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Henrik Horn

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Research Institute of Industrial Economics
P.O. Box 55665
SE-102 15 Stockholm, Sweden
info@ifn.se
www.ifn.se

Investment Treaty Reforms to Prevent Developing Country Regulatory Chill from Causing Global Warming

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

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*Address: Research Institute of Industrial Economics (IFN); Box 55665; SE-102 15 Stockholm; Sweden. Email: henrik.horn@ifn.se. The author gratefully acknowledges financial support from the Torsten Söderberg Foundation.

Abstract

Developing countries have 1300+ investment treaties with developed countries. Investment treaties are often alleged to constrain developing country climate policies. This paper examines four treaty reforms that are often suggested as remedies to such regulatory chill. It considers an investment treaty that protects a stranded developed country investment in a developing country. The reforms are compared with regard whether they can induce the developing country to regulate the investment, welfare effects, and political attractiveness in other respects. The reforms are shown to have features that seem to have gone unnoticed in the debate. Exclusion of investor-state dispute settlement (ISDS) may be ineffective due to a hold-up problem, and if effective requires unlawful regulation by the host country. A shortening of a sunset period applicable to unilateral withdrawal can postpone regulation until expiry. A reduction in the amount of stipulated compensation can induce the developing country to phase out the stranded investment, but will then require a compensation payment from the developing country to the developed country investor. The reform with best potential to address stranded investment problems appears to be an increase in a carve-out from the compensation requirement for measures with sufficiently positive climate effect.

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

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Contents

1 Introduction

Developing countries are signatories to over 1 300 *bilateral investment treaties* with developed country partners.[1] These agreements safeguard investments between partner countries against losses from a wide array of policy measures by host countries. A main function is to ensure that investors from partner countries are compensated for losses incurred as a result of host country policy interventions.[2] Since there is very little investment by developing countries in developed economies, these 1 300+ agreements in practice mainly protect investments from developed countries against policy measures undertaken by developing countries.

The investment treaty regime, which globally consists of more than 2 600 agreements, has been severely criticized on numerous fronts, including for amorphous drafting, poor quality of the case law, speculative methods for calculating compensations, confidentiality provisions, etc. But recent criticism has in particular focused on their purported chilling effects on the incentives for host countries to phase out carbon-intensive investments.[3,4] Such regulatory chill should significantly affect developing countries, given the large number of investment treaties that developing countries are parties to.

The perceived problems with the regime have led both to redrafting of some existing agreements, and to very different drafting of some new agreements compared to traditional treaties. The EU, in particular, has led this latter development. 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.

A significant example is the just concluded five year renegotiation of the Energy Charter Treaty, 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. An explicit purpose of the renegotiation was to make the agreement better compatible with climate objectives.[5] But despite significant changes to the agreement,

[1] The UNCTAD website (https://investmentpolicy.unctad.org) provides information on a large variety of aspects of investment treaties.

[2] See e.g. Dolzer and Schreuer (2022) for an introduction to International Investment Law.

[3] See e.g. Bernasconi-Osterwalder and Brauch (2019) for references to the huge policy literature on the impact of investment agreements on the climate, and climate policies.

[4] The critique has been fuelled by a large number of fossil fuel-related disputes. For instance, the UNCTAD Dispute Settlement Navigator reports 118 investment treaty disputes since 1996 in the sectors Mining of coal and lignite, Extraction of crude petroleum and natural gas, and Manufacture of coke and refined petroleum products. 41 of these disputes were initiated 2018 or later. There have also been many disputes regarding withdrawal of a support scheme for renewable energy. See Di Salvatore (2021) for an assessment of the economic magnitudes that have been involved in fossil fuel disputes.

[5] Ipp, Magnusson and Kjellgren (2022) provide a detailed analysis of Energy Charter Treaty cases from a climate perspective.

a number of EU member states are in the process of withdrawing from the agreement, citing the incompatibility of also the renegotiated agreement with the Paris Agreement. The EU Commission is now recommending coordinated withdrawal from the agreement by EU member states, as well as by the EU.[6]

Many developed economies have hence modified, or withdrawn from, their internal investment treaties, citing the incompatibility of the treaties with climate protection purposes. But developed countries have at the same time left the vast majority of their 1 300+ bilateral agreements with developing countries untouched. While some developing countries have modified or terminated some agreements, this has typically been at their own initiative, and has mainly concerned treaties with other developing countries.[7]

This paper While there is wide-spread agreement that the investment protection regime needs to be revised, and a large number of reforms have been proposed, there is less agreement on how to proceed. The matter is complicated by the fact that reforms need the approval of all parties to the treaties, and if this cannot be achieved, that unilateral withdrawals do not lead to immediate cessations of the treaties (see below). This paper examines pros and cons of four treaty reforms that are often suggested in the policy debate as means of encouraging host countries to pursue more active climate policies, and that also have been implemented in some recent agreements. The paper focuses a single agreement between a developing (South) and a developed (North) country, but is meant to represent a more general, multilateral, reform of the investment treaty regime, possibly as part of a climate agreement.

Section 2 introduces the framework. A firm from North has invested in South. The investment yields commercial benefits for both South and North, but also contributes to worsening the climate. The investment is protected by an investment treaty that requires South to compensate the investor for a specified fraction of its foregone profits in case South regulates production, which effectively shuts down operations. But the agreement can include an exception from the compensation requirement—a carve-out—for situations where the climate problem is sufficiently severe.

South has three policy options with regard to the treatment of the investment: to allow production, to regulate and pay the compensation that is required according to the agreement, or to regulate without compensation. In case South regulates without compensation when compensation is required according to the agreement, the investor will initiate a dispute (a choice regarding litigation is introduced in a later section). In

[6]There is an ongoing discussion, related to the functioning of the sunset provision (see below) in the treaty, regarding whether the withdrawal should be done from the existing agreements, or the renegotiated and yet not fully ratified, agreement.

[7]Developing countries that have withdrawn from investment treaties include Bolivia, Ecuador, India, Indonesia, Italy, South Africa, and Venezuela.

case of a dispute, South can respond by either allowing the restoration of production, but then compensate the investor for the incurred cost for restoration, or by maintaining 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 ceases, but where South does not find it optimal to regulate due to the investment agreement.

The analysis then turns to implications of four stylized reforms, affecting the rules regarding compensation, dispute settlement, and withdrawal.

- Section 3 considers the impact of an *increased carve-out* for severe climate problems. This is practice often achieved by introducing exception clauses for e.g. policy measures that serve to protect human, animal or plant health, or the environment.

- Section 4 examines a *reduction of the required amount of compensation* in case of compensable regulation. This can be implemented e.g. by specifying principles for the calculation of compensation.

