THE HAMILTON PROJECT

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How to Change U.S. Climate Policy after There Is a Price on Carbon

Roberton C. Williams III

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Abstract

An economy-wide carbon price is a necessary centerpiece of an economically efficient strategy for addressing climate change. Implementing a sufficiently high carbon price will make some other existing policies redundant or inefficient. Removing or modifying those policies as part of carbon-pricing legislation could boost both economic efficiency and political support for the legislation.

This paper addresses the question of which existing policies should be removed or modified after there is a carbon price. It first articulates the economic and political arguments for changing other policies, and general principles for which policies should be changed (and how that varies with the level of the carbon price). It then proposes a carbon tax and accompanying changes to existing policies, including suspension of stationary-source CO_2 regulations and vehicle fuel-economy standards, elimination of the renewable fuel standard and tax expenditures for the fossil fuel industry, and modification of tax expenditures for renewable energy. Other regulations would be retained, such as limits on methane emissions (until the tax base expands to include methane). The proposal is designed to be "reconciliation proof": suspended policies will come back into force if subsequent legislation repeals the carbon tax or lowers its rate.

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Introduction

An economy-wide carbon price is a necessary centerpiece of an economically efficient strategy for addressing climate change.[1] The broad-based incentive created by that price will cost-effectively reduce greenhouse gas (GHG) emissions, forcing market participants to take into account the negative externality from (i.e., the damage caused by) those emissions. But implementing that carbon price is not the only change necessary to get from today's policies to that efficient strategy. We also need policy to address other externalities, most notably the positive externality from technology spillovers. And after we have a sufficiently high carbon price, it will be efficient to remove, suspend, or modify many other existing policies targeting GHG emissions, which will become unnecessary and/or inefficient after the carbon price is in place.

This paper addresses that last piece: Which existing policies could or should be removed, suspended, or modified once a carbon price is in place? It focuses primarily on the economic rationale for such changes and what economic measures (e.g., efficiency and cost-effectiveness) tell us about which policies could be changed. But it also provides some analysis and discussion of the political aspects of the issue.

The economic argument for changing other policies once a carbon price is in place is that because the carbon price provides a broad-based incentive for relatively low-cost emissions reductions, non-price policies targeting emissions covered by the price will generally become redundant, or simultaneously both less effective (e.g., reducing emissions by less) and more costly (e.g., cost per ton of emissions reductions) after the carbon price is in place. In either case, it makes sense to suspend or eliminate the policy, possibly also increasing the carbon price slightly to make up for any lost emissions reductions. The key exception is if the policy in question addresses another market failure in addition to the climate-change externality. Even in that case, though, it probably makes sense to revise that policy to better target that other market failure.

There is also a strong political argument for changing other policies when a carbon price is implemented. Many of those who oppose a price on carbon are even more opposed to carbon regulations. As a result, a policy proposal that swaps a carbon price for regulations (i.e., implementing a carbon price and simultaneously removing, suspending, and/or relaxing regulations) could win the support of a substantially broader political coalition than a carbon price by itself and in the process reduce emissions by more than the current regulatory regime and at a lower cost. But for such a swap to work, it must be designed so that it is relatively resistant to future change, to avoid cases in which one half of the swap (the carbon price) could easily be repealed while leaving the other half (removal of non-price regulations) in place.

All of these arguments are predicated on the carbon price being sufficiently high. Exactly what "sufficiently high" means varies depending on the argument for the swap. From a cost-benefit perspective, the higher the carbon price, the stronger the argument for removing other regulations targeting emissions covered by the price. In the absence of other market failures, a carbon price in the neighborhood of the marginal damage from carbon emissions (i.e., the optimal carbon price) will be sufficient to justify removing other regulations.[2] From a political perspective, a carbon price high enough to reduce emissions by more than the existing regulations should be sufficient; studies suggest that this reduction could be accomplished with a carbon price well below most estimates of marginal damage.[3] The proposal in this paper is intended to accompany a carbon price roughly equal to marginal damage. See the next section of this paper for a discussion of what that means in terms of dollars per ton.

The first section of this paper begins by briefly articulating why we need a carbon price, and then presents a framework for evaluating existing policies, such as which to keep, which to modify, and which to eliminate or suspend in the presence of a carbon price. It then discusses useful metrics for evaluating policies, key concepts, and important principles. The second section presents a proposal for a carbon tax and accompanying changes to existing policies, drawing on the metrics, concepts, and principles discussed in the previous section. The third section addresses possible questions and concerns about the proposal. The paper closes with some conclusions.

The Challenge

WHY WE NEED A CARBON PRICE

As is by now well known, rising concentrations of GHGs in the atmosphere trap heat, warming the planet and causing other related changes in climate. Carbon dioxide (CO_2) accounts for the majority of human-caused GHG emissions. These CO_2 emissions are primarily the result of the combustion of fossil fuels, but process emissions (e.g., from cement manufacturing) are also substantial. Emissions of other GHGs, such as methane and nitrous oxides, play a smaller but still significant role. In order to limit climate change it is necessary to reduce GHG emissions. And although many policies could reduce GHG emissions, a carbon price—or, more precisely, a price on GHG emissions—is the most cost-effective way to reduce emissions.

From an economic standpoint, GHG emissions represent a negative externality. That is, the emissions contribute to a global problem, and emitters do not have sufficient incentive to reduce GHG emissions because they do not bear the cost of those emissions. Imposing a price on emissions corrects that market failure by providing an incentive to reduce emissions. That imposed price leads to cost-effective emissions reductions. Emitters will have an incentive to take any emissions-reducing action that costs less per ton than the carbon price, but to pass up steps that cost more than that.

From a political standpoint that cost-effectiveness is crucial for substantial emissions reductions. At low levels of emissions reductions, policies that cost more per ton might well be politically simpler. But as emissions reduction goals become more ambitious, their cost disadvantage will become increasingly prohibitive. Thus, a carbon price needs to be the centerpiece of any program to substantially reduce GHG emissions.

FRAMEWORK FOR EVALUATING EXISTING CLIMATE POLICIES

As policymakers implement carbon prices, how should they evaluate the host of other existing and proposed policies that also seek to limit carbon emissions? To what extent do those other policies substitute for a carbon price, and how should they be altered if and when a sufficiently high price is implemented? These questions are relevant not just for governments that have already constructed a system for pricing carbon, but also for those policymakers who are contemplating a new carbon price and would like to understand how to change other climate policies and what the costs and benefits of such changes would be.

This section begins by discussing a set of metrics for evaluating policies. It then looks at economic arguments for changing (i.e., eliminating, suspending, or modifying) GHG policies after imposing a carbon price, before going on to briefly discuss political arguments for such changes. Finally, it provides a brief review of estimates of the marginal damage from carbon emissions.

Metrics

This subsection briefly discusses three metrics for evaluating policies targeting GHG emissions: environmental effectiveness, average or marginal cost, and distributional implications.

- *Environmental effectiveness.* The first and most obvious metric to consider is environmental effectiveness, which refers to how much a given policy reduces emissions. Given that this paper focuses on policies targeting GHG emissions, we could assess the effectiveness in reducing GHGs; that is, we could look at the difference in CO_2-equivalent emissions with or without the policy in question, holding other policies constant. But because GHG policies often also reduce emissions of other pollutants, primarily local air pollutants such as sulfur dioxide, nitrous oxides, fine particulates, and so on, we might also want to consider effectiveness in reducing each of those pollutants.

