DISCUSSION PAPER SERIES

DP17928

INVESTMENT TREATY REFORM WHEN REGULATORY CHILL CAUSES GLOBAL WARMING

Henrik Horn

INTERNATIONAL TRADE AND REGIONAL ECONOMICS

CEPR

ISSN 0265-8003

INVESTMENT TREATY REFORM WHEN REGULATORY CHILL CAUSES GLOBAL WARMING

Henrik Horn

Discussion Paper DP17928
Published 21 February 2023
Submitted 13 February 2023

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

INVESTMENT TREATY REFORM WHEN REGULATORY CHILL CAUSES GLOBAL WARMING

Abstract

State-to-state investment protection treaties, and the Energy Charter Treaty in particular, are alleged to dissuade host countries from regulating foreign-owned investment with adverse climate impact. This paper examines implications of treaty reforms that have been proposed as remedies for such regulatory chill. It finds that an increased carve-out, and reduced compensation in case of regulation, can address the stranded investment problem, but might not be accepted by both parties to the agreement. Disallowing investor-state dispute settlement (ISDS) solves the chill less effectively, but is more acceptable to both parties. Shortening of a sunset period applicable to unilateral withdrawal will tend to worsen the problem.

JEL Classification: F21, F23, F53, K33

Keywords: climate

Henrik Horn - henrik.horn@ifn.se
Research Institute of Industrial Economics (IFN) and CEPR

Acknowledgements
Financial support from Torsten Söderberg Foundation is gratefully acknowledged.

Investment Treaty Reform when Regulatory Chill Causes Global Warming

Henrik Horn[1]
Research Institute of Industrial Economics (IFN), Stockholm
Centre for Economic Policy Research, London

February 13, 2023

[1] Financial support from Torsten Söderberg Foundation is gratefully acknowledged. Address: Research Institute of Industrial Economics (IFN); Box 55665; SE-102 15 Stockholm; Sweden. Email: henrik.horn@ifn.se.

Abstract

State-to-state investment protection treaties, and the Energy Charter Treaty in particular, are alleged to dissuade host countries from regulating foreign-owned investment with adverse climate impact. This paper examines implications of treaty reforms that have been proposed as remedies for such regulatory chill. It finds that an increased carve-out, and reduced compensation in case of regulation, can address the stranded investment problem, but might not be accepted by both parties to the agreement. Disallowing investor-state dispute settlement (ISDS) solves the chill less effectively, but is more acceptable to both parties. Shortening of a sunset period applicable to unilateral withdrawal will tend to worsen the problem.

JEL Codes: F21, F23, F53, K33
Keywords: Investment treaties, climate, stranded assets, regulatory chill

Contents

1 Introduction

International investment treaties aim to promote investment between the partner countries by protecting investors and investment against host country policy measures. The stipulated protection applies to almost any type of government policy measure, regardless of whether taken at a local or a national level.[1] More than 2 500 such agreements are in force.[2] The agreements were initially bilateral, and formed between developed and developing countries, during a period when expropriations were common in developing countries. But today there are also a large number of agreements in force between developed countries, often as part of larger trade and investment agreements.

This investment protection regime has been intensively criticized in the policy debate. The critique has recently focused on the perceived conflict between these agreements, and the need to phase out fossil-fuel based production. It is alleged that host countries' willingness to pursue vigorous climate policies are likely to be reduced by the agreements' potentially far-reaching compensation obligations, and the right that most agreements give to private investors to pursue disputes regarding the fulfillment of these obligations—the investor-state dispute settlement (ISDS) mechanisms that most agreements include.[3] This critique has been directed in particular at the Energy Charter Treaty (ECT), a trade and investment agreement for the energy sector with approximately 50 member states, including the EU, all individual EU member states (except for Italy), the UK, and Japan.

The magnitude of the fossil fuel-based investment that are protected by investment agreements is difficult to assess. Studies often suggest extremely large magnitudes for stranded investment in general. For instance, IRENA (2017) estimates the stock of investment in the upstream oil and gas industry to be USD 3-7 trillion. It is not clear how much of this stock that is covered by investment agreements. But identifying 257 coal power plants with partly or fully foreign ownership, Tienhaara and Cotula (2020) estimate that at least 75 percent of these are covered by one or more investment agreement with ISDS. In the case of the EU, most foreign-owned investment comes from ECT countries, and are thus covered by the agreement. A very large stock of investment is clearly protected by investment agreements globally.

Some recent disputes illustrate the alleged conflicts between investment treaties and climate policy. The German industrial groups RWE and Uniper initiated in 2021 separate ECT disputes against the Netherlands regarding its recent ban on coal-based power generation, demanding more than EUR 3.5 billion in compensation.[4] There is an ongoing dispute between the US firm West-

[1] See e.g. Dolzer and Schreuer (2012) for an introduction to International Investment Law.

[2] Investmentpolicy.unctad.org/international-investment-agreements.

[3] There is a huge policy literature on the role of investment agreements for climate policies; see Bernasconi-Osterwalder and Brauch (2019) for references to this literature.

[4] See Bohmer (2021a,b) and Putter (2021) for descriptions of these disputes. The Uniper case is reportedly withdrawn as part of the agreement between the German government and Uniper regarding the recent government bailout of Uniper; see Bohmer (2022a). The Netherlands argues that the RWE dispute is inadmissible due to its intra-EU character, but the outcome of this is not yet determined.

moreland and Canada concerning the 2015 decision by Alberta's provincial government to phase out coal-fired power plants by 2030, in which the investor requests CAD 470 million in compensation. There are also a very large number of disputes involving environmental policies more generally. For instance, Italy was recently requested to compensate the UK oil company Rockhopper with EUR 190 million for an offshore drilling ban, imposed for environmental reasons.[5]

The investment protection regime is currently undergoing substantial modifications, both through redrafting of existing agreements, and through novel designs of new agreements.[6] There is a trend toward restricting the scope of both compensation requirements, and the ISDS mechanisms.[7] These developments are partly driven by a general dissatisfaction with the performance of the treaties. But the reforms are increasingly motivated by a desire to better align the investment regime with climate goals.

Of particular significance in this regard is the just concluded five year renegotiation of the ECT, mainly initiated by the EU and EU member states. An explicit purpose of the renegotiation was to make the agreement better compatible with climate objectives. But despite significant changes to the agreement, there is a widespread view that the ECT also in its renegotiated form is a serious obstacle for climate policies, as evidenced by the fact that a number of EU member states are in the process of withdrawing from the agreement, citing the incompatibility of also the renegotiated ECT with the Paris Agreement.[8] The EU Commission is now recommending coordinated withdrawal from the agreement by EU member states, as well as by the EU.

While there are many proposals for how investment agreement should be reformed to become better aligned with climate objectives, there has to be best of our knowledge hardly been any economic analysis of the effects of these proposals. The purpose of this paper is to contribute to filling this void by examining the potential for several proposed treaty reforms to ease the phase-out of climate-unfriendly foreign investment, within in a very simple formal setting.

The structure of paper The paper first provides a brief description of some core legal features of investment agreements in Section 2. Section 3 then introduces the economic framework that will be used to compare the reforms, which is as simple as it could be. It assumes that a private firm in one country, Source, has invested in another country, Host. The investment gives rise to commercial benefits for both Host and Source. But the investment also contributes to worsening the climate for both Host and Source. But these effects may or may not be sufficiently strong for the countries

[5] See Di Salvatore (2021) for a comprehensive examination of several hundred investment disputes regarding fossil fuels.

[6] Paine (2023) provides an overview of the many developments in these regards during 2022.

[7] For instance, the revised version of NAFTA—the United States-Mexico-Canada Agreement (2020)—no longer allows for ISDS between Canada and the other two countries, and the scope for ISDS between the US and Mexico has been drastically reduced. The investment chapter of the US-Australia Free Trade Agreement (2005) only allows for SSDS, and so does the Japan-UK Comprehensive Economic Partnership Agreement (2020), and the post-Brexit EU-UK Trade and Cooperation Agreement (2020). The possibility to use ISDS is curtail in various other ways; for instance, by requiring that local legal remedies are exhausted before disputes are taken to arbitration.

[8] For a critical assessment, see for instance Brewin and Schaugg (2022).

to prefer production to be shut down.

Section 4 considers reforms to the provisions governing compensation payments, and dispute settlement. A formalized investment agreement is introduced, intended to capture some salient features of actual investment treaties. The agreement gives Host three policy options with regard to the treatment of the investment: to allow production, to regulate production (which effectively shuts down the operations) while paying the compensation that is required according to the investment agreement, or to regulate without compensation. In case Host regulates without compensation when compensation is required, the investor or the Source government (depending on the mode of dispute settlement) can choose to pursue a dispute, or to let the illegality pass unchallenged. Finally, if there is litigation, Host can either allow the restoration of production, which requires Host to pay the associated cost, or maintain the regulation and instead pay the stipulated compensation for the investor's foregone operating profits.

A "stranded investment" outcome is defined as a setting in which it would be desirable from a joint welfare perspective that production is prevented, but where Host does not find it optimal to regulate. Section 4 considers three types of reforms that have been suggested as remedies to such problems. First, *increased Host policy space* in the sense of a larger carve-out from compensation requirements, can induce Host to switch to lawful uncompensated regulation. Second, a sufficiently large *reduction in the required amount of compensation* in case of compensable regulation will induce Host to regulate, despite having to compensate the investors. Hence, both proposals cause Host to regulate in a lawful manner, but in a choice between the two reforms, Host will prefer the former and Source the latter.

The third reform is to *only allow for state-state dispute settlement* (SSDS), which is often suggested as a means for host countries to avoid excessive litigation by private investors. It is shown that an exclusion of ISDS will not always have the desired impact, even if the governments of both countries would prefer regulation without compensation to production. Once Host has regulated without compensation, not only the investor, but also the Source government can have an incentive to initiate a dispute, even if it benefits from the regulation. The Source government then foresees that if faced with litigation, Host will maintain the regulation in place and pay compensation if the cost of restoring production is sufficiently high. But being aware of this incentive for Source, Host might refrain from unlawful regulation in the first place, to avoid facing litigation. The countries then in equilibrium end up with production, despite this not being in their joint interest, and possibly not in either country's interest. The agreement thus causes a form of "climate hold-up problem" that makes the exclusion of ISDS ineffective.

Almost all agreements have sunset clauses that extend protection of existing investment for years or decades after parties unilaterally withdraw from the agreements. For instance, the ECT gives 20 years of protection to investment that exist at the time a member withdraws. These provisions have frequently been criticized for causing regulatory chill by providing protection for too long periods after withdrawals. To examine consequences of a *shortening of a sunset period,* Section 5 extends

the analysis to a dynamic setting. It is shown that a shorter sunset period can induce Host to defer regulation until after the expiry of the sunset clause, instead of regulating immediately after withdrawal. The suggested type of reform hence has the opposite effect to what is suggested.

