.e. in the expectation that once one state has taken the lead and announced credible reduction obligations, other states will follow suit and will in turn assume credible reduction obligations. For this, the options mechanism seems particularly well suited. As other states follow, the leading state may take the additional step of increasing the commitment by issuing options with a higher strike price and thereby initiate a new round of stricter commitments. Thus negotiations are translated into a repeated game, opening them for the opportunity of engaging the public and thus increasing acceptance of policy decisions (Setear 1996).

III. The Legal Backbone: Human Rights and Arbitration

The following section will explain that the property guarantee protects against invalidation of option rights by the government. The terms and conditions of the option contract may provide further protection by subjecting the dispute to international arbitration and by the government's waiver of its sovereign immunity. This would also make the scheme independent of the functioning of the legal order of the state granting the options.

1. Human Rights Protect against Invalidation of Option Rights by the Government

In legal terms, the main challenge is to devise a scheme that is secure against the government simply invalidating the options. The starting point should be the fact that liberal democracies

protect property rights held by individuals or associations not only against disruption from other individuals, but also against the state itself. This legal⁸ protection of property rights makes the proposed approach distinct from the private enforcement approach which, to a large extent, only gives standing to the private individuals concerned, the abolition of which would not trigger compensation.

According to settled case law of the European Court of Justice, "fundamental rights form an integral part of the general principles of law, whose observance the Court ensures. For that purpose, the Court draws inspiration from the constitutional traditions common to the Member States and from the guidelines supplied by international treaties for the protection of human rights on which the Member States have collaborated or to which they are signatories (See, to that effect, Case 44/79 *Hauer* [1979] ECR 3727, paragraph 15). The European Convention on Human Rights has special significance in that respect (Case C-274/99 *P. Connolly v Commission* [2001] ECR I-1611, paragraph 37, and Case C-94/00 *Roquette Frères* [2002] ECR I-9011, paragraph 25). The principles established by that case-law have been reaffirmed in the preamble to the Single European Act and in Article F(2) of the Treaty on European Union. They are now set out in Article 6(2) EU pursuant to which the Union shall respect fundamental rights, as guaranteed by the European Convention for the Protection of Human Rights and Fundamental Freedoms ... and as they result from the constitutional traditions common to the Member States, as general principles of Community law. The right to property is one of the fundamental rights protected by the Court" (Case C-20/00 and 64/00 *Booker Aquaculture and Hydro Seafood*, [2003] ECR I-7411, paragraphs 65 ff.). Article 1 of the First Protocol of the European Convention on Human Rights, to which the European Court of Justice referred, provides for the protection of property stating that "each natural or legal person is entitled to the peaceful enjoyment of his possessions. No one shall be deprived of his possessions except in the public interest and subject to the conditions provided for by law and by the general principles of international law". This guarantee is then qualified among other qualifiers by the "right of a State to enforce such laws as it deems necessary to control the use of property in accordance with the general interest".

The entitlements arising from the option contract would fall under the term "possessions". The term has been construed broadly by the European Court of Human Rights and includes contractual rights, even if the rights from that contract are conditional. In

⁸ Besides that, of course, there are other non-legal forms of protection of property rights in liberal democracies such as through media, lobbying and other types of organized societal action, see Victor (1999), 158.

addition, it has been held that in principle the right to the enforcement of a contract was a possession for the purposes of the First Protocol (App. No. 12947/87 (1989) 62 D&R 226, 234 – *Association of General Practitioners v. Denmark*).

The property guarantee protects against the deprivation of the owners from their rights of property, i.e. the extinction of the owner's rights regarding the options. A deprivation may only take place where the measure was in the public interest, which, however, is subject to a very limited review only, largely aimed at finding and disallowing cases of manifest arbitrariness. In addition, the deprivation measure must be proportionate. Proportionality requires a fair balance between the interest of the community and the requirement of the protection of the individual's fundamental rights. In particular, an individual and excessive burden must not be imposed on the individual. The taking of property without payment of an amount reasonably related to its value would normally constitute a disproportionate act. Legitimate objectives of 'public interest' such as pursued in measures of economic reform or measures designed to achieve a greater social justice may, however, call for less than reimbursement of the full market value (Van Dijk/van Hoof 1998, 631 ff.).

All this means that an act by the European Union aimed at annihilating the options scheme would trigger compensations payments. A contrary provision in the act stipulating that the compensation should be zero would be null and void.