- *Average or marginal cost.* Another obvious metric is cost. Given the wide variation across different policies in how much they reduce emissions, it is much more useful to look at cost per ton than at aggregate cost. That per-unit cost could be average cost (i.e., cost divided by the emissions reduction) or marginal cost (i.e., the cost of reducing emissions by one additional ton). When considering whether to suspend or eliminate a policy, *average cost* is the relevant metric. When adjusting the stringency of a policy, *marginal cost* is the relevant metric. Thus, for example, if we are considering eliminating a small policy and raising the carbon price slightly to offset the effect on emissions, we would want to compare the average cost of emissions reductions for the policy in question in the presence of the carbon price to the marginal cost of emissions reductions for the carbon price.

Table 1, based on results from Gillingham and Stock's (2018) compilation of economic studies shows the average cost per ton of CO_2 reductions from a variety of existing policies. Two points are immediately apparent from the table. First, there is a great deal of disagreement in the literature about the costs of many of these programs, and cost estimates vary widely from study to study. For some policies, the highest estimate from the literature is an order of magnitude larger than the lowest estimate. For others, the estimates differ in sign. Second, costs vary even more widely across policies, with some policies having negative estimated costs and others having costs of hundreds or thousands of dollars per ton. A third point is less obvious, but perhaps more important: Almost all of these policies have costs that are higher than the cost of a carbon price that would yield equivalent reductions in emissions.[4]

- *Distributional implications*. We may care not only about how much a policy reduces emissions and how much it costs, but also about where those emissions reductions occur and who bears the burden of those costs. The distributional implications could matter for economic reasons (i.e.,

TABLE 1.

Average CO_2 Abatement Costs for Selected Policy Approaches

	Estimate ($2018/ ton CO_2e)	
Approach	**Low estimate**	**High estimate**
Agriculture		
Corn starch ethanol	-18	318
Reforestation	1	10
Agricultural emissions policies	51	67
Soil management	58	58
Livestock management policies	73	73
Clean energy		
Renewable portfolio standards	0	195
Wind energy subsidies	2	266
Clean Power Plan	11	11
National Clean Energy Standard	52	113
Renewable fuel subsidies	102	102
Low carbon fuel standard	102	2,971
Solar photovoltaics subsidies	143	2,151
Biodiesel	154	430
Dedicated battery electric vehicle subsidy	359	656
Energy efficiency		
Behavioral energy efficiency	-195	-195
CAFE standards	-110	318
Cash for Clunkers	277	430
Weatherization assistance program	359	359
Fossil fuel		
Gasoline tax	18	48
Methane flaring regulation	20	20
Reducing federal coal leasing	34	70

Source: Gillingham and Stock 2018; author's calculations.

Note: Estimates are measured in average cost per ton. The values were updated to 2018 dollars using the CPI-U-RS. This table applies a different categorization of selected policy approaches than was used in Gillingham and Stock (2018).

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concentrating the costs on economically vulnerable groups is undesirable) or political reasons (i.e., concentrating costs on politically powerful groups would make it difficult to enact the policy or could lead to it being repealed). Where estimates of the distribution of costs and benefits of a given policy across different groups are available, this paper will try to report them. But in many cases solid estimates do not exist. We should not interpret the lack of estimates as indicating that distributional effects are unimportant or that the policy does not have significant distributional effects. The distribution of costs and benefits is generally more difficult to estimate than the other metrics discussed here, and thus solid estimates are often unavailable.

A carbon price has another advantage. Any kind of regulatory policy that increases costs also has distributional implications and often impacts the poor (Levinson 2019), but a carbon price will generate revenues that can be used for redistribution to cushion any regressive impacts. Indeed, if revenues from a carbon price are returned via equal per capita "dividend" payments (as a number of recent carbon-tax proposals do, including those by the Citizen's Climate Lobby [n.d.] and the Baker et al. [2019]), lower-income groups are substantially better off on net, even before considering any environmental benefits (i.e., the dividend payments substantially exceed the burden of the tax for lower-income groups; see, for example, Williams et al. 2015 or Goulder et al. 2019).

Economic Arguments for Changing Greenhouse Gas Policies After Imposing a Price on Carbon

The economic argument for changing other policies once a carbon price is in place can be expressed in several different ways. The first way is to think in terms of cost-effectiveness. The broad incentive from an economy-wide carbon price will induce a wide range of actions that reduce emissions covered by the tax. For instance, a carbon price of $X/ton of CO_2 will cause firms and consumers to take any emissions-reducing action that has a marginal cost of $X/ton or less.[5] This price (and the incentive it creates) could make an existing regulation redundant. If every emissions-reducing action required by that regulation has a marginal cost of $X/ton or less, then once the carbon price is in effect, that regulation will not have any effect. In fact, it will be nonbinding, and everything it requires will be something that firms or consumers would choose to do in response to the carbon price, even in the absence of the regulation. There would still be enforcement and compliance costs from such a regulation, and it would not reduce emissions at all, so eliminating or suspending it would make sense.

In other cases, an existing regulation will not become entirely redundant in the presence of a carbon price, but will reduce emissions by less, and at a substantially higher cost per ton. This will occur for a regulation that requires some actions that have a lower marginal cost than the carbon price and some actions that have a higher marginal cost. Once the carbon price is in place, the lower-cost actions become redundant, but higher-cost actions do not, so the regulation still accomplishes some emissions reductions, but less than without a carbon price, and with a much higher average cost per ton. Such a regulation could pass a cost-benefit test even in the presence of a carbon price if the carbon price is set below the marginal damage per ton of emissions (i.e., the marginal value of the negative externality, or the social cost of carbon [SCC]). But it would still be more cost-effective to eliminate the regulation and raise the carbon price enough to achieve the same total emissions reduction. The marginal cost per ton of reducing emissions (i.e., the level of the carbon price) will be lower than the cost per ton for the regulation.

Box 1 illustrates three key points. First, a regulation—under the assumptions made in box 1—has less (potentially much less) of an effect on emissions after carbon has been priced than it does without the carbon price, because the price induces many of the same emissions-reducing actions as the regulation. Second, because those duplicated actions are the lowest-cost actions induced by the regulation, the average cost per ton of the additional reductions achieved by the regulation after the carbon price is in place (the average height of the purple area in box figure 1) is much higher than the average cost per ton for the regulation taken by itself (the average height of the blue and purple areas taken together). Third, the average cost per ton for the regulation after the carbon price is in place will necessarily be more than the carbon price (because all of the actions with a cost less than the carbon price are duplicative).[6] Keeping the regulation in place could still pass a cost-benefit test if the environmental benefits are high enough (if the damage per ton is more than the average cost: i.e., more than the average height of the purple area in box figure 1). But that can only happen if the carbon price is set too low. Rather than keeping the regulation in place, it would be more cost-effective to raise the carbon price.