Section 6 compares the reforms with regard to whether they can be designed to resolve the stranded investment problem for any intensity of the climate problem, and whether they would be accepted by both parties. If a reform fails on the first ground, it does not seem to be promising candidate for a solution to problems with stranded investment, and if the reform fails in the latter regard, it will not be implemented since any partner country can veto any change to a treaty. The analysis suggests a trade-off between the efficacy of the reforms and the likelihood that they will be accepted by both partners to the agreement, in that the reforms of the compensation schemes tend to be effective in addressing the stranded investment problem, but have worse distributional impacts, than an exclusion of ISDS. The reforms also differ widely in the response they trigger, in that they can lead to lawful regulation without compensation payments, lawful regulation with compensation payments, unlawful regulation without compensation payments, or unilateral withdrawal. These differences are likely to further affect the relative attractiveness of the reforms in practice. Hence, neither of the reforms will be both effective and acceptable by both parties, unless the climate problem is sufficiently severe that both countries prefer uncompensated regulation to production.

Section 7 makes some concluding remarks.

The literature The economic literature on investment agreements is very meagre. But there are some, mostly recent, theory contributions that illuminate various aspects of the rationale for, and implications of, treaty design. In their seminal analysis Aisbett, Karp and McAusland (2010a) show how a carve-out scheme under which investors receive compensation in excess of foregone operating profits can achieve an efficient outcome, in a setting with distorted incentives to regulate and where arbitration courts are imperfectly informed about the magnitude of regulatory shocks. The efficient mechanism entails punitive damage payments. Aisbett, Karp and McAusland (2010a) also derive an alternative efficient solution where compensation is a linear combination of operating profits and initial investment costs. Aisbett, Karp and McAusland (2010b) highlight the interaction between a National Treatment (NT) provision and compensation requirements, assuming that the host country can charge investment-specific payments for investment protection.

There are some more recent papers on investment agreements, which mostly seem to have been inspired by the policy debate in the EU during the negotiations regarding the Transatlantic Investment and Trade Agreement (TTIP), and the EU-Canada Trade Agreement (CETA). Konrad (2017), and Schjelderup and Stähler (2020), show how investment agreements might induce strategic overinvestment by foreign investors. Stähler (2018) draws on mechanism design to characterize an efficient compensation mechanism, assuming that the payment balance between the host country and investors can be broken, and that compensation can be based on host country utility of regulation rather than on foregone operating profits. Janeba (2019) formally defines the popular, but vague,

notion of regulatory chill, and examines its occurrence in a specific setting. Kohler and Stähler (2019) compare an agreement with exogenous investment protection sustained by compensation requirements, to an agreement that solely relies on a NT provision for investment protection. They show that the latter is better than compensation payments from a total surplus perspective if the domestic industry affected by NT is large relative to the foreign industry. Ossa, Staiger and Sykes (2020) examine the difference between dispute settlement mechanisms in investment and in trade agreements, assuming that disputes are in either case arbitrated by an imperfectly informed court. ISDS differs from SSDS since a foreign investor suffers more from an expropriation than does the source country government, similar to what is assumed here in Section 4.6. The authors also consider the role of retrospective remedies in situations where the investor can suffer harm before the conclusion of the litigation process; this is formally similar to the question of what share of foregone operating profits should be compensated for, examined here in Section 4.5. Horn and Tangerås (2021) derive properties of a negotiated investment agreement with carve-outs. It is shown that when the parties negotiate over properties of a carve-out scheme, the negotiated outcome will under robust circumstances fully mitigate distortions both to foreign investment and to host country regulation. Finally, Horn and Tangerås (2022) analyze the choice of dispute settlement mechanism when SSDS causes political costs that affect the source country's incentives to initiate disputes, and the host country's incentives for opportunistic regulation of investments. It is shown that whereas countries might agree to exclude ISDS for a given obligation regarding investment protection, countries will always allow for ISDS when they negotiate both investment protection and dispute settlement. Neither of these papers captures climate externalities, however.

2 Legal background

This section briefly describes some basic features of investment agreements, partly to motivate the assumptions regarding the formalized agreement below, and partly as a primer for the reader who is less familiar with these agreements.

2.1 Compensation and dispute settlement

Compensation in case of regulation A core substantive obligation in virtually all agreements is that host countries shall provide "fair and equitable treatment" of investment that is covered by agreement. This amorphous obligation is the most commonly invoked ground for disputes. It has been the source of considerable controversy, leading some arbitration panels to make far-reaching interpretations regarding the extent of investor protection that the agreements provide. Another core substantive obligation is the requirement for host countries to compensate investors in case of expropriation. The provision typically applies to both direct expropriation, where a host country seizes an investor's asset, and indirect (or regulatory) expropriation, where a host country action

deprives an investor of (most of) its profit, but does not involve formal take-over of assets. The agreements typically also contain a range of other substantive obligations, such as non-discrimination undertakings, provisions regarding the right for investors to transfer profits, etc.[9]

A standard requirement in the case of expropriation is that investors should receive "prompt, adequate and effective" compensation, and agreements often also state that compensation shall represent the "fair market value" of the expropriated investment. To determine these amounts, arbitration panels normally use the general notion in international law that compensation should wipe out all consequences of unlawful acts. The agreements typically do not specify how much compensation investors should receive in case of violations of other provisions in the agreements, such as the fair-and-equitable-treatment provision. But panels have used the same principle from international law in these instances. A common interpretation is that compensation should equal the discounted future earnings that the investor foregoes due to the host country measure. But panels have also used approaches that have resulted in lower compensation levels.[10]

Carve-outs from compensation requirements There are some counterbalancing forces to these restrictions on host countries, however. Arbitration panels sometimes point to the "police powers exemption" in international law that allows states to protect public welfare.[11] Also, while the agreements formed up until approximately a decade ago had typically had no, or small, explicit *carve-outs* from compensation requirements, this has become much more prominent in recent agreements, reflecting the desire to increase host country policy space. But these carve-outs in turn often come with qualifications. For instance, a common exception applies to measures that are "necessary to protect life and health of humans, animals and plants". But this only applies to measures that are not "disguised protection". The burden of proof to show that a measure is necessary, and not disguised protection, typically falls on the regulating country, and can be demanding to fulfil.

Dispute settlement It is very rare in international law that private actors, who are formally not parties to the agreement, can legally challenge the fulfillment of the obligations by the contracting parties; for instance, exporters cannot pursue disputes against importing countries under trade agreements. The early investment treaties that were formed in the 1960s only allowed for SSDS. But ISDS became increasingly common in the 1970s, and has been a standard component since the 1990s.[12] All agreements also allow for SSDS, but virtually all known disputes have been brought by private investors.

[9] The agreements do not include any direct contracting on investment levels, nor any direct commitments on subsidies or taxes.

[10] International law does not allow for punitive compensation requirements.

[11] Often cited examples of the more investor-friendly interpretation are the panel reports in *Metalclad v. Mexico,* 1997, and *TECMED v. Mexico,* 2003. The more host country-friendly approach are exemplified by the report in *Methanex v. United States,* 2005, and *Philip Morris v. Uruguay,* 2017.

[12] Pohl, Mashigo and Nohen (2012) find that in a sample of 1 660 bilateral investment treaties, 93% included ISDS.

A crucial feature of the investment regime is that investment agreements are supported by several multilateral conventions that request signatory states to recognize and enforce awards made in other signatory countries.[13] Due to these conventions, investment agreements have a form of third-party enforcement that makes the enforcement mechanisms much stronger than dispute settlement mechanisms in other international agreements, including trade agreements.

2.2 Withdrawal

The reforms of the compensation and dispute settlement provisions leave the integrity of the agreement intact. A more radical solution would be to dissolve the agreement entirely. The legal aspects of the scrapping of treaties are complex and ambiguous however, in particular when motivated by climate effects.[14]

The Vienna Convention on the Laws of Treaties (VCLT) provides general rules regarding the interpretation of international treaties. According to Art. 54 of the Convention it is possible for a party to unilaterally withdraw from a bilateral agreement if the agreement so allows; an example of such a provision is Art. 47 ECT. It is also possible to withdraw if the other parties so agree. Art. 56 VCLT opens up certain possibilities for withdrawal/termination in situations where the agreement does not explicitly allow for this. It states that a treaty which contains no provision regarding its termination, and which does not provide for denunciation or withdrawal, is not subject to denunciation or withdrawal unless "...(a) it is established that the *parties intended* to admit the possibility of denunciation or withdrawal; or (b) a right of denunciation or withdrawal may be *implied by the nature of the treaty*" (with added emphasis). Whether these grounds for withdrawal are present in a particular situation will often be hard to assess. For instance, it is often hard to verify the intentions of the parties when entering into an agreement, and the "nature" of a treaty is an amorphous concept.

Art. 62 VCLT provides more specific grounds for a party to be able to unilaterally terminate a bilateral treaty. It states that "unforeseen" and "fundamental change of circumstances" may be invoked as grounds for terminating or withdrawing from a treaty if these circumstances constituted an "essential basis" of the consent of the parties to be bound by the treaty, and the effect of the change is "radically to transform" the extent of obligations under the treaty. It appears as if the emergence of the climate problem could potentially be interpreted as such a fundamental change of circumstances for investment agreements that were formed several decades ago. But there is still no affirmative case law on this.

[13] These include Convention on the Recognition and Enforcement of Foreign Arbitral Awards (the "New York Convention"), the United Nations Convention on International Trade Law (UNCITRAL), and the Convention on the Settlement of Investment Disputes between States and Nationals of Other States (ICSID Convention).

[14] See e.g. Helfer (2012), and Reinisch and Mansour Fallah (2022) for overviews.

Sunset clauses A treaty goes through several phases with regard to withdrawal or termination. Treaties commonly specify initial periods during which they cannot be withdrawn from. These periods vary considerably in length. Examining a sample of 2 061 agreements with investment protection involving 55 countries, Pohl (2013) finds an average length of 10.7 years for this phase. After this initial period has expired, the agreements are typically extended through either tacit extensions for unlimited periods, or tacit renewals for fixed periods.

Most treaties require advance notice of denunciation—normally 12 months. 99 percent of the bilateral agreements in Pohl's (2013) study include "sunset clauses" that extend the agreements, or parts thereof, for a specified period of time.[15] These clauses typically apply to investment that exist at the time the denunciation takes effect. Pohl (2013) finds that the average length of this period of time is 12.5 years among the 2 061 agreements. For the ECT this period is 20 years.

Sunset clauses clearly apply to investment in countries that unilaterally withdraw from treaties. They might also apply to investment from the withdrawing countries in partner countries; for instance, this is stipulated in Art. 47 ECT.[16]

Withdrawal in practice It is very common that treaties are terminated. According to the UNCTAD International Investment Agreement Navigator, out of a total of 2 872 bilateral investment treaties, 491 have been terminated. The terminations have occurred for a variety of reasons. For instance, 143 agreements were jointly terminated. 123 of these agreements are intra-EU agreements that were terminated 2019 or later.[17] Predating this there were approximately 15 terminations through consent, many of which involving either Czechia or Italy. A further 177 agreements were unilaterally terminated. Prominent among those were agreements involving Bolivia, Ecuador, India and Indonesia as partners. All these agreement were terminated 2004 or later, with only one exception.