Similarly, in the US, the Fifth Amendment provides inter alia that no person shall be deprived of property except where private property is taken for public use and with just compensation. Contractual option rights fall under the heading of "property" (*Lynch v. United States*, 292 U.S. 571, 579 (1934)). If the taking in the form of invalidating the option rights may be held to follow public use – which is not altogether unlikely, seeing the recent tendencies in the rulings by the US Supreme Court, for example in the *Kelo v. City of New London*, 545 U.S. [] (2005) property development case – then the real issues becomes how much compensation is needed for it to be *just compensation*. "When the power of eminent domain is exercised, it can only be done by giving the party whose property is being taken over or whose use and enjoyment of such property is interfered with, full and adequate compensation, not excessive or exorbitant, but just compensation" (*Backus v. Fort Street Union Depot Co.* 169 U.S. 557, 573 (1898)). Generally, the amount to be compensated is determined by the market value of the property (*United States v. Miller*, 317 U.S. 369, 374 (1943)). However, valuation is not a straight-forward exercise (Serkin 2005), and compensation based on the

market value may be problematic when the market value of the options is low because the markets expect the government not to default.

One might assume that this could offer an opportunity to undermine the mechanism. Governments might abolish the mechanism at a point in time when the value of the options is low and thus also the required compensation would be low. Therefore, the punishment would be endangered. However, as the process of abolishing the options *per se* changes the value of the options – by manifesting an increased likelihood that allowance prices will drop – the value of the option increases. Hence the *ex ante* valuation of the option seems no longer "just". But it is unclear what value should take the place of the *ex ante* market price to provide for a "just compensation".

One solution to that conundrum could be to specify in the terms and conditions of the contract an appropriate compensation for the holders of the options, e.g. perhaps at the level of the strike price. This would apply if trading of the underlying base value (i.e. allowances) ceases. Such a conditional claim would also be protected under the property guarantee.; even if the government wanted to claim that the sum should be lower, the sum should at least still be close to the full payment, creating a risk for the government significant enough to act as a deterrent.

2. Arbitration and Waiver Allow International Enforcement

Under the well-established sovereign immunity doctrine of public international law, one sovereign state (the forum state) does not adjudicate on the conduct of a foreign state; thus the foreign state is entitled to procedural immunity from the processes of the foreign state. This means states can generally not be sued in courts of another country. Moreover, enforcement by a state regarding titles obtained against another state is generally not permissible either. Indeed, "there is widespread acceptance that the immunity of the foreign State from adjudication jurisdiction may properly be restricted by exceptions, whereas immunity from enforcement jurisdiction remains largely absolute" (Fox 2004, p. 21). Following this principle, if a property guarantee is undermined or held not to apply by the domestic courts of a state issuing the options, the holders might be excluded from pursuing their claims in the courts of another jurisdiction. This could apply both to obtaining title and to enforcing such title.

Yet, as already indicated, the immunity granted to states is not absolute; rather, a state entering into commercial transactions is not given immunity from adjudication. In the words of (the British judge) Lord Wilberforce:

"The basis on which one state is considered to be immune from the territorial jurisdiction of the courts of another State is that of a '*par in parem non habet imperium*' ... The relevant exception, or limitation, which has been engrafted on the principle of immunity of states, under the so-called restrictive theory, arises from the willingness of States to enter into commercial or other private law transaction with individuals. It appears to have two main foundations: (a) it is necessary in the interests of justice to individuals having transactions with States to allow them to bring such transactions before courts; (b) to require a State to answer a claim based on such transactions does not involve a challenge or inquiry into any act of sovereignty or governmental act of that State. It is, in accepted phrases, neither a threat to the dignity of that State nor any interference with its sovereign functions" (*I Congreso del Partido* [1983] 1 AC 244).

Indeed, the exception is now enshrined e.g. in Section 3 of the British State Immunity Act 1978⁹ and in Section 1605 of the US Foreign Sovereign Immunities Act, as amended in 1997.¹⁰ Furthermore, in 2004, the UN General Assembly (A/RES/59/38) adopted the UN Convention on the Jurisdictional Immunities of States and their Property (hereinafter: "UN Convention"), which however must still be ratified by the UN member states.