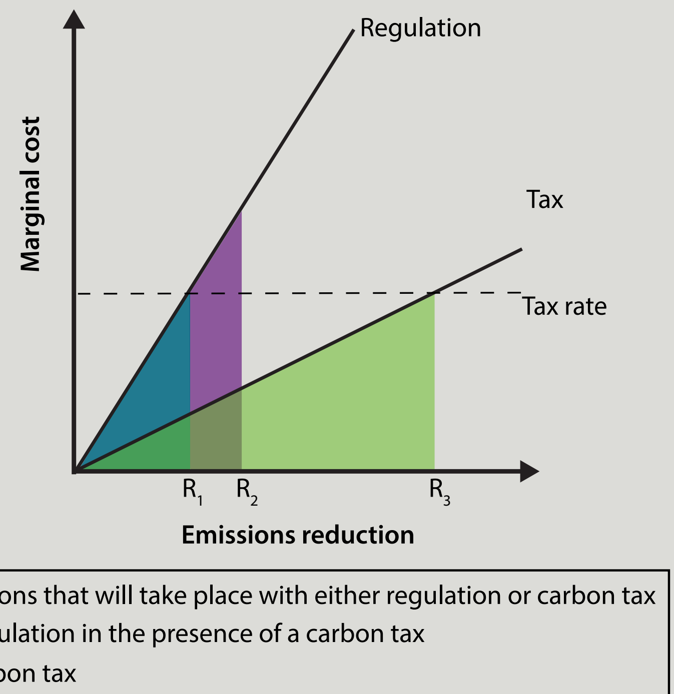
Another way to understand this point is to think in terms of correcting a negative externality. In the absence of any price, GHG emissions are inefficiently high because emissions have a social cost (i.e., harm from climate change), but emitters do not pay that cost. A carbon price set equal to marginal damage internalizes that externality; with the carbon price in place, emitters face a cost equal to the social cost of their emissions. This cost to emitters gives them an incentive to choose the economically efficient level of emissions, equating the marginal cost of reducing emissions with the marginal damage caused by those emissions. Thus, there is no net benefit to reducing emissions further.[7]

BOX 1

A Conceptual Framework for Assessing a Carbon Price and Overlapping Regulations

BOX FIGURE 1.

The Costs of a Regulation in the Presence of a Carbon Tax



Box figure 1 shows the marginal abatement cost (MAC) curves for a regulation and for the carbon tax. Each MAC curve shows the marginal cost (the cost of reducing emissions by one additional ton) as a function of how much the policy has already reduced emissions. Note that because the carbon tax is more comprehensive (providing incentives for a wider range of potential emissions-reducing actions) it can reduce emissions by more at a given marginal cost; therefore, the MAC curve for the carbon tax is flatter than for the regulation.

By itself, the emissions regulation lowers emissions by the amount R_2, and has a cost equal to the area under the MAC curve from the left side of the graph to R_2 (i.e., the shaded blue and purple areas in box figure 1). A carbon tax—again, taken by itself—set at the level indicated by the dashed line on the figure would lower emissions by the amount R_3, and has a cost equal to the area under the MAC curve from the left side of the figure to R_3 (i.e., the shaded green area in box figure 1).

Some emissions-reducing actions are induced by either policy: all of the actions covered by the regulation that have a marginal cost less than the carbon tax rate (under the assumption that there are no other market failures and that the tax covers all of the emissions targeted by the regulation). Those duplicated actions (actions induced by either policy) reduce emissions by R_1 and have a cost equal to the shaded blue area on the figure. Therefore, having both policies in place at once achieves reductions of $R_2 + R_3 - R_1$, and has a cost equal to the green and purple areas on the graph (for both emissions reductions and costs, this is the sum of the effects of the two policies taken separately, minus the effect of the duplicated actions).

One can then see the effect of removing the regulation after the carbon tax is in place: emissions go up by $R_2 - R_1$, and costs go down by the purple area on the figure (the difference between the effect of both policies together and the effect of the carbon tax alone).

Both versions of the economic argument rest on the assumption that there are no other market failures affected by the policy in question. If the policy also addresses another uncorrected market failure (e.g., if the policy reduces local air pollution and local air pollution emissions are not already optimally priced), then it could be economically efficient to keep it after implementing a carbon price. We might point out that in the real world, unlike in simple economic models, there are a multitude of other uncorrected market failures. But note that the existence of another market failure is a necessary but not sufficient condition. To justify keeping another GHG policy in place after implementing a carbon price requires three conditions to hold: (1) there is at least one other uncorrected market failure, (2) the policy in question ameliorates that other market failure (e.g., it also reduces emissions of some unpriced local air pollutant), and (3) the gain from addressing that other market failure is large enough to outweigh the policy's cost disadvantage relative to a carbon price in reducing carbon emissions.

Moreover, even if it is efficient to keep the policy in place, we might still want to modify it to better target that other market failure. Some existing policies represent a compromise between reducing GHG emissions and addressing another market failure. Once the carbon price corrects the GHG externality, that compromise is no longer necessary, and the policy can focus more directly on that other market failure. For example, the market for new low-carbon technologies has two major externalities: the negative externality from GHG emissions and a positive externality from new technology development (the firm that develops or refines a technology cannot capture all the benefits of that technological advance, because other firms will copy it). Existing subsidies for deployment of low-carbon technologies represent a compromise, because they try to address both of those externalities with a single policy. But in the presence of a carbon price (which would address the GHG emissions externality), the subsidies could be revised to better address the spillover externality by shifting them to earlier stages (development and/or deployment) where the spillover externalities are larger than they are at the deployment stage.

A related point is that these economic arguments assume that the policy in question is targeting GHG emissions covered by the carbon price. There is no clear economic argument for suspending or eliminating policies that address emissions not covered by the price. Spillover effects from the carbon price could imply changes in such policies, though those changes would not necessarily be relaxing regulations and could just as easily be tightening them. For example, if the carbon price does not cover methane emissions, and if imposing a carbon price increases natural gas use and accompanying methane leakage, then it might be efficient to tighten regulations addressing methane after the carbon price has been imposed.

Finally, the discussion thus far assumes a carbon price in the neighborhood of the marginal damage from CO_2 emissions. (See below for a brief review of the estimates of the marginal damage from carbon emissions.) Suppose the carbon price is substantially lower or higher than that. How would that change the analysis? In general, the higher the carbon price, the stronger the argument for eliminating, suspending, or modifying other policies addressing emissions covered by the price. A very low carbon price would not noticeably change the economics of other policies. If those policies pass a cost-benefit test now, they would very likely still pass a cost-benefit test after imposing a very low carbon price. In contrast, a carbon price well above marginal damage would push emissions below the efficient level; in the presence of such a high price, there would actually be a net benefit to increasing carbon emissions.[8] In that case, it could be worthwhile to suspend or eliminate other carbon regulations even if they effectively address other market failures, although it could be better still to modify them to exclusively target those other market failures.

Political Arguments for Changing Greenhouse Gas Policies After Imposing a Price on Carbon

Although this paper focuses primarily on the economics of how and why it makes sense to change other policies after we have a price on carbon, there is also a strong political argument for changing those other policies. Many of those who oppose a price on carbon are even more opposed to environmental regulations. This preference could stem from ideological opposition to government intervention in the economy since regulations targeting carbon are a more heavy-handed intervention than a carbon price. Or it could stem from concerns about the cost of the policy, since regulations will generally be less cost-effective than a price. Either rationale might lead someone to oppose a carbon price by itself, for instance if their ideal is no carbon policy at all, but to prefer a carbon price over carbon regulations. This creates the potential for substantially broadening the political coalition for carbon pricing by making that pricing part of a swap: Impose carbon pricing and eliminate or suspend some other existing regulations.

