

Climate Nationalism

Climate change is a global commons problem. The costs of emissions in any given country are mostly borne by foreigners. Absent strong measures to overcome this dynamic, pursuit of national self-interest will lead people and countries to underinvest in decarbonization, relative to what's best for the world as a whole. And we do see such underinvestment. Many countries are not on track to meet their Paris Agreement pledges, and those pledges, even if met, are not ambitious enough to meet the headline temperature stabilization goals of the agreement. This is the fairly banal pursuit of national interest in the climate domain. But we've also seen the emergence of a stranger phenomenon: climate nationalism, or the pursuit of global climate goals through nationalistic means. These means include discriminatory subsidies for green technology production and deployment; proposed carbon tariffs, hoarding of green technology and critical minerals, and unilateral deployment of high-leverage geoengineering. Each of these policy interventions could be deployed in ways that reduce net climate risk and are generally deployed by policymakers that understand themselves to be doing so. However, the nationalist elements of these policies often undermine their effectiveness in mitigating climate risk and generate their own costs, both for the implementing country and the world. Nonetheless, some scholars defend these policy approaches on their merits and others insist that they are necessary to build the domestic coalitions needed to enact strong climate change mitigation policies. This paper assesses the tradeoffs involved in climate nationalism and sets forth a framework for assessing climate policies that contain nationalist elements, including how the governments of countries harmed by the nationalist provision and international legal institutions like the WTO should respond.

I. Introduction

Economic nationalism is having a moment in the U.S. While there have always been substantial pockets of support for protectionism in Congress, the US president had been a consistent force in favor of relatively open trade for at least four decades leading up to 2016, and arguably longer.¹ While successful presidential candidates have often deployed protectionist rhetoric to appeal to key constituencies on the campaign trail, their actual policies in the office tended to be more supportive of free trade. This makes sense in political economy terms. While protectionism can generate concentrated benefits for key political constituencies, most economists agree that it generally imposes net economic costs for countries that engage in it. Presidents are accountable to a

¹ James C. Capretta & Stan Veuger, U.S. Economy: Biden's Abandonment of Free Trade Won't Check China or Lower Inflation, *Foreign Policy*, June 12, 2023, <https://foreignpolicy.com/2023/06/12/free-trade-new-washington-consensus-biden-protectionism-trump/> (last visited Aug 30, 2023).

national constituency, and so less subject to the influence of geographically concentrated interests that stand to benefit from protectionism. But this pattern was sharply broken in 2016, with the election of Donald Trump. Trump ran as an economic nationalist and largely stuck to it in the White House, most prominently in the form of section 232 tariffs on steel and aluminum.² And President Biden has largely maintained this posture, defending the Section 232 tariffs.³

Of course, one major discontinuity between the Trump and Biden administrations was their stances on climate policy. Where the Trump administration withdrew from the Paris Agreement, adopted an extremely low social cost of carbon (SCC), and repealed the Obama-era Clean Power Plan, the Biden Administration rejoined Paris, restored and then increased the Obama-era SCC, and championed new legislation largely targeted at reducing GHG emissions.⁴ But the tentpole climate legislation the Biden Administration succeeded in passing, the IRA, was striking in its incorporation of economic nationalism into legislation that was ostensibly designed largely to tackle the global problem of climate change. The Biden Administration went to the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) in Sharm El-Sheik and boasted about the passage of IRA, only to find a cold reception to the law among many attendees, especially those from EU member countries.⁵ Since the COP, concern about the protectionist provisions in the IRA, like the domestic content requirements for electric vehicle subsidies, has only intensified.⁶

² Adam Posen, U.S.-China Decoupling: America's Zero-Sum Economics Doesn't Add Up, Foreign Policy, March 24, 2023, <https://foreignpolicy.com/2023/03/24/economy-trade-united-states-china-industry-manufacturing-supply-chains-biden/> (last visited Aug 30, 2023).

³ David J. Lynch, Biden's course for U.S. on trade breaks with Clinton and Obama, The Washington Post, August 27, 2023, <https://www.washingtonpost.com/business/2023/08/27/biden-trade-trump/> (last visited Aug 27, 2023).

⁴ Niina H. Farah, EPA floats sharply increased social cost of carbon, E&E News by POLITICO (2022), <https://www.eenews.net/articles/epa-floats-sharply-increased-social-cost-of-carbon/> (last visited Sep 1, 2023).

⁵ Adrian Wooldridge, How the West Can Win the Geoeconomics Revolution, Bloomberg, January 17, 2023, https://www.bloomberg.com/opinion/articles/2023-01-17/how-the-west-can-win-the-geoeconomics-revolution?utm_source=website&utm_medium=share&utm_campaign=twitter&in_source=embedded-checkout-banner (last visited Sep 1, 2023).

⁶ Christian Scheinert, EU's response to the US Inflation Reduction Act (IRA), European Parliament Directorate-General for Internal Policies, Policy Department for Economic, Scientific and Quality of Life Policies,

The reasons for the recent turn toward economic nationalism in US policymaking are not entirely clear, at least to me. It seems to be driven, at least in part, by a rising bipartisan tide of anti-China sentiment. This shift, in turn, has been spurred by a change in Chinese government behavior under Xi Jinping, including its own subversion of international trade law, among other abuses. Russia's 2022 invasion of Ukraine has also played some role in further bolstering the rise of U.S. economic nationalism.⁷ But neither of these developments can fully explain the scope of the shift, which includes actions that do not spare key U.S. allies and trading partners, like the EU, from unfavorable trade policy treatment.⁸

Another posited set of explanations is structural. Pascal Lamy posits that the primacy of Congress in setting trade policy and the overrepresentation of farm states in the Senate are important drivers of protectionism in the U.S.⁹ Additionally, Lamy notes that American policymakers tend to chafe at any limits imposed by international law that are disadvantageous to the U.S. in the present context.¹⁰ While these factors are surely import drivers of U.S. policy in some domains, several factors limit their explanatory powers over recent developments in trade policy. First, all these factors have been constants throughout the period in which the U.S. transitioned from a champion, albeit an inconsistent and hypocritical one, of free trade and globalization to its present stance. Perhaps it can be argued that the Trump Administration heralded a new zenith in disrespect for international law, but the George W. Bush Administration cared little about international law when deciding to invade Iraq, and the Biden Administration at least offered lip service to the

PE 740.087 (2023), available at

[https://www.europarl.europa.eu/RegData/etudes/IDAN/2023/740087/IPOL_IDA\(2023\)740087_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2023/740087/IPOL_IDA(2023)740087_EN.pdf).

⁷ Levitz, E. (2023, May 3). The Biden Administration Just Declared the Death of Neoliberalism. *Intelligencer*. <https://nymag.com/intelligencer/2023/05/biden-just-declared-the-death-of-neoliberalism.html>.

⁸ James C. Capretta & Stan Veuger, U.S. Economy: Biden's Abandonment of Free Trade Won't Check China or Lower Inflation, *Foreign Policy*, June 12, 2023, <https://foreignpolicy.com/2023/06/12/free-trade-new-washington-consensus-biden-protectionism-trump/> (last visited Aug 30, 2023).

⁹ Pascal Lamy, The slow American protectionist turn, *CEPR* (2023),

<https://cepr.org/voxeu/columns/slow-american-protectionist-turn> (last visited Aug 30, 2023).