⁹ Section 3 reads:

- "(1) A State is not immune as respects proceedings relating to
- (a) a commercial transaction entered into by a State;
 - (b) an obligation of the State which by virtue of a contract (whether a commercial transaction or not) falls to be performed wholly or partly in the United Kingdom...
- (3) In this section, 'commercial transaction' means
- (a) any contract for the supply of goods or services;
 - (b) any loan or other transaction for the provision of finance and any guarantee of indemnity in respect of any such transaction or any other financial obligation;
 - (c) any other transaction or activity (whether of a commercial, industrial, financial, professional or other similar character) into which a State enters or in which it engages otherwise than in the exercise of sovereign authority

¹⁰ "§ 1605. General exceptions to the jurisdictional immunity of a foreign state

(a) A foreign state shall not immune from the jurisdictions of the courts of the United States or of the States in case --

(2) in which the action is based upon a commercial activity carried on in the United States by the foreign state ; or upon an act performed in the United States in connection with a commercial activity of the foreign state elsewhere; or upon an act outside the territory of the United States in connection with a commercial activity of the foreign state elsewhere and that act causes a direct effect in the United States;

..."

There is some uncertainty on the exact delimitation of what constitutes a "commercial transaction". Article 2 para. 2 of the UN Convention, for example, reads:

"[i]n determining whether a contract or a transaction is a 'commercial transaction' under paragraph 1 (c), reference should be made to the nature of the contract or transaction, but its purpose should also be taken into account if the parties to the contract or transaction have so agreed, or, if in the practice of the State of the forum, that purpose is relevant to determining the non-commercial character of the contract or transaction".

This would make the process of deciding whether or not sovereign immunity applies to the options contract, given its function to facilitate enforceability of the international climate change agreement, fraught with difficulties and ambiguities.

However, there seems to be a relatively easy way to deal with such problems: in accordance with the well-known principle of *volenti non fit inuria*, a state that has consented in writing to be submitted to the adjudication and enforcement of another state can no longer raise the sovereign immunity exception (Aust 2005, p. 165). The most common form of such submissal would be arbitration. This is widely used in finance transactions where states raise money by issuing government bonds. Submitting any dispute to arbitration can also imply that the execution of arbitral awards would not be subject to immunity (Fox 2004, p. 266 ff.). Following this approach, a clause could be introduced in the terms and conditions of the put option contracts that provides for arbitration of the dispute. For clarity and to avoid uncertainty in case of a later change of law, such submissal to arbitration would not only extend to obtaining a title, but also expressly allows the holder of the option right to enforce the title against property of the issuing state. Such subjection could be far-reaching and encompass all property that is not necessary for sovereign activities such as consular activities or defense. It could even include¹¹ enforcement into central bank assets or tax revenues.¹² In practice, however, states issuing the options may wish to be fairly restrictive on the property submitted to enforcement, invoking grounds of sovereignty. The exact scope of the submissal to enforcement would thus have to be laid down in the international agreement between the states as well as in the put option contract between the respective state and the investor.

¹¹ See Article 21 (c) of the UN Convention. For a practical case involving such a waiver see *Camdex International Ltd. v. Bank of Zambia* [1996] 3 All ER 431.

¹² Under the ICSID Convention, taxes from ship-owners to Liberia were held to be exempt, *Liberian Eastern Timber v. Government of the Republic of Liberia* 89 ILR 360.

3. Arbitration Allows the Implementation Irrespective of Domestic Legal Order

If enforcement were reliant solely on the protection of property rights by the respective state, the proposed mechanism might not be universally applicable. However, as has been pointed out above, international arbitration may do the trick: if all states undertaking obligations accept to submit disputes with option holders to arbitration and waive their sovereign immunity regarding adjudication and enforcement, the protection of property rights by that state cease to be much of a concern, as long as other states remained willing to enforce the arbitral awards on their territory, i.e. as long as those forum states maintained the rule of law.

IV. Implementation Details

1. Mechanism for Issuing the Options

While it is beyond the scope of the present text to elaborate on the exact details of the number and duration of options to be issued – not least because it is determined by the level of commitment negotiated internationally or chosen by societies advancing national policies – we could envisage the following rough outline for the mechanism. The options should be such that there is not one single date in the future at which the options can be cashed in. Rather, we would suggest a continuum of cashing in dates. Initially, to get the scheme rolling, on say three different dates within a time frame of three years, options should be issued. The duration of the option should be timed so that, at the end, there are (e.g.) 15 tranches ending in 15 consecutive years. As time passes and one tranche expires, the same volume of new options is issued to retain the commitment time and value. The options can be designed as European or American options. In the first case they can only exercised at the expiry date in the later any time before the expiry date. Thus the European options can offer a clearly defined commitment value for every year, and thus allow for a fine tuning of the level of desired commitment. They do however require that either some options expire in any one time period or that allowances can be banked between time periods to ensure a continuity of commitment.¹³

¹³ Unless emitting activities are inter-temporally substitutable in which case the demand for allowances in the next period might be depressed by the over-issue in the current period.

