INCREASING EMISSIONS CERTAINTY UNDER A CARBON TAX

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INTRODUCTION

Various organizations and individuals, including issue-oriented advocacy groups, research institutes, business groups, and members of Congress, have recently proposed that the United States consider use of a carbon tax as the primary federal policy to reduce greenhouse gas emissions.[1] A carbon tax establishes a fixed fee per unit of emissions and thereby provides a certain price incentive to cut emissions.[2] However, one concern regarding a carbon tax is that it does not ensure that the nation will achieve a specific emissions goal because the economy's response to such a tax is unknowable in advance.[3] This concern mirrors the reciprocal apprehension over allowance-price uncertainty (and ultimately cost uncertainty) under a cap-and-trade

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[1] *See, e.g.*, American Opportunity Carbon Fee Act of 2015, S.1548, 114th Cong. (2015) (proposing a federal fee on fossil fuel products producing carbon dioxide as well as other greenhouse gas emissions, including methane); Adele C. Morris, *Proposal 11: The Many Benefits of a Carbon Tax*, *in* 15 WAYS TO RETHINK THE FEDERAL BUDGET 63–69 (2013) (proposing "a modest carbon tax to finance reforms to the U.S. tax system to promote economic growth, reduce budget deficits, reduce redundant and inefficient regulation, reduce unnecessary subsidies, and reduce the costs associated with climate change"); JERRY TAYLOR, NISKANEN CENTER, THE CONSERVATIVE CASE FOR A CARBON TAX 15–27 (2015), https://perma.cc/ZTG2-YY5G (reviewing Adele Morris's proposal from a conservative point of view); *Carbon Fee and Dividend Policy*, CITIZENS' CLIMATE LOBBY, https://perma.cc/2X8K-STYQ (proposing "a national, revenue-neutral carbon fee-and-dividend system" as the organization's preferred climate solution); *Climate 2.0: Fact Sheet*, PARTNERSHIP FOR RESPONSIBLE GROWTH, https://perma.cc/8VUH-Y4JT (discussing the "merits of a simple carbon fee" while offering "a pro-growth solution"). The U.S. Department of the Treasury also recently released a paper outlining a methodology for analyzing a carbon tax. JOHN HOROWITZ ET AL., U.S. DEPT. TREASURY, METHODOLOGY FOR ANALYZING A CARBON TAX 13–14 (2017), https://perma.cc/SG3G-BZMG (pointing to policy provisions for "responding to real-world outcomes" as a design option for a carbon tax).

[2] This Essay uses the term "carbon tax" to denote a tax on greenhouse gas emissions without taking a particular stand on which greenhouse gases the tax would cover.

[3] *See* Richard G. Newell & William A. Pizer, *Regulating Stock Externalities under Uncertainty*, 45 J. ENVTL. ECON. & MGMT. 416, 418 (2003) ("When uncertainty exists about costs, and policies must be fixed before the uncertainty is resolved, priced policies will lead to distinctly different outcomes than quantity policies"); Marc J. Roberts & A. Michael Spence, *Effluent Charges and Licenses under Uncertainty*, 5 J. PUB. ECON. 193, 194 (1976) ("Effluent charges and marketable licenses have the virtue of inducing the private sector to minimize the costs of cleanup. But in the presence of uncertainty, they differ in the manner in which the ex post achieved results differ from the socially optimal outcome."); Martin Weitzman, *Prices vs. Quantities*, 41 REV. ECON. STUDIES 477, 480 ("If there is any advantage to employing price or quantity control modes, therefore, it must be due to inadequate information or uncertainty").

program, which does provide for a certain emissions outcome. Moreover, just as policy mechanisms can increase price certainty under a cap-and-trade program,[4] so too can policy mechanisms increase emissions certainty under a carbon tax.

Ultimately, there is an underlying tradeoff between certainty about emissions and certainty about prices and costs. To reduce uncertainty about whether a tax will achieve specific emissions goals, additional mitigation measures could be called upon if emissions exceed those goals. However, such additional measures introduce uncertainty about costs. At the extreme, a commitment to achieve emissions targets at all costs would imply that costs could be quite high. Discussions of policy mechanisms to increase price and cost certainty under several current cap-and-trade programs confronted this same dilemma: how much uncertainty about emissions outcomes is acceptable given reciprocal uncertainty about costs?[5]

Viewed through a slightly different lens, mechanisms that balance emissions and cost uncertainty can be viewed as a way to structure a more careful compromise between cost concerns and environmental interests. Under a cap-and-trade program, a price ceiling or allowance reserve may allow economic interests to agree to what may be viewed as an economically risky cap with the assurance that further steps will be taken should prices become too high. Similarly, under a carbon tax, mechanisms that can increase mitigation action may allow environmental constituencies to agree to what they may view as an environmentally risky tax with the assurance that further steps will be taken should emissions become too high.