2.3 Climate aspects

It is very rare that investment agreements specify different regulatory spaces for different types of regulatory shocks. Instead, if there are exceptions or other forms of carve-outs, they are typically expressed in rather general form, potentially applying to any regulatory measure. Climate policies therefore typically face the same, sometimes very challenging, tests to show that they are eligible

[15] See Kouroutakis (2022) for a comprehensive description of sunset clauses, with a particular focus on the ECT.

[16] It is less clear if sunset clauses also apply in case of joint decisions to terminate agreements. According to one legal view, investors have acquired or vested rights that cannot be withdrawn through the termination of agreements. But the dominating view seems to be that the parties are effectively the masters of their agreements, and can revoke any protection that the agreements stipulate, including in sunset clauses. For instance, this is argued in the detailed analysis by Reinisch and Mansour Fallah (2022). This view also seemed to be relied upon in the Agreement for the termination of Bilateral Investment Treaties between the Member States of the European Union, in May 2020; see Letizia (2022) for a discussion of sunset clauses and this agreement.

[17] This was mainly in response to the "Achmea" ruling by the Court of Justice of the European Union that declared intra-EU bilateral investment agreements to be incompatible with EU law

for exceptions. However, there is a recent trend for investment treaties to give host countries more policy space for climate protection. For instance, the revised ECT has a carve-out from the agreement for new fossil fuel-dependent investment that applies to the EU and the United Kingdom.

There are different types of climate-related measures that might violate standard investment agreements. The agreements protect investment against measures that, at least in their direct effects, seem climate *unfriendly*. For instance, this could be the introduction of a tax on renewable energy, or the withdrawal of a support scheme for renewable energy. Most climate-related disputes thus far has concerned such withdrawals. Spain has been the target of more than 50 such litigations. Many of these disputes are still not arbitrated. But Spain has been requested to pay more than USD 9.5 billion in compensation so far.[18] These disputes are often pointed at as evidence for the climate-friendliness of investment treaties. But these disputes have not had any direct positive impact on the climate, since they have not led to the restoration of host country support schemes, even when host countries have lost disputes, the only consequences have been compensation payments.

Investment agreements also protect investment against measures that in their direct effect somehow *improve* the climate—this is what this paper focuses on. For example, this could be the introduction of taxation of CO_2 emissions, or the removal of an existing support scheme, such as a removal of subsidies for fossil fuels. These forms of disputes are likely to become more common if the goals in e.g. the Paris Agreement are to be implemented, given the vast stock of stranded investment that will have to be taken out of production globally.

The ECT is currently seeing a number of unilateral withdrawals. Belgium, France, Germany, Luxembourg, the Netherlands, Slovenia and Spain have all declared their intention to withdraw, citing the incompatibility of the revised ECT with climate goals, and the Paris Agreement, in particular. Also Poland has denounced the (ECT). Among the stated reasons are that Poland has been burdened with significant legal costs also for disputes that Poland has won, and that the ECT causes regulatory chill.[19] The EU Commission now recommends a coordinated withdrawal from the ECT by all member states, as well as by the EU.[20]

Another noticeable development is that in the draft for the renegotiated ECT, the EU managed to include a fossil fuel carve-out for investment in the EU, that distinguishes between existing and future investment in such products in the EU. In broad terms, for existing investment, the revised sunset clause stipulates 10 years of protection, rather than the 20 years that the agreement normally provides, and new fossil fuel investment are not covered at all by the agreement. The revised ECT also excludes ISDS between EU member states. Since most foreign direct investment in the energy sector in the EU come from other EU member states, this is de facto a significant step toward withdrawal from the agreement by the EU.

[18] Lavranos (2022). Ipp, Ipp, Magnusson and Kjellgren (2022) provide a detailed analysis of these and other ECT cases from a climate perspective.

[19] Bohmer (2022b) and Tropper (2022).

[20] Djanic (2023).

3 The economic setting

The economic setting is as simple as it could possibly be. There are two countries, Host and Source. A firm from Source has made an irreversible investment in a production facility in Host. Host has two policy options absent an investment agreement. One is to allow production in the facility. This creates benefits $z > 0$ for Host, for instance in the form of consumer surplus, employment, technological spill-overs, or learning-by-doing by the work-force. But production also causes climate damage with a cost $C^H(\theta) > 0$ to Host. The parameter θ indicates the intensity of the climate problem, with a larger θ corresponding to a more severe problem, $C^H_\theta > 0$.[21] The net welfare for Host from allowing production is $w^H = z - C^H(\theta) \equiv V(\theta) \gtrless 0$. The other option for Host is to regulate production, which effectively shuts down operations, and yields Host welfare $w^H = 0$. Consequently, absent an agreement, Host is indifferent between production and regulation if $\theta = \theta^H$, given by

$$V(\theta^H) \equiv 0.$$

Host will be said to be *climate sensitive* if Host prefers uncompensated regulation to production, that is, if $\theta^H < \theta$.

If production is allowed, the foreign investor will reap operating profits π. The Source country derives welfare from these profits, but is also adverse affected by the climate impact from production, $C^S(\theta) \geq 0$, which increases in the intensity of the climate problem, $C^S_\theta > 0$. If there is production Source welfare is $w^S = \pi - C^S(\theta)$, and Source welfare is $w^S = 0$ if there is no production, absent an investment agreement. Source is indifferent between production and regulation if $\theta = \theta^S$, as defined by

$$\pi - C^S(\theta^S) \equiv 0.$$

Source is climate sensitive if Source prefers uncompensated regulation to production, $\theta^S < \theta$.

The joint welfare of the countries will be used as a benchmark for the efficiency of outcomes. Regulation is jointly desirable if $\theta > \theta^E$, given by

$$V(\theta^E) + \pi - C^S(\theta^E) \equiv 0. \tag{1}$$

Since either or both countries can be climate sensitive, $\theta^H < \theta^E < \theta^S$, $\theta^S < \theta^E < \theta^H$, and $\theta^E < \max[\theta^H, \theta^S]$ are all possible scenarios.

4 Compensation and dispute settlement

We start by analyzing suggested reforms of compensation and dispute settlement provisions as means of solving stranded investment problems. To prepare the ground, we first introduce an investment

[21] Subscripts on functional operators denote partial derivatives throughout.

agreement and the sequence of events in the interaction between the countries, and then derive circumstances under which these provision induce Host not to regulate.

4.1 The assumed provisions

Host and Source have an investment agreement that protects the investment in Host.

Compensation in case of regulation The agreement between Host and Source is assumed to include the following compensation obligation:

§ *1. Host shall compensate the investor if and only if Host regulates for* $\theta \leq \hat{\theta}$.

§ *2. Compensation shall then be* $\phi\pi$*, with* $0 < \phi \leq 1$.

§ 1 hence requires Host to pay compensation if it regulates when the intensity of the climate problem is below a threshold value, $\theta \leq \hat{\theta}$. But the agreement has a carve-out from the compensation requirement for a sufficiently severe intensity of the climate problem, $\theta > \hat{\theta}$. The parameter $\hat{\theta}$ will be referred to as capturing the *policy space* that the agreement gives Host, with a smaller $\hat{\theta}$ corresponding to a larger policy space. The agreement would be irrelevant if $\hat{\theta} \leq \theta^H$, since Host would then be free to regulate without compensation whenever it so wanted (i.e., whenever $\theta > \theta^H$). We therefore assume throughout that $\theta^H < \hat{\theta}$, so that the agreement can potentially restrict Host's regulatory decision for $\theta \in (\theta^H, \hat{\theta}]$.

In case of compensable regulation, Host must according to § 2 pay the fraction ϕ of the earnings π that are foregone for the investor due to the regulation. As mentioned above, based on general principles in international law, the most common interpretation by arbitration panels is full reparation ($\phi = 1$). But panels also occasionally award less compensation.

Dispute settlement To support the implementation of the compensation requirements, the agreement between Host and Source also includes the following dispute settlement provisions:

§ *3. Disputes can be initiated by the investor (ISDS)/the Source government (SSDS).*

§ *4. If Host regulates without compensation for* $\theta \leq \hat{\theta}$*, and then after litigation allows for the restoration of production, Host shall cover the investor's full cost* ρ *for the temporary closure.*

§ 3 thus specifies whether the investor or the Source government can pursue a dispute. Actual agreements typically allow for both ISDS and SSDS, as noted above. But to avoid having to introduce a coordination game that always leads to litigation by the investor when both ISDS and SSDS are allowed, it is assumed that ISDS is the benchmark mode of dispute settlement.

§ 4 covers the possibility that Host regulates production, and then after facing litigation allows for the restoration of production. Restoration can be costly for the investor; for instance, the production unit might have been damaged by the time it has not been in use, or there might have been

losses of revenue during this period, or there might be start-up costs for the production.[22] Investment agreements often do not specify how much compensation investors should receive in case of restitution.[23] But the basic international law principle regarding full reparation in case of unlawful acts suggests that host countries should fully compensate investors in cases where unlawful measures are revoked. It is thus assumed here that Host must ensure that the investor suffers no loss due to the temporary regulation.

4.2 The sequence of events

The interaction occurs through the following sequence of events:

(1) Host decides whether to:
- allow production;
- regulate with the stipulated compensation payment $\phi\pi$; or
- regulate without a compensation payment.

(2) Depending on the form of dispute settlement, the investor or the Source government decides whether to litigate.

(3) In case of litigation, Host decides whether to:
- maintain the measure and pay the stipulated compensation $\phi\pi$; or
- withdraw the measure and pay the investor's cost ρ for restitution.

The game tree is depicted in Figure 1, with the brackets on the right-hand side specifying the payoffs for Host and Source, respectively.

Litigation implements the agreement correctly and with full certainty. Litigation still causes a friction since it gives rise to legal costs λ^H and λ^S for Host and Source, respectively. In actuality, these costs mostly fall on the losing party, which here will be Host whenever Host has unlawfully regulated without compensation. But in line with what also often occurs in practice, some litigation cost also falls on the winning party; λ^S is taken to be very small, however.

[Figure 1]

4.3 A stranded investment outcome

The interaction is solved for through backward induction in standard fashion.

[22] Revocations of contested measures are rare, but occasionally happens; see e.g. Grenada Power Limited and WRB Enterprises, Inc, v. Grenada. ICSID Case No. ARB/17/13.

[23] A counter example is the revised Energy Charter Treaty which in Article 26(10) prescribes that monetary damages "...shall not be greater than the loss suffered by the investor..." due to the breach of the agreement.