2. Does the Mechanism Really Provide Enforcement?

One may wonder whether the scheme proposed here really provides for enforcement, for two reasons: first, the enforcement mechanism does not result from the international obligation, but from the later issue of new options. Until the obligation to issue options has been complied with, there is no effective punishment mechanism in place; sanctions would only be possible under public international law, which is, as indicated above, sometimes regarded as rather toothless. Second even once the put options have been sold, maintaining the effectiveness of the threat means that the state must continuously provide for new options.

The first point is mostly true: the obligation to enter into the options contracts is largely not enforceable. Yet the whole process of getting the international agreement in place (negotiation, signing, and ratification) may take a long time; adding some more time after ratification may not change all that much, in particular given that the obligations and the timeframe for complying with them are clearly defined. One could even envisage that the obligations are implemented through a process where governments issue options on a yearly basis over several years. As they can observe each other's behavior they can thus ensure mutual implementation.

The second point also contains some truth: over time, the obligation to enter into new options contracts is again generally not enforceable. However, non-compliance with the obligation to issue new options would not invalidate the outstanding options. The state not issuing new options would therefore be free from penalties for too low a carbon price only after the lapse of additional time. In effect, the possibility to refuse to issue new options amounts to the possibility of terminating the enforcement provision, which is not altogether unusual in public international law (cf. Vogel (1997), Art. 29). Moreover, since the duration of the options as well as the number of options issued would be laid down in the international agreement, the implicit "notice period" for the termination by way of not issuing any new options could be fine-tuned according to the wishes of the contracting states.

3. Protection against Market Imperfections

We expect the market price for the put options to be fairly low, for two reasons. First, the government can control the issuance of allowances. It can therefore *ex ante* ensure sufficient scarcity such that the market price of the allowances does not fall below the strike price of the

put option. Second, physical settlement *ex post* drives up the carbon price. Thus, from the perspective of a rational investor, it would appear unlikely that the carbon price falls below the strike price, which in turn means that the price of the put option should be low. A state wishing to alter its policy and wishing to escape from the commitment made to the financial market might be tempted simply to buy put options on a large scale and only afterwards reveal its intention to negate on its commitment regarding the carbon price.

With sufficiently transparent markets and diverse ownership of the option contracts any such attempt by the state would easily be detected. This would lead market participants to update their beliefs about the future carbon price. With market expectations of lower carbon price, the price of the remaining options increases. If the attempt is detected sufficiently early, then the higher price to be paid for the remaining options again prevents such attempts by the government. Transparency requirements, e.g. the notification of significant ownership by any entity are thus again beneficial. If this is judged not to be sufficient, then one might also consider restricting the state or any entity related to the state from repurchasing any put options issued. Any violation of this obligation should be punished through the mechanism of rendering the purchase contract invalid, with the purchase price paid to the seller being forfeited.

4. Why Not Simply Put Money into an Escrow Account?

Finally, another objection to the proposed scheme might be to ask: why not simply oblige governments to put an adequate amount of money into an escrow account? Then, a violation by the state of the obligations under the international agreement would lead it to forfeit that amount (Victor 1999, 155). An independent trustee could be empowered to check the compliance and take forfeiture actions where necessary. Structurally, such a proposal would not be dissimilar to the mechanism proposed in this paper.

However, in our view, such mechanism would suffer from some serious drawbacks: first, it is hard to imagine that the trustee would be absolutely independent. Rather, one would envisage that his position could be altered by some kind of a resolution by the member states to the international agreement establishing his position. The trustee could not resist such a change since his position is one of holding the property on trust and not for self-interest. Therefore, the enforcement would in the end be subject to negotiations between the states and thus suffer from the costs of enforcement which the other states may not be willing to bear (as

evidenced by the European Growth and Stability Pact). Second, compared to the options model, the costs are higher, since the governments would have actively to raise money to pay into the escrow account, whereas under the put option scheme they would initially receive (an admittedly) small amount of money. Third, the question would arise as to what should be done with the money while held in escrow, a problem which, given the fairly large sums of money involved to secure attractive deterrence, appears non-trivial. Fourth, such a scheme would lack the advantage of *ex post* automatic price stabilization.

V. Discussion

1. Evaluation Criteria for Enforcement Mechanisms

The overarching concern for an enforcement mechanism is that it must be seen as legitimate. However, the criterion needs to be broken down into further sub-criteria in order to become operational. We thus propose the following sub-criteria that would make an enforcement mechanism legitimate.