- Section 5 turns to the main proposed reform of the dispute settlement systems, *the exclusion of investor-state dispute settlement* (ISDS). ISDS mechanisms allow foreign investors to pursue disputes against host countries regarding the fulfillment of their obligations under the agreements, and are included in most agreement. Exclusion of ISDS leaves State-State Dispute Settlement (SSDS) as the only form of dispute settlement.

- Finally, Section 6 examines a *shortening of a "sunset period."* Virtually all agreements continue to apply after the withdrawal by any party during a period that typically ranges between 10 and 25 years. It is often suggested that this period should be shortened to ease withdrawal from agreement. To examine consequences of such a reform, the model is extended to include multiple periods, and a sunset clause.

Section 7 compares the reforms in three respects, all of which should affect their potential as solutions to stranded investment problems: whether they can be designed to resolve the stranded investment problem for any intensity of the climate problem; whether they will yield welfare gains for both parties; and the political attractiveness of the reforms in other respects.

According to these criteria, the exclusion of ISDS, and the shortening of the sunset period, are inferior in several regards. For the exclusion of ISDS to trigger regulation by South, it must induce South to unlawfully regulate without compensation, since South is not willing to regulate with compensation in a stranded investment setting. This in

turn requires that South must believe that regulation will not induce litigation by the North government. However, even if the North government for climate reasons prefers uncompensated regulation to production, once South has de facto shut down production, it will be costly for South to reverse the decision. This creates a temptation for the North government to exploit this lock-in by litigating, in order to not only get regulation but also compensation for its investor. Aware of this, South refrains from unlawful regulation in the first place. The countries then in equilibrium end up with production despite the exclusion of ISDS, and despite this possibly not being in either country's interest.

The shortening of the sunset period will also be ineffective as a means of inducing immediate regulation by South. If the stranded investment problem is due to that South is deferring regulation until after the expiry of the sunset period, shortening the period will make it even more attractive to postpone regulation, albeit now to an earlier date. What should be done is instead the opposite: by *extending* the sunset period sufficiently, Host might be induced to not postpone regulation any longer.

The two reforms of the compensation scheme have more potential to induce South to regulate, and they do not involve any unlawful regulation, nor the complete withdrawal from the agreement. But there are some important differences between these reforms that seem to have gone unnoticed in the debate. In particular, when regulation is triggered by a reduction in the fraction of foregone profits that must be compensated, regulation will be accompanied by a compensation payment. South is then effectively *paying the polluting Northern investor to be able to protect the climate*. Such a solution to the stranded investment problem is unlikely to be politically acceptable in regulating developing countries, and perhaps not in developed countries either.

In contrast, an increased carve-out will not require any compensation payment to be effective. It has the drawback that it will reduce North welfare if North is more concerned about the profits of its investor than the climate impact of the investment. However, developed economies have in climate negotiations committed to annual transfers of USD 100 billion to developing countries, to encourage developing country cooperation in the negotiations, and to enhance their mitigation and adaptation efforts. Some studies find that trillions of dollars in annual transfers may be required in the coming years to this end. It therefore does not seem far-fetched that developed economies would be willing to forego compensations to its investors, if this would induce developing countries to more actively contribute to the phase-out of investments that are harmful to the climate.

The conclusion is thus that an increased carve-out is the reform with most potential to address the stranded investment problem and to be accepted, among the four stylized reforms investigated here.

The economic theory literature The economic theory literature on investment agreements is meagre. In their seminal analysis Aisbett, Karp and McAusland (2010a) show how a punitive carve-out compensation scheme can achieve an efficient outcome, in a setting with distorted incentives to regulate, and where an arbitration court is imperfectly informed about a regulatory shock. They also show how an efficient solution can be achieved using a linear combination of operating profits and initial investment costs. Aisbett, Karp and McAusland (2010b) highlight the interaction between a National Treatment provision and compensation requirements, assuming that the host country can levy investment-specific charges for investment protection.

Some more recent papers seem mostly to have been inspired by the policy debate regarding the Transatlantic Investment and Trade Agreement, and the EU - Canada Trade Agreement. Konrad (2017), and Schjelderup and Stähler (2023), show how investment agreements might induce strategic overinvestment by foreign investors. 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 National Treatment provision for investment protection. Stähler (2023) 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. Ossa, Staiger and Sykes (2023) 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 5. Horn and Tangerås (2021) derive properties of a negotiated investment agreement with carve-outs, showing how a negotiated compensation scheme will fully mitigate distortions both to foreign investment and to host country regulation. 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. Horn and Sanctuary (2024) studies the impact of an investment agreement when an investor can choose the environmental impact of a replacement investment. None of these papers studies treaty reforms to address climate externalities, however.

2 The setting

We will start by analyzing suggested reforms of compensation and dispute settlement provisions as means of solving stranded investment problems. We first describe the assumed simple economy, then introduce an investment agreement and the sequence of events in the interaction between the countries under the agreement, and finally derive circumstances under which these provision induce South not to abstain from regulation, thus contributing to the climate problem.

2.1 The economy

The economic setting is kept as simple as possible. There are two countries, South and North. A firm from North has made an irreversible investment in a production facility in South. South has two policy options absent an investment agreement. One is to allow production in the facility. This creates benefits for South, 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, which is costly to South. The parameter θ indicates the intensity of the climate problem, with a larger θ corresponding to a more severe problem.

The net welfare for South from allowing production is $V(\theta) \gtrless 0$. The other option for South is to regulate production, which effectively shuts down operations, and yields South welfare w^S, which is normalized to equal 0. Consequently, absent an agreement, South is indifferent between production and regulation if $\theta = \theta^S$, given by

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

South will be said to be "climate sensitive" if South prefers uncompensated regulation to production, that is, if $\theta^S < \theta$.

A reform of a single bilateral agreement will typically yield very small gains for the countries involved from the physical reduction in climate damage. But there would be more significant gains if the whole investment regime between developed and developing countries were to be reformed, as we have in mind here. Regulation of stranded investments might also yield the host country government international good-will, domestic political benefits, or might be driven by a sense of duty; similar considerations to those that seem to induce countries to sign on to multilateral climate agreements, and at least partly also live up to their commitments.

If production is allowed, the foreign investor will reap operating profits π. North derives welfare from these profits, but is also adversely affected by the climate impact

from production, $C^N(\theta) \geq 0$, which increases in the intensity of the climate problem, $C^N_\theta > 0$.[8] If there is production North welfare is $w^N = \pi - C^N(\theta)$, and absent an investment agreement North welfare is $w^N = 0$ if there is no production. North is indifferent between production and regulation if $\theta = \theta^N$, as defined by

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

North is "climate sensitive" if North prefers uncompensated regulation to production, $\theta^N < \theta$.

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

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

2.2 Compensation and dispute settlement provisions

South and North are assumed to have an investment agreement that protects the North investment in South, and that allows for dispute settlement. To motivate how it is modelled, and as a primer for the reader who is less familiar with these treaties, we very briefly describes some core features of the rules for these areas that most investment agreements include before introducing our formalized agreement.