¹⁰ *Id.*

importance of a rules-based international order in a manner similar to prior administrations.¹¹ The primacy of Congress in policy making has, if anything, waned over the relevant period, as presidents have responded to congressional gridlock by asserting ever-greater executive power. Meanwhile, the overrepresentation of farm states is a poor fit for explaining the measures like Section 232 tariffs on steel and aluminum, whose intended beneficiaries are in states with heavy industry, and from which farm states stand to suffer from retaliatory tariffs on their exports and higher prices for protected industrial products. Lamy also posits that the inadequacy of the American welfare state leaves workers more exposed to the churn generated by trade and technological change.¹² This point is supported by the rhetoric of the Biden and Trump administrations, which each, in their own ways, have emphasized the role of their nationalist policies in supporting high-wage jobs. A related factor raised by defenders of the current wave of industrial policy is the imperative to restore U.S. manufacturing capacity and secure the supply chains the U.S. relies on for critical goods. These imperatives, of course, relate back to the concerns over dependence on China.

Another potential explanation is an ideological backlash against neoliberal globalism on both the right and the left.

Whatever is driving the rise of U.S. economic nationalism, it is now coinciding with a restored commitment to tackling the global problem of climate change under the Biden Administration. Indeed, one key split on climate policy between the Trump and Biden Administrations is over whether the estimate of the SCC used to evaluate regulatory policies considers only U.S. impacts (a domestic SCC) or incorporates impacts on foreigners (a global SCC). In restoring a global SCC, the Biden Administration is eschewing, at least symbolically, a more banal form of national self-interest maximizing in the climate domain. That is, since climate change is a global commons problem, a government seeking to maximize the welfare of its own citizens or

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¹² Lamy, *supra* note x.

some related conception of the national interest, will have limited reasons to consider the impacts of their emissions on foreigners. To be sure, if they have reason to think that other countries will seek to punish them for poor emissions performance, or even that other countries will follow the U.S.'s lead in adopting their own GHG emissions policies, this would give U.S. policymakers some reason to consider impacts on foreigners. But those reasons are unlikely, given the current state of global climate governance, to warrant anything close to the adoption of a fully global SCC. Indeed, much of my prior academic work has been devoted to explaining the ways in which the voluntary pledge-and-review model that resulted in the Paris Agreement fails to render it incentive compatible for countries to decarbonize as sharply as would be optimal for the world as a whole.¹³ So, while the adoption of a global SCC estimate does not translate directly into actually adopting policies that reduce emissions fast enough to meet the world's stated temperature stabilization targets, it does represent both a rhetorical rejection and a partial substantive separation from nationalist climate policy in this more banal sense.

The emerging climate nationalism I explore in this paper is stranger and more complex. It entails a country seeking a global end - mitigating climate change - via nationalist instruments. In the U.S., this has most prominently taken the form of discriminatory subsidies supporting clean tech deployment. Other potential forms of climate nationalism include carbon tariffs and border adjustments of various forms, unilateral deployment of risky, high-leverage climate interventions (commonly referred to as geoengineering) like stratospheric aerosol injection, and green technology hoarding. What these policies have in common is the combination of means that are typically deployed in service of a narrow and often-misguided conception of the national interest with the claim that they are necessary or at least expedient means of contributing to a global public good.

¹³ See Gabriel Weil, Incentive Compatible Climate Change Mitigation: Moving Beyond the Pledge and Review Model, 42 WM. & MARY ENVTL. L. & POL'Y REV. 923 (2018); The Carbon Price Equivalent: A Metric for Comparing Climate Change Mitigation Efforts Across Jurisdictions, 124 DICK. L. REV. 101 (2021); Global Climate Governance in 3D: Mainstreaming Geoengineering Within a Unified Framework, 83 U. PITT. L. REV. 507 (2022).

The rationales for this odd couple combination of means and ends vary but generally fall into two buckets. First, it is sometimes claimed that domestic political constraints limit the U.S. capacity to cut emissions or otherwise contribute to climate change mitigation through non-nationalist means. That is, even if the discriminatory provisions of the IRA are themselves harmful, the IRA could not have passed without them, and the ends justify the means. Second, some advocates claim that climate nationalism is justified on the merits. That is, even if non-nationalistic climate change mitigation efforts of comparable scale were politically feasible, they would not be preferable to climate nationalism. This paper critically examines these two sorts of rationales for each of the four potential forms of climate nationalism.

Part II considers discriminatory subsidies, with a particular focus on the IRA. Part III addresses carbon border charges, including a discussion of which of these measures qualify as forms of climate nationalism. Part IV speculates on the possibility of green technology hoarding. This sort of climate nationalism could take two forms. First, governments could insist on aggressive global intellectual property protections for their green technology advances, seeking to profit off those technologies at the cost of slower global deployment. Second, governments could actively seek to limit access to particular technologies. This seems less likely in the climate domain, but has precedents in efforts to limit the spread of nuclear weapons technology, and more recently in the U.S.-led effort to choke off China's access to the most advanced microchips. Part V analyzes the prospect of unilateral deployment of risky, high-leverage climate interventions. Part VI concludes.

II. Discriminatory Subsidies

The IRA represents the most significant federal legislative action on climate in U.S. history. The Rhodium Group's projects that the legislation will push U.S. emissions down to 31-44% below 2005 levels, compared to 24-45% under the pre-IRA policy status quo. Key climate-related provisions include tax credits for the purchase of new electric or hydrogen fuel cell vehicles,

expanded investment tax credits (ITC) and production tax credits (PTC) for qualifying low-emissions electricity generation, grants to support heat pump production, clean hydrogen PTC, advanced manufacturing PTC, mineral security grants, and grants for waste reduction and recycling infrastructure.

For new light duty clean vehicles, the IRA provides for credits up to \$7500 under several conditions. These conditions include, but are not limited to: the final assembly of the vehicle must take place in North America; a (rising over time) share of battery components must come from North America, a (rising over time) share of critical mineral must come from a country with which the U.S. has a free trade agreement. The entire credit is contingent on assembly in North America, but vehicles can qualify for a \$3750 credit if they meet *either* the critical minerals or the battery component sourcing requirements. Guidance issued by the Department of Treasury indicated that companies leasing vehicles to consumers may claim the commercial clean vehicle credits, which can provide \$7,500 without stringent requirements on battery sourcing. More broadly, the commercial clean vehicle tax credits provide up to \$7,500 for vehicles less than 14,000 pounds and \$40,000 for larger vehicles (or 30% of the purchase price or incremental cost of an internal combustion engine replacement, whichever is lower).

The clean energy PTC is awarded per megawatt-hour of electricity output from qualifying resources, while the ITC is awarded as a percentage of the investment cost. Facilities that meet the 100% domestic content requirements for steel and aluminum used in clean energy projects are eligible for an extra 10% PTC or an extra 10 percentage points ITC.

The domestic content requirements clearly violate World Trade Organization (WTO) rules.¹⁴ Article 3 of the WTO Agreement of Subsidies and Countervailing Measures prohibits “subsidies contingent, whether solely or as one of several other conditions, upon the use of domestic over imported goods.”¹⁵ Extending the subsidy eligibility to products assembled and materials originating in Mexico or Canada, or to any country with which the U.S. has a Free Trade Agreement, does not cure the violation.¹⁶ Article III of the General Agreement on Tariffs and Trade also requires that:

The products of the territory of any contracting party imported into the territory of any other contracting party shall be accorded treatment no less favourable than that accorded to like products of national origin in respect of all laws, regulations and requirements affecting their internal sale, offering for sale, purchase, transportation, distribution or use.

Again, the domestic content requirements in the IRA subsidies clearly violate this requirement.