One major potential concern about such a proposal is how durable it would be over time with shifts in political control of Congress and the presidency and, in particular, whether both pieces of the swap would be equally durable. The potential for a filibuster in the Senate implies that any change in regulations will need 60 votes there. But changing the rate of a carbon tax could be accomplished via reconciliation, and thus would need only a simple majority. We might worry that if we enact a swap that imposes a carbon price and repeals regulations, a future Congress could easily lower or even eliminate the price, resulting in an outcome with no carbon regulations and a low or nonexistent carbon price.

A promising way to address this concern would be to suspend the regulations rather than to repeal them entirely, and to make that suspension contingent on the carbon price remaining in place at a level on or above the price path established in the original legislation enacting the swap.[9] This would make the swap reconciliation proof: If a future Congress uses reconciliation to reduce or eliminate the carbon price, the regulations suspended as part of the swap would come back into effect. Of course, with a large enough majority to overcome a filibuster, future legislation could eliminate that provision—but a majority that large could also simply eliminate today's regulations, so the swap would be no more vulnerable than the existing regulations. Including such a reconciliation-proofing provision, or something with the same effect, seems essential for building a broad political coalition. It is difficult to imagine environmental groups, for example, supporting a swap that does not include such a provision.

Brief Review of Estimates of the Marginal Damage from Carbon Emissions

Estimating the marginal damage from carbon emissions (i.e., the SCC) is hugely challenging. Climate change will have a wide range of effects, many harmful but some likely beneficial. Estimating the future damage from a given degree of climate change requires predicting those effects and valuing each of them. This in turn requires forecasts of what the future will look like: How much will the world economy, population, and emissions grow? And there is the question of what degree of climate change a given emissions path (and resulting path of atmospheric GHG concentrations) implies. Finally, there is the vital question of how to discount those future damages to put a value on emissions today. Each one of those steps is challenging, and each one entails substantial uncertainty.

The most widely used estimates of the SCC come from the U.S. Interagency Working Group on the Social Cost of Carbon (U.S. IAWG), which produced a first set of SCC estimates during 2009–10 and subsequently updated those estimates, most recently in 2016. That update provided SCC estimates for a range of different discount rates (from 2.5 percent up to 5 percent), as well as estimates of the uncertainty in those estimates. For emissions in the year 2020, those SCC estimates (updated to 2019 dollars) were roughly $15/ton for a 5 percent discount rate, $51/ton for a 3 percent discount rate, and $76/ton for a 2.5 percent discount rate (U.S. IAWG 2016). The estimates then rise over time, with a higher discount rate implying a faster rate of increase (roughly 2.5 percent–3.5 percent/year for a 5 percent discount rate versus 1.3 percent–1.7 percent/year for a 2.5 percent discount rate).

These estimates all assume a constant discount rate. But there is a strong argument that when discounting over long time horizons, one should use a discount rate that declines over time (Weitzman 1998). Moreover, given the huge uncertainty about the effects of climate change, one can argue for taking risk aversion into account, but the IAWG estimates simply use the expected value. For these and other reasons, one should probably lean toward the higher end of the range of estimates, though it is hard to know by how much.

The Proposal

This section lays out a proposal for a carbon price and accompanying changes to existing policies targeting GHG emissions. For each element of the proposal, this section presents the proposed policy change or the decision to retain existing policy, outlines existing policy, and presents an analysis and discussion of the evidence for and against changing existing policy when a carbon price is implemented, drawing on the concepts from the previous section.

The proposal is based primarily on economic analysis rather than on political considerations. Political feasibility is obviously important here. A politically feasible policy that is even a small improvement over the status quo will do more good than a policy that would be far superior if implemented but is politically infeasible. But it is important for the policy discussion to be grounded in an accurate understanding of the economic theory and evidence.

Where possible, the analysis includes quantitative estimates of the effects of the policy in question, taken from the existing literature. However, the existing literature generally focuses on the effects of these policies without any carbon price in place. That focus is natural: The United States does not have a national carbon price, and even in the handful of states that have state- or regional-level carbon prices, those prices are relatively low. But that focus means that those results are not directly relevant for the question this paper addresses, which is, how should other policies change after there is a price on carbon? To answer that question the key is not what effects those policies currently have, but instead what effects they would have in the presence of a substantial carbon price. The policies' effects in that case, as discussed in the previous section, will be quite different from their effects without a carbon price.[10]

This suggests a need for further research, especially simulation modeling of the interactions between existing policies and a carbon price, which could help in evaluating both what effect those policies would have in the presence of a carbon price and what effect a carbon price would have if layered on top of those existing policies.

In part because of that gap in the existing research, I have substantially less confidence in the specific recommendations for which other GHG policies to retain and which to eliminate or suspend than I have in the principles underlying those recommendations. Due to the limited quantitative evidence available, reasonable people could easily disagree with some of these specific policy recommendations even if they agree on the underlying principles.

A CARBON PRICE

Proposed Policy

I propose an economy-wide carbon tax, initially covering all energy-related CO_2 emissions and major sources of process emissions (e.g., cement, etc.) and subsequently expanding to cover other GHGs, starting with methane. Energy-related CO_2 emissions would be taxed upstream at natural choke points in the supply chain, not at the point of combustion. Process emissions would be taxed at the emitting facility. Approaches for taxing non-CO_2 GHGs will need to be developed, reflecting available monitoring technology (and will be updated as monitoring technology advances).

The carbon tax rate would roughly follow the SCC (IAWG 2016), starting at roughly $75/ton and rising at 2 percent/year plus inflation. The tax will include an automatic tax adjustment mechanism.[11] The target pathway for emissions will be established by modeling of the expected emissions reductions for the carbon price path outlined above. If emissions are more than 10 percent above that pathway, the tax rate will increase by 4 percent/year above inflation, instead of 2 percent/year, in the subsequent year and every year thereafter until emissions are less than 5 percent above that pathway. If emissions are below that pathway by more than 10 percent, the tax rate will increase by 1 percent/year above inflation.

Existing Policy

The United States does not currently have any national-level price on carbon.

Analysis and Discussion

In theory, the broader the range of GHGs covered by the price, the more cost-effective it will be, since broad coverage equalizes the price across all covered GHGs. In practice, monitoring emissions of non-CO_2 GHGs is more difficult, and thus enforcing the tax on these emissions will be more challenging. Correspondingly, the tax will initially cover only CO_2 emissions, but will expand later to cover other GHGs.

However, as a first step, a tax that only covers carbon emissions will still cover a majority of U.S. GHG emissions. As shown in figure 1, CO_2 represents more than 80 percent of U.S. GHG emissions. Methane emissions make up an additional 10 percent of total GHG emissions, with nitrous oxide and fluorinated gasses making up the remainder.