Compensation requirements in actual agreements A core *substantive obligation* in virtually all agreements is that host countries shall provide "fair and equitable treatment." 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]

With regard to the magnitude of compensation, arbitration panels often refer to the long-standing general principle in international law that compensation for unlawful acts shall wipe out all consequences for the harmed party. A common interpretation is that

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

[9] The agreements do not include any commitments with regard to investment levels, subsidies or taxes.

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. However, important from an economic point of view, international law does not allow for punitive compensation requirements.

There are some counterbalancing forces to these compensation requirements, however. Arbitration panels sometimes point to the "police powers" exemption in international law that allows states to protect public welfare. Also, while the agreements formed up until approximately a decade ago typically had no, or minor, 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.

The assumed rules for compensation The brief description above does not in any way give justice to the complexity of the legal aspects of investment treaties. Any formal description will be necessity be a very crude description. However, it seems reasonable to describe a core feature of these agreements as being the requirement to compensate investors for losses from regulatory interventions, unless there are sufficiently strong public welfare motives for the intervention. Another core feature is that compensation should normally cover the full loss to the investor, or possibly less, but never more. We therefore assume that the agreement between South and North includes the following substantive compensation obligations:

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

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

§ 1 requires South to pay compensation if it regulates, unless the climate problem is sufficiently severe, $\theta > \hat{\theta}$. The parameter $\hat{\theta}$ hence captures the magnitude of the carve-out from the compensation requirement, with a smaller $\hat{\theta}$ corresponding to a larger carve-out. The agreement would be irrelevant if $\hat{\theta} \leq \theta^S$, since South would then be free to regulate without compensation whenever it so wanted, that is, whenever $\theta > \theta^S$. We therefore assume throughout that $\theta^S < \hat{\theta}$, so that the agreement can potentially restrict South's regulatory decision for $\theta \in (\theta^S, \hat{\theta}]$.

In case of compensable regulation, South 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.

The assumed agreement has a carve-out with a cut-off level $\hat{\theta}$ for when regulation is compensable. Such cut-off levels cannot be found in the texts of actual agreements. However, arbitration panels have to consider the seriousness of the regulatory problem when assessing the applicability of at least certain types of carve-outs. For instance, a common form of carve-out is for "measures that are necessary to protect human, animal or plant life and health." Strictly speaking, it can be necessary to close a foreign-owned plant to protect the life of a single ant that lives nearby (the ant is hiding underground). The measure thus formally fulfils that criterion of being necessary to protect animal life. But an arbitration panel would obviously not accept the measure, if this is all that it achieves, unless there is something very special with the ant. The measure would be deemed to be disproportional to the environmental benefit it yields. That is, the carve-out will only be applicable when the regulatory problem is sufficiently severe. This is what § 1 is meant to capture in a simple fashion.[10]

Dispute settlement in actual agreements It is very rare in international law that private actors, who are formally not parties to state-to-state agreements, 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.[11] All agreements also allow for SSDS, but virtually all known disputes have been brought by private investors.

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.[12] 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.

[10]Exceptions clauses such as the one mentioned here are often accompanied with other requirements, for instance, that measures should not constitute "disguised protection." Disproprotional measures as in the ant example might be found to not fulfil such requirements.

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

[12]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).

Assumed dispute settlement rules To support the implementation of the compensation requirements, the agreement between South and North also includes the following dispute settlement provisions:

§ *3. Disputes can be initiated by the investor (ISDS),* or by the North government *(SSDS).*
§ *4. If South regulates without compensation for* $\theta \leq \hat{\theta}$*, and then after litigation allows for the restoration of production, South shall cover the investor's full cost* ρ *for the temporary closure.*

§ 3 captures the fact that most actual investment agreements allow for both ISDS and SSDS. To avoid having to introduce a coordination game the results in the investor pursuing a dispute whenever ISDS is allowed, we here assume that the investor litigates when allowed to do so, even if the North government also would be willing to do so. (We will consider the role for SSDS in Section.)

§ 4 covers the possibility that South regulates production, and when as a result faces litigation, allows for the restoration of production. Restoration can be costly for the investor; for instance, the production facility 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.[13] Investment agreements often do not specify how much compensation investors should receive in case of restitution. 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 South must ensure that the investor suffers no loss due to the temporary regulation.

2.3 The sequence of events

The interaction takes place as follows:

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

(2) The investor (ISDS) decides whether to litigate.

(3) In case of litigation, South 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.

[13] 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.

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

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

2.4 A stranded investment outcome

We will now first derive the equilibrium outcome, and then identify settings where the investment can be said to be stranded.

2.4.1 The equilibrium outcome

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

South's decision if facing litigation Facing litigation after an unlawful climate regulation, that is, regulation without compensation when $\theta \leq \hat{\theta}$, South can keep the contested measure and pay compensation $\phi\pi$, and obtain welfare $w^S = -\phi\pi$. The alternative is to withdraw the measure and pay the investor ρ for its restoration cost, and get welfare $w^S = V(\theta) - \rho$.[14] Let $\theta^R = \Theta^R(\phi, \rho)$ be the cut-off level of θ at which South 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, South 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 The litigation decision by the investor is trivial. If South 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 $\pi - \lambda^N > 0$ if South withdraws the measure, since South will carry the full cost for restoration, and the profit $\phi\pi - \lambda^N > 0$ in case the