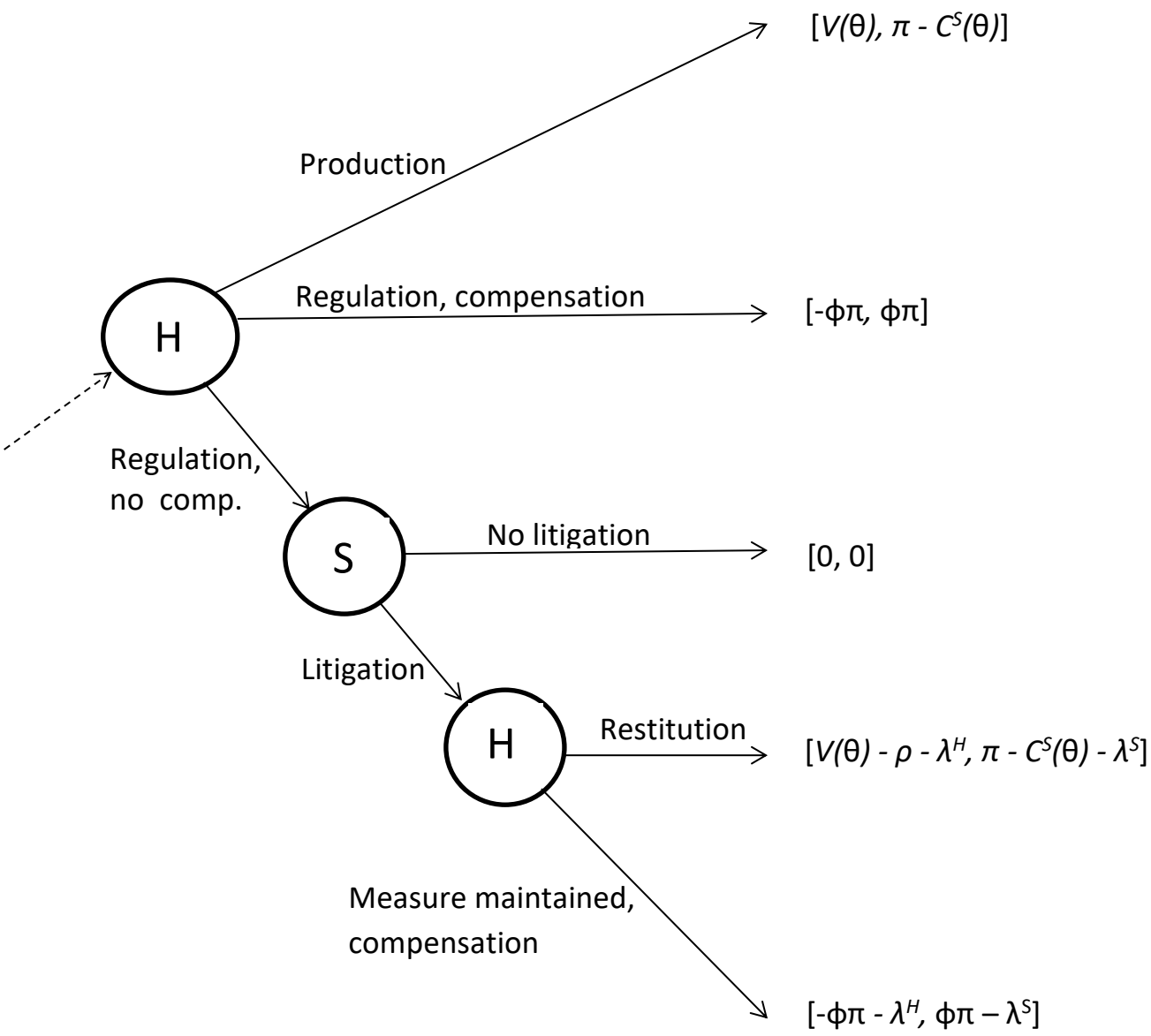

Figure 1: The regulation stage

Host's decision if facing litigation Host has two options if facing litigation after an unlawful regulation, that is, regulation without compensation when $\theta \leq \hat{\theta}$. One option is to keep the contested measure and pay compensation $\phi\pi$, which yields welfare $w^H = -\phi\pi$. The alternative is to withdraw the measure and pay the investor ρ for its restoration cost, and thus obtain welfare $w^H = V(\theta) - \rho$.[24] Let $\theta^R = \Theta^R(\phi, \rho)$ be the cut-off level of θ at which Host is indifferent between restoring production, and keeping the measure in place while paying the stipulated compensation:

$$V(\Theta^R(\phi, \rho)) - \rho \equiv -\phi\pi. \tag{2}$$

It follows from $V_\theta < 0$ that when faced with litigation after an unlawful regulation, Host will withdraw the regulation and pay the restitution cost ρ if $\theta \leq \theta^R$, and will maintain the regulation and pay compensation $\phi\pi$ if $\theta^R < \theta$.

The investor's litigation decision If Host has regulated without paying compensation despite $\theta \leq \hat{\theta}$, and the investor abstains from litigation, the regulation will remain in place. The investor income is then 0. Litigation will yield the investor the profit $\pi - \lambda^S > 0$ if Host withdraws the measure, since Host will carry the full cost for restoration, and the profit $\phi\pi - \lambda^S > 0$ in case the measure is maintained but compensation is paid. Hence, in either case litigation yields a better outcome for the investor.

Host's initial regulation decision Host will never intervene for $\theta \leq \theta^H$, and will always want to regulate without compensation for $\theta^H < \theta$. Host knows that intervention without compensation for $\theta \leq \hat{\theta}$ will induce the investor to litigate. If Host will eventually end up allowing production (that is, if $\theta \leq \theta^R$), it is better to allow production at the outset rather than to regulate without compensation, and then go through a dispute that results in Host paying the restoration cost as well as litigation costs λ^H. Likewise, if Host will eventually end up with the regulation kept in place and compensation paid, it is better to pay immediately to avoid a costly dispute. The choice for Host is thus whether to allow production or to regulate with immediate compensation. The marginal level of θ for this decision is given by

$$V(\Theta^A(\phi)) \equiv -\phi\pi. \tag{3}$$

Since $V_\theta < 0$, and the right-hand side of (3) is negative,

$$\theta^H < \Theta^R(\phi, \rho) < \Theta^A(\phi). \tag{4}$$

Characterizing the equilibrium Based on the above definitions we can characterize the outcome with ISDS:

[24] It is assumed that the litigation cost λ^H is already sunk. But it should not affect the choice between the two options here in any event.

Lemma 1 *The regulation stage outcome with $\theta \leq \hat{\theta}$ is as follows:*
(i) Host allows production regardless of the agreement if $\theta \leq \theta^H$.
(ii) Host allows production due to the agreement if $\theta^H < \theta \leq \min[\hat{\theta}, \Theta^A(\phi)]$.
(iii) Host regulates with compensation if $\Theta^A(\phi) < \theta < \hat{\theta}$.

The first statement stems directly from the definition of θ^H. The second statement follows from the fact that Host would prefer to regulate with $\theta^H < \theta$, but is bound by the agreement, $\theta \leq \hat{\theta}$, and prefers to allow production to regulate with compensation, $\theta \leq \theta^A$. The last statement is implied by the fact that compensation is required in case of regulation for $\theta \leq \hat{\theta}$, but Host prefers regulation with compensation to allowing production for $\theta^A < \theta$.

The resulting Host welfare is hence

$$w^H = \begin{cases} V(\theta) & \text{if} \quad \theta \leq \min[\hat{\theta}, \Theta^A(\phi)], \\ -\phi\pi & \text{if} \quad \Theta^A(\phi) < \theta \leq \hat{\theta}, \end{cases} \tag{5}$$

and Source welfare is

$$w^S = \begin{cases} \pi - C^S(\theta) & \text{if} \quad \theta \leq \min[\hat{\theta}, \Theta^A(\phi)], \\ \phi\pi & \text{if} \quad \Theta^A(\phi) < \theta \leq \hat{\theta}. \end{cases} \tag{6}$$

Stranded investment There are different understandings of the notion of stranded assets in the debate. A common approach defines assets to be stranded if they are "environmentally unsustainable" and "suffer from unanticipated or premature write-downs, downward revaluations or are converted to liabilities".[25] This definition seems based on the notion that the assets have lost in value due to government climate policy. A stranded investment is then not a problem from an efficiency point of view, since it is destined to be scrapped.

This paper will use a different definition: *the unwillingness of a host country that is bound by an investment agreement to regulate production in a foreign-owned plant, when it should be regulated from a joint welfare perspective due to its adverse climate impact.* As noted above, it is very often argued that investment agreements in general, and the ECT in particular, will impose such regulatory chill on the regulation of climate-unfriendly investment. For an investment to be stranded in this sense in our formal setting, several conditions must be fulfilled. First, for Host to be bound by the agreement, it is required that $\theta \leq \hat{\theta}$. Second, for the agreement to potentially impose some form of regulatory chill, Host must prefer production to regulating with compensation, that is, $\theta \leq \theta^A$. Third, $\theta^E < \theta$ is necessary for production to be optimal from a joint welfare point of view. Hence, the investment will be stranded if

$$\theta^E < \theta \leq \min[\theta^A, \hat{\theta}]. \tag{7}$$

A couple of points should be noted regarding the stranded investment setting. First, the in-

[25] See e.g. Caldecott et al (2013).

equality (8) holds unambiguously for $\phi = 1$. As discussed above, this is the natural benchmark case since it reflects the international law principle of full compensation. But $\theta^E < \theta^A$ would also be fulfilled for a range of lower values of ϕ, but not for very small ϕ.

Second, the assumption that $\theta^E < \theta^A$ is equivalent to the assumption that $V(\theta^E) > V(\theta^A)$, or

$$\pi - C^S(\theta^E) < \phi\pi \tag{8}$$

according to (1) and (3). Since $C^S_\theta > 0$, (8) implies that $\pi - C^S(\theta) < \phi\pi$ for $\theta > \theta^E$. The stranded investment scenario hence implies that Source prefers regulation with compensation to production. But Source can be either climate sensitive or not climate sensitive.

The stage is now set for examining consequences of reforms that have been suggested as means of inducing host countries to phase out stranded investment. This will be done by analyzing changes to each of provisions §§ 1-4 in the agreement above. The analysis will disregard implications of the reforms for other industries than the one under study. This will be less of a problem if the reforms can be designed to mainly apply to sectors with severe climate impact. But if not, a complete analysis would obviously require that effects on other sectors are taken into account.

4.4 Increasing the carve-out

A common suggestion is that investment agreements should allow host countries *more space to pursue climate policies without having to compensate investors*, and there is also currently a trend to revise some major agreements along these lines.[26] There are many ways in which agreements could be modified to reduce the risk for host countries to face successful compensation claims by investors when regulating stranded investment. In terms of our model, many of these reforms could naturally be captured by a reduction in the cut-off level $\hat{\theta}$.