- 1) First, and obviously, the enforcement mechanism shall only apply if there has been a breach of obligations under the agreement that is to be enforced. Where sanctions under an enforcement mechanism are triggered even though the state in question has fulfilled its obligations, the enforcement would not be legitimate. In statistical theory, the aim can be described as avoiding a type I error, in the sense that behavior by a state is considered as not being in conformity with a treaty although in reality it is.
- 2) In turn, the enforcement mechanism should apply for a maximum number of cases where a state has violated its obligations under the agreement. For if the sanctions were not applied regularly, the effectiveness of the threat of sanctions would be reduced. In addition, the cases in which enforcement did take place would be considered as illegitimate: a state subject to sanctions would seek to argue that the sanctions were unfair given that another state "got away" with its breach of obligations. In statistical theory, the aim can be likened to avoiding a type II error, in the sense that behavior by a state is considered as being in conformity with a treaty although in reality it is not.

- 3) The sanctions must in some sense be proportionate (though not necessarily linearly related to) to the breach of obligation: a minor breach of obligation should not trigger maximum punishment, as this would be seen as unfair. Such maximum penalty enforcement even for only trivial violations would go beyond what is necessary to secure the application of the treaty.
- 4) The sanctions mechanism should be triggered automatically and not require another round of voting by the signatory states: the sanctioning mechanism contained in the European Union Stability and Growth Pact has shown that the additional round of voting gives rise to all sorts of unrelated arguments and may delay, if not altogether stop, the implementation of sanctions.
- 5) The mechanism should be transparent. Often, the judgment of what constitutes compliance and what constitutes non-compliance is fuzzy. Since large-scale commitments by the states are called for, the citizens of a state against which the sanctions have to know why the sanctions are triggered and therefore whom they have to hold accountable on a domestic level. To achieve this aim, the enforcement mechanism needs to have an easily verifiable trigger event, the responsibility for which can be attributed to specific agents of the respective states.
- 6) In the very long run, the mechanism should provide some flexibility to reflect altered thinking due to scientific and technological progress or due to changed attitudes. For example, a particularly severe drought, inundation or series of hurricanes may increase the sense of urgency to take mitigation measures.

2. Assessing the Proposed Solution against these Criteria

Measuring the proposal advanced in this paper against the yardstick of the evaluation criteria developed above, the proposal fares quite well:

The mechanism meets the first requirement as it brings about a payment obligation only if the carbon price falls below the strike price. Therefore, there the enforcement mechanism is only triggered if a government has violated its obligation to maintain the carbon price at or above the specified level. The mechanism continues to bite even if a government achieved the emission reduction targets – e.g. it continues to be subject to the minimum

carbon price requirement. This is certainly desirable from the internal commitment perspective of creating investment security, but might be considered to be excessively strong from an international commitment perspective. In theory one could introduce in the options contract a clause such that the put option can only be exercised if the state misses its reduction target. Yet it would at the same time make the put option subject to uncertainties, for example regarding the measurement of emissions, and could create large financial incentives to influence the metrics of such measurements.

The second requirement is also met: a violation of the obligation to maintain the price of the allowances at a certain level results in a payment obligation towards the holders of the put option.

The third requirement – proportionality – is equally satisfied: where the respective state violates its price maintenance obligation only slightly, the ensuing "penalty" is also mild as only few options would be exercised. The ability to fine tune the level of commitment by choosing the option strike price, duration and number of options issued.

The fourth requirement – i.e. that the enforcement is triggered automatically, rather than being subject to a consensus by the other contracting states – is also fulfilled: the individuals holding the options can be thought of as rational, self-interested individuals. They will then pursue their claims against the state.

Regarding the fifth requirement, the process is transparent, since the price of allowances is formed on a liquid market. The number of put options is public information. A supervisory international agency could oversee the number and conditions of options issued. Their option price again forms in a market and is publicly known. Transparency is increased with disclosure requirements when companies or groups of companies hold more than certain threshold levels. Although it is possible to create financial instruments that are based on other values, such as the level of a carbon tax, they would almost inevitably be less transparent. For example, it would then have to be argued what emissions activities were to be taken as the basis – probably the lowest taxed – and whether nominal or effective tax rates mattered.¹⁴

¹⁴ Domestic enforcement would also present an issue for the approach advocated in this paper: A state willing to break its obligation to maintain a high price of allowances would instead of having the official price collapse rather resort to very lax controls. One would, however, expect that such behavior would bring down the market price of allowances also.