This Essay discusses a range of mechanisms that could increase emissions certainty under a carbon tax. It draws from recent discussions between the authors and other policy experts, and its goal is to define a set of options for deeper exploration. Other Essays in the Symposium explore specific proposals related to one of these ideas, automatic adjustments to the tax rate.[6]

Here, we begin with a discussion of how to measure emissions performance, or what it means to be achieving or not achieving an emissions goal. This performance could provide the basis for pursuing remedial mechanisms. Next, the Essay presents a taxonomy of such mechanisms and the challenges and opportunities of each. It discusses ideas for initiating these mechanisms, either through some automated or discretionary procedure. The Essay concludes with a summary of areas for additional research.

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[4] *See* JAN MAZUREK ET AL., NICHOLAS INST. FOR ENVTL. POL'Y SOLUTIONS, CONQUERING COST: OPTIMAL POLICY APPROACHES TO THE COST OF CLIMATE CHANGE WORKSHOP 4–5 (2009), https://perma.cc/8GKZ-CLYT; Harrison D. Fell et al., *Soft and Hard Price Collars in a Cap-and-Trade System: A Comparative Analysis*, 64 J. ENVTL. ECON. & MGMT. 183, 183–85 (2012); Brian Murray et al., *Balancing Costs and Emissions Certainty: An Allowance Reserve for Cap-and-Trade*, 3 REV. ENVTL. ECON. & POL'Y 84, 86–89 (2009); Adele Morris et al., *Time for a Price Collar on Carbon*, BROOKINGS (July 24, 2009), https://perma.cc/Z68J-TK8M; Darren Samuelsohn, *Behind 'Safety Valve' Debate Resides 30+ Years of History*, E&E NEWS (Mar. 11, 2008), https://perma.cc/2H9N-WBCA.

[5] See sources cited *supra* note 4.

[6] *See* Joseph E. Aldy, *Designing and Updating a U.S. Carbon Tax in an Uncertain World*, 41 HARV. ENVTL. L. REV. F. 28 (2017); Marc Hafstead et al., *Adding Quantity Certainty to a Carbon Tax Through a Tax Adjustment Mechanism for Policy Pre-Commitment*, 41 HARV. ENVTL. L. REV. F. 41 (2017).

I. MEASURING EMISSIONS PERFORMANCE

What does it mean to decide whether the country is achieving an emissions goal after some period of time? Emissions goals are at times expressed as targets for a particular year. Indeed, the goal of the U.S. in the Paris Agreement is to achieve an emissions reduction of twenty-six to twenty-eight percent below 2005 levels in 2025.[7] In this context, the most obvious definition of achieving or not achieving the target would be whether emissions in 2025 exceed this range. This raises two issues: (1) whether emissions in a single year is the best indicator of achievement for an emission adjustment mechanism, and (2) how projections of future emissions might affect an interim assessment of achievement.

Greenhouse gases are stock pollutants whose impacts depend on accumulated atmospheric concentrations. Moreover, emissions can be high or low in any single year for a variety of reasons, including weather, economic cycles, accidents, or other unforeseen events. For these reasons, defining success or failure on the basis of performance in a single year could lead to inappropriate conclusions about environmental impact.[8] For an emission adjustment mechanism, a single-year goal can create unnecessary disruption—adjustments may be made, but then need to be reversed. Much of the short-term emissions volatility will tend to average out over a number of years without requiring any (or as frequent) interventions to achieve a desired environmental outcome. That is, it is this average emission level over longer periods of time—accumulated emissions—that matter for the environment.

A focus on multi-year average emission outcomes avoids these issues. Virtually all programs with compliance regimes include multi-year targets. For example, the Kyoto Protocol set a goal that measured performance on the basis of average emissions over five years (2008–2012).[9] Even with annual targets, programs often define compliance over a longer window. The 2009 Waxman-Markey Bill, passed by the House of Representatives, used a two-year window and allowed costless borrowing of the following year's emissions allowances.[10] The European Union Emissions Trading System similarly allows the circulation of future vintage allowances for compliance, so long as they are from the same five- to eight-year trading period.[11] The Regional Greenhouse Gas Initiative has three-year compliance periods.[12] All of these programs allow emission permits to be banked for future use if they are not used during the year issued. This

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[7] U.S. COVER NOTE, INDC AND ACCOMPANYING INFORMATION, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (2015), https://perma.cc/6WL4-H8N5.

[8] *See* Michael Lazarus et al., *Single-Year Mitigation Targets: Unchartered Territory for Emissions Trading and Unit Transfers*, 4–11 (Stockholm Env't. Inst., Working Paper No. 2014-01, 2014), https://perma.cc/Y4ZD-VW2K.

[9] Kyoto Protocol to the United Nations Framework Convention on Climate Change art. 3, ¶ 8–9, Dec. 10, 1997, 37 I.L.M. 22.

[10] The American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. §§ 702, 722–725 (2009).