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

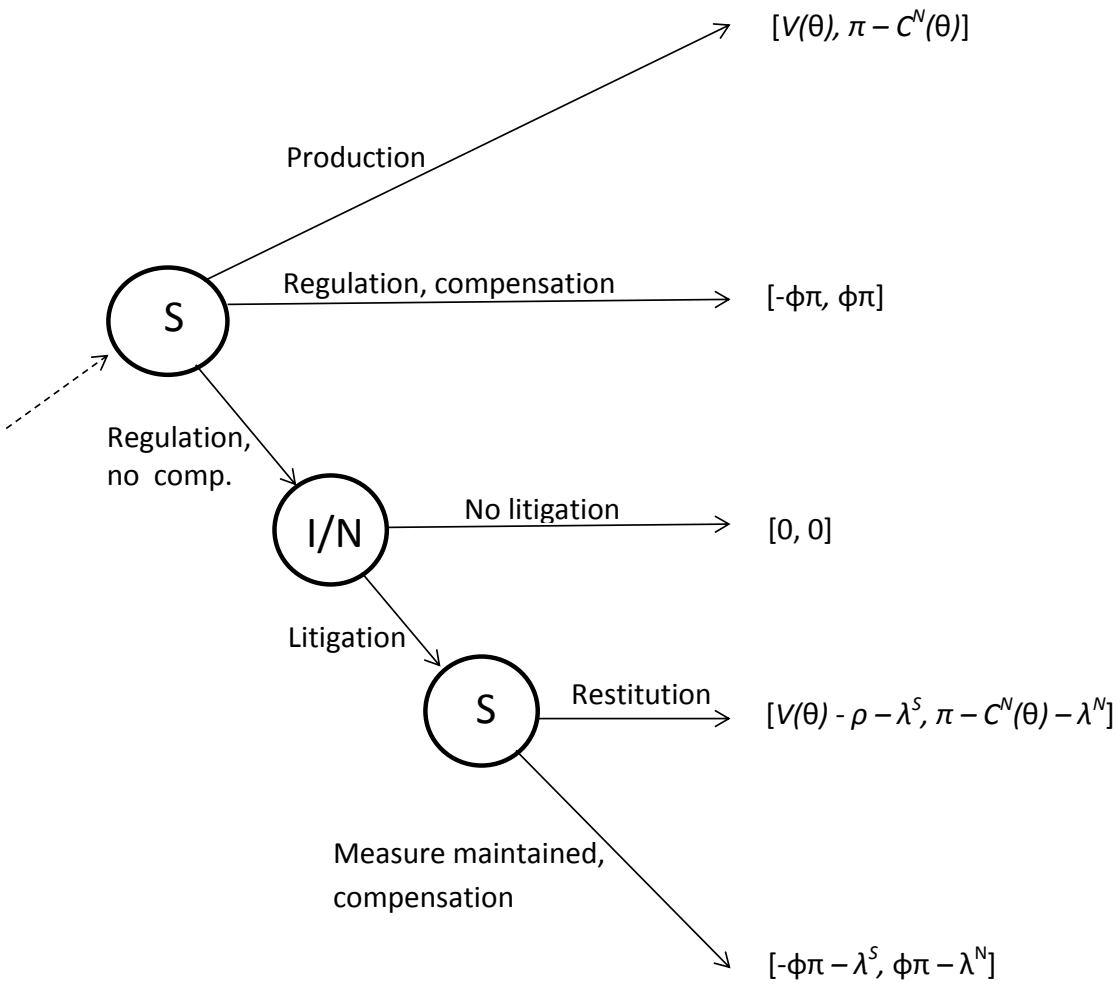

Figure 1: The regulation stage

measure is maintained but compensation is paid. Hence, in either case litigation yields a better outcome for the investor, since λ^N is small.

South's regulation decision South will never intervene for $\theta \leq \theta^S$, and will always regulate without compensation for $\hat{\theta} < \theta$. South knows that intervention without compensation for $\theta \leq \hat{\theta}$ will induce the investor to litigate. If South 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 South paying the restoration cost as well as litigation costs λ^S. Likewise, if South 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 South 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,

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

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

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

The first statement stems directly from the definition of θ^S. The second statement, which identifies situations with regulatory chill, follows from the fact that South would prefer to regulate with $\theta^S < \theta$, 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 South prefers regulation with compensation to allowing production for $\theta^A < \theta$.

The resulting South welfare is hence

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

and North welfare is

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

2.4.2 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".[15] This definition seems based on the notion that the assets have lost in value due to government climate policy. Apparently, a stranded investment is then not a problem from an efficiency point of view, since it is destined to be scrapped. We will instead denote an investment to be stranded if *the host country refrains from regulating the investment due to the agreement, despite that 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 Energy Charter Treaty 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 setting, several conditions must be fulfilled. First, for South to be bound by the agreement, it is required that $\theta^S < \theta \leq \hat{\theta}$. Second, for the agreement to potentially impose some form of regulatory chill, South must prefer production to regulation with compensation, that is, $\theta \leq \theta^A$. Third, $\theta^E < \theta$ is necessary for regulation to be optimal from a joint welfare point of view. Hence:

Definition 1 *The investment is stranded if*

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

2.4.3 Remarks

Different scenarios of interest the assumption that $\theta^E < \theta^A$ is equivalent to the assumption that

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

according to (1) and (3). Since $C^N_\theta > 0$, (8) implies that $\pi - C^N(\theta) < \phi\pi$ for $\theta > \theta^E$. The stranded investment scenario hence implies that North prefers regulation with full compensation to production. But North can be either climate sensitive or not climate sensitive. Second, the inequality (8) holds unambiguously for $\phi = 1$. As discussed above, this is the natural benchmark case since it reflects the international law principle of full

[15] See e.g. Caldecott, Howarth and McSharry (2013).

compensation. But $\theta^E < \theta^A$ would also be fulfilled for a range of lower values of ϕ, but not for very small ϕ.

Transfers can be ineffective To enhance mitigation and adaptation efforts in developing countries, and to encourage their cooperation in climate negotiations, developed nations have committed to annual transfers of USD 100 billion to developing countries. BUt of developing country reluctance to reluctance to actively phase out stranded investment is due to the threat of compensation claims under investment treaties, it is unclear whether such financial transfers will avtually increase mitigation. As described in the formal setting above, the agreements present developing countries with a choice. They can either abstain from phasing out CO2-intensive investment and then enjoy the benefits they yield in terms of the incomes, tax revenues, productivity spill-overs, etc.. Or the countries forego these benefits by phasing out the investment, and then in addition risk having to pay compensation to the foreign investors for their foregone profits. One should expect that any transfers to developing countries that are not specifically conditioned on undertaking phase-outs will have only limited impact on developing countries' regulatory decisions.

Endogenous investment The investment protection regime is sometimes depicted as a race-to-the-bottom for developing countries in their attempts to attract foreign investment. If so, developing countries should be reluctant to reduce the protection that their agreements yield since this might cause new investment to go to other developing countries that have not reduced the level of protection in their agreements. Such effects are not included here, since we have not included any endogenous investment.[16] But if the reforms to be considered apply to North-South agreements in general, for instance as part of a climate agreement, the competition for investment between developing countries should not be affected.

The analysis to follow 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 agreement specified 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.

[16]Horn and Tangerås (2021) derive a negotiated agreement with in a setting with endogenous investment.

3 Increasing the carve-out

A common view holds that investment agreements should allow host countries *more space to pursue climate policies without having to compensate investors*, and as mentioned above, there is also currently a trend to revise some major agreements along these lines. 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 an increased carve-out level, that is, a reduction in $\hat{\theta}$.