It’s striking that such clear violations of international law, supported unapologetically by President Biden, come at a time when the Biden Administration claims to prioritize maintenance of a rules-based international order and criticizes China’s government for violating those rules.¹⁷ Regardless of whether these violations are likely to result in significant retaliation from U.S. trading partners, they signal that the U.S. commitment to a rules-based international order, even under an administration that claims to champion it, does include a willingness to be constrained by those ruling when doing so is costly or inconvenient. Indeed, these moves have provoked at least a rhetorical backlash. For instance, at a BRICS summit in August 2023 Brazilian President Luiz Inácio

¹⁴ See Steve Charnovitz, Green Subsidies and the WTO, Robert Schuman Centre for Advanced Studies Research Paper No. RSCAS 2014/93, available at https://scholarship.law.gwu.edu/cgi/viewcontent.cgi?article=2341&context=faculty_publications, 27; David Kleimann, Climate versus trade? Reconciling international subsidy rules with industrial decarbonisation, Bruegel | The Brussels-based economic think tank (2023), https://www.bruegel.org/policy-brief/climate-versus-trade-reconciling-international-subsidy-rules-industrial#_ftn1 (last visited Sep 2, 2023); James Bacchus, The Case for Clean Subsidies, Harvard Business Review (2012), <https://hbr.org/2012/11/the-case-for-clean-subsidies> (last visited Sep 1, 2023).

¹⁵ WTO Agreement on Subsidies and Countervailing Measures, Art. 3.1(b).

¹⁶ Kleimann, *supra* note x.

¹⁷ The White House, National Security Strategy (2022), 3, 34, available at <https://www.whitehouse.gov/wp-content/uploads/2022/10/Biden-Harris-Administrations-National-Security-Strategy-10.2022.pdf>.

Lula da Silva said that BRICS “cannot accept a green neocolonialism that imposes trade barriers and discriminatory measures under the pretext of protecting the environment.”¹⁸ Korean Industry Minister Lee Chan has indicated that the Korean Government is concerned about the IRA and actively reviewing whether to bring a WTO challenge.¹⁹ French President Macron has indicated an interest in implementing similar subsidies with European content requirements, while German Chancellor Scholz is cool to that idea, but agrees on the need to push back against U.S. policy.²⁰

At times, U.S. Trade Representative Katherine Tai has welcomed a response like Macron is proposing of Europe adopting its own green subsidy regime.²¹ But trade law experts have pointed out that, should Europe move forward with such subsidies, the U.S. is likely to respond with countervailing duties.²² Others have argued that such a subsidy race, even if it did not escalate to other forms of trade retaliation, would be wasteful and distortionary.²³ Still others, including supporters of the IRA, worry that domestic content requirements will slow down the green

¹⁸ China to BRICS: Hegemonic countries will constrain emerging economies, InsideTrade.com (2023), https://insidetrade.com/daily-news/china-brics-hegemonic-countries-will-constrain-emerging-economies?utm_source=dlvr.it&utm_medium=twitter (last visited Sep 1, 2023); China to BRICS: Hegemonic countries will constrain emerging economies, InsideTrade.com (2023); Alan Beattie, The west has too little to offer leaders like Lula, Financial Times, April 20, 2023,

<https://www.ft.com/content/0a668661-8938-4d11-8a38-d963b16a5f1b?desktop=true&segmentId=7c8f09b9-9b61-4fbb-9430-9208a9e233c8#myft:notification:daily-email:content> (last visited Sep 1, 2023).

¹⁹ Seoul to review possible WTO complaint over US inflation act: industry minister, The Korea Times, August 22, 2022, https://www.koreatimes.co.kr/www/nation/2022/08/419_334843.html (last visited Sep 1, 2023).

²⁰ Hans von der Burchard & Clea Caulcutt, Scholz and Macron threaten trade retaliation against Biden, POLITICO, October 27, 2022, <https://www.politico.eu/article/france-and-germany-find-ground-on-a-common-concern-u-s-protectionism/> (last visited Sep 1, 2023).

²¹ Greg Ip, Who Is Going to Police the New World Trading System?, The Wall Street Journal, January 14, 2023, <https://www.wsj.com/articles/world-trade-organization-sidelined-11673629991> (last visited Sep 1, 2023).

²² See BGH Edelmetall Siegen GmbH v. United States, 1:21-cv-00080, (Ct. Intl. Trade Jan 10, 2023) ECF No. 48; Simon Lester on X, X (formerly Twitter), David Kleimann, Climate versus trade? Reconciling international subsidy rules with industrial decarbonisation, Bruegel | The Brussels-based economic think tank (2023), https://www.bruegel.org/policy-brief/climate-versus-trade-reconciling-international-subsidy-rules-industrial#_ftn1 (last visited Sep 2, 2023); <https://twitter.com/snlester/status/1584694672340885505> (last visited Sep 2, 2023); David Kleimann on X, X (formerly Twitter), <https://twitter.com/DavidKleimann/status/1622269099836411907> (last visited Sep 2, 2023); Scott Lincome, Countervailing Calamity: How to Stop the Global Subsidies Race, Cato Institute (2012), <https://www.cato.org/policy-analysis/countervailing-calamity-how-stop-global-subsidies-race> (last visited Sep 2, 2023).

²³ Charnovitz, supra note x, at 4-5; The destructive new logic that threatens globalisation, The Economist (2AD), https://www.economist.com/leaders/2023/01/12/the-destructive-new-logic-that-threatens-globalisation?utm_content=ed-picks-image-link-1&utm_etear=nl_weekly_1&utm_campaign=a.the-economist-this-week&utm_medium=email.internal-newsletter.np&utm_source=salesforce-marketing-cloud&utm_term=1/12/2023&utm_id=1446808 (last visited Sep 2, 2023); Rem Korteweg on X, X (formerly Twitter), <https://twitter.com/remkorteweg/status/1599704457188585472> (last visited Sep 2, 2023).

transition.²⁴ This is because China and other key markets that are excluded from some IRA subsidies are the lowest cost and largest scale producers of key products and commodities that support clean energy deployment, including critical minerals, solar panels, and electric vehicles.²⁵ For a policy that was largely justified on the basis of geopolitical competition with China, many analysts worry that the IRA did too little to include U.S. allies in Europe and Asia, and that it potentially alienated non-aligned countries in the developing world that often cannot afford to deploy similar subsidies of their own.²⁶

- But it's not clear whether any substantial climate legislation could have passed without these or similar provisions.
- Some folks defend the discriminatory provisions on domestic political grounds, saying (implicitly at least) they are a price worth paying to get meaningful US climate legislation passed.
- Others want to defend the industrial policy vision of the IRA and other related pieces of legislation on the merits. These arguments are less convincing to me.

²⁴ Lydia DePillis, Energy Tax Credits, Meant to Help U.S. Suppliers, May Be Hard to Get, The New York Times, June 9, 2023, <https://www.nytimes.com/2023/06/09/business/economy/energy-tax-credits.html> (last visited Sep 2, 2023); Lydia DePillis, Energy Tax Credits, Meant to Help U.S. Suppliers, May Be Hard to Get, The New York Times, June 9, 2023, <https://www.nytimes.com/2023/06/09/business/economy/energy-tax-credits.html> (last visited Sep 2, 2023). Daniel Gros, America's Inward Turn on Trade, Project Syndicate (2022), <https://www.project-syndicate.org/commentary/inflation-reduction-act-european-criticism-wto-rules-by-daniel-gros-2022-12> (last visited Sep 2, 2023); Kelly Sims Gallagher, The Paradox of the Green Transition, | Organisation for Economic Co-operation and Development |, March 17, 2023, <https://www.oecd-forum.org/posts/the-paradox-of-the-green-transition> (last visited Sep 2, 2023).

²⁵ 'The Ezra Klein Show,' Opinion, The New York Times, August 22, 2023, <https://www.nytimes.com/2023/08/22/opinion/ezra-klein-podcast-meghan-osullivan-jason-bordoff.html?showTranscript=1> (last visited Sep 2, 2023).