Assume therefore a stranded investment setting in which the carve-out is increased from $\hat{\theta}$ to $\hat{\theta}' < \hat{\theta}$. This will induce Host to regulate if Host is climate sensitive, $\theta^H < \theta$, and the revised agreement allows Host to regulate without compensation, $\hat{\theta}' < \theta$. If induced to regulate, Host will benefit from the reform, since Host prefers regulation without compensation to production for $\theta^H < \theta$. Whether Source benefits or loses from the reform depends on whether Source is climate sensitive ($\theta \gtrless \theta^S$). Hence:

Proposition 1 *In the stranded investment setting, an increase in the carve-out from $\hat{\theta}$ to $\hat{\theta}' < \hat{\theta}$ will induce Host to lawfully regulate without compensation if and only if $\max[\hat{\theta}', \theta^H] < \theta$. If regulation is induced, it will benefit Host, harm Source if $\theta \leq \theta^S$, and otherwise benefit Source.*

[26] For instance, in addition to the above-mentioned renegotiation of the Energy Charter Treaty, Germany and the EU Commission proposed in August 2022 a redrafting of parts of the Comprehensive Economic and Trade Agreement (CETA) between the EU and Canada. The purpose is to clarify the meanings of the concepts "fair and equitable treatment", and "indirect expropriation", partly to encourage the parties to pursue more vigorous climate policies (EU Commission, 2022).

4.5 Reducing required compensation in case of regulation

A second possible reform of the compensation scheme would be to *reduce the amount of compensation* that Host is required to pay in case of compensable regulation. This would in terms of the formal framework correspond to a reduction in ϕ. The level of ϕ affects Host's decision regarding whether to regulate, and how to respond to litigation. But the latter impact is irrelevant with ISDS, since it will never be in Host's interest to unlawfully regulate without compensation in this case. But a reduction in ϕ might affect Host's regulatory decision by making it optimal to regulate with compensation, rather than to allow production.

It follows from definition (3) that Host prefers to regulate with compensation rather than to allow production if $\Theta^A(\phi') < \theta$. To see that such a ϕ' always exist, note that $\Theta^A(\phi)$ increases in ϕ, $\Theta^A_\phi = -\pi/V_\theta > 0$, and that $\Theta^A(\phi)$ converges to θ^H as ϕ becomes small. Hence, it is possible to make $\Theta^A(\phi')$ sufficiently small that $\Theta^A(\phi') < \theta$. This will benefit Host by revealed preference, since Host could continue to allow production also with ϕ'.

With regard to the implication for Source welfare, it was noted above that in the stranded investment scenario—that is before the reform—Source prefers regulation with compensation $\phi\pi$ to production. With the reform there will be regulation with compensation, but the compensation will now be smaller, $\phi'\pi$. If Source is climate sensitive, Source will clearly benefit from the reform, since it gives both regulation and compensation. But if Source is not climate sensitive, the compensation may or may not be enough for Source to benefit from the regulation.

Hence:

Proposition 2 *In the stranded investment setting, a reduction in the compensable fraction of foregone profits from ϕ to ϕ' will induce Host to regulate with compensation if $\Theta^A(\phi') < \theta$. If regulation is induced, Host benefits, Source is harmed if $\pi - C^S(\theta) > \phi'\pi$, and otherwise benefits.*

A basic observation in earlier papers on investment agreements is that a full compensation requirement ($\phi = 1$) induces host countries to internalize the full externalities of their regulatory decisions. Due to this feature, an agreement can under certain circumstances implement a jointly efficient outcome (see Aisbett et al., 2010a, and Horn and Tangerås, 2021). However, in the current setting the climate impact on Source drives a *wedge between the interests of the investor and the Source government*, implying that full compensation no longer induces Host to correctly internalize the consequences for Source of its regulatory decision. It requires $\phi < 1$ to induce Host to undertake jointly desirable regulation.

4.6 Excluding ISDS

A common perception in the policy debate is that private investors have too strong incentives to litigate relative to what would somehow be desirable. It is also claimed, at least implicitly, that

source country governments have weaker incentives to litigate than private investors.[27] Based on such reasoning it is increasingly argued that agreements should be revised so as to *disallow ISDS,* to encourage host governments to pursue climate policies.[28]

In the setting above the investor always litigates whenever there is unlawful regulation. Since the Source government is also concerned with the climate impact, a switch to SSDS can indeed reduce Source's propensity to litigate, and thereby induce Host to regulate without compensation when Host is not willing to regulate with compensation. Intuitively, for Host to be willing to regulate without compensation, Host must be climate sensitive ($\theta^H < \theta$). But this does not suffice. It is also required that Source does not have incentive to litigate regarding the unlawful regulation if this induces Host to allow for the restoration of production ($\theta < \theta^R$), and this requires that also Source is climate sensitive ($\theta^S < \theta$). More formally:

Proposition 3 *In the setting with a stranded investment, a removal of ISDS will:*
(i) have no effect if (approx.) $\theta \leq \max[\theta^H, \theta^S]$, *or* $\theta^R \leq \theta$;
(ii) induce Host to unlawfully regulate without compensation if (approx.) $\max[\theta^H, \theta^S] < \theta < \theta^R$*; and*
(iii) then benefit both Host and Source.

Proof: With regard to the first statement in point (i), if $\theta \leq \theta^H$ it will never be in Host's interest to regulate. If $\theta^H < \theta$ Host prefers uncompensated regulation to production. But with $\theta \leq \theta^S$, Source prefers both compensated regulation and restored production to uncompensated regulation. Uncompensated regulation will then induce the Source government to litigate, since either outcome of litigation will be better for Source than not litigating, disregarding the small litigation cost λ^S (hence "approx."). Realizing this, Host abstains from regulating without stipulated compensation. The exclusion of ISDS is thus without effect if either $\theta \leq \theta^H$ or $\theta \leq \theta^S$.

Consider next the case where $\max[\theta^H, \theta^S] < \theta$. If Host has regulated without compensation and faces litigation, Host will maintain the measure due to its climate effect if $\theta^R < \theta$. Source will therefore find it optimal to litigate whenever there is uncompensated regulation and this condition holds even if $\theta^S < \theta$, since Source will thereby not only get regulation, but also compensation. Realizing this incentive for Source, Host abstains from regulating. The switch to SSDS then again has no effect. Hence, the second statement in part (i).

The verification of part (ii) follows largely the same reasoning with reversal of signs. With $\theta^H < \theta$ Host prefers uncompensated regulation to production, but Host will restore production if facing litigation when $\theta \leq \theta^R$. If these conditions hold and Host thus regulates without compensation, Source will abstain from regulation if $\theta^S < \theta$ to avoid triggering restoration of production by Host. This will make uncompensated regulation optimal for Host.

[27] See, for instance, Bernasconi-Osterwalder (2021). A recent example is the resolution that the European Parliament (2022) adopted on in November 2022, concerning the adverse impact of ISDS for the climate and the environment.
[28] See Alarcon (2023) for a comprehesive account of the many reforms to ISDS that were introduced during 2022.

Part (iii) follows directly from $\max[\theta^H, \theta^S] < \theta$.■

Intuitively, Proposition 3 identifies a form of "litigation hold-up" with SSDS for $\theta^R < \theta$. Assume both parties prefer uncompensated regulation to production. Since Host prefers not to regulate if it has to compensate the investor, Host needs an assurance that uncompensated regulation will not lead to litigation, to take such action. The Source government would be willing to enter into such a commitment beforehand. But absent such commitment, once Host has regulated without compensation, Source will litigate if $\theta > \theta^R$, knowing that Host will then choose to retain the measure and additionally pay compensation. However, realizing that the Source government has this incentive, Host will abstain from regulating, to the detriment of both countries. Put differently, by striving for the first best—to get both regulation and compensation—Source misses the opportunity to get the second best—regulation—and ends up with the third best—production.

Observation 1 *Even if both countries are climate sensitive, the threat of litigation by the Source government once Host has regulated without compensation can induce Host to refrain from regulation.*

The finding in Proposition 3 is compatible with the common claim that source country governments have weaker incentives to litigate than private investors, and that disallowing ISDS will therefore contribute to the phasing out of stranded investment. In the present setting the weaker incentives stem from the climate impact from production. It might appear counter-intuitive however, that the popular proposal to only allow for SSDS requires *unlawful* behavior on part of the host country. However, as long as these proposals are based on the notion that the substantive obligations remain the same under SSDS as under ISDS, the effect of excluding ISDS must come through less enforcement of these obligations in case of violations.

Observation 2 *Exclusion of ISDS must trigger unlawful regulation by Host for it to have any effect.*

SSDS ineffective also in another setting SSDS can be shown to be ineffective also with a different rationale for the distinction between ISDS and SSDS. The main explanation in the legal literature for the inclusion of ISDS in investment agreements is that source country governments face political costs when pursuing disputes that do not arise for private investors. Assuming that the Source government faces such costs here, it would refrain from litigation when the compensation at stake is too small relative to the political litigation costs. In such cases, a switch to SSDS would indeed induce Host to opportunistically regulate without compensation, potentially to the benefit of both countries. However, this mechanism would not work when sufficiently large operating profits are at stake, implying that SSDS reform would not be fully effective in this setting either (see Horn and Tangerås, 2022).

4.7 Excluding ISDS in combination with other reforms

Proposition 3 states that for exclusion of ISDS to trigger uncompensated regulation, both parties must prefer uncompensated regulation to production, $\theta^H < \theta$ and $\theta^S < \theta$. Neither of these constraints can be eased through reforms of the agreement under consideration. But even if these constraints are fulfilled, it is also required that there is no "litigation hold-up", that is, that Source does not prefer to litigate if Host regulates without compensation, $\theta < \Theta^R(\phi, \rho)$. There are two complementary reforms to the exclusion of ISDS that can make this restriction less binding.

Increasing the compensable fraction of foregone operating profits Proposition 2 showed that in the case of ISDS, a reduction in the compensable fraction of foregone operating profits to ϕ' would trigger regulation with compensation if $\Theta^A(\phi') < \theta$. Assuming that both parties are climate sensitive, this would benefit both parties.

Assume instead that ϕ is *increased* to ϕ'' such that $\theta < \Theta^R(\phi'', \rho)$.At the face of it, this would harm Host, since it would make regulation with compensation more costly. However, as long as such a regulation does not occur in equilibrium, this direct effect will not matter. But the increase to ϕ'' will also induce Host to regulate without paying compensation. Host will know that Source will abstain from litigation, since litigation will induce Host to restore production due to the (now larger) compensation that would be required to maintain the regulation. Hence, when the exclusion of ISDS is combined with the increase in the compensable fraction of foregone operating profits, it can trigger regulation. What more, the increase in the required compensation *benefits* Host.

However, while Θ^R increases in ϕ,

$$\Theta^R_\phi = \Theta^A_\phi = -\pi/V_\theta > 0$$

it will not always be possible to find a $\phi'' \leq 1$ such that $\theta < \Theta^R(\phi'', \rho)$ when $\Theta^R(\phi, \rho) < \theta$. This will only be possible if $\theta < \Theta^R(\phi = 1, \rho)$, since in this case there will exist a $\bar{\phi} < 1$ such that $V(\theta) - \rho = \bar{\phi}\pi$.

Reducing the compensation in case of restitution Another reform of the dispute settlement system that would increase the level $\Theta^R(\phi, \rho)$ would be to *reduce stipulated compensation for restitution (ρ)* after illegal regulations are withdrawn, since Θ^R is falling in ρ: $\Theta^R_\rho(\rho) = 1/V_\theta < 0$. If the reduction of ρ to ρ' is sufficiently large that $\theta < \Theta^R(\phi, \rho')$, Host's optimal response to litigation will change from retaining the measure and pay compensation, to restoring production. This will make litigation unattractive for the Source government, if it is climate sensitive.