Consider therefore a stranded investment setting in which the carve-out is increased to $\hat{\theta}' < \hat{\theta}$. This will induce South to regulate if South is climate sensitive, $\theta^S < \theta$, provided that the revised agreement allows South to regulate without compensation, $\hat{\theta}' < \theta$. If induced to regulate, South will benefit from the reform, since South prefers regulation without compensation to production for $\theta^S < \theta$, and can in any event retain the pre-reform outcome by abstaining from regulation. Whether North benefits or loses from the reform depends on whether North is climate sensitive ($\theta \gtrless \theta^N$). Hence:

Proposition 1 *In the stranded investment setting, an increase in the carve-out from $\hat{\theta}$ to $\hat{\theta}' < \hat{\theta}$ will induce South to lawfully regulate without compensation if $\hat{\theta}' < \theta$. Regulation will then benefit South, harm North if $\hat{\theta}' < \theta \leq \theta^N$, and otherwise benefit North.*

4 Reducing the amount of compensation

A second possible reform of the compensation scheme would be to *reduce the magnitude of the compensation* that South is required to pay in case of compensable regulation, that is, to reduce the fraction ϕ of the investor's foregone profits in case of regulation that is compensated for. The level of ϕ affects South'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 South's interest to unlawfully regulate without compensation in this case. But a reduction in ϕ might affect South's regulatory decision by making it optimal to regulate with compensation, rather than to allow production.

It follows from definition (3) that South 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^S as ϕ becomes small. Hence, it is possible to make $\Theta^A(\phi')$ sufficiently small that $\Theta^A(\phi') < \theta$. This will benefit South by revealed preference, since South could continue to allow production also with ϕ'.

With regard to the implication for North welfare, it was noted above that in the stranded investment scenario—that is before the reform—North 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 North is climate sensitive, North will still benefit from the reform, since it gives both regulation, which by itself would suffice for North benefit from the reform, but North additionally gets some (albeit reduced) compensation. But if North is not climate sensitive, the compensation may or may not be enough for North 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 South to regulate with compensation if $\Theta^A(\phi') < \theta$. Regulation will then benefit South, harm North if $\pi - C^N(\theta) > \phi'\pi$, and otherwise benefit North.*

The Proposition points to an important distinction between the climate problem and negative local externalities from foreign investment. A basic observation in earlier papers on investment agreements is that a full compensation requirement (here corresponding to $\phi = 1$) 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. However, in the current setting the climate impact on North drives a *wedge between the interests of the investor and the North government*, implying that full compensation no longer induces South to correctly internalize the consequences for North of its regulatory decision. The compensation requirement must be less than full ($\phi < 1$) to induce South to undertake jointly desirable climate regulation.

5 Disallowing ISDS

It is common perception in the policy debate 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.[17] Based on such reasoning it is increasingly argued that agreements should be revised so as to *only allow for SSDS,* to encourage host governments to pursue more vigorous climate policies.[18]

[17]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.

[18]See Alarcon (2023) for a review of recent ISDS reforms.

In the present setting the investor always litigates whenever there is unlawful regulation. Since the North government is also concerned with the climate impact, a switch to SSDS can indeed reduce North's propensity to litigate, and thereby induce South to regulate without compensation when South is not willing to regulate with compensation. For South to be willing to regulate without compensation, South must be climate sensitive ($\theta^S < \theta$). But it is also required that *North does not have incentive to litigate* regarding the unlawful regulation if litigation subsequently would induce South to allow for the restoration of production ($\theta < \theta^R$). This requires in turn that also North is climate sensitive ($\theta^N < \theta$). More formally:

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

Proof: With regard to the first statement in point (i), if $\theta \leq \theta^S$ it will never be in South's interest to regulate. If $\theta^S < \theta$ South prefers uncompensated regulation to production. But with $\theta \leq \theta^N$, North prefers both compensated regulation, and restored production, to uncompensated regulation. Uncompensated regulation will then induce the North government to litigate, since either outcome of litigation will be better for North than to abstain from litigation, disregarding the small litigation cost λ^N (hence "approx." in the proposition). Realizing this, South abstains from regulating without stipulated compensation. The exclusion of ISDS is thus without effect if either $\theta \leq \theta^S$ or $\theta \leq \theta^N$.

Consider next the case where $\max[\theta^S, \theta^N] < \theta$. If South has regulated without compensation and faces litigation, South will maintain the measure due to its climate effect if $\theta^R < \theta$. North will therefore find it optimal to litigate whenever there is uncompensated regulation and this condition holds even if $\theta^N < \theta$, since North will thereby not only get regulation, but also compensation. Realizing this incentive for North, South 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 $\theta^S < \theta$ South prefers uncompensated regulation to production, but South will restore production if facing litigation when $\theta \leq \theta^R$. If these conditions hold and South thus regulates without compensation, North will abstain from litigation if $\theta^N < \theta$ to avoid triggering restoration of production by South. This will make uncompensated regulation optimal for South. The mutual benefit follows directly from $\max[\theta^S, \theta^N] < \theta$.■

Proposition 3 and its verification lead to several observations.

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

Observation 1 *Even if both countries prefer uncompensated regulation due to the climate impact of production, the threat of litigation by the North government once South has regulated without compensation can induce South to refrain from regulating.*

Unlawful climate regulation is required The second part of 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. What does not seem to have been recognized in the debate however, is that the regulation that the switch to SSDS can trigger will require *unlawful* behavior on part of the host country: South must be induced to undertake an uncompensated regulation that South would refrain from in case the agreement would be enforced by the investor. As long as the substantive obligations remain the same under SSDS as under ISDS, this measure must violate the agreement, otherwise South would have undertaken also with ISDS.

Observation 2 *Exclusion of ISDS must trigger unlawful regulation by South, and South must trust that it will not lead to a dispute, for the reform to have any effect .*

SSDS ineffective also in other settings SSDS can be shown to be ineffective also with other rationales 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 North 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 South 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 Ossa, Staiger and Sykes, 2023, and Horn and Tangerås, 2022).

Combining reforms to escape the litigation hold-up Proposition 3 states that for an exclusion of ISDS to trigger uncompensated regulation, both parties must prefer uncompensated regulation to production, $\theta^S < \theta$ and $\theta^N < \theta$. Neither of these constraints can be affected by reforming 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 North does not prefer to litigate if South regulates without compensation, $\theta < \Theta^R(\phi, \rho)$. There are two complementary reforms within the present setting that would counteract the litigation hold-up, and thus make the exclusion of ISDS more potent.

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 $\Theta^A(\phi') < \theta$. This would benefit both parties if they are both climate sensitive. Assume instead that ϕ is *increased* to ϕ'' such that $\theta < \Theta^R(\phi'', \rho)$. At the face of it, this would harm South, 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 imply that South will be ensured that North will abstain from litigation, since it will lead South 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 South*.

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 $\theta < \Theta^R(\phi, \rho')$, South's optimal response to litigation will change from retaining the measure and pay compensation, to restoring production. This will make litigation unattractive for the North government, if it is climate sensitive.