[11] A. DENNY ELLERMAN & PAUL J. JOSKOW, THE EUROPEAN UNION'S EMISSIONS TRADING SYSTEM IN PERSPECTIVE 3 (2008), https://perma.cc/9YQ8-UJ6A.

[12] MODEL RULE, REG'L GREENHOUSE GAS INITIATIVE 13 (2013), https://perma.cc/KH8W-L8RK.

further emphasizes cumulative, rather than annual, emission levels as the targeted outcome.

In addition to a multi-year performance metric, the choice about whether to make an adjustment and, if so, how to tailor it, should consider any additional knowledge about likely *future* emissions. For example, suppose emissions were two percent above the stated emissions goal for several years. This overage might typically demand an adjustment. But whether and how much to adjust would likely be different if this deviation were projected to grow, shrink, or stay the same given emerging technological and market conditions. That is, the response might be different if nuclear power facilities were slated to come online in the very near future and replace a large number of coal units, dramatically reducing emissions, versus a situation where such activity is not anticipated.

Moving beyond the conceptual question of what time window or windows to use, there is also the question of data. Policymakers will need to decide on which emissions data they rely on to measure current performance as well as which models, if any, should be used for projecting future emissions. One source for historic emissions may be the national greenhouse gas inventory,[13] and one source for projections may be government forecasts such as those produced by the U.S. Energy Information Administration ("EIA").[14] It will be important to ensure that selected sources are up to the task. This includes ensuring that the timing of the release of nationally aggregated emissions data and of emissions projections is aligned with the timing of any performance measures used to make policy adjustments. It also includes ensuring the programs' reliability, accuracy, and disclosure policy is sufficiently robust to drive market-based policy interventions with potentially significant financial consequences.

II. MECHANISMS TO INCREASE THE EMISSIONS CERTAINTY OF A CARBON TAX

If emissions outcomes under a carbon tax are above or below a chosen performance goal, policy makers have several policy mechanisms they could use to guide the emissions level toward the goal. These mechanisms include changing the tax rate or schedule, using traditional regulatory tools as a backup to the tax, using revenue to pay for additional emission reduction activities, or applying hybrid approaches that combine elements of all three.

A. Tax Adjustments

One approach to increase emissions certainty with a carbon tax would be to adjust the tax rate to reflect updated information about greenhouse gas emissions performance. This adjustment could occur on the basis of a predetermined formula or on a more ad hoc

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[13] The EPA submits the national greenhouse gas inventory to the United Nations in accordance with the Framework Convention on Climate Change. *See* EPA, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2014 (2016) ("Under decision 3/CP.5 of the UNFCCC Conference of the Parties, national inventories for UNFCCC Annex I parties should be provided to the UNFCCC Secretariat each year by April 15."), https://perma.cc/A253-MGCT.

[14] *See, e.g.*, U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2017 (2017), https://perma.cc/67LU-RJVN.

basis. With a predetermined formula, legislators would decide up front how the tax would change over time and in response to established performance metrics. With an ad hoc adjustment, Congress would first establish the emissions performance goals and an initial trajectory for the tax rate over time. Then, either Congress or a delegated agency would review emissions performance and determine the necessary adjustments to achieve the stated performance goals in the future. An adjustment using a predetermined formula is discussed here; the idea of a more discretionary approach is discussed below in the context of triggering mechanisms.

A predetermined formula would need to specify the exact timing and method of a tax rate adjustment as well as the performance metrics used to determine the adjustment. The adjustment could be relatively simple. For example, the tax schedule might include pre-determined high and low paths for the tax rate, along with conditions under which the actual tax rate path would switch from one to the other. The tax might start on the low path, but if emissions were deemed too high relative to the established goal, the tax rate would switch to the high path. In economic policy, there is a long history of such operational models in which an initial default path is maintained until a threshold is reached that justifies a large, discrete adjustment.[15] This type of adjustment—one in which there are fewer, relatively large changes in the tax rate rather than more frequent, smaller changes—is preferred when there are fixed costs associated with any changes in the tax rate. For a carbon tax, such fixed costs could include the additional time and resources for businesses to consider and respond to a tax change. That is, they would need to bring in accountants, engineers, and business experts to adjust their activities, which would have an associated cost every time the path of expected tax rates is adjusted.

More complex rules for guiding the adjustments might also exist. Such rules might allow triggering events based on a wider set of performance indicators along with more gradations in the tax rate change. In determining whether simple or more complex rules are preferable, it will be important to consider the objectives of the policy. In addition to increasing emissions certainty, it will be valuable to limit the volatility of the tax rate. As noted earlier, this is partly a fundamental trade-off between certainty about emissions and cost. Uncertainty introduced by frequently adjusting the tax rate can drive up business costs.[16] Regardless of the trade-off chosen, one can strive to make the rules transparent, predictable, and easy to understand. It will also be important to consider whether adjustments are symmetric: if the tax rate can adjust up when emissions are above the established goal, can it also adjust down when emissions are below it (or cease to be above it)?