²⁶ Phred Dvorak, India Is Losing a Green-Energy Subsidy Race, The Wall Street Journal, September 1, 2023, <https://www.wsj.com/business/energy-oil/india-is-losing-a-green-energy-subsidy-race-1936debb> (last visited Sep 2, 2023); Ed Ballard, Jason Douglas & #38; Jon Emont, The Economic Losers in the New World Order, The Wall Street Journal, August 14, 2023, <https://www.wsj.com/articles/global-economy-economic-losers-fba30b53> (last visited Sep 2, 2023); Bryce Baschuk | Bloomberg, How World Fell Into a Subsidy Race in Pursuit of Climate Goals, The Washington Post, July 29, 2023, https://www.washingtonpost.com/business/energy/2023/07/29/how-world-fell-into-a-subsidy-race-in-pursuit-of-climate-goals/edcbc290-2dd5-11ee-a948-a5b8a9b62d84_story.html (last visited Sep 2, 2023).

- If it's true that refusing to include the discriminatory provisions in the IRA would have significantly imperiled its prospects for passage, how should we (domestic climate advocates, free traders, trading partners who want the US to act of climate) think about the tradeoffs involved here? How should other countries respond?

III. Carbon Border Charges

Carbon border charge proposals come in at least three forms. First, there are (ideally) trade-neutral border adjustments of domestic carbon prices. Such measures may be implemented on a unilateral basis, but are not best understood as a form of climate nationalism. In its simplest form, a border-adjusted carbon tax would simply apply the domestic carbon tax rate to the embodied carbon in all imports, and rebate any carbon taxes paid during the production of export goods. This sort of border adjustment shifts a carbon tax from a domestic production base to a domestic consumption base, consistent with the destination principle of international trade law, which holds that products are to be taxed by the country in which they are consumed. In this sense, a border-adjusted carbon tax is similar to a value-added tax (VAT), which is uncontroversially and routinely border-adjusted. Border adjustment of carbon prices implemented via emissions trading systems raises greater technical and trade law challenges, but the underlying principle is the same. The European Union's (EU) proposed Carbon Border Adjustment Mechanism (CBAM), which would be attached to the EU's existing Emissions Trading System (ETS), is best thought of primarily as an attempt to implement a trade-neutral border adjustment, though some of its design features deviate from this ideal and are the source of controversy.

Second, there are coercive border charges tied to the exporting countries' climate policy efforts and/or emissions performance. The most prominent proposal along these lines is William Nordhaus's climate club idea. In Nordhaus's formulation, club countries would agree to set a minimum economy-wide carbon price and impose across-the-board tariffs on non-club countries.

Nordhaus presents game theory modeling suggesting that a 5% across-the-board tariff would be sufficient to achieve near-total participation in a climate club up to a required \$50/ton carbon price. There are reasons to be skeptical of the modeling assumptions that drive this conclusion, which include no retaliation on the part of non-member countries. More recent work by Ahmad Lashkaripour and Farid Farrokhi suggests that a Nordhaus-style carbon club could still produce broad participation even if this no-retaliation assumption is eliminated. However, neither of these modeling efforts addresses the domestic political constraints that block most countries from adopting high economy-wide carbon prices. Alternative proposals for Nordhaus-style carbon clubs could allow for more policy instrument flexibility, so long as member countries achieve a specified minimum level of policy effort. The carbon price equivalent metric that I developed in a prior article could be used to implement such a flexible carbon club. Other potential variations could involve softening the sharp dichotomy between members on non-members, allowing for intermediate credit for countries making substantial, but insufficient, efforts to reduce their GHG emissions. Finally, Nordhaus-style carbon clubs could change their enforcement mechanism, shifting from across-the-board tariffs to border charges that reflect the carbon content of imports, or even to non-trade measures.

One key feature that unifies these different variants, however, is their plurilateral nature. The point of a coercive, Nordhaus-style carbon club is to make club membership sufficiently attractive (and non-membership sufficiently unattractive) that countries will choose to join and ramp up their level of policy effort accordingly. Accordingly, while Nordhaus-style carbon clubs are decidedly not trade-neutral, they are also inherently non-nationalistic, as they are designed to foster international cooperation. This leads us to the third category of border carbon measures, which can stray into climate nationalism.

The third type of border measure is neither trade-neutral nor inherently open and plurilateral. While there is substantial variation among these proposals, the central feature is a border charge on carbon embodied in imports that is not tethered to a domestic carbon price. In some variations, such as the bill introduced by Senator Chris Coons and Congressman Scott Peters, the border charge is based on some measure of the compliance cost associated with non-pricing domestic climate policies. In others, it is not tethered to any specific domestic policy, but rather to acknowledge and credit the lower carbon intensity of domestic production in specific sectors. No specific detailed proposal along these lines has been issued, but ideas discussed include basing a border charge on the US Government's estimate or the social cost of carbon (SCC) or simply picking a rate based on political considerations. A more fleshed-out proposal along these lines is actually a hybrid between a border-adjusted carbon price and a standalone border adjustment. In June 2022, Senator Whitehouse introduced the Clean Competition act, which would have established a domestic carbon fee and border adjustment, including an export rebate, but the bill would only have kicked in for emissions in excess of the US industry average. The system would have applied to energy-intensive products, including fossil fuels, refined petroleum products, petrochemicals, fertilizer, hydrogen, adipic acid, cement, iron and steel, aluminum, glass, pulp and paper, and ethanol.

Trade-neutral border adjustments of domestic carbon prices should not be thought of as a form of climate nationalism. For carbon taxes, they are straightforwardly compliant with the destination principle, which holds that goods should be taxed in the country where they are consumed. Just as value-added taxes (VAT) are not considered nationalist policies, border-adjusted carbon taxes are best thought of as one way of implementing domestic carbon emissions and tax policies, which happens to involve an adjustment at the border.

A similar analysis applies to genuinely trade-neutral symmetrically border adjusted emissions trading programs, given that carbon taxes and cap-and-trade programs are two ways of achieving the

economic and environmental effects of carbon pricing. In principle, there are many ways to adjust emissions taxes and emissions trading systems so that each can take on more of the features of the other. Allowance price collars, and banking and borrowing of allowances, produces more stable carbon prices, at the expense of near-term emissions certainty. Emissions assurance mechanisms, by contrast, can provide more emissions certainty in emissions taxes, at the expense of reduced price certainty. From an international trade perspective, the key feature of emissions trading systems that is relevant to the legitimacy of border adjustment is the method for allocating allowances. Systems that auction allowances function most similarly to a carbon tax and so the economic arguments for border adjustment run through similarly. But systems that allocate at least some portion of allowances freely, say in proportion to production, effectively combine a carbon price with a production subsidy. Border-adjusting a system like that is not trade-neutral.

But the economics of border-adjustment for emissions trading systems does not straightforwardly translate into international trade law. There is no equivalent of the destination principle for taxes that allows border adjustment of carbon prices that are implemented as emissions trading systems. This is why the EU's proposed Carbon Border Adjustment Mechanism (CBAM) instead relies on GATT Article XX(b), which exempts measures "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption" from the GATT's most-favored nation (MFN), national treatment, tariff binding requirements. There are two challenges with this compliance pathway. First, the GATT Article XX does not apply to the ASCM. This means it cannot be used to exempt an export rebate from qualifying as an actionable or prohibited subsidy. For this reason, the EU CBAM only applies to imports and does not include an export rebate. From an economic perspective, this means it is not trade-neutral. Assuming the policy works as advertised and free allowances phase out as the CBAM ramps up, it creates a level competitive playing field for all carbon-intensive

production in the EU market. But EU producers of carbon-intensive products for the export market are still subject to a carbon price not faced by their competitors. In this sense, exporters are hurt by the shift from free allowance allocations to the import CBAM. In equilibrium the reduced competitiveness of carbon-intensive EU exporters should cause the value of the Euro to adjust downward, resulting in some combination of reduced EU imports and increased EU exports of less carbon-intensive goods and services. These are substantial trade distortions, but they are artifacts of the structure of international trade law, not any EU effort to circumvent that body of law.