Particular complications can arise when a country wants to shift quickly from a trading scheme to a tax-based scheme rather than gradually fading out the options.

Finally, regarding the sixth requirement, the mechanism provides flexible in the long-run. The state can phase out the put options. When no put options are outstanding any longer, it is not bound any more. Alternatively, it may simply accept the penalty and pay the option holders their dues. Conversely, the mechanism can be made more stringent over time, either through the issue of additional put options or by raising the strike price for new options replacing old ones. In addition, the state may also choose to issue additional put options that have a maximum payable amount. For example, where the state has as a first step issued one billion put options with a strike price of EUR 15, the state may increase commitment by issuing as a second step a further one billion options exercisable at the same date with a strike price of EUR 20, but which pay a maximum amount of EUR 5. This would be equivalent to the state in a single step issuing one billion put options with a strike price of EUR 20 without maximum payment.

Furthermore, the mechanism is also sufficiently flexible so as to allow a transition to a carbon tax. This seems all the more important since carbon trading is still a rather new policy tool, and both current experience and changing circumstances might imply that in the future or in other countries taxation might be perceived as the preferred option for internalising carbon prices. In principle carbon taxation can replicate allowance trading, e.g. create the same charge as the costs incurred for the acquisition of allowances. A set of sectors or characteristics of installations is defined in the option contract that are covered thereby. If the certificates have been replaced by a carbon tax and the level in any one of these sectors has fallen below the strike price defined in the option contract on a day on which the option may be exercised, then the holder of an option contract can exercise the option. The holder then receives from the government the difference between the 'promised' carbon tax level and the realised carbon tax level. In essence, this means that the lowest taxed sector determines the value of the options. Due to the nature of taxation, there cannot be a physical settlement.

To ensure the proper functioning of such transition, three challenges have to be dealt with: First, imputation on other taxes. The government may seek to undermine its commitment by providing for an imputation system. They might do so by allowing companies to offset carbon taxes against their corporate income tax liabilities. Such imputation would have to be ruled

out. This would obviously not preclude companies from accounting for carbon taxes as costs when calculating the taxable income of the corporation.

Second, it is easier to differentiate taxes and create exemptions for specific sectors or installations. The history of energy taxation indicates that energy intensive industries can argue for specific exemptions to accommodate for their requirements. The clause in the option contract according to which the option holder could choose ex post the sector for which the tax level determines the value of the option creates a strong incentive for governments to avoid such behaviour, as market participants will identify the sector with the lowest carbon tax level, and realise their options if that level is below the strike price.

Third, governments could adjust other energy related taxes to compensate for some of the carbon taxation. This is a risk that is not unique to carbon taxation but also applies to carbon allowance trading. One would expect this risk to be largest in energy intensive industries for internationally traded goods. Lower taxation might create a national advantage and thus attract more profits and jobs. However, for exactly this reason these sectors are already typically characterised by low energy tax levels, and thus the scope for further reductions of energy taxes to compensate for carbon taxes is low. This might create an interesting dynamic – the sectors most exposed to carbon taxes will argue for means to benefit from some of the corresponding tax reductions. If they cannot benefit from energy related tax reductions, they will try to look at other aspects, e.g. labour or corporate profit taxes. Thus they might push for exactly the adjustments desired by macro-economists that want to harvest the double dividend of carbon taxation.

VI. Conclusion

This paper has shown that states can overcome both the internal and the external commitment problem and thus credibly promise to foreign governments and to investors in low-carbon technologies to maintain the carbon price at or above a certain level. If states take measures that reduce the carbon price, e.g. through issue of more allowances, they are "punished" by the financial markets: the holders of the options exercise their options and receive a payment amounting to the shortfall of the carbon price under the commitment level. They are protected by the domestic property guarantee and by an international arbitration clause which allows them to obtain title against a state seeking to default on its obligations. Once in place, the mechanism thus largely prevents non-compliance. The approach can be "fine-tuned", in the

sense that states can, through the number and duration of options issued and the determination of the strike price, select a desired level of commitment from a continuum of choices. More research seems warranted on the exact structure of the options scheme, as well as on possibilities for the actors to abuse the scheme.

The mechanism has the advantage of compatibility with the Kyoto process, while also addressing concerns regarding free-riding and ability to commit, as well as ease of monitoring and predicting compliance. It is also simple and dynamically flexible. In short: the proposed mechanism gives decision-makers the choice as to how much of a commitment they wish to make.

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