In the context of the tradeoff between emissions and cost certainty, there is the question of the degree and type of emissions certainty that is desired. If the objective is to move emissions closer to a goal when they are otherwise too high, it might be sufficient to have simply a high and low path for the emissions tax. However, a high and low path

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[15] Here, we are referring to the (S,s) model in economics, first applied to the problem of inventory control in Kenneth J. Arrow et al., *Optimal Inventory Policy*, 19 ECONOMETRICA 250 (1951). For a recent review, see Andrew Caplin & John Leahy, *Economic Theory and the World of Practice: A Celebration of the (S,s) Model*, 24 J. ECON. PERSPECTIVES 183 (2010). This model applies to a situation where there are fixed costs to making any policy change, large or small.

[16] *See generally* AVINASH K. DIXIT & ROBERT S. PINDYCK, INVESTMENT UNDER UNCERTAINTY (1994).

may be insufficient if the goal is to ensure with a greater probability that the U.S. meets an explicitly defined emissions target. In this case, unless there is willingness to allow the high tax rate path to be quite high, it might be more appropriate to make sequential adjustments as necessary without raising the tax more than required to achieve the emissions target. Put another way, a system designed for fine-tuning might have to adjust the tax more frequently by smaller amounts on the basis of smaller deviations from the emissions goal. Thinking through these choices—what triggers the adjustment, how large it is, and what constraints should be placed on its frequency—are important policy design questions as well as ripe topics for further research.[17]

A number of relevant precedents for automatic policy adjustments based on observed outcomes exist. Marginal income tax rates vary based on individuals' income. Borrowing this idea, we could apply the principal to the country as a whole under a carbon tax. A simple formula could set the carbon tax rate to rise with aggregate emissions across the U.S. economy. The government would assess a higher tax rate as national U.S. emissions grow larger, rather than simply with the passage of time. Many income-support payments as well as tax brackets and exemptions are automatically adjusted on the basis of inflation indexes. In trade, tariff-rate quotas allow a certain amount of imports with limited or no tariff.[18] If imports exceed the quota, a tariff or upward tariff adjustment is applied. The Taylor Rule[19] provides a formulaic guide for central banks to adjust interest rates in response to specific changes in inflation, unemployment, or gross domestic product, though the formula is not necessarily codified in central bank rules.[20] As noted in the introduction, formulaic adjustments to a carbon tax are analogous to the price collar/allowance reserve approach under a cap-and-trade system, and these adjustments thus have precedent in alternative carbon-pricing systems now in operation.[21]

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[17] *See* Marc Hafstead et al., *Adding Quantity Certainty to a Carbon Tax Through a Tax Adjustment Mechanism for Policy Pre-Commitment*, 41 HARV. ENVTL. L. REV. F. 41 (2017) (examining how a mechanism to provide greater emissions certainty might be designed, what its key elements would be, and what modeling might be undertaken by economists to better understand the implications of such a policy design).

[18] *See generally* 19 U.S.C. § 3601 (2012); DAVID W. SKULLY, U.S. DEP'T OF AGRIC., ECONOMICS OF TARIFF-RATE QUOTA ADMINISTRATION (2001), https://perma.cc/HC3A-LDXT (analyzing tariff-rate quota administration in the United States in the context of the Uruguay Round Agreement of the World Trade Organization's Uruguay Round Agreement on Agriculture).

[19] *See* John B. Taylor, *Discretion Versus Policy Rules in Practice*, 39 CARNEGIE-ROCHESTER CONF. SERIES PUB. POL'Y 195, 199–203 (1993); *see also* Athanasios Orphanides, *Historical Monetary Policy Analysis and the Taylor Rule*, 50 J. MONETARY ECON. 983 (2003); Athanasios Orphanides, *Monetary Policy Rules Based on Real-Time Data*, 91 AM. ECON. REV. 964 (2001); Michael Woodford, *The Taylor Rule and Optimal Monetary Policy*, 91 AM. ECON. REV. 232 (2001).

[20] Recently, there has been talk of an alternative central bank rule to target an interest rate that is "neither expansionary nor contractionary." *See* Donald Luskin, *Yellen Gives Conservatives Something to Cheer*, WALL ST. J. (Feb. 16, 2017), https://perma.cc/X559-V4CD.

[21] *See* CAL. CODE REGS. tit. 17, § 95914 (2017); MODEL RULE, REGIONAL GREENHOUSE GAS INITIATIVE 13 (2013), https://perma.cc/4UP7-2ERT; CAL. AIR RES. BD., STAFF REPORT: INITIAL STATEMENT OF REASONS PROPOSED REGULATION TO IMPLEMENT THE CALIFORNIA CAP-AND-TRADE PROGRAM app. at G-5 to G-9 (2010), https://perma.cc/PC4Q-7XRS; *see also* Richard Schmalensee & Robert Stavins, *Lessons Learned from Three Decades of Experience with Cap-and-Trade* 10, 12, 17 (Harvard Kennedy School, Faculty Research Working Paper 15-069, 2015), https://perma.cc/CV3D-2X7A (analyzing major existing emissions trading programs to draw implications for future applications of this policy).