Observation 3 *In situations where exclusion of ISDS would be inconsequential due to the litigation hold-up, it could lead to regulation if combined with an increase in the compensable fraction of foregone profits, or with a reduction in stipulated compensation for restoration costs. South would then be induced to unlawfully regulate without compensation, to the benefit of both parties if they are climate sensitive, and to the climate.*

6 Easing 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 a sunset period*, the agreement 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 be an indefinite sequence of periods. The entities $V(\theta)$, π, $C^N(\theta)$, etc., then refer to per period flows. The parties seek to maximize their respective aggregate stream of welfare. To simplify, discounting is disregarded, but it could be introduced without affecting the qualitative findings. Also to simplify notion, assume that compensation is required to be full ($\phi = 1$). Let the investment under consideration have a remaining lifespan of $\hat{T}$ periods at outset of the analysis. Each of these periods it yields a profit of π. Hence, the value of the investment is $\hat{T}\pi$ at the outset. Let $t = 0, 1...$ denote periods after a withdrawal.

6.1 Withdrawal provisions

To set the stage, we will first briefly describe some salient features of the rules concerning withdrawal from agreements, before specifying the assumed withdrawal provisions.

Withdrawal provisions in actual agreement The rules regarding unilateral withdrawal and termination of treaties are complex and ambiguous, with unclear implications when withdrawal is motivated by climate concerns.[19] The Vienna Convention on the Laws of Treaties provides general rules regarding the interpretation of international treaties. In Art. 62 it provides 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 rationale 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.

Almost all treaties include sunset clauses that extend the agreements, or parts thereof, for a specified period of time.[20] Pohl (2013) finds that in a sample of 2 061 agreements, the average sunset period is 12.5 years. Sunset clauses clearly apply to investment in

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

[20] See Kouroutakis (2022) for a comprehensive description of sunset clauses, with a particular focus on the Energy Charter Treaty, which has a sunset period of 20 years.

countries that unilaterally withdraw from treaties, but also apply to investment from the withdrawing countries in partner countries; for instance, this is explicitly stipulated in Art. 47 of the Energy Charter Treaty.[21]

The assumed rules for withdrawal As mentioned, one possible view is that the climate problem has fundamentally changed the circumstances underlying the agreement, and that it therefore no longer applies with regard to climate measures. Using such an argument in our formal setting, South could argue that the agreement would not have come into existence if the climate problem θ was known at the time the agreement was formed. We mention this, since it appears as if it could be a serious challenge to the applicability of these agreement. But as also noted, it is unclear however whether such an argument would hold up legally. We will instead assume that the parties to our agreement can unilaterally withdraw from the agreement, but that a sunset provisions applies in such an event:

§ *5. Each party can unilaterally withdraw from the agreement.*
§ *6. In case of unilateral withdrawal, the agreement continues to apply for* T *years..*

6.2 The sequence of events

While withdrawal by a party from a bilateral agreement will terminate the agreement, it will not affect any obligation created through the execution of the treaty prior to its termination.[22] 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:

(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.

[21] 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.

[22] Art. 70 of the Vienna Convention on the Laws of Treaties.

(3) If at least one party withdraws, or if there was withdrawal but no regulation in the past, South decides whether:

- to regulate given the sunset clause; or
- not to regulate.

6.3 A stranded investment outcome

In case of a withdrawal from an agreement, the sunset provision will apply to all investments that come under the agreement. These can of course have very different impacts, and lead to different regulatory decisions. We will distinguish between situations where the sunset period is longer ($T > \hat{T}$) and shorter ($T < \hat{T}$) than the remaining economic lifespan of the investment, and between cases where South would be willing to fully compensate the investor for the loss due to regulation to avoid production ($V(\theta) < -\pi$), and where it would not want to do so ($V(\theta) > -\pi$).

If the sunset period exceeds the lifespan of the investment ($T > \hat{T}$), South will be required to compensate the investor for the full remaining value of the investment, whenever South regulates. Since all periods are identical, the question then boils down to whether in any period, South prefers compensation or production. If South prefers compensation to production ($V(\theta) < -\pi$), it will thus be optimal for South to regulate in any period, including in the first period after withdrawal. And when South prefers production to compensation, it will be the other way around. The outcome will then not be affected by the withdrawal.

If the lifespan of the investment instead exceeds the sunset period ($T < \hat{T}$), there is a rationale for South to delay regulation until the expiry of the sunset period: when it has expired South can regulate *without having to compensate for the remaining lifespan of the investment*, which will save South $(\hat{T} - T)\pi$. There are again two cases to consider. First, it is clear that if South prefers production to compensation ($V(\theta) > -\pi$), South will definitely prefer to delay regulation in this way: not only will South avoid having to compensate for part of the investor's loss, South will also benefit during each period it delays regulation until the expiry of the sunset clause. It is thus clearly optimal for South to defer regulation until this point.

The opposite case, where South prefers compensation to production ($V(\theta) < -\pi$), is somewhat more involved, since South now faces a trade-off between a short-term cost from delaying regulation and a long-term gain. South will definitely regulate in period $T + 1$, when the sunset clause has just expired, if South has not regulated before, since this can be done without any compensation and $V(\theta) < 0$.

In period $t = T$, regulation requires compensation π for period $t = T$ plus $(\hat{T} - T)\pi$ for the remaining lifespan for the investment. South can also wait with regulation until after

the expiry of the sunset provision, which will have the disadvantage of exposing South to the low welfare level $V(\theta)$ during $t = T$, but would instead yield the welfare level zero afterwards. South prefers to not regulate in period T if $V(\theta) > -\pi - (\hat{T} - T)\pi$, that is, if $V(\theta) < -\pi$, which holds by assumption.

If there were no regulation before, with two periods remaining until the expiry of the sunset clause ($t = T - 1$), if South refrains from regulation, it will get welfare is $V(\theta)$ in each of $t = T - 1$ and in $t = T$ (since there will be no regulation in $t = T - 1$). If South instead regulates immediately, South has to pay compensation π for each periods $T - 1$ and T, and South will also have to compensate for the remaining value $(\hat{T} - T)\pi$. Hence South will prefer not to regulate if $2V(\theta) > -2\pi - (\hat{T} - T)\pi$. It follows that with τ periods left before the expiry of the sunset clause, South will refrain from regulating immediately if

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

Hence, the larger is τ the more likely that this inequality is violated, and it becomes optimal for South to regulate. Since the incentive to regulate is weaker, the closer in time is the expiry of the sunset period, the incentive will be the strongest immediately after withdrawal ($t = 1$), when there are T years remaining until the expiry of the sunset clause. It will then be optimal to delay regulation until the expiry of the sunset clause if

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

For this inequality to hold with $V(\theta) < -\pi$, T must be sufficiently smaller than $\hat{T}$. Let $\bar{T}$ be given by

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

$\bar{T}$ is hence the length of the sunset clause at which South would be indifferent between regulating immediately and paying compensation for the whole remaining lifespan of the investment ($\hat{T}\pi$), and delaying investment until the expiry of the sunset clause.