Observation 3 *In situations where an exclusion of ISDS is inconsequential, combining it with an increase in the compensable fraction of foregone profits, or with a reduction in stipulated compensation for restoration costs, might induce Host to unlawfully regulate without compensation, to the benefit of both parties.*

5 Unilateral withdrawal

A common criticism of investment agreements is that they specify too long sunset periods for withdrawals from the agreements. The examine the consequences of shortening the period of protection specified by a sunset clause, the agreement considered above is extended to include a simple representation of a sunset provision. Since a sunset clause is an inherently dynamic concept, the underlying model also needs to be modified.

Let there thus be an indefinite sequence of periods ("years"). The entities $V(\theta)$, π, $C^S(\theta)$, etc, the refers to yearly flows. The parties seek to maximize their respective future aggregate streams of welfare. To simplify, discounting is disregarded, but it could be introduced without affecting the qualitative findings. The investment under consideration has a remaining life-span of $\hat{T}$ years at the start of the analysis. Each of these years it yields a profit of π. Hence, the value of the investment is $\hat{T}\pi$ at the outset. Let $t = 1, ...$ be the index for the years after a withdrawal. For simplicity, we set $\phi = 1$.

5.1 The assumed provisions

As discussed in Section 2, one possible view of the problem with stranded investment is that the climate problem has fundamentally changed the circumstances underlying the agreement. Applied to our formal setting, a party seeking to denounce the agreement could argue that the agreement would not have come into existence if θ was known at the time the agreement was formed. It is unclear however whether such an argument would hold up legally. We will instead assume that the parties can unilaterally withdraw from the agreement, but that a sunset provisions applies in such an instance.[29]

Assume that the agreement above is extended to include the following provisions:

§ *5. Each party can unilaterally withdraw from the agreement.*

§ *6. If Host regulates production within T years after either party withdraws, Host must pay the investor the foregone operating profits.*

5.2 The sequence of events

While withdrawal by a party from a bilateral agreement will terminate the agreement, it will not affect any obligation under the treaty prior to its termination (Art. 70 VCLT). Hence, in the present framework, withdrawal cannot interrupt a litigation process. To capture this in the present setting, it is assumed that decisions on withdrawal are in each period made prior to regulation/litigation decisions. The events thus unfold as follows in any period:

[29] An agreement can also be jointly terminated by the parties. As noted above, there are differing legal opinions regarding whether sunset provisions still apply in case of joint termination, but it appears as if the dominant view is that they don't. This would imply that a shortening of the period specified in a sunset clause would not affect the propensity for joint termination.

(1) If there was no withdrawal in the past, the parties decide separately whether:
- to withdraw; or
- not to withdraw.

(2) If neither party withdraws, the interaction moves to the regulation/litigation stage, resulting in the stranded investment outcome derived above.

(3) If at least one party withdraws, or if there was withdrawal but no regulation in the past, Host decides whether:
- to regulate given the sunset clause; or
- not to regulate.

5.3 A stranded investment outcome

To load the dice in favor of regulation, assume that Host is sufficiently climate sensitive that $V(\theta) < -\pi$, so that in each period in which there is production, Host is would willing to fully compensate the investor for its loss from regulation; the alternative case will be considered below. Assume further that there was a withdrawal and that the sunset provision stipulates continued protection for the next T years.

A withdrawal by Source will not affect Host's regulatory decision. Host can always refrain from regulating if it so prefers, making the withdrawal ineffective, and the consequences of a withdrawal are the same for Host regardless of whether Host or Source withdraws. Hence, Source will not be able to affect the outcome by withdrawing.

Host's decision regarding regulation after withdrawal Starting from the end of the sunset period, if Host has not regulated before, Host will do so immediately after the expiry of the sunset period, that is, in year $t = T + 1$, since regulation can be done without cost, and $V(\theta) < 0$.

(1) If the sunset period is *longer* than the life-span of the investment, $T > \hat{T}$, there can be no production from $t = \hat{T} + 1$ and onwards since the investment has reached its physical end. In the preceding period $t = T$, the required compensation in case of regulation is $-\pi$, since this is full the remaining value of the investment. The welfare stream from not regulating is $V(\theta)$ in this period, and 0 for the rest of the future, so with $V(\theta) < -\pi$ there will be regulation.

In the preceding period, $t = T - 1$, regulation requires compensation 2π, since the remaining value of the investment is now larger, and not regulating yields welfare $V(\theta)$ in $t = T - 1$, and $-\pi$ in year $t = T$, since there will then be regulation, and 0 thereafter. There will thus be regulation in $t = T - 1$ if $V(\theta) + (-\pi) < -2\pi$, that is, if $V(\theta) < -\pi$, which holds. Etc. Consequently, if $T > \hat{T}$, there will be regulation immediately after withdrawal.

Intuitively, when the sunset clause covers the whole life-span of the investment and the sunset clause has been triggered, Host has to compensate the investor with the whole remaining value

whenever regulation occurs. If for each of these years $V(\theta) < -\pi$, it will optimal to regulate immediately.

(2) If the sunset period is *shorter* that the lifetime of the investment, $T < \hat{T}$, there are $\hat{T} - T$ years remaining for the investment to generate profits at the expiry of the sunset period, if Host has not regulated before. Host will then regulate at the first instance after the expiry, that is, at $t = T + 1$, since it can be done without compensation. This will result in an uncompensated loss of $(\hat{T} - T)\pi$ for the investor.

In the preceding period $t = T$, Host has two options. Host can regulate immediately. This requires compensation π for period $t = T$ plus $(\hat{T} - T)\pi$ for the remaining lifetime for the investment. Host can also wait with regulation until after the expiry of the sunset provision, which will give rise to welfare $V(\theta)$ during $t = T$ and zero afterwards. Not regulating is optimal for Host if

$$V(\theta) > -\pi - (\hat{T} - T)\pi.$$

Assume that this holds; it is compatible with $V(\theta) < -\pi$.

If there were not regulation before, with two years remaining until the expiry of the sunset clause ($t = T - 1$), if Host refrains from regulation the welfare is $V(\theta)$ in each of $t = T - 1$ and in $t = T$ (since there will be no regulation in $t = T - 1$), so the total stream is $2V(\theta)$. If Host instead regulates immediately, Host has to pay compensation $(\hat{T} - T)\pi + 2\pi$ since the value of the investment in $T - 1$ is larger then it will be one year ahead, in $t = T$.. Hence Host will prefer not to regulate if

$$2V(\theta) > -2\pi - (\hat{T} - T)\pi.$$

Hence, with two years left until the expiry of the sunset clause, if this condition holds, it will be better for Host to take cost of not regulating during the next two periods, $V(\theta) < -\pi$, to be able to escape having to compensate the investor for the remaining life of the investment, after the expiry of the sunset clause.

It follows that with τ periods left, Host will refrain from regulating immediately if

$$V(\theta) > -\pi - \frac{(\hat{T} - T)}{\tau}\pi. \tag{9}$$

In particular, immediately after withdrawal ($t = 1$), when there are T years remaining until the expiry of the sunset clause, it will be optimal not to regulate:

$$V(\theta) > -\pi - \frac{(\hat{T} - T)}{T}\pi = -\frac{\hat{T}}{T}\pi. \tag{10}$$

For this inequality to hold, T must be sufficiently smaller than $\hat{T}$. Let $\bar{T}$ be given by

$$-\frac{\hat{T}}{\bar{T}}\pi \equiv V(\theta).$$

It follows from$V(\theta) < -\pi$, that $\bar{T} < \hat{T}$. Hence, if $T < \bar{T} < \hat{T}$ Host will defer regulation until after the expiry of the sunset clause. If instead $\bar{T} < T < \hat{T}$ there will be some point in time during the sunset period, before which it will be optimal with regulation for Host all years. Regulation will then occur immediately after withdrawal.

The optimal regulatory behavior for Host is hence as follows:

Lemma 2 *Assume that withdrawal has been triggered, there is a sunset provision of length T, and that $V(\theta) < -\pi$.*
(i) If $T < \bar{T}$, Host will refrain from regulating until the expiry of the sunset provision.
(ii) If $\bar{T} < T < \hat{T}$, or $\hat{T} < T$, Host will regulate at the outset of the interaction.

Postponing withdrawal? It was assumed above that a withdrawal had triggered the sunset clause. If Source does not withdraw, there is a question of whether it is in Host's interest to withdraw. Host could instead defer withdrawal until next year (or later). This is clearly not optimal when $T > \hat{T}$, since while it would save Host the compensation $-\pi$ in the first period, it would expose Host to the welfare $V(\theta) < -\pi$.

If $T < \hat{T}$ and it is optimal not to regulate during the whole sunset period, postponing withdrawal with one period adds $V(\theta) < 0$ the stream of welfare, but does not save on any compensation payments, since regulation will not take place until after the expiry of the sunset clause.

If $T < \hat{T}$ and it is optimal to regulate immediately after withdrawal, postponing withdrawal with one year saves compensation payment π in $t = 1$, but exposes Host to $V(\theta)$ in this period, which is welfare reducing. It will not affect the compensation payment required in year $t = 2$ however, since the life-span of the investment is longer than the sunset period. And if the withdrawal is pushed sufficiently into the future that $T > \hat{T}$, immediate regulation will be optimal from then onwards.

Consequently, there is no gain for Host to delay withdrawal if it is ever desirable, that is, if Host is climate sensitive.

The case where $V(\theta) > -\pi$ If $T > \hat{T}$, there can be no production from $t = \hat{T} + 1$ and onwards since the investment has reached its physical end. In the preceding period $t = T$, the required compensation in case of regulation is $-\pi$, since this is full the remaining value of the investment. The welfare stream from not regulating is $V(\theta)$ in this period, and 0 for the rest of the future, so with $V(\theta) > -\pi$ there will not be regulation in $t = T$. In $t = T-1$ regulation requires compensation 2π, and not regulating yields welfare $V(\theta)$ in each of the years $T - 1$ and T. There will hence not be regulation, and the same reasoning applies to each year. So with $T > \hat{T}$ and $V(\theta) > -\pi$ there will be no regulation.

If $T < \hat{T}$ matters are even clearer, since regulation anytime before the expiry of the sunset period will trigger an additional compensation payment covering the remaining life-span of the investment.

Hence:

Observation 4 *If* $0 > V(\theta) > -\pi$, *so that Host is climate sensitive, withdrawal will still not trigger regulation until after the expiry of the sunset provision.*

A stranded investment setting The findings above can be summarized as follows:

Proposition 4 *After a withdrawal, even if Host is climate sensitive, there will be no regulation until after the expiry of the sunset period if:*
(i) $V(\theta) > -\pi$; *or*
(ii) $V(\theta) < -\pi$ *and* $T < \bar{T}$.