The biggest challenge to the formulaic approach is the added complexity of establishing not just the initial path of the tax rate, but the various performance metrics and responses. Given these parameters must be established upfront, agreement on their levels might bog down a deliberative process. Additional research could shed light on how different adjustment approaches work when applied to historic or future-simulated data.

The biggest advantages of this approach are its transparency and potential to tailor the parameters to deliver the desired degree of certainty. These advantages are analogous to those of price collars (floors and ceilings), which are similarly transparent and tailored to such preferences under a cap-and-trade program.

B. Regulatory Tools

A second potential mechanism to promote emissions certainty is to make use of various regulatory tools as a backup to the carbon tax. This approach would initiate one or more regulatory programs if the United States failed to meet its performance goals with the carbon tax. If legislators decide to use such regulatory tools, they could choose from multiple options. This includes use of existing mechanisms under the Clean Air Act, modification of those mechanisms, or creation of an entirely new regulatory mechanism.

For example, suppose a carbon tax were implemented as a replacement for regulation under EPA's existing authority under the Clean Air Act. One approach would be to reinstate that existing authority and to use the associated regulatory tools if emissions fail to meet necessary performance goals. Under such an approach, the federal government implements a carbon tax. In parallel, the EPA constructs a regulatory program to achieve emissions reductions as envisioned under existing authority. Under the cooperative federalism principles of this authority, such actions will have to consider state goals and implementation of regulatory plans for emission reductions. The EPA would activate this program, however, only in the event of a finding that the U.S. has failed to meet its emissions goals with the carbon tax.

The Clean Power Plan has an analogous policy model using a parallel backup plan. Under the Clean Power Plan, states could opt for a "state measures" plan to meet federal emission goals. However, states choosing this route must also create a federally enforceable backup plan. In the event that the "state measures" plan does not meet the Clean Power Plan's emissions targets, the federally enforceable backup plan would be activated.[22] This approach turns to a federal plan when the state plan fails. In comparison, the carbon tax example could turn to a state- or federally-enforced regulatory program if the federal carbon tax failed.

A second approach would be to modify the Clean Air Act in a way that provided more flexible regulatory authority if emissions performance goals were not met under the carbon tax. Under this approach, Congress could modify EPA's authority to enact regulation state-by-state and sector-by-sector under Section 111. This might include

[22] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 40 C.F.R § 60.5740(3) (2017).

explicit authority to make use of flexible regulations that span source categories, sectors, and/or states. Or, the modifications could suggest a particular approach, such as a national tradable performance standard for the power sector or a cap-and-trade system spanning multiple sectors.

If one of the goals of a carbon tax is to achieve a particular emissions goal that could be reached using regulations under the Clean Air Act, there is a simple logic to reinstating the suspended regulatory approach should a carbon tax fail to achieve that goal. However, except in rare cases such as the statutory sulfur dioxide cap (8.9 million tons),[23] the Clean Air Act generally does not legislate a particular emissions cap or goal. Thus, the choice of a Clean Air Act-justified emissions goal for carbon dioxide and other greenhouse gases could be contentious if such a quantitative target were put into new carbon tax legislation. This contention could arise even if the target is exclusively for the purpose of triggering additional regulation.

Moreover, some stakeholders are looking to a carbon tax as a replacement for either a Clean Air Act-based regulatory program or an economy-wide cap-and-trade program. This motivation may make such regulatory options in response to emissions target shortfalls less appealing to those stakeholders. In addition, while the idea of modifying existing regulatory authority to allow flexible, less expensive regulation might look like a reasonable compromise, it may not turn out that way. In particular, it may be difficult to make changes to the Clean Air Act without opening the whole statute to amendment. This, in turn, could quickly turn into a quagmire among various stakeholders, particularly between businesses and environmental and public health interest groups. Even small amendments to the Clean Air Act could make the congressional committee process considerably more complicated.

Unlike the tax adjustment mechanism, a regulatory tools approach does not lend itself to fine-tuning. Nor is there symmetry: it would be difficult to undo the regulation if the emissions goal is overachieved after various regulatory tools are implemented. Given this challenge, it may make sense to be more cautious when deciding how such regulation is triggered. In other words, policy makers choosing this approach might establish a trigger that reflects a larger and more persistent deviation from the emission goal than a trigger associated with a reversible tax adjustment.