It follows from $V(\theta) < -\pi$, that $\bar{T} < \hat{T}$. Hence, if $T < \bar{T} < \hat{T}$, South will defer regulation until after the expiry of the sunset clause. If instead $\bar{T} < T < \hat{T}$, it is not worthwhile to delay regulation, which will instead occur immediately after withdrawal.

These findings are summarized in the following Lemma and in Table 1.

Lemma 2 *Assume that withdrawal has just occurred, triggering a sunset provision of length T.*
(i) If $V(\theta) > -\pi$ and $T < \hat{T}$, South refrains from regulating.
(ii) If $V(\theta) > -\pi$ and $\hat{T} < T$, or if $V(\theta) < -\pi$ and $T < \bar{T} < \hat{T}$, South delays regulation until expiry of the sunset provision.

	$V(\theta) > -\pi$	$V(\theta) < -\pi$
$T < \bar{T} < \hat{T}$	No regulation	Delay until expiry
$\bar{T} < T < \hat{T}$	No regulation	Immediate regulation
$\hat{T} < T$	Delay until expiry	Immediate regulation

Table 1: **Outcome with sunset clause**

(iii) If $V(\theta) < -\pi$ and $\bar{T} < T$, South regulates at the outset of the interaction.

Intuitively, when $V(\theta) > -\pi$ each period of delay yields an immediate gain for South, and it is then optimal to delay regulation until the sunset clause eventually expires, or the investment has lost its economic value. So refraining from immediate regulation is clearly optimal. If instead $V(\theta) < -\pi$, delay is costly in the short run, since South would rather pay compensation than experience the welfare level $V(\theta)$. However, if $T < \hat{T}$, delaying regulation until the expiry of the sunset period also has the benefit that South does not need to compensate for remaining economic value, $(\hat{T} - T)\pi$. But this requires that the sunset period is sufficiently short ($T < \bar{T}$). Otherwise it is better to regulate immediately.[23]

In the absence of the sunset clause there would be immediate regulation of the investment after the withdrawal. The sunset clause can hence be said to cause a stranded investment problem when it causes South to delay regulation until the clause has expired.

6.4 Shortening the sunset period

Consider now a shortening of the sunset period, as often proposed in the policy debate, and as also has been implemented in the renegotiation of the Energy Charter Treaty. The idea that such a reform could induce host countries to regulate stranded investment is only weakly, if at all, supported in the present setting.

Proposition 4 *A shortening of the sunset clause:*
(i) will induce regulation in the first period that no longer is covered by the clause, but will not induce immediate regulation, if the initial sunset clause induces South to delay regulation; and
(ii) can induce South to delay regulation until the expiry of the sunset period, if the initial sunset period induces South to regulate immediately.

[23]We have thus far assumed that a withdrawal from the agreement has triggered the sunset clause. In the present setting, South cannot lose from withdrawing, since South can achieve the same outcome as with no withdrawal simply by abstaining from regulation. The framework is not adequate for addressing this question, however, since it does not include investment decisions.

Intuitively, if it is worth waiting for the expiry of the sunset period at the outset, shortening this period without removing it completely will make it even more attractive to wait for its expiry. Similarly, if the initial clause would induce South to regulate immediately, the reduction in the length of the sunset clause can make it worthwhile to wait for its expiry.

With regard to the welfare implications, South must weakly benefit from a shortened sunset period, since South can without any additional cost reproduce the outcome with the initial sunset provision. If the reform implies that South will regulate sooner due to the earlier expiry of the sunset period, North will during each of the years that no longer are covered by the sunset clause, have the welfare level 0 rather than $\pi - C^N(\theta)$. North hence benefits if and only if North is climate sensitive. Conversely, if the reform delays regulation that would otherwise occur immediately, North gets the welfare level $\pi - C^N(\theta)$ during each period of delay, instead of 0, and therefore loses if and only if North is climate sensitive.

The above analysis leads to a policy conclusion that perhaps at first might seem odd, but at second thought is quite intuitive:

Observation 4 *If the purpose of redrafting the length of the sunset period is to induce South to impose immediate climate regulation, the sunset period should not be shortened, but be extended sufficiently that is it no longer preferable for South to wait until it expires to regulate.*

7 Comparing the reforms

The analysis above has given a rather scattered picture of the effects of the four reforms, despite the simplicity of the economic setting that has been employed. This section will use three natural criteria to evaluate whether the reforms will have the capacity to address the stranded investment problem.

7.1 Three aspects of the reforms

The reforms will be evaluated from three perspectives. First, the reforms should be *effective*, in the sense of being capable of inducing phase-out of stranded investments for a broad range of situations; the column "Any $\theta > \theta^S$?" in Table 2 reflects whether it is possible to design the reform to resolve a stranded investment problem for any climate problem that is severe enough to make South climate sensitive. Table 2 does not include the case where South is not climate sensitive ($\theta \leq \theta^S$), since South would then refrain

Reform	**Effective for any $\theta > \theta^S$?**	**N gains if S climate sens.**	**N gains if both climate sens.**	**Measures if regulation**
$\hat{\theta} \downarrow$	Yes	No	Yes	Lawful reg., no comp.
$\phi \downarrow$	Yes	Ambig.	Yes	Lawful reg., comp.
SSDS	No	No	Yes	Unlawful reg., no comp.
$T \downarrow$	No	No	Ambig.	Withdrawal, no comp.

Table 2: **Consequences of the reforms with a stranded investment at the outset**

from regulating also absent the agreement due to South's preference for production over uncompensated regulation.

The second aspect is the *distributional* impact of the reforms. Reforms of international treaties require the consent of all parties to the agreements. In the present setting, South will benefit from any reform that triggers regulation, since South can abstain from regulation if this reduces welfare. However, North may or may not gain. Columns "N gains if...?" capture the potential for the reforms to be weakly accepted by both parties, if the reforms trigger regulation. The columns distinguish between cases where only South is climate sensitive, $\theta^S < \theta < \theta^N$, and where both parties are climate sensitive, $\max[\theta^S, \theta^S] < \theta$.

Third, there are several other aspects of the reforms that might affect their political acceptability. One such factor is whether or not the reforms lead to *compensation payments* by South. 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 South 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. Yet another 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 column "Measures if regulation" in Table 2 captures these aspects of the reforms when they lead to regulation.

7.2 The ranking

Neither reform dominates all other in all respects. But two of the reforms appear to come out worse than the other two. First, the exclusion of ISDS will not resolve the stranded investment problem even if South is climate sensitive when North 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 $\max[\theta^S, \theta^N] < \theta < \theta^R$. This is due to the climate hold-up problem with SSDS that was identified above—the incentive for North to litigate once South has regulated without compensation in instances with the most severe stranded investment problems, those where $\theta^R < \theta \leq \max[\hat{\theta}, \Theta^A(\phi)]$. For the exclusion of ISDS to resolve the stranded investment problem in this setting requires a degree of cooperation between countries that is rarely seen in the climate area. Another drawback of this reform is that it tends to destabilize the agreement, in the sense that it requires that a violation of the agreement goes unchallenged. The main positive aspect of the SSDS reform is that it does not require compensation payments by South, which is likely to make it more acceptable to South.