Setting the tax rate equal to marginal damage yields the economically efficient level of emissions reductions. Thus, the tax rate will roughly follow the estimated marginal damage from carbon emissions (i.e., the SCC), but existing estimates of the SCC have notable limitations. Some types of climate change damage are too difficult to evaluate, and thus are omitted from the estimates. And the SCC does not take risk into account. These factors argue for a tax rate somewhat above the estimated SCC.[12] But it is difficult to assess just how much higher. The central discount rate of 3 percent from U.S. IAWG (2016) implies a 2020 SCC (in 2019 dollars) of roughly $50/ton. But given the various arguments for a higher value, and given the argument for using a declining discount rate over long time horizons, it seems more reasonable to take the low discount rate (2.5 percent) value, implying a 2020 SCC of roughly $75/ton.

The automatic tax adjustment mechanism turns the tax into a hybrid instrument, with more price certainty than a pure quantity instrument (e.g., a cap-and-trade system) and more emissions certainty than a pure price instrument (e.g., a tax without any adjustments). This has both economic and political advantages.[13]

RECONCILIATION PROOFING

I propose that any regulations that are suspended will remain suspended only as long as the carbon price remains on or above the path described above. If future legislation reduces the carbon price to a level below that path, the suspended regulations come back into effect. As discussed above, this makes the package deal—the removal of regulations and the introduction of a carbon price—credible and durable, by reducing the likelihood that a future Congress would scale back the carbon price without reinstating the regulations.

STATIONARY SOURCE CO_2 REGULATIONS UNDER THE CLEAN AIR ACT

Proposed Policy

I propose suspension of stationary source CO_2 regulations under the Clean Air Act.

Existing Policy

Two parts of Section 111 of the Clean Air Act provide the basis for regulation of emissions of CO_2 from stationary sources. New Source Performance Standards prescribe emissions control technologies that new, or substantially modified, pollution sources must adopt. The Prevention of Significant Deterioration program requires some existing

FIGURE 1.

U.S. Greenhouse Gas Emissions by Type of Pollutant

Source: EPA n.d.

Note: Total emissions in 2017 were 6,457 million metric tons of CO_2 equivalent. Percentages may not add up to 100 percent due to rounding.

emitters to implement a best available control technology. The Obama administration's Clean Power Plan used these provisions. That plan has since been replaced with the Trump administration's Affordable Clean Energy rule, which relies on the same provisions but is substantially less stringent.

Analysis and Discussion

The 2011 Environmental Protection Agency regulatory impact analysis for the Clean Power Plan estimated the cost at \$11/ton of CO_2. That estimate is quite low compared to most regulations addressing CO_2, and reflects the relatively efficient design of the Clean Power Plan. But that cost is still higher than the cost of a carbon price that would achieve similar emissions reductions. For example, Knittel (2019) finds that a \$7/ton carbon price in 2020 could achieve the same level of emissions reductions as the Clean Power Plan, Corporate Average Fuel Economy (CAFE) standards, and the Renewable Fuel Standards program put together. The Affordable Clean Energy rule has significantly lower costs, but also smaller emissions reductions.

The case for suspending these regulations when implementing a substantial carbon price is fairly strong. These regulations specifically target CO_2, which would certainly be covered by a carbon price. The one potential argument for keeping them would be that they lead to some reductions in local air pollutants, addressing another market failure. But it seems unlikely that those local air pollution reductions will be large enough to justify retaining these regulations. And even if the reductions are large enough, it would be better still to eliminate these regulations and add or tighten policies directly addressing those local air pollutants.

TAX EXPENDITURES TO THE FOSSIL FUEL INDUSTRY

Proposed Policy

I propose elimination of significant tax expenditures for the fossil fuel industry, such as percentage depletion and expensing of intangible drilling costs for oil and gas wells.

Existing Policy

The percentage depletion allowance permits independent domestic oil and gas producers to take a tax deduction for depletion that is a percentage of gross receipts, which typically provides a more generous deduction than a depletion deduction based on costs. Expensing of intangible drilling costs for oil and gas wells allows those costs to be deducted immediately, rather than being amortized and deducted over time.

Analysis and Discussion

The Joint Committee on Taxation estimates the revenue loss from the excess of percentage over cost depletion for oil and gas wells at \$2.3 billion for 2018–22, an average of slightly under \$0.5 billion/year, and expensing of drilling costs at \$2.9 billion over the same period (Joint Committee on Taxation 2018). These policies likely increase emissions. Metcalf (2018) estimates that eliminating these two provisions, and making oil and gas ineligible for the domestic manufacturing deduction, would reduce domestic oil and gas production by 4–5 percent over the long run. Other studies have found smaller effects. For example, a 2013 National Academy of Sciences study found that eliminating percentage depletion would have virtually no effect on oil production and no net effect on GHG emissions.

The economic argument for eliminating these tax expenditures is strong. There is some question about whether they affect emissions significantly, but if they do the effect is very likely an increase. And they are not addressing a different market failure.

However, there may be a political argument for keeping these in place: They benefit the fossil fuel industry, which has opposed carbon pricing. This opposition is true at least historically, though more recently the major integrated oil and gas companies have become increasingly supportive of carbon pricing. Eliminating these tax expenditures might make it harder to build a political coalition for carbon pricing.

TAX EXPENDITURES FOR RENEWABLE ENERGY

Proposed Policy

I propose allowing the Investment Tax Credit and Production Tax Credit to phase down and expire as scheduled over the next several years, to suspend the portions of the Investment Tax Credit that are not scheduled to expire, and to replace these tax credits with smaller tax credits that target an earlier stage (e.g., development or demonstration, not deployment).

Existing Policy

Generators of electricity from renewable sources benefit from the Investment Tax Credit or Production Tax Credit. The Investment Tax Credit provides a credit based on the amount invested, whereas the Production Tax Credit provides a credit based on electricity produced over the first 10 years of operation. The Production Tax Credit is currently scheduled to expire at the end of 2019 (with projects that commence construction by the end of the year being eligible). The Investment Tax Credit is scheduled to phase down over the next few years, with the credit for some categories of projects set to expire completely, while a reduced credit (a 10 percent rate) will remain for some other categories.

Analysis and Discussion

The argument for keeping these tax credits in place is that, in addition to reducing carbon emissions, they address an additional market failure: the positive externality from knowledge spillovers in renewable energy technology. But these subsidies are almost entirely targeted at deployment, where the spillovers are weakest. In the presence of a carbon tax it would make sense to modify these policies to target an earlier stage, such as development or demonstration instead of deployment. It is important to note that one important justification for the Investment Tax Credit and Production Tax Credit was that the absence of a price on carbon put these carbon-free technologies at an artificial cost disadvantage relative to electricity generation from fossil fuels. In the presence of a carbon price of at least $75 per ton, there would be a strong incentive to invest in these technologies with or without a subsidy.

REGULATIONS ADDRESSING METHANE AND OTHER NON-CO_2 GREENHOUSE GASES

Proposed Policy

I propose retaining existing regulations on non-CO_2 GHG emissions (and reinstating the methane leak regulations that were recently rolled back), unless and until the carbon price expands to include these emissions, at which point regulations addressing the newly covered emissions would be modified or suspended.

Existing Policy

The Environmental Protection Agency imposed regulations in 2016 to limit methane leaks from natural gas extraction operations. The Trump administration recently rolled back those regulations, though it argued that other regulations, such as those limiting emissions of volatile organic compounds, still limit methane emissions.