The second challenge with the EU's chosen compliance pathways is Article XX's chapeau, which requires that "measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade".²⁷ This requirement is distinct from the MFN and national treatment provisions that Article XX provides exceptions to. Instead of prohibiting discrimination with respect to treatment of "like products" the chapeau focuses on "countries where the same conditions prevail." The WTO Appellate Body has interpreted this language as prohibiting attempts to coerce "specific policy decisions made by foreign governments." In *U.S.—Shrimp*, the original U.S. ban was found inconsistent with the chapeau because it required other countries to "adopt essentially the same policy."²⁸ The Appellate Body approved a modified U.S. provision conditioning market access on "the adoption of a program comparable in effectiveness," finding that this "allows for sufficient flexibility in the application of the measure so as to avoid 'arbitrary or unjustifiable discrimination.'"²⁹

In the context of GHG emissions, this could be read to require any border adjustment mechanism using an Article XX compliance to account for existing emissions regulations in

²⁷ GATT, *supra* note x, at Art. XX

²⁸ Appellate Body Report, *United States—Import Prohibition of Certain Shrimp and Shrimp Products*, ¶161, WTO Doc. WT/DS58/AB/R (adopted Oct. 12, 1998).

²⁹ *Id.*

exporting countries, regardless of whether they take the same form as those in the importing country. This is not what the EU CBAM does. Instead, it only offers credit for explicit carbon prices. This could be viewed as an attempt to coerce other countries to adopt “essentially the same policy” as the EU — carbon pricing. It is worth noting, however, that the policy that was disfavored in U.S.—Shrimp involved a complete ban on imports from countries that failed to adopt the required policies, whereas imports to the EU would merely be required to purchase CBAM credits in order to gain market access. It is possible, therefore, the WTO dispute settlement system, should it be sufficiently functional to hear a challenge to the CBAM, would look more favorably on this provision.

What is more clear is that this aspect of the CBAM is also not completely trade-neutral. A trade-neutral (on the import side) policy would credit neither explicit carbon prices nor other emissions policies, simply charging the prevailing allowance price on the EU ETS for all imports, regardless of their country of origin. If some of the exporting countries are enforcing domestic carbon prices or other cost-imposing emissions policies, they could offer export rebates to offset those costs. But crediting only explicit carbon prices opens the door to a multitude of distortions and perverse incentives, whereby countries can avoid the CBAM by adopting high explicit carbon prices and then undermining the emissions and trade impact of those prices using other policy tools. Nonetheless, it seems clear that the CBAM is a good faith effort to construct a border-adjusted carbon price, subject to constraints imposed by the ACSM, which likely prohibits an export rebate attached to an emissions trading system, the EU’s own internal rules that would make it difficult to convert the ETS into a carbon tax, and the practical difficulty of determining how much credit to give for non-pricing emissions policies. The carbon price equivalent methodology I developed in prior work might help overcome these practical barriers, though it would have to be modified to

avoid credit emissions-reducing policies that do not impose a cost on domestic producers, like the subsidies in the U.S. IRA.

More broadly, carbon border charges may be warranted to the extent that they serve at least one of two functions: enabling greater domestic emissions reductions or encouraging other countries to adopt strong emissions policies. Border-adjusted carbon prices are optimized for the first purpose. They are trade-neutral, and so offer other countries little incentive to increase the ambition of their climate policies, though they do offer foreign exporters some incentive to decarbonize their production. More importantly, a border adjustment is necessary for a carbon price to cover the energy-intensive trade exposed sectors, without offsetting subsidies or free allowances, without eviscerating domestic production in those sectors. Consequently, it is also essential for the political viability for an economy-wide carbon price that foregoes such subsidies or free allowances. And compared to subsidies and free allowances, border-adjustments will tend to enable the achievement of greater emissions reductions at the same economic costs, the same emissions reductions at lower economic cost, or some combination. This is because subsidies and free allowance that scale with output dilute the signal sent by the carbon price, so the incentive for decarbonization is not present across all relevant margins. Also, the outlays or lost revenue from subsidies or free allowances generally must be made up for with increases in other distortionary taxes, spending cuts in other areas, or increases in government borrowing, each of which has its own costs.

Approaches like Nordhaus's climate club proposal, discussed above, are optimized for the second purpose. While under Nordhaus's modeling assumptions member countries benefit from imposing across-the-board tariffs on non-member countries, there are reasons to be skeptical of these assumptions. The more straightforward benefit of such a club formulation are the incentives for other countries to strengthen their emissions policies.

Genuine hybrid policy designs are also possible. The EU's CBAM proposal arguably fits this mold, since it combines an attempt to border-adjust a domestic carbon price with an explicit incentive for other countries to adopt their own carbon prices. Alternative formulations could also credit non-pricing emissions policies that impose costs on carbon-intensive production methods, such as tradable performance standards. At the expense of greater potential trade distortion, they could credit any emissions-reducing policy, as measured by the carbon price equivalent, regardless of whether it is cost-imposing or applied to the particular goods subject to the CBAM. This would increase the incentives for exporting-country governments to adopt stronger emissions-reducing policies, but would likely result in excess advantages for certain carbon-intensive exports. For instance, the U.S. exports to the EU would receive credit for the emissions-reducing impacts of the IRA. Multilateral clubs based on border charges that scale with embodied carbon, rather than Nordhaus's proposed across-the-board tariffs, are also possible.

However, some proposed carbon border measures do little to advance either of these objectives, while substantially distorting international trade. Measures of the third type discussed above, that are neither trade-neutral border adjustments of domestic carbon prices nor open and plurilateral are most likely to fall short on these objectives. To be sure, some hybrid policies may fall into this category. For instance, the EU CBAM is neither purely trade neutral, nor inherently open and plurilateral, but it does significantly advance the goal of enabling a truly economy-wide carbon price with no free allowances, while also giving other countries some incentive to adopt their own carbon price. However, policies that impose a border carbon charge that is untethered from any domestic climate policy, as has been discussed in U.S. climate and trade policy circles, would neither facilitate stronger domestic policies nor substantially encourage other jurisdictions to strengthen their climate policies.³⁰

³⁰ While all the existing border carbon adjustment legislation introduced is tethered to some form of new or existing climate policy, much of the private discussion that I was privy to during my time at the Climate Leadership Council