C. Revenue Spending

In addition to tax rate adjustments and regulatory tools, if emissions are higher than expected then legislators could use part of the revenue from a carbon tax to fund programs that provide financial support for mitigation within or outside the sectors covered by the carbon tax. This method is similar to offset mechanisms under a cap-and-trade program, particularly if the mitigation achieved through this financial support is designed to exactly negate the emissions that exceed an established emissions goal. However, because the revenue programs would be based on government procurement rather than private sector trading, this mechanism operates quite differently than a traditional offset program. In particular, the government has the ability to scrutinize and

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[23] 42 U.S.C. § 7651b(a)(1) (2012).

adapt to developments in the supply of mitigation projects. It is possible that such procurement guidelines might encourage better quality projects, i.e., greater assurance that emission reductions are real and verifiable.[24]

Unlike tax rate adjustments or regulatory tools, this mechanism requires government expenditure when triggered. However, the revenue requirement arises when emissions—and hence carbon tax revenue—exceed the original goal. Moreover, the unexpected revenue could be more than enough to support offsetting mitigation projects because mitigation options outside the sectors covered by the tax are often cheaper than those within sectors covered by the tax. For example, changes in forest and agricultural practices, land use changes, and methane capture, domestically and abroad, can be difficult to include in a tax (or cap-and-trade) program for practical and political reasons. At the same time, these activities often provide inexpensive mitigation options.

One appeal of this mechanism is that it imposes neither an additional regulatory burden nor increased tax rates when emissions exceed the goal. Rather, it uses the additional revenue collected from the higher emissions base to improve emissions outcomes. That distinction is an advantage for those being taxed or regulated. One question about this approach, however, is whether and how quickly such external mitigation actions might be available. Unless there are other markets where suppliers can sell mitigation when government demand is low, it may take considerable time to incentivize new mitigation activities.[25] This issue may mean that the government will need to smooth its purchases, perhaps committing to spend a portion of carbon tax revenues on an ongoing basis in order to bolster the performance of such a mitigation market. In addition to positioning the market to be responsive if significant future purchases are required, smaller, regular purchases could also create a provisional "reserve" of offsets to handle smaller emissions performance shortfalls should they occur.

Perhaps the main challenge is that the revenue spending approach still may not ensure a particular emissions outcome. If the tax rate is too low, revenue may not be sufficient to buy enough mitigation elsewhere to make up for the emissions reduction shortfall. That is, unless the government is willing to turn to sources of revenue *in addition to* the carbon tax revenue associated with excess emissions. Moreover, it may take some time to incentivize new mitigation activities and ensure they are "additional." Establishing how much of the emissions mitigation purchased through the tax revenues is additional to mitigation that would have happened anyway is difficult. The same issue arises under offset markets in a cap-and-trade programs.[26] Under cap-and-trade offset programs, a verification system is used to help ensure that the purchased offsets are the result of additional mitigation efforts that would not have otherwise occurred.[27] It is worth noting that the other main approaches discussed above also may fail to ensure a

[24] The government can also oversee quality in cap-and-trade offset markets in a regulatory capacity, but it might be a more effective monitor as the direct buyer of the reduction unit.

[25] One possibility is the use of International Transferred Mitigation Outcomes ("ITMO"s) under the Paris Agreement. *See* Framework Convention on Climate Change, Adoption of the Paris Agreement art.6, U.N.Doc. FCCC/CP/2015/10 (Jan. 29, 2016).

[26] *See generally* Brian Joseph McFarland, *Carbon Reduction Projects and the Concept of Additionality*, 11 SUSTAINABLE DEV. L. & POL'Y 15 (2011).

[27] CAL. CODE REGS. tit. 17, § 95977 (2016) (requiring verification from a California Air Resources Board-accredited verification body for offset project data reports).

particular emissions outcome. However, they do ensure additional effort by domestic regulated entities toward that outcome. The revenue approach risks being viewed as (or being in reality) a transfer payment without much additional mitigation effort.

Two additional challenges relate to implementation of such an approach. First, legislators or the administering body must decide how to allocate spending among mitigation options. Offset and mitigation finance programs often target particular sectors outside the policy's coverage, such as forestry, agriculture, and landfills.[28] But, unlike an offset program, a revenue spending mechanism could also include spending *within* sectors covered by the tax. For example, in addition to taxing emissions from coal-fired power plants, the government could spend money to subsidize their retirement. Other programmatic expenditures could be directed to complementary programs in energy efficiency or zero-emitting power sources, such as renewables or nuclear units. Under a tax system, such expenditures decrease emissions. Under a standard cap-and-trade system, these complementary policies serve only to reduce the price needed to meet the fixed emissions target.[29]

Second, the revenue spending for mitigation approach requires new government infrastructure. This could be housed at an existing agency—such as the EPA or U.S. Department of Agriculture—or at a new agency created for this purpose. The government could also fashion a role for states in this program, one similar to federal-state responsibilities under the Clean Air Act.[30]

D. Hybrid Approaches

Two or more of the above-described mechanisms could be combined, perhaps better addressing the range of stakeholder concerns. For example, legislation could pair an adjusting carbon tax rate with a regulatory approach only as a last resort. In this situation, modest refinements could be achieved using the carbon tax rate adjustments. This approach could, on the one hand, limit the conditions wherein a regulatory approach would replace the tax, while on the other hand providing an alternative to higher tax rates if additional mitigation is needed. Although using hybrid approaches may help achieve such balance, they may also be relatively complicated to design, requiring additional consensus.