Analysis and Discussion

The key question here is whether the GHG in question is covered by the carbon price. If it is, then there is a solid case for suspending the regulation. But non-CO_2 GHGs are likely not to be covered, at least initially, and regulations addressing emissions not covered by the price should remain in place. By the same logic, the recently rolled back methane leak regulations should be reinstated. It is true that other regulations (such as those limiting emissions of volatile organic compounds) still limit methane emissions even in the absence of specific regulations targeting methane. But that does not imply methane regulations are unnecessary. Those other regulations address local air pollution concerns, but not methane's GHG effects. This is a case with multiple market failures (in this case, multiple types of pollution), which in general is best addressed with multiple policies (separately targeting local air pollutants and GHGs).

If and when the GHG price coverage broadens to include a particular emissions source, regulations targeting that source could be suspended. But given potential difficulties in measuring and monitoring emissions of non-CO_2 GHGs, it might be better to modify the regulations to target gaps in measurement and monitoring.

FUEL ECONOMY STANDARDS (CORPORATE AVERAGE FUEL ECONOMY)

Proposed Policy

I propose suspension of the Corporate Average Fuel Economy standards for light-, medium-, and heavy-duty vehicles.

Existing Policy

The CAFE standards require car and truck manufacturers to have new vehicle average fuel economy above a required level (expressed in miles per gallon [mpg]). The standard varies based on vehicle footprint, with looser standards (lower mpg) for larger vehicles. The standards had been scheduled to tighten over time, hitting an average of 54.5 mpg (across cars and light trucks) by 2025. Analogous standards apply for medium- and heavy-duty vehicles. The Trump administration recently announced that it is freezing the car and light-truck standards at 2020 levels through 2026.

Analysis and Discussion

This is another policy that, we can argue, addresses multiple market failures. In addition to reducing carbon emissions, it also potentially corrects a market failure in the vehicle market: consumer undervaluation of fuel economy due to myopia (i.e., undervaluation of future savings) or similar behavioral explanations and/or manufacturer underprovision of fuel economy due to imperfect competition.

Estimates of the cost effectiveness of these standards vary widely. For example, Gillingham and Stock (2018) cite a range of cost estimates from –$107/ton to $310/ton of carbon reductions achieved by CAFE standards. That huge range of estimates results largely from differences in assumptions across studies about consumer undervaluation of fuel economy. Some studies implicitly assume that if customers are not choosing the vehicle with the lowest combined purchase price and fuel cost, that is entirely because they are undervaluing fuel economy, and thus forcing consumers to buy more fuel-efficient vehicles will benefit those consumers. Such studies typically find fuel economy standards have negative costs. Other studies assume that consumers correctly value fuel economy, so if they are not choosing the lowest-cost option, it must be because they value other characteristics of the less-fuel-efficient vehicles (e.g., they enjoy driving higher-horsepower cars, and thus are willing to pay more to buy them and more for gas to drive them). In that case, forcing consumers to buy more fuel-efficient vehicles makes them worse off. Such studies typically find very fuel economy standards have very high costs per ton of carbon reductions.[14] So the key question is how significant consumer undervaluation of fuel economy is.

Recent empirical evidence suggests that consumer undervaluation of fuel economy is relatively modest, and is not enough to provide much justification for fuel economy standards; see the discussion in Anderson and Sallee (2016). Moreover, if undervaluation is heterogeneous, with some consumers substantially undervaluing fuel economy and others not undervaluing it at all, or even overvaluing it, then CAFE standards are poorly targeted. They raise average fuel economy, but may do so by encouraging consumers who correctly value (or overvalue) fuel economy to buy vehicles that are more fuel efficient, while having no effect on vehicles purchased by consumers who substantially undervalue fuel economy.

Evidence on manufacturer underprovision of fuel economy due to imperfect competition is much scarcer. This is a theoretical possibility, but there is very little solid empirical evidence for or against it.

OTHER ENERGY EFFICIENCY STANDARDS

Proposed Policy

I propose retention of other energy efficiency standards, such as appliance standards.

Existing Policy

The U.S. Department of Energy imposes efficiency standards on a wide range of products, including televisions, water heaters, laundry washers and dryers, air conditioners, and refrigerators.

Analysis and Discussion

The issues here are generally similar to those raised by vehicle fuel-economy standards. As in that case, the policy potentially addresses an additional market failure. But here the arguments seem a bit stronger. In addition to potential myopia, there is also much more of a worry about cases in which the purchaser of an appliance and the person who pays the utility bill are different (e.g., landlord and tenant).

And appliance standards are more often minimum efficiency standards, rather than requirements on average efficiency. Minimum efficiency standards work better in the presence of heterogeneous undervaluation, when they boost energy-efficiency for those who substantially undervalue energy efficiency, while having little effect on those who correctly value it. On the other hand, when there are rational reasons for significant variations in energy efficiency (e.g., someone who will only use an appliance infrequently buying a less efficient but also less expensive model, while a frequent user would spend more for a more efficient model), minimum efficiency standards can create serious inefficiencies. Thus, a key question is how important these differences in undervaluation are relative to rational reasons for variations in energy efficiency choices. More research on the degree of undervaluation and on sources of variation in energy efficiency choices would be valuable. In the absence of clear guidance from the literature that these policies should be repealed, I am proposing to leave them in place.

MOTOR FUEL TAXES

Proposed Policy

I propose retention of existing motor fuel taxes.

Existing Policy

The federal government currently taxes gasoline at a rate of 18.4 cents/gallon and diesel fuel at 24.4 cents/gallon. State tax rates per gallon average roughly 36 cents/gallon for gasoline and 38 cents/gallon for diesel.[15]

Analysis and Discussion

Motor fuel taxes address a wide range of negative externalities. In addition to carbon emissions, they also affect local air pollution, traffic congestion, traffic accidents, and so on. And the current level of motor fuel taxes is well below what would be justified by those other externalities alone. Parry and Small's (2005) estimates for those other externalities (all except GHG emissions) would imply an optimal tax of 95 cents/gallon in year 2000 dollars (roughly $1.42/gallon in 2019 dollars), substantially higher than the combination of federal and state taxes even in the highest-tax state.[16] Thus, even in the presence of a carbon tax, current motor fuel tax rates are below optimal levels, so there is no case for eliminating or reducing these taxes. However, motor fuel taxes are relatively poorly targeted at those other externalities. For example, congestion pricing targets traffic congestion far better than motor fuel taxes. As a result it would make sense to shift away from motor fuel taxes toward other, better-targeted policies, although it might be politically unrealistic to include that kind of shift in a carbon-pricing plan.

RENEWABLE FUEL STANDARD

Proposed Policy

I propose elimination of the renewable fuel standard.

Existing Policy

The federal renewable fuel standard requires minimum volumes of specified renewable fuels (ethanol and biodiesel) to be blended into transportation fuels. It includes separate requirements for conventional renewable fuel (primarily corn-based ethanol) and advanced fuels (primarily ethanol produced from cellulose).