The other problematic reform from a climate perspective is the shortening of the sunset period. In certain situations it can make regulation occur earlier. But it cannot trigger immediate regulation, unless the provision is removed completely. As noted above, if the purpose is to get immediate regulation, the sunset period should instead be extended. The shortening of the sunset period also tends to have more adverse consequences for North than the other reforms. Furthermore, it requires that the whole agreement is dissolved. This would not have any further costs within the present setting, but might be costly e.g. if the agreement has the capacity to induce attractive investment.[24]

The two reforms regarding the compensation provisions are more promising in several regards. As summarized in the table, if South is climate sensitive, both reforms can be designed to trigger regulation for any intensity of the climate problem: South can be induced to regulate for any $\theta^S < \theta$ by increasing the South policy space such that $\hat{\theta}' \leq \theta^S$, and it is always also possible to achieve this by setting the compensable fraction of foregone profits ϕ' such that $V(\theta^S) = -\phi'\pi$. The two reforms also have the virtue of not relying on either unlawful measures going unchallenged, or the tearing up of the agreement.

But the two reforms still differ in ways that do not appear to have been recognized in the policy debate. South will prefer an increased carve-out, since this will allow South to regulate without any compensation payment. If North is climate sensitive, North will benefit from both reforms. But North will prefer reduced compensation since this will

[24]Horn and Sanctuary (2024) analyze the impact of an investment treaty in a setting with a stranded investment and a possible replacement investment.

lead to a compensation payment, which will be an added benefit to the regulation.

The two reforms have even more problematic distributional impact when North is not climate sensitive. When regulation is caused by an increase of South policy space, there are no compensation payment, so North unambiguously loses. 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 North for lost producer profits.

Another difference that is likely to be important politically is that when regulation is triggered by a reduction in the fraction of foregone profits that must be compensated, regulation will be accompanied by a compensation payment. South is then effectively *paying the polluting Northern investor to be able to protect the climate*. Such a solution to the stranded investment problem is likely to be politically unacceptable to regulating developing countries, and perhaps also developed countries. In contrast, an increased carve-out will not require any compensation payment to be effective.

The increased carve-out does have the above-mentioned drawback of reducing North welfare if North is more concerned about the profits of its investor than the climate impact of the investment. However, in light of the large sums that developed economies have pledged climate negotiations committed to transfer to developing countries, it does not seem far-fetched that developed economies would be willing to forego compensations to its investors, if this would induce developing countries to more actively contribute to the phase-out of investments that are harmful to the climate.

In sum:

Observation 5 *The increased carve-out is the most promising reform to address the stranded investment problem since it:*
- is (weakly) more effective in inducing South to phase out the stranded investment;
- benefits both parties when they are both climate sensitive;
- does not require unchallenged violations of the agreement, or its dissolve; and
- does not require compensation payments to the Northern investor.

Finally, a critical assumption with regard to the welfare effects is that the reforms address North-South agreements, that protect investments from North to South, but not the other way around. If the partner countries were both sources and hosts to investment—as is typically the case with investment treaties between developed countries—an increase in the carve-out that triggers regulation in both countries, would tend to benefit both countries.

It can in this regard be noted that at the same time as EU member states have renegotiated the Energy Charter Treaty, and are leaving the agreement for climate reasons, they

have shown hardly any interest in revising the approximately 1 350 bilateral agreements that they have with developing countries. While the renegotiation of these agreements might be less pressing since they typically cover smaller stocks of investment than the Energy Charter Treaty, these agreements are likely to be as poorly designed from a climate perspective as the Energy Charter Treaty. Based on the analysis above one 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, and the climate benefits from revising the agreements would not outweigh the lost profits from their investments.

8 Concluding remarks

It is a common perception that investment treaties can dissuade host countries from regulating foreign investment that is stranded from a climate perspective. A number of reforms have been proposed to reduce this problem. Hardly any economic analysis of the effects of these proposals have been presented, however. This paper is to our knowledge the first to compare the consequences of four of the main proposals for investment treaty reforms that have been suggested as means of making treaties more climate friendly. The paper has employed a very simple formal framework. But we do believe that they are more general than what the simplicity of the employed framework might suggest.

There are of course many aspects of the climate impact of investment treaties that need to be better understood. We will end by point to three of many policy-relevant issues that deserve attention.

First, a central purpose of investment agreements is to increase investment. If they do—the empirical literature offers at best weak support for this—the question arises regarding the nature of the new investments that are triggered by the agreements. There are here two distinctly different views in the debate. Some criticize the investments for encouraging new fossil-based investment; this is common argument against the Energy Charter Treaty, for instance. A counter-argument is that the agreements can play an important role by providing incentives for replacement investment in more climate-friendly production. This raises questions regarding how to design reforms such that they not only alleviate existing stranded investment problems, and deter new climate-unfriendly investment, but also encourage new investment with better climate profiles.

Second, a core concept in case law for the implementation of e.g. clauses regarding fair and equitable treatment investment and indirect expropriation is investor "legitimate expectations," and the concept also appears in some treaty texts. This is a rather enigmatic notion from an economic perspective, however. "Legitimate" can hardly be interpreted to mean "rational", since rational investors should expect opportunistic gov-

ernments to behave opportunistically, thus rendering the protection of legitimate expectations meaningless. Is it possible to give some economically reasonable, and preferably also operational, interpretation of the central concept of investors' "legitimate expectations" regarding policy stability?

Third, in the above-mentioned disputes regard renewable energy, the support schemes were often withdrawn to correct for mistakes made in the design of the schemes. For instance, the support schemes were in some cases too generous, 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. How should the risk for policy mistakes (as opposed to opportunistic behavior) be allocated across host countries and investors?

9 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.

Caldecott, Ben, N. Howarth, and P. McSharry (2013). Stranded Assets in Agriculture: Protecting Value from Environment-Related Risks. Smith School of Enterprise and the Environment, University of Oxford.

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

Dolzer, Rudolf and Christoph Schreuer (2022). *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).

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. 18 827.

Horn, Henrik and Mark Sanctuary (2024). Investment Treaties and the Replacement of Stranded Investment. 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.

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). Standing in international investment and trade disputes. Journal of International Economics 145:103791.

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.

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 (2021). Investor State Dispute Settlement and Multinational Firm Behavior. Review of International Economics 29(4), 1013-1024.

Stähler, Frank (2023). An Optimal Investor State Dispute Settlement Mechanism. Journal of Economics 138, 1–16.