IV. ACTIVATING AN EMISSIONS CERTAINTY MECHANISM

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[28] *See, e.g.*, *id.* §§ 95970–95 (describing the offset program in California); *About the PAF*, WORLD BANK GROUP, https://perma.cc/EHW3-YVNB; *What is the CDM*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, https://perma.cc/JGB2-4KET; *see also* LYDIA OLANDER ET AL., NICHOLAS INST. FOR ENVTL. POL'Y SOLUTIONS, DESIGNING OFFSETS POLICY FOR THE U.S. 16 (2008), https://perma.cc/QC6W-C72Z (noting examples of offset programs for uncapped or outside-of-regulation mitigation opportunities).

[29] ELEC. POWER RESEARCH INST., EXPLORING THE INTERACTION BETWEEN CALIFORNIA'S GREENHOUSE GAS CAP-AND-TRADE PROGRAM AND "COMPLIMENTARY" GHG EMISSIONS REDUCTION POLICIES 5-1 to 5-12 (2013), https://perma.cc/Z6M9-N2DV.

[30] *See* 42 U.S.C. § 7410 (2012) (providing for the cooperative federalism framework whereby states are able to create and manage their state's implementation of National Ambient Air Quality Standards).

When including any of the above mechanisms in a carbon tax, policy-makers will need to determine the conditions that initiate their use. Up to this point, this Essay generally assumes use of an automatic trigger, whereby actions occur automatically when a defined notion of emission performance exceeds a specified threshold. However, the activation of measures could also be discretionary. Because Congress can always undo its own laws, discretionary adjustment could be viewed as the default approach. The discretionary option also includes variations that would either delegate authority or create nuanced differences in the kind of congressional action required. Both approaches are defined and contrasted below. Given that the discussion thus far has been primarily about automatic adjustments, much of this section will emphasize specific examples of discretionary adjustment as an alternative pathway.

A. Automatic Adjustment

Any of the above mechanisms could have an automatic trigger, meaning that the enabling statute forces the mechanism to initiate under given circumstances. Using examples from the discussion of tax adjustment options above, if the emissions performance of the U.S. exceeds a predetermined emissions range in period one, the tax would automatically increase to a higher level for some specified time period beginning in period two. This approach requires no further political action to adjust the tax rate or implement whatever mechanism has been triggered. Rather, the policy can initiate automatically according to emissions data.

An established carbon tax and automatic adjustment mechanism provide transparency to firms and individuals about what will happen in the future. On the other hand, unforeseen events and new information could make automatic adjustments unnecessarily disruptive. Therefore, a well-defined but discretionary approach may be more appealing under certain circumstances.

B. Discretionary Adjustment

A well-defined discretionary approach would specify a timeline, process, and guidance for Congress or a delegated agency to implement some combination of the mechanisms described above. By defining the parameters that affect a discretionary decision, firms and individuals can be well-informed about the timing and possible size of a policy adjustment even if the exact outcome remains uncertain.

Although Congress always has the option to adjust a tax or institute a regulatory program through new legislation, one discretionary approach would require regular congressional review of the carbon tax to ensure it is achieving its stated objectives. This review could be undertaken in lieu of, or in tandem with, an automatic adjustment. For example, the initial legislation could mandate that if Congress failed to implement an update, the automatic mechanism would proceed subject to the specified performance and response parameters.[31]

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[31] An example of this type of mechanism is the Medicare "doc fix" legislation to delay implementation of the Medicare Sustainable Growth Rate ("SGR"). Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251 (1997). The SGR was meant to limit Medicare spending, but because of the rate of healthcare spending, using

Another alternative is to delegate carbon tax adjustment authority to an agency. This option would allow an Executive Branch agency or independent commission to determine whether and how to implement a particular mechanism on the basis of data on the effects of the program and other extenuating factors. This approach parallels the 2009 Waxman-Markey Bill's recommendation of a carbon market board that would have, among other things, been charged with protecting against price uncertainty in the carbon market.[32] Such a body would provide flexibility for dealing with unanticipated changes in circumstances or with policy indicators beyond those anticipated when the legislation is passed. By delegating carbon tax adjustment authority to an agency, policy could adapt to changes in our understanding of climate change impacts and risks as well as to economic developments and other world events.