Analysis and Discussion

To the extent that the renewable fuel standard is intended to reduce carbon emissions from vehicles, there is a strong economic case for suspending or eliminating it. Gillingham and Stock (2018, 54) argue, "Blending corn ethanol into gasoline up to a 10 percent ratio provides essentially costless emissions reductions . . . because ethanol is a less-expensive octane booster than alternatives derived from petroleum." But if that is true, then refiners would continue to blend ethanol into gasoline at that ratio even in the absence of regulation. And the complexity of the system (including the tracking and pricing of credits) suggests there could be efficiency gains from removing the regulation. Moreover, to the extent that the ethanol mandate exceeds that 10 percent ratio (known as the "blend wall"), it becomes substantially more costly, because many conventional engines will suffer damage if they use fuel with more than 10 percent ethanol. And the advanced fuel requirement is substantially more costly, because the costs of producing cellulosic ethanol remain high.

This is another case where there is a potential political argument for keeping the policy in place. It is essentially a farm-support program, and so repealing or suspending it could make it harder to get corn-state legislators to support carbon pricing.

STATE AND REGIONAL POLICIES

Proposed Policy

I propose that there be no federal preemption of state and regional policies, such as carbon pricing programs, renewable portfolio standards, low carbon fuel standards, etc. However, states and regions may well choose to respond to the federal carbon price by loosening or repealing these policies.

Existing Policy

A range of state and regional policies target carbon emissions. For example, California has a cap-and-trade program covering carbon emissions within the state. The state also has a low-carbon fuel standard that limits the average life-cycle carbon emissions from transportation fuels within the state. The Regional Greenhouse Gas Initiative (RGGI) cap-and-trade program covers carbon emissions from electric power generation in a group of Northeastern states. Many states have renewable portfolio standards that mandate a minimum percentage of electric power generation must come from renewable sources.

Analysis and Discussion

Estimates of the costs of these programs vary widely. Allowance prices under RGGI and the California cap-and-trade program have been relatively low, implying a low cost per ton. Gillingham and Stock (2018) cite estimates for the cost of renewable portfolio standards that range from zero to $190/ton, a very wide range. And estimates for the low-carbon fuel standard suggest that it is very costly (e.g., Holland, Hughes, and Knittel 2009 estimate costs [updated to 2017 dollars] of $385/ton to $2,852/ton).

There is a strong economic efficiency argument for suspending or eliminating most or all of these programs in the presence of a federal price on carbon. They target emissions that would be covered by the federal price, and any substantive federal price would substantially exceed existing state and regional carbon prices. These arguments are particularly strong for high-cost policies such as the low-carbon fuel standard.

However, the argument for federal legislation to preempt such programs is much weaker. States on their own would have a substantial incentive to loosen or eliminate these programs in the presence of a federal carbon price; to the extent that they choose to keep them in place, that suggests that they see the programs as addressing other market failures such as local air pollution (Williams 2012), in which case it could be efficient to leave them in place.[17]

Questions and Concerns

1. What about risk? How can we be sure that a carbon price will reduce emissions by enough to justify suspending regulations?

Modeling suggests that even a modest carbon price would reduce emissions by more than all major regulations targeting CO_2 combined. Knittel (2019) finds that a $7/ton carbon price could reduce GHG emissions in 2020 by as much as the CAFE standards on light-, medium-, and heavy-duty vehicles, the Clean Power Plan, and the Renewable Fuel Standard put together. Because those regulations become more stringent over time, the carbon price necessary to match them rises, but the study finds that, even in 2030, a $36/ton price would be sufficient. This proposal calls for a price substantially above that; by 2030 the price in this proposal would be roughly $90/ton.

Moreover, that modeling is probably too conservative. Historical evidence suggests that emissions are more responsive to emissions pricing programs than estimates had suggested prior to the implementation of those programs. Under cap-and-trade programs, this finding implies lower-than-expected permit prices: The sulfur dioxide trading program, the European Union carbon emissions trading system, and the California carbon cap-and-trade system have all seen substantially lower permit prices than had been predicted prior to implementation of these programs. Indeed, I am unaware of any emissions pricing system in which emissions have not been more responsive than initially predicted. Under a carbon tax, that greater responsiveness would show up as larger emissions reductions than had been projected.

Finally, the proposal includes a tax adjustment mechanism. If emissions reductions are significantly less than projected, the tax rate will rise faster, thus bringing emissions back in line with the targets.

2. But a recent study showed that even a $200/ton carbon price would have little effect on emissions. Does that mean a carbon tax will be ineffective and that we need regulations to reduce emissions?

Heal and Schlenker (2019) use detailed oilfield data to show that even very high carbon prices would have only small effects on cumulative oil extraction over the long term. Their results indicate that a $200/ton carbon tax would reduce long-run cumulative oil extraction by only 4 percent. This study has drawn substantial attention because, if its result is even close to accurate, it suggests that carbon pricing would have a very limited effect on emissions from oil.

But we should be cautious about drawing strong conclusions from that result, for two reasons. First, the study's result is only for oil. Other sources of emissions are more responsive to carbon pricing. Most notably, even a relatively modest carbon price would cause major reductions in emissions from burning coal. Second, nothing in the study challenges the result that a carbon price is the most cost-effective way to reduce emissions from oil. In other words, what the study's result really indicates is that reducing long-run cumulative oil extraction is very expensive. Other policies would have a cost at least as high, and likely higher, for a comparably small effect.

3. Some existing regulations can pass a cost-benefit analysis based on local air pollution cobenefits alone, even ignoring any benefits of reducing carbon emissions. Does that not imply that those regulations should remain in place even after implementing a carbon price?

Perhaps, but not necessarily. As discussed earlier in the paper, the effects of a carbon price overlap substantially with those of regulations (i.e., the carbon price induces many of the same emissions-reducing actions as the regulations do). Consequently, the effect of suspending a regulation after a carbon price is in place can be very different than the effect of removing that regulation without the carbon price in place. If the cobenefits of the regulation (i.e., positive impacts distinct from the reduction in the carbon externality) come mostly from those overlapping effects, then the cobenefits from keeping that regulation in place (on top of the carbon price) will be much smaller than when evaluating the regulation by itself. For example, suppose that the vast majority of the local air pollution cobenefits of a particular regulation come from reducing coal-fired electricity generation (as is the case for most existing regulations that target the power sector). The carbon price in this proposal is high enough to largely eliminate coal-fired electricity generation, so the cobenefits of eliminating that coal use would remain even when the regulation is suspended. In such a case, even though the regulation by itself could pass a cost-benefit test based on local air pollution cobenefits alone, keeping it in place after imposing a substantial carbon price probably would not pass a cost-benefit test.

4. Are alternatives to carbon pricing simply more politically feasible, and therefore desirable to retain despite their economic disadvantages?

The politics of climate policy options change more rapidly and more unpredictably than the economics. For example, a decade ago carbon cap-and-trade was seen as vastly more politically feasible than a carbon tax, whereas the widespread view today is that a carbon tax will be easier to pass.

But in any case, this proposal is to suspend policies that become unnecessary or inefficient in the presence of a sufficient carbon price. As such, those other policies—regardless of whether they are more or less feasible than the carbon price—would be altered only *after* the carbon price has been enacted.

Conclusion

An economy-wide price is an essential part of an economically efficient approach to addressing climate change. An efficient carbon price would force emitters to pay the true social cost of their greenhouse gas emissions, correcting the negative externality from those emissions and providing an incentive for cost-effective emissions reductions. Implementing that carbon price will make some other existing policies redundant or inefficient. Removing or modifying those policies as part of carbon-pricing legislation could lead to a more efficient outcome and boost political support for the legislation.