Hence, since in the absence of the sunset clause there would be immediate regulation of the investment after the withdrawal, the sunset clause can be said to cause a stranded investment problem for the length of its duration, when the conditions in the Proposition 4 are fulfilled.

5.4 Shortening the sunset period

Consider now a shortening of the sunset period, as has been proposed in the policy debate, and as has been implemented in the renegotiation of the ECT.

As long as Host is not climate sensitive, a shortened sunset period will be inconsequential. This would also be the case if $V(\theta) > -\pi$, since there would then be no regulation regardless of the length of the sunset period. In other settings a shortening might have effect, however.

Lemma 3 *If Host is climate sensitive and* $V(\theta) < -\pi$, *shortening the sunset clause from* T *to* T' *will have the following implications for regulation after a withdrawal.*
(i) If $\hat{T} < T$ *there will be immediate regulation regardless of* T'.
(ii) If $T < \hat{T}$ *and:*
- $\bar{T} < T'$ *there will be immediate regulation both before and after the reform.*
- $T' < \bar{T} < T$ *Host will regulate immediately before the reform, but will delay regulation until after the expiry of the sunset period after the reform.*
- $T < \bar{T} < \hat{T}$ *Host will refrain from regulating until the expiry of the sunset provision both before and after the reform.*

It follows from the above that a shortening of the sunset clause will not resolve the stranded investment problem in the short run:

Proposition 5 *A shortening of the sunset clause can affect regulation:*
(i) by delaying regulation from occurring immediately after withdrawal, to occurring after the expiry

of the sunset clause; and
(ii) by inducing regulation in the years that no longer are covered by the clause.

Hence, the popular notion that sunset clauses should be shortened in order to induce host countries to regulate stranded investment does not hold up in the present setting. Of course, if the provision is removed entirely, it might stimulate regulation. However, if the provision causes Host to refrain from regulation before being reformed, this must be because it is better to allow production than to pay the required compensation. If it is worth waiting for the expiry of the sunset period at the outset, shortening this period without removing it completely will then make it even more attractive to wait for its expiry. Instead, to get immediate regulation, the sunset provision should be made to make deferral of regulation more *un*attractive:

Observation 5 *If the purpose of redrafting the length of the sunset period is to induce Host to regulate immediately, this period should be extended, not shortened.*

Turning to the welfare implications of the reform, it is clear that if Host is not climate sensitive, there will be no impact on either party. Nor will there be any impact if there is regulation immediately both with and without the reform. But there will consequences in other situations:

Proposition 6 *If Host is climate sensitive, a shortening of the sunset clause will have the following welfare implications:*
(i) If Host regulates after the sunset period expires both before and after the reform, Host benefits, Sources benefits if Source is climate sensitive, and otherwise loses.
(ii) If the reform induces Host to switch from immediate regulation after withdrawal to regulation after the sunset period expires, Host benefits, and Source loses.

Intuitively, if the sunset clause both with and without the reform causes Host to defer regulation until after the stipulated period expires, a shortening of this period will induce regulation during the periods that no longer covered by the clause after the reform. But it will not affect compensation payments, since there are no payments in either case. This will have the effects stated in part (i). If instead the reform leads to regulation only after the expiry of the sunset period, Host benefits by revealed preference, since Host can continue to regulate immediately if this is better. Source will lose the compensation $T\pi$ that was paid without the reform, and instead get welfare $T'[\pi - C^S(\theta)]$ with the reform. Since $T' < T$, $T\pi > T'[\pi - C^S(\theta)]$, Source thus loses from the reform regardless of whether Source is climate sensitive, as stated in part (ii). However, if Source is climate sensitive, it will lose on two accounts: it will only get the profit incomes π in T' periods, instead of for the whole life-span of the investment $\hat{T}$. Additionally, it will be exposed to the climate problem.

6 The relative merits of the reforms

A basic finding in the analysis above is that the reforms have very different implications in several respects. These differences can importantly affect the likelihood that they will be implemented. For instance, as highlighted in Table 1, when the reforms trigger regulation that solves the stranded investment problem, they still differ widely in the actions accompanying regulation, despite the simplicity of the economic setting that has been employed.

Reform:	**Action:**
$\hat{\theta} \downarrow$	Lawful regulation without compensation
$\phi \downarrow$	Lawful regulation with compensation
SSDS only	Unlawful regulation without compensation
$T \downarrow$	Unilateral withdrawal with compensation

Table 1: Actions in response to the reforms

The reforms differ in whether they lead to *compensation payments* by Host. It seems plausible that strong political reactions can be triggered in host countries that resolve regulatory chill problems in the context of climate policy, by paying (potentially substantial) compensation to foreign investor. Another difference between the reforms is that exclusion of ISDS, but not the reforms of the compensation scheme, require the Host government to *violate the agreement*. Even if the reforms target industries where there are severe climate problems, undermining the implementation of the agreement in these industries might negatively affect the respect for the agreement in other industries where there are no severe problems with underregulated investment. A third difference is whether the reforms *maintain the integrity of the agreement*. The reforms to the compensation scheme and to dispute settlement will in practice be less drastic than withdrawal from the agreement. Withdrawal from the agreement is also the reform that most likely will have repercussions for other industries than the one considered here.

The reforms also differ significantly with regard to their economic effects. One important aspect is whether the reforms have the capacity to resolve the stranded investment problem for *any* intensity of the climate problem. If a reform can only handle this problem under certain or no circumstances within this simple framework, there is reason to doubt the efficacy of the reform more generally. A second aspect is the *distributional impact* of the reforms when regulation is triggered, which is central since adoption of reforms requires consent by both parties.

Table 2 summarizes the findings with regard to the first two aspects. The columns "Any θ?" reflect whether it is possible to design the reform to resolve a stranded investment problem for any climate intensity, and columns "Vetoed by S?" capture whether the reforms would harm Source, and therefore not be accepted by both parties. The table distinguishes between three settings:

- where Host is not climate sensitive, $\theta \leq \theta^H$, and where thus Source is climate sensitive due to the assumption that $\theta > \theta^E$;
- where only Host is climate sensitive, $\theta^H < \theta < \theta^S$; and
- where both parties are climate sensitive, $\max[\theta^H, \theta^H] < \theta$.

	$\theta \leq \theta^H$	$\theta^H < \theta < \theta^S$		$\max[\theta^H, \theta^S] < \theta$	
Reform:	**Any** θ?	**Any** θ?	**Vetoed by S?**	**Any** θ?	**Vetoed by S?**
$\hat{\theta} \downarrow$	No eff.	Yes	Yes	Yes	No
$\phi \downarrow$	No eff.	Yes	Ambig.	Yes	No
SSDS only	No eff.	No eff.	No	No	No
$T \downarrow$	No eff.	None	Yes	None	Ambig.

Table 2: Potentials of the reforms to induce regulation, and whether vetoed by Source

An immediate observation is that none of the reforms can address the stranded investment problem when Host is not climate sensitive ($\theta \leq \theta^H$). This is not surprising as such, given that Host would then refrain from regulating also absent the agreement due to Host's preference for production over uncompensated regulation. But the observation points to the asymmetry between Host and Source with regard to the distributional impact of the reforms: Host can insulate itself from adverse effects of all the reforms by continuing to allow production also after they are implemented. The problem is thus to find reforms that are both effective and *acceptable to Source.*

Efficacy With regard to the efficacy of the reforms, if Host is climate sensitive, the reforms of the compensation scheme can be designed to trigger regulation for any intensity of the climate problem. Host can be induced to regulate for any $\theta^H < \theta$ by increasing the Host policy space such that $\hat{\theta}' \leq \theta^H$, and it is always also possible to achieve this by setting the compensable fraction of foregone profits ϕ' such that $V(\theta^H) = -\phi'\pi$. Both reforms can be designed to effectively undo the compensation requirement.

In contrast, the exclusion of ISDS will not resolve the stranded investment problem even if Host is climate sensitive, *if Source is not climate sensitive.* Nor will it resolve the problem for all θ for which both countries are climate sensitive, since it can only handle cases where $\max[\theta^H, \theta^S] < \theta < \theta^R$. This is due to the "litigation hold-up" with SSDS described above—the incentive for Source to litigate once Host has regulated without compensation in instances with the most severe stranded investment problems, those where $\theta^R < \theta \leq \max[\hat{\theta}, \Theta^A(\phi)]$.

The shortening of the sunset period fails completely, in that it cannot trigger immediate regulation, unless the provision is removed completely. But in certain situations it can make regulation

without compensation occur earlier, by reducing the time until regulation occurs. But as noted above, if the purpose is to get immediate regulation, the sunset period should be extended.

Acceptability As noted above, Host will benefit from any reform that triggers regulation, since Host can always without cost refrain from regulating if regulation reduces Host welfare.

If Source is climate sensitive, also Source will benefit any reform that leads to regulation. There is therefore no reason for Source to veto the two reforms regarding the compensation scheme. Source will prefer reduced compensation since this will lead to a compensation payment. But the compensation will just be an added benefit. Source will also gain if regulation is triggered through exclusion of ISDS, although this will not lead to compensation. It is unclear whether Source benefits from the shortening of the sunset period however, since while it might benefit a climate sensitive Source by making regulation occur earlier, it might also induce Host to switch from immediate regulation to regulation after the expiry of the sunset period, which would then harm Source (Proposition 6).

When Source is not climate sensitive, the reforms that reduce compensation payments have more problematic distributional impact, however. When regulation is caused by an increase of Host policy space, there are no compensation payment, so Source unambiguously loses, and will therefore veto a proposal for such a reform. When regulation is triggered by reduced compensation in case of regulation, there will be compensation payments, but there is no guarantee that the payments will be enough to compensate Source for lost producer profits. So it depends on the exact circumstances whether Source will accept a proposed cut in the compensable share of foregone profits. In contrast, when regulation is triggered by the exclusion of ISDS, there will be no compensation for Source. However, since the Source government can decide when to litigate—and *when not to litigate*—Host will regulate without compensation only when this benefits Source, according to Proposition 3. The exclusion of ISDS will therefore have no impact on Source if Source is not climate sensitive.

Finally, the shortened time-span for the sunset period, which will never trigger immediate regulation after withdrawal, can still harm Source if Source is not climate sensitive, by part (i) of Proposition 6.

A trade-off between efficacy and acceptability In sum, the reforms of the compensation scheme are effective partly since Source cannot block regulation. But this is also the reason why they are problematic if Source is not climate sensitive. In contrast, since the switch to SSDS requires Host to commit an illegality to be effective, it gives Source some influence over the outcome, by allowing Source to litigate. This possibility is what induces Host to refrain from regulating in certain instances, possibly to the detriment of both parties. But it is also what allows Source to prevent the uncompensated regulation when Source is not climate sensitive.

Observation 6 *The analysis suggests a trade-off between the efficacy and acceptability of the re-*

forms.