The Coons-Peters proposal mentioned above would base its carbon border charge on the average “domestic environmental cost” incurred in each covered sector and in the production of each covered fuel.³¹ This “domestic environmental cost” figure would in turn be based on the total average cost imposed by federal, state, regional and local environmental laws and regulations, including those under the Clean Air Act, greenhouse gas emissions standards for passenger cars and light trucks, and State, regional, or local law, regulation, policy, or program that imposes a cap-and-trade system with respect to, or a tax or fee on, carbon dioxide.³² The proposal would apply only to imports and would not offer any credit for foreign emissions policies. While this approach could have some benefits in terms of enabling greater domestic emissions policy ambition, it also has several important liabilities. First, it would do little to encourage exporting countries to adopt stronger emissions policies, since they would not benefit from a lower import fee rate if they did so (though any reductions in the carbon intensity of their exporters would mechanically result in a benefit). Second, it would substantially distort international trade, since even exporters that are subject to explicit carbon prices, like EU steel producers, would still be subject to the import fee. It is also difficult to imagine an equilibrium in which this policy design meshes well with other countries’ border carbon policies. If every country adopted a similar policy, with no export rebate or credit for exporting country emissions policies, it would result in a substantial aggregate bias toward consumption of domestically produced carbon-intensive goods. As conceived, it also almost

centered around border charges that were not linked to any domestic policy. The only carbon border charge bill with any Republican co-sponsors is a proposal to have the Department of Energy study the possibility of a border adjustment and generate the data needed on carbon intensity, with no proposed domestic policy basis for any eventual border charge. Maxine Joselow, A bipartisan plan to punish global climate laggards: Tax them, *The Washington Post*, June 7, 2023, <https://www.washingtonpost.com/climate-environment/2023/06/07/carbon-border-tax/> (last visited Sep 5, 2023); S.1863 - 118th Congress (2023-2024): PROVE IT Act of 2023, Library of Congress (2023), <https://www.congress.gov/bill/118th-congress/senate-bill/1863> (last visited Sep 5, 2023); Fireside Chat on CBAM, Fair Access to Banking Act, Permitting Reform, Kevin Cramer, <https://www.cramer.senate.gov/news/press-releases/sen-cramer-joins-axios-pro-for-fireside-chat-on-cbam-fair-access-to-banking-act-permitting-reform> (last visited Sep 5, 2023).

³¹ S. 2378 (117 Congress). Fair, Affordable, Innovative, and Resilient Transition and Competition Act (2021), sec. 9902, available at <https://www.govinfo.gov/content/pkg/BILLS-117s2378is/pdf/BILLS-117s2378is.pdf>.

³² Id.

certainly violates WTO rules. As with the EU's CBAM, it would have to appeal to an Article XX exception. But it would have an even harder time satisfying the chapeau than the EU ETS, since it would impose border carbon charges even on products from countries with stronger emissions policies, including explicit carbon prices, than the U.S. The inclusion of other domestic environmental regulations, including those targeting non-GHG pollutants in the average cost calculation may also raise some concerns. Additionally, it is worth noting that greenhouse gas emissions standards for cars and light trucks are already border-adjusted in the sense that imported cars have to comply with those standards. So, charging an import fee reflecting the cost of complying with those regulations would be redundant. There are also substantial administrability and WTO compliance concerns with applying a border charge based on state, local, and regional policies that vary widely across the country. Finally, basing a border carbon charge solely on the costs associated with environmental regulations, rather than their impact on emissions, would generate incentives to adopt costly policies that can be plausibly labeled as climate or environmental policies, but that largely serve other political or policy functions. It would not reward the adoption of more cost-effective emissions policies.

Senator Whitehouse's Clean Competition Act more plausibly fulfills the function of enabling stronger domestic emissions policies. The Clean Competition Act would impose a sectoral carbon price on domestic and foreign goods, but only for good whose carbon intensity exceeds the U.S. industry average, and only on the portion of the embodied carbon in excess of that average. Under this design, the cleaner half of U.S. producers would not pay any carbon fee initially. Since U.S. industries have a lower carbon intensity than most of their competitors in the covered sectors, this policy would have the effect of favoring U.S. producers in the domestic market, while also giving the dirtier half of U.S. producers an incentive to reduce their carbon intensity. Domestic producers would be rebated any carbon fees paid upon exports. This means that the policy is, in essence, a

symmetrically border-adjusted sectoral carbon fee with an exclusion for the first X tons per unit of output, where X is the domestic industry average. Importantly, however, the exclusion benchmark decline by 2.5 percentage points per year for the first four years, then by 5 percentage points per year after that. After 12 years, the exclusion would only cover half the initial industry average carbon intensity. After 22 years, it would convert into a full sectoral carbon price with no exclusions. In this way, the policy design threads the needle between appealing to the nationalist sentiments toward policy that favor U.S. producers, while genuinely enabling stronger emissions policies and minimizing trade distortions. It is also likely compliant with WTO rules, since taxes are border adjustable under the destination principle, and domestic products are treated the same as foreign products, except inasmuch the initial exclusion benchmark is based on the U.S. industry average and therefore tends to favor U.S. producers. The other reason the policy tends to benefit U.S. producers is that the legislation arguably cherry picks sectors where U.S. producers do have a carbon intensity advantage, declining to impose the carbon price on an economy-wide basis. While an economy-wide carbon price would surely be preferable, and Senator Whitehouse may be the most important congressional champion of carbon pricing, this policy seems like a clear win for the climate, despite its mild nationalist overtones.

IV. Green Tech/Resource Hoarding

- China restricting exports of critical minerals
- Outside climate domain, US restricting China's access to high-tech chips
- More prosaically, countries may want to maximize their returns domestic returns on green innovations and aggressively protect IP, slowing green transition even if the intent is not to restrict access to technology as an end in itself⁵³

V. Unilateral High-Leverage Geoengineering

Some climate interventions, particularly stratospheric aerosol injection, are sufficiently high-leverage that a single country could afford to deploy them at a scale that would dramatically and rapidly alter the earth's climate system.³⁴ Stratospheric aerosol injection, the most commonly discussed form of solar radiation management, involves injecting aerosol particles like sulfates into the upper atmosphere—mimicking the effect of a volcano.³⁵ This intervention was first proposed in the mid-1970s and gained greater attention after the 1991 eruption of Mount Pinatubo in the Philippines, which resulted in a temporary global cooling that peaked at about 0.5°C.³⁶ Once deployed, stratospheric aerosol injection would start to reduce temperatures within a year.³⁷ Stratospheric aerosol injection would offer much greater leverage and lower implementation costs compared to other interventions. In theory, the direct cost to deploy stratospheric aerosol injection at a scale sufficient to substantially reduce global warming could be as low as \$2 billion dollars per year,³⁸ though other estimates suggest a minimum annual cost of \$10 billion.³⁹ Even extending stratospheric aerosol injection in perpetuity, the present discounted direct cost could be as low as \$100 billion.⁴⁰ This compares to estimates on the order of \$500 billion to \$1 trillion per year for the global cost of conventional mitigation.⁴¹

However, there is significant uncertainty about the magnitude of the stratospheric aerosol injection cooling response and concerns about the secondary effects stratospheric aerosol injection

³⁴ Scott Barrett, *The Incredible Economics of Geoengineering*, 39 ENV'T RSCH.ECON. 45, 49 (2008); Edward A. Parson & Lia N. Ernst, *International Governance of Climate Engineering*, 14 THEORETICAL INQUIRIES L. 307, 313–14 (2013).

³⁵ THE ROYAL SOC'Y, *GEOENGINEERING THE CLIMATE:SCIENCE, GOVERNANCE AND UNCERTAINTY* 10 (2009).

³⁶ *Id.*

³⁷ *Id.*, at 31.

³⁸ Wake Smith & Gernot Wagner, *Stratospheric Aerosol Injection Tactics and Costs in the First 15 Years of Deployment*, 13 ENV'T RSCH.LETTERS No. 124001, Nov. 2018, at 1; Barrett, *supra* note x.