One question with this approach, however, is whether Congress would pass legislation providing an agency with the authority to change carbon tax rates or implement other adjustment mechanisms.[33] In part, the question may be whether the balance of emissions and economic concerns are sufficiently resolved to define clear objectives for the delegated authority. Such objectives are clear, for example, for the Federal Reserve Board in managing monetary policy, namely full employment and stable prices. Regarding climate change, it is not clear that all parties would be able to agree on similar objectives. There may be agreement on a particular carbon tax level and emissions goal, but if that level and goal prove incompatible, there may not be agreement about how much the emission goal should be sacrificed or the carbon tax should be raised. If Congress cannot resolve such high-level issues about the burden and benefit of climate change policy, it is unclear why Congress would be willing to delegate that decision to an agency.

V. FUTURE RESEARCH AREAS

Drawing upon these different ideas, a research roadmap emerges that could inform future carbon tax design.

Broadly speaking, a deeper review of relevant precedents would be useful, including precedents for articulating environmental or other purposes in tax legislation; for different adjustment mechanisms in domestic and international fees; and for congressional delegation of authority over tax rates and schedules. Such a review can help identify cases in which similar efforts were made to blend dual objectives and conditional adjustments into legislation to both clarify issues of legal precedent and assess efficacy.

In terms of measuring emissions performance, it would be useful to research the best way to recognize persistent versus transitory emissions deviations in order to

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the SGR would have cut reimbursement to doctors. In other words, without legislation, each year, the SGR would go into effect and cut payments to doctors. Thus, to prevent this outcome, Congress needed to pass a bill delaying the SGR's implementation. *See Congress Repeals Medicare 'Doc Fix Law,' Ending Annual Scramble*, NPR (Apr. 16, 2015), https://perma.cc/8VES-MB6N. Here, the carbon tax, similar to the SGR, would automatically adjust unless Congress acted to prevent or change the adjustment.

[32] H.R. 2454, 111th Cong. § 726 (2009).

[33] For an examination of whether Congress can delegate tax authority to an agency or independent commission, see James R. Hines Jr. & Kyle D. Logue, *Delegating Tax*, 114 MICH. L. REV. 235, 241–48 (2015).

determine the necessity and timing of any adjustments. Furthermore, current sources of emissions data, projections, or both may need upgrades to be suitable for regulatory activities. It will be important to review their timing, comprehensiveness, reliability, and disclosure procedures, among other possible concerns.

Regarding the use of tax adjustments in response to emissions outcomes, one question is how one might define an "optimal" policy based on minimizing emission uncertainty subject to a limit on adjustment costs. Research could also explore other options for determining the adjustment trigger, size, time interval, and frequency.

Looking at regulatory tools as a backup to carbon tax performance, one question is how/whether the triggering event for such a mechanism should differ from those considered for a tax adjustment. Another is whether there are adjustments to the Clean Air Act that might be acceptable to all parties as part of such a mechanism. Finally, we noted earlier that a regulatory mechanism is difficult to tailor in the same way one can fine tune emission outcomes by finely-tuned tax adjustments. Future research might look for ways around this.

Revenue spending mechanisms to procure additional emissions mitigation raise different questions. It will be important to review what we know from experience to date regarding existing offset and mitigation purchase programs. This includes questions of additionality, what kind of opportunities might be pursued, and where such a program would be housed. Then there are unique possibilities raised by a tax: might some revenue be spent to further encourage mitigation among taxed activities? Does there need to be some revenue allocated to such activities, regardless of emission outcomes, in order to create a market in advance of the potential need? Or might other markets (for example, the internationally transferred mitigation outcomes under the Paris Agreement)[34] be tapped?

Finally, further research could examine how timelines, processes, and guidance might make discretionary adjustments more predictable and less disruptive for those most impacted by the carbon tax and potential changes.

CONCLUSION

As long argued in the literature and demonstrated in practice, the use of economic incentive mechanisms—both taxes and cap-and-trade—to achieve emissions outcomes can offer significant economic welfare improvements over less flexible approaches. Both mechanisms can be modified to more flexibly balance competing economic and environmental interests. Such balance may better achieve society's objectives as well as be helpful or necessary to reach agreement for policy enactment.

This Essay describes three possible adjustment mechanisms applicable to carbon taxes that might help steer actions toward achieving quantitative emissions goals: tax adjustments, regulatory tools, and revenue spending. Each has potential advantages and disadvantages, some of which are discussed here. Moreover, variants and combinations of each mechanism exist. In particular, it is possible to imagine an automatic adjustment,

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[34] Framework Convention on Climate Change, Adoption of the Paris Agreement, U.N. DOC. FCCC/CP/2015/L.9/REV.1, art. 6 (Dec. 12, 2015), https://perma.cc/5ZRS-4NP3.

triggered when a particular emissions performance threshold is reached, or to imagine that such an intervention would be at the discretion of Congress or a delegated agency. As a compromise, policy could establish the prospect of periodic intervention with a clear timeline for Congress or a delegated agency to act before default automatic adjustments come into play.

The main purpose of this Essay is to explore options for incorporating emissions goals into a carbon tax. Consequently, it raises more questions than it answers. As discussions of a possible carbon tax evolve over time, research aimed at providing answers to these questions may be important for policy decisions and design.