7 Concluding remarks

A very simple economic framework has been employed to examine consequences of a number of investment treaty reforms that have been suggested in the policy debate as means of making treaties more climate friendly. But the findings at least in part seem to reflect much more general features of the considered reforms than what the simplicity of the model might suggest. First, when reforms are implemented in situations with stranded investment, host countries should in general be able to insulate themselves from adverse implications of the reforms, by continuing to allow production. Hence, host countries should weakly benefit from any reform that leads to increased regulation. Second, source countries that prefer production to uncompensated regulation should in general lose from increased carve-outs from compensation requirement, since the use of carve-outs do not lead to compensation payments. Third, whether source countries will benefit or lose from reforms involving reduced compensation should depend on how drastic the reduction in the compensation is, as well as their preferences with regard to the climate. Fourth, the exclusion of ISDS is a very blunt instrument for addressing stranded investment problems, although it can sometimes be sharpened by combining it with certain other reforms. For an exclusion have effect, as long as no other provisions are reformed, it must be that the host country opportunistically violates the agreement, knowing that the source country government will choose not to enforcement challenge the violation. Finally, a shortening of the applicable period for a sunset provision, should make it more attractive to wait with regulation until the expiry of the sunset clause in much more general settings, thus worsening the short-run problem with stranded investment.

The just completed renegotiation of the Energy Charter Treaty illustrates the difficulties in renegotiating investment treaties to address stranded investment problems. Despite the fact that the renegotiation was largely motivated by a desire to make the agreement compatible with climate ambitions, a number of EU member states now seek to withdraw from the agreement, arguing that the renegotiated version will not be compatible with the commitments made in the Paris Agreement. It is also noteworthy that at the same time as EU member states withdraw from the ECT for climate reasons, they have not shown much interest in revising the more than 1 000 bilateral agreements that they have with third countries. While the renegotiation of these agreements might be less pressing due since they typically cover smaller stocks of investment than the ECT, they are likely to be as poorly designed from a climate perspective. Based on the analysis above it might conjecture that EU member states are less interested in renegotiating these agreements since they typically play the role of source countries in the agreements.

Finally, there are many aspects of the nexus between the climate problem and investment treaties that need economic research. Investment agreements such as the ECT are frequently criticized for not only protecting stranded investment, but also for encouraging new fossil-based investment.

Close the present analysis is thus the question of how to design reforms such they both alleviate existing stranded investment problems, and at the same time *reduce the build-up of more stranded investment*. The present analysis considered only the former aspect, assuming an already existing investment. However, the direct effect of the reforms of compensation schemes and the exclusion of ISDS are likely to be to reduce the incentives for new investment, and thereby to further contribute to reducing the climate problem. What complicates the issue however is that smaller investment should also plausibly reduce Host's commercial benefits from the investment, and also reduce the source country's commercial benefits from investment, thus affecting the incentives for regulation and litigation in unclear fashion.

Another issue that deserves to be examined is the impact of investment agreements on *host country incentives to introduce new support schemes for climate-friendly investment*, for instance in renewable energy, and the appropriate design of investment agreements from this perspective. As mentioned above, a large number of climate-related disputes have concerned withdrawals of support schemes, such as feed-in tariffs, for renewable energy investment. The fact that the direct effect of the contested measures in these disputes is to harm the climate, is sometimes taken as evidence for the climate-friendliness of investment treaties. It can be noted though that these disputes have not have not led to the restoration of the support schemes, even when host countries have lost the disputes, the only consequence have been compensation payments. The main implication of these disputes has instead probably been to make governments more aware of the obligations that investment agreements impose. This might in some instances have made governments more reluctant to withdraw such support. But it might also have made governments less willing to introduce new support schemes, to the detriment of the climate.

A central theme in these disputes is whether the initial introduction of the withdrawn support schemes created "legitimate expectations" on behalf of investors that the measures would remain unchanged. The "legitimate expectations" notion is a rather enigmatic notion from an economic perspective. It can hardly be interpreted to mean "rational", since rational investors should expect opportunistic governments to behave opportunistically, thus rendering the "protection of legitimate expectations" meaningless. The withdrawals of support schemes in the above-mentioned disputes often occurred to correct for mistakes made in the design of the schemes. For instance, the support schemes were in some cases too generous for investors, triggering more investment than expected, and thus became too costly from a budgetary perspective. Such policy mistakes should be expected in the context of new technologies. This raises fundamental questions concerning the role of investment agreements in situations with rapidly evolving external conditions. How should the risk for policy mistakes (as opposed to opportunistic behavior) be distributed across host countries and investors? Is it possible to give some economically reasonable, and preferably also operational, interpretation of the central concept of investors' "legitimate expectations" regarding policy stability?

8 References

Aisbett, Emma, Larry Karp and Carol McAusland (2010a). Police Powers, Regulatory Takings and the Efficient Compensation of Domestic and Foreign Investors. *The Economic Record* 86(274), September, 367–383.

Aisbett, Emma, Larry Karp and Carol McAusland (2010b). Compensation for Indirect Expropriation in International Investment Agreements: Implications of National Treatment and Rights to Invest. *Journal of Globalization and Development* 1(2), 1-35.

Alarcon, Maria José (2023). 2022 in Review: Institutional and Structural ISDS Reforms. Kluwer Arbitration Blog, January 29.

Bernasconi-Osterwalder, Nathalie (2021). Energy Charter Treaty Reform: Why Withdrawal is an Option. Energy Treaty News, June 24, International Institute for Sustainable Development.

Bernasconi-Osterwalder, Nathalie and Martin Dietrich Brauch (2019). Redesigning the Energy Charter Treaty to Advance the Low-Carbon Transition. Trans-National Dispute Management Special Issue on the Modernisation of the Energy Charter Treaty (ECT), February.

Bohmer, Lisa (2021a). The Netherlands is Facing its First ICSID Arbitration, as German Energy Giant RWE Makes Good on Earlier Threats. Investment Arbitration Reporter, February 3.

Bohmer, Lisa (2021b). Uniper Lodgers Treaty-Based Claim Against The Netherlands. Investment Arbitration Reporter, April 27.

Bohmer, Lisa (2022a). Uniper is Required to Withdraw its Intra-EU ECT Claim Against the Netherlands as Part of German Bailout Package. Investment Arbitration Reporter, July 22.

Bohmer, Lisa (2022b). Deeming the ECT's Modernization Process Insufficient, Poland Drafts a Law Denouncing the Treaty. Investment Arbitration Reporter, September 2.

Brewin, Sarah and Lukas Schaugg (2022). Modest Modernization or Massive Setback? An Analysis of the Energy Charter Treaty Agreement in Principle. IISD Report, August.

Di Salvatore, Lea (2021). Investor–State Disputes in the Fossil Fuel Industry. IISD Report December.

Djanic, Vladislav (2023). European Commission Recommends Coordinated EU Withdrawal from the Energy Charter Treaty. Investment Arbitration Reporter, February 8.

Dolzer, Rudolf and Christoph Schreuer (2012). *Principles of International Investment Law.* Oxford, UK: Oxford University Press.

European Parliament (2022). Joint Motion for a Resolution on the Outcome of the Modernisation of the Energy Charter Treaty. 2022/2934(RSP).

EU Commission (2022). Statement from the Commission on Clarifications Discussed with Germany Regarding Investment Protection in the Context of the CETA Agreement. 29 August.

Helfer, Laurence R. (2012). Terminating Treaties. In Duncan Hollis (ed.), *The Oxford Guide to Treaties,* Oxford University Press, 634-649.

Horn, Henrik and Thomas Tangerås (2021). Economics of International Investment Agreements. *Journal of International Economics* 131, 103433.

Horn, Henrik and Thomas Tangerås (2022). Investor-State vs. State-State Dispute Settlement. Centre for Economic Policy Research Discussion Paper No. 14 480.

Ipp, Anja, Magnusson, Annette and Andrina Kjellgren (2022). The Energy Charter Treaty, Climate Change and Clean Energy Transition. A Study of the Jurisprudence. Climate Change Counsel.

Janeba, Eckhard (2019). Regulatory Chill and the Effects of Investor State Dispute Settlement. *Review of International Economics* 27(4), 1172-1198.

Kohler, Wilhelm and Frank Stähler (2019). The Economics of Investor Protection: ISDS versus National Treatment. *Journal of International Economics* 121, 103254.

Konrad, Kai A. (2017). Large Investors and Permissive Regulation: Why Environmentalists May Dislike Investor-State Dispute Settlement. *European Economic Review* 98, 341-353.

Kouroutakis, Antonios (2022). Sunset Clauses in International Law and their Consequences for EU Law. STUDY Requested by the JURI committee, European Parliament.

IRENA (2017). "Stranded Assets and Renewables: How the Energy Transition Affects the Value of Energy Reserves, Buildings and Capital Stock", International Renewable Energy Agency, Abu Dhabi.

Kohler, Wilhelm and Frank Stähler (2019). The Economics of Investor Protection: ISDS versus National Treatment. *Journal of International Economics* 121, 103254.

Lavranos, Nikos (2022). How States Comply with Investment Treaty Arbitration Awards: Insights from a 2022 Report on Compliance. Kluwer Arbitration Blog, November 26.

Letizia, Valerio (2022). The EU Termination Agreement and Sunset Clauses: No 'Survivors' on the (Intra-EU) Battlefield? Kluwer Arbitration Blog, June 22.

Ossa, Ralph, Staiger, Robert W. and Alan Sykes (2020). Disputes in International Investment and Trade. Stanford Law and Economics Olin Working Paper No. 553

Paine, Joshua (2023). 2022 in Review: Climate Change as a Mainstream Issue for Investment Treaty Policymakers. Kluwer Arbitration Blog, January 27.

Pohl, Joachim (2013). Temporal Validity of International Investment Agreements. A Large Sample Survey of Treaty Provisions .OECD Working Papers on International Investment 2012/04.

Pohl, J., K. Mashigo and A. Nohen (2012). Dispute Settlement Provisions in International Investment Agreements: A Large Sample Survey .OECD Working Papers on International Investment No. 2012/02,. OECD Publishing, Paris.

Putter, Stan (2021). The Netherlands Coal Phase-Out and the Resulting (RWE and Uniper) ICSID Arbitrations. Kluwer Arbitration Blog, August 24.

Reinisch, August and Sara Mansour Fallah (2022). Post-Termination Responsibility of States?—The Impact of Amendment/Modification, Suspension and Termination of Investment Treaties on (Vested) Rights of Investors.*ICSID Review* 37(1-2), pp.101-120.

Schjelderup, Guttorm and Frank Stähler (2020). Investor State Dispute Settlement and Multinational Firm Behavior. Department of Business and Management Science Discussion Paper 9, Norwegian School of Economics.

Stähler, Frank (2018). An Optimal Investor State Dispute Settlement Mechanism. Mimeo, March 1.

Tienhaara, Kyla and Loenzo Cotula (2020). Raising the Cost of Climate Action? Investor-State Dispute Settlement and Compensation for Stranded Fossil Fuel Assets. International Institute for Environment and Development (IIED), London.

Tropper, Johannes (2022). Withdrawing from the Energy Charter Treaty is (Not) Near. Kluwer Arbitration Blog, November 4.