³⁹ Ryo Moriyama, Masahiro Sugiyama, Atsushi Kurosawa, Kooiti Masuda, Kazuhiro Tsuzuki & Yuki Ishimoto, *The Cost of Stratospheric Climate Engineering Revisited*, 22 MITIGATION & ADAPTATION STRATEGIES FOR GLOB. CHANGE 1207, 1207 (2017)

⁴⁰ David G. Victor, *On the Regulation of Geoengineering*, 24 OXFORD REV. ECON. POL'Y 322, 326 (2008)

⁴¹ Per-Anders Enkvist, Tomas Nauc ler & Jerker Rosander, *A Cost Curve for Greenhouse Gas Reduction*, MCKINSEY Q. (2007),

<https://www.mckinsey.com/business-functions/sustainability/our-insights/a-cost-curve-for-greenhouse-gas-reduction>.

deployment could have, such as on stratospheric ozone and high-altitude tropospheric clouds.⁴² Additionally, all solar radiation management intervention, including stratospheric aerosol injection, share three important differences. First, solar radiation management interventions do not directly address ocean acidification, whereas interventions that reduce the atmospheric concentration of CO₂ would mitigate ocean acidification in tandem with reducing expected warming.⁴³ Even if solar radiation management interferences otherwise mimicked GHG interferences, this would be a significant shortcoming that would militate against treating solar radiation management interventions as favorably as CO₂ intervention per unit of radiative forcing. Those who are particularly concerned with ocean acidification, moreover, may worry that the potential to reduce global temperatures and extreme weather events with solar radiation management may dampen incentives for decarbonization and thereby exacerbate ocean acidification. However, it is possible that other non-CO₂ interventions could somewhat ameliorate the ocean acidification problem.⁴⁴ Note also that this first feature of solar radiation management interferences is shared by abatement or removal of GHGs other than CO₂ and by cirrus cloud thinning. To the extent that the objection to solar radiation management is its failure to address ocean acidification, we should be equally concerned about strategies that emphasize abatement of GHGs like methane, nitrous oxide, and fluorinated gasses.

Second, solar radiation management would imperfectly counteract atmospheric GHG-driven climate change. Depending on the precise pattern of deployment, the effects on precipitation and temperature are likely to be somewhat uneven.⁴⁵ Solar radiation management tends to cool the

⁴² *Id.*, at xi.

⁴³ National Research Council, *Climate Intervention: Reflecting Sunlight to Cool Earth*, 39 (National Academies Press, 2015). But see David W. Keith, Gernot Wagner & Claire L. Zabel, *Solar Geoengineering Reduces Atmospheric Carbon Burden*, 7 *Nat. Clim. Ch.* 617 (2017), arguing “Solar geoengineering reduces the carbon burden, and therefore ocean acidification, due to the three pathways explored here: carbon-cycle feedback, reduced permafrost melting, and reduced energy-sector emissions.

⁴⁴ David G. Victor, *Global Warming Gridlock: Creating More Effective Strategies for Protecting the Planet*, 184 (2011).

⁴⁵ Jesse L. Reynolds & Joshua B. Horton, *An earth system governance perspective on solar geoengineering*, 3 *EARTH SYS. Gov.* 100043 (2020).

tropics more than the poles, such that the tropics may have to be cooled below pre-industrial temperatures to stop the melting of polar ice sheets.⁴⁶ Solar radiation management is also more effective at reducing anthropogenic precipitation anomalies than temperature.⁴⁷ This means that, for a given temperature target, solar radiation management interventions are expected to lead to a drier world than GHG interventions or cirrus cloud thinning. The environmental, economic, and social consequences of each class of intervention will vary significantly across regions.

Third, solar radiation management interventions, once implemented, would produce changes in global temperatures much faster than GHG interferences.⁴⁸ GHG interventions increase or decrease the rate at which GHGs are emitted or removed from the atmosphere. But the radiative forcing produced by GHGs is dependent on the stock of GHGs in the atmosphere — the result of cumulative GHG emissions and removals over the full history of the earth’s atmosphere. Unlike other pollution, such as acid rain precursors, dramatically reducing emissions of CO₂ — the most important GHG — has little short-term effect on the atmospheric concentration of CO₂. Changes in the flow of GHGs take decades to significantly alter atmospheric GHG concentrations.⁴⁹ Solar radiation management interferences, by contrast, can realize their full effect on radiative forcing relatively soon after implementation. It does take as long as a few years for the climate system to fully adjust to a sudden change in radiative forcing and settle at a new temperature equilibrium, but this is much faster than the decades that sustained GHG interferences take to realize their full effects.⁵⁰

⁴⁶ Nicholas J. Lutsko, Jacob T. Seeley, and David W. Keith, Estimating Impacts and Trade-offs in Solar Geoengineering Scenarios with a Moist Energy Balance Model, 47 *Geophys. Res. Ltrs* L087290 (2020), available at https://keith.seas.harvard.edu/files/tkg/files/2020_may_lutsko-seeley-keith.pdf. But see Simone Tilmes Et. al., CESM1(WACCM) Stratospheric Aerosol Geoengineering Large Ensemble Project, 99 *Bull. Am. Meteorol. Soc.* 2361 (2018), suggesting that strategic injection at multiple sites could greatly reduce the unevenness of induced cooling.

⁴⁷ David Keith, Daniel Raimi, & Elizabeth Wason, Reflecting on Solar Geoengineering, with David Keith, *Resources Radio*, May 12, 2020, <https://www.resourcesmag.org/resources-radio/reflecting-solar-geoengineering-david-keith/> (last visited October 19, 2020).

⁴⁸ THE ROYAL SOC’Y, *supra* note x, at x

⁴⁹ *Id.*

⁵⁰ *Id.*

In prior work, relying heavily on Joshua Horton's analysis, I argued that unilateral deployment of high-leverage ⁵¹ This case relied on five key arguments, which I will only briefly summarize here. First, the direct implementation costs for controversial unilateral deployment would be significantly higher than for consensus multilateral deployment, due to added costs of defensive measures.⁵² Second, unilateral deployment runs the risk of destructive interference with other countries' unconventional climate interventions.⁵³ Third, any country that initiated a large-scale high-leverage short-duration solar radiation management deployment would confront the so-called termination problem — rapid warming would occur if they ever halted deployment.⁵⁴ Fourth, governments that strongly oppose a unilateral geoengineering deployment have a number of options for offsetting its effects, including intentional black carbon deposition to increase the earth's surface albedo and emission of highly potent, short-lived GHGs like hydrofluorocarbons.⁵⁵

I still believe this analysis accurately characterizes the incentives for unilateral deployment of stratospheric aerosol injection of other forms of high-leverage solar radiation management. To the extent that national governments behave like rational maximizers of their citizen's welfare or some other coherent conception of the national interest, this analysis suggests that unilateral deployment is indeed unlikely, at least if the global governance tools to enable coordination of a multilateral deployment are available. However, two additional considerations that fall outside of the scope of this analysis give some reasons for worry.

First, the reemergence of great power conflict, now between the U.S. and China, and the more general rise in nationalist sentiment in much of the world, suggests that national governments may be less inclined toward multilateralism and more willing to accept the risk of retaliation. After

⁵¹ Gabriel Weil *Global Climate Governance in 3D: Mainstreaming Geoengineering Within a Unified Framework*, 83 U. Pitt. L. REV. 507, 579-582 (2022); Joshua B. Horton, *Geoengineering and the Myth of Unilateralism: Pressures and Prospects for International Cooperation*, 4 STAN.J.L.SCI.&POL'Y 56, 59-62 (2011).

⁵² Horton, *supra* note x, at 59.

⁵³ *Id.*, at 60.

⁵⁴ *Id.*

⁵⁵ *Id.*, at 62.

all, some of the same downsides risks of unilateral geoengineering can be ascribed to protectionist trade policies. In particular, discriminatory subsidies and carbon border measures can be offset by countervailing duties and export subsidies, and could result in forms of retaliation whose economic costs exceed any domestic benefits achieved by the original policy.

Second, the willingness of countries to engage in nationalist means of tackling a global problem suggests that high-leverage geoengineering deployment may be subject to a strong form of the unilateralist's curse. The unilateralist's curse, first examined by Oxford University researchers Nick Bostrom, Thomas Douglas, and Anders Sandberg, applies in situations where independent agents each have an opportunity to undertake that would have significant, but uncertain effects on other agents.⁵⁶ They show that, even if all the agents act altruistically, based on their own judgment of what is best for the group, the unilateral action will tend to be undertaken more often than is optimal.⁵⁷ This is because the agents are likely to have a range of assessments regarding the likely effects of the action, and it only takes one agent that assesses the action to have overall positive effects for the action to be taken.⁵⁸

Recall the explanations canvassed above for the U.S. turn toward climate nationalism and related forms of economic nationalism. These included geopolitical rivalry, especially with China and Russia, institutional factors that disproportionately empower certain concentrated domestic constituencies, and a general ideological backlash against neoliberal globalism. At least among elite actors on the left, this backlash has coincided with high and rising prioritization of tackling the global problem of climate change.⁵⁹ It is easy to imagine this mix leading U.S. policymakers to

⁵⁶ Nick Bostrom, Thomas Douglas, & Anders Sandberg, *The Unilateralist's Curse: The Case for a Principle of Conformity*, 30 *Social Epistemology* 350, 351 (2016).

⁵⁷ *Id.*, at 353-356.

⁵⁸ *Id.*, at 353-355.

⁵⁹ Matthew Yglesias, *Climate politics for the real world*, *Slow Boring*, March 16, 2022, <https://www.slowboring.com/p/sunrise-movement> (last visited Sep 3, 2023); Alexander C. Furnas, & Timothy M. LaPira, *Political Elites Are More Supportive of Progressive Policies Than the Average Voter*, *Data For Progress*, December 9, 2021,

downplay the second-order risks of unilateral geoengineering if they judge a deployment to be in the U.S. national and/or the global interest based strictly on the climate impacts. Similar stories can likely be told about the strategic and domestic political considerations that might lead other countries to act on their own assessment of the risks and benefits of a deployment. If a rising tide of nationalism makes it more difficult to coordinate on a decision procedure for selecting the timing, circumstances, and manner of any potential multilateral deployment, many countries may be tempted to go it alone. Importantly, moreover, they may be tempted to do so even if they place significant weight on the interests of other countries, so long as they trust their own judgment regarding what course of action is likely to serve those interests. Given that even the current wave of climate nationalism does involve a substantial degree of relative downweighting of the value of the foreigner's welfare, the uneven geographical distribution of the benefits and risks of high-leverage geoengineering is also likely to be an important factor.

To lift the unilateralist's curse, Bostrom, Douglas, and Sandberg propose the Principle of Conformity. "When acting out of concern for the common good in a unilateralist situation, reduce your likelihood of unilaterally undertaking or spoiling the initiative to a level that ex ante would be expected to lift the curse."⁶⁰ In turn, they offer three potential pathways complying with this principle: the collective deliberation model, the meta-rationality model, and the moral deference model.⁶¹ The collective deliberation model relies on sharing information between agents with the hopes that they arrive at a consensus regarding the best course. In cases where there are barriers to information sharing, or deliberation fails to produce consensus, the authors suggest moving on to one of the other two models.

<https://www.dataforprogress.org/blog/2021/12/9/political-elites-are-more-supportive-of-progressive-policies-than-the-average-voter> (last visited Sep 3, 2023).

⁶⁰ Bostrom, Douglas, & Sandberg, *supra* note x, at 357.

⁶¹ *Id.*, at 357-350.

A meta-rational agent conditions their estimate of the value of a given unilateral undertaking on the agent's estimate of the first-order value of the undertaking being the highest (which it would be in cases where the agent deciding to act unilaterally would be decisive).⁶² This approach would cause countries capable of unilateral high-leverage geoengineering deployment to be more reluctant to do so than their first-order estimation of the value of such a deployment would suggest, and the magnitude of this reluctance would increase with the number of countries or other players that are capable of a unilateral deployment.⁶³ Needless to say, this model of meta-rationality is extremely unlikely to be implemented by all of the countries that are capable of unilateral high-leverage geoengineering deployments.

Perhaps the most promising approach in the context of high-leverage geoengineering deployment is the moral deference model. In this model, the agent need not defer to the group in forming beliefs about the value of the initiative, only in deciding whether to act on those beliefs.⁶⁴ One example of a norm consistent with this model is picking a single arbitrary member of the group to decide whether to take the action at issue. Since this approach has some obvious practical and normative shortcomings, the authors propose three more appealing ways of implementing the moral deference model.

- (1) When in a unilateralist's situation, defer to existing institutions, such as laws or customs, if universal deference to those institutions would lift the unilateralist's curse...
- (2) When in a unilateralist's situation, promote the holding of a majority vote among those capable of undertaking the initiative. If the vote takes place, then (a) defer to its verdict, and (b) encourage others to do likewise.
- (3) When in a unilateralist situation, bring about the outcome if and only if you judge that a majority vote among those capable of undertaking the initiative would yield a majority in favor of doing so.

Option (1) doesn't work in the high-leverage geoengineering deployment context, since the existing laws and customs, even if followed by countries with the power to violate them, probably do not place meaningful constraints on high leverage geoengineering deployment decisions. Option (2)

⁶² Id., at 357-358.

⁶³ Id., at 359.

⁶⁴ Id., at 360.

seems the most promising, with the caveat that a binding majority vote among all countries and other agents with the capacity to engage in a unilateral high-leverage geoengineering deployment is geopolitically unrealistic, given the likely power imbalance among members of that group. Option (3) seems unrealistic for reasons similar to those suggesting most national governments are unlikely to adopt a meta-rational epistemological stance. The political process that generate nationalist policies point in the opposite direction, toward placing excessive weight on the inside-view and actively distrusting the views of at least some other members of the decision-relevant group.

The upshot of this analysis is to underscore the urgency of crafting robust governance tools to enable coordination around a multilateral process for deciding when, under what circumstances, and in what manner to engage in high-leverage geoengineering. In my prior article on geoengineering governance, I emphasized two reasons for acting early to set up this framework, before scientific research to characterize the risk and benefits of various interventions is complete. First, early action enables the key players to agree on basic geoengineering governance principles and decision rules while still behind a partial veil of ignorance regarding the precise contours of their interests. Second, early action allows more time for greater influence over high-leverage multilateral geoengineering deployment decisions to be used as an inducement for countries to improve their GHG emissions reduction policies.

Heading off the unilateralist's curse provides a third reason. If national governments are likely to rely too heavily on their own inside views of the benefits of high-leverage geoengineering and downplay the risks of retaliation or destructive interference, then it is all the more important to establish clear rules and decision procedures before any government concludes that unilateral deployment is warranted. To be sure, the same nationalist forces that lead some countries to flout WTO may lead some governments to violate any international legal constraints on unilateral geoengineering deployment. Likewise, rising nationalist sentiment and great power conflict is likely

to complicate any effort to negotiate a geoengineering governance framework. Nonetheless, such an agreement seems worth pursuing. The history of successful U.S.-Soviet arms control negotiations shows that major agreements are possible even during periods of conflict and distrust. Similarly, the prevailing taboo on geoengineering may make it easier to achieve compliance with an agreement to forgo unilateral deployment, even if the taboo would not be sufficient on its own to prevent unilateral deployment in the absence of a global governance framework. Also, at least some of the arguments for ignoring WTO rules — they are outdated and stand in the way of tackling climate change, China is already cheating on trade on and stealing foreign intellectual property, it is based on discrediting neoliberal economic idea — would not apply with the same force to a geoengineering governance framework, which would be specifically designed with climate change in mind, would likely enter force in a world where no country has ever in engaged in a large-scale high-leverage geoengineering deployment, and has little to do with the economic theories associated with economic globalization.