This paper starts by reviewing the economic and political arguments for changing other policies after there is a price on carbon. It then articulates general principles for which policies should be removed or modified, and discusses how the level of the carbon price and breadth of coverage affect the decision about which policies to remove or modify. The second part of the paper proposes a carbon tax and accompanying changes to existing policies, including suspension of stationary-source CO_2 regulations and vehicle fuel-economy standards, elimination of the renewable fuel standard and tax expenditures for the fossil fuel industry, and modification of tax expenditures for renewable energy. Other regulations would be retained, such as limits on methane emissions (until the tax base expands to include methane). The proposal is designed to be "reconciliation proof": suspended policies will come back into force if subsequent legislation repeals the carbon tax or lowers its rate.

I have much more confidence in the general principles discussed in the first section of the paper than I have in the specific details of the proposal. There is serious uncertainty about many of the specifics. Much of that uncertainty is simply an indication of how challenging the problem is. That is particularly true when it comes to setting an appropriate carbon price. Assessing the future damage from climate change, discounting back to the present, and adjusting for risk are all hugely difficult.

But in addition to that inherent difficulty, there is a substantial gap in existing research. There is very little research on how the costs and benefits of specific policies would change in the presence of a carbon price. Many studies simulate the effects of existing regulations, and many simulate the effects of a carbon price in the absence of other policies, but I did not find any that simulated how existing regulations would interact with a carbon price. Careful quantitative analysis of those interactions would be very valuable in deciding how to change existing policies once there is a price on carbon.

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Endnotes

1. As is common in the literature, I use the term "carbon price" as a shorthand for a policy that puts a price on GHGs, including—but not necessarily limited to—carbon dioxide (CO_2). Proposed carbon prices typically cover energy-related CO_2 emissions and potentially also a range of other GHG emissions, such as non-energy CO_2 emissions (e.g., process emissions from cement production) and non-CO_2 GHGs. How broad the carbon price is (i.e., how wide a range of GHG emissions it covers) is a key question in determining which other policies should be changed once the carbon price is in place. This issue is discussed at length later in this paper.
2. The marginal damage from carbon emissions and the social cost of carbon (SCC) are very similar concepts. Indeed, the two terms are often used interchangeably. Both refer to the marginal damage (i.e., the present value of the increase in future climate-change damages that would result) from a one-ton increase in CO_2 emissions today. A potential distinction between the two terms is what they assume about the path of future emissions. Because damages are nonlinear in emissions, different emissions paths will yield different marginal damages. In practice, though, marginal damage estimates are quite similar for different emissions paths. For example, Nordhaus's (2017) estimates of marginal damages on the optimal path and on the current-policy path differ by only 1–2 percent.
3. For example, Knittel 2019 finds that a $7/ton carbon price in 2020 could achieve the same level of emissions reductions as the Clean Power Plan, Corporate Average Fuel Economy (CAFE) standards, and the Renewable Fuel Standards program put together.
4. As mentioned above, Knittel (2019) finds that a $7/ton carbon price in 2020 could achieve the same level of emissions reductions as the Clean Power Plan, CAFE standards, and the Renewable Fuel Standards program (the three major regulations that existed as of 2016) put together. The price necessary to match those regulations rises over time (because the projected emissions reductions from those regulations rise over time), but even by 2030 (the last year the study reports) the necessary price is still only $36/ton. Rausch and Karplus (2014) also find that a carbon price would cost much less than regulations, for similar levels of emissions reductions.
5. For this argument to work perfectly, there must be no other market failures that affect emissions-reduction decisions. Other market failures could cause firms or consumers to pass up cost-effective emissions reduction options. To the extent that other market failures do exist, and that current regulations address those failures, that could provide a reason for keeping those regulations in place. But even in such a case one might want to modify that existing regulation so that it more directly targets that other market failure. See the discussion later in this section for more on these points.
6. This assumes that the regulation does not become completely redundant in the presence of the carbon price. If it were completely redundant, the additional emissions reductions and costs would be zero.
7. In the case of a carbon tax, we can think of this in terms of offsetting externalities. Emitting an additional ton of CO_2 increases damage by harming those affected by climate change, but also increases the revenue from the carbon tax, which benefits those who get that revenue. If the carbon price is set equal to marginal damage, those two effects exactly offset, so there is no net gain from reducing or increasing emissions at the margin.
8. The prospect of a carbon price well above marginal damage may seem too remote to be worth considering. After all, the United States has never had a nationwide carbon price, existing state and regional prices are well below marginal damage, and proposals for national carbon pricing almost all start at prices at or below most estimates of marginal damage. But it is common for proposed carbon prices to rise faster over time than marginal damage estimates, so even if the carbon price starts at a level lower than marginal damage, it could eventually wind up well above. The Citizen's Climate Lobby proposal, for example, starts the carbon price at $15/ton, well below current estimates of marginal damage, which are in the (very approximate) neighborhood of $75/ton, but the price then rises by $10/ton/year, so within less than a decade the price would be well above marginal damage, unless new information causes damage estimates to be revised upward during that time. The Climate Action Rebate Act, recently introduced by Senator Chris Coons (D-DE), also starts the carbon price at $15/ton, but has it rise even faster, at a rate of $15/ton/year.
9. Aldy (2018) suggests such an approach for reconciliation proofing a carbon tax.
10. Similarly, studies that model the effects of a carbon price generally simulate a carbon price in the absence of any other environmental policies, rather than starting from a baseline that includes existing GHG policies.
11. See Hafstead, Metcalf, and Williams (2017) and Hafstead and Williams (forthcoming) for discussion of carbon tax adjustment mechanisms.
12. See Williams (2017, 58–61) for a brief discussion of these issues.
13. Roberts and Spence (1976) show that hybrid policy instruments are generally more efficient than either pure price or pure quantity instruments. Hybrid policies also provide an opportunity to strike a political compromise between those who want price certainty and those who want emissions certainty.
14. See Anderson and Sallee (2016) for a discussion of this literature.
15. State motor fuel tax rates are from the American Petroleum Institute (2019).
16. Parry (2008) provides a similar analysis for fuel used by heavy-duty trucks. Again, the estimates for externalities other than GHG emissions add up to a level well above current tax rates.
17. This argument relies on the implicit assumption that state governments are acting in the best interests of their residents when setting regulations. If instead state governments set regulations that are substantially stricter than what would be in their own residents' best interest, then federal preemption of those regulations could be beneficial.

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Highlights

In this paper, Roberton Williams of The University of Maryland, the Climate Leadership Council, and Resources for the Future aims to make climate policy more efficient after a carbon price is implemented. If a robust carbon price is successfully implemented, other regulations that target carbon emissions may become redundant, less effective, or more expensive. Williams puts forward proposals to suspend or modify current climate policies that will become unnecessary or inefficient after a sufficiently high carbon price is implemented.

The Proposals

Implement an economy-wide carbon tax. Given uncertainties around the appropriate price, a sensible insurance policy would be to set the price slightly higher than many estimates of the social cost of carbon.

Ensure that any subsequent policy changes are "reconciliation proof" by making policy suspension contingent on a carbon tax remaining in place. If the price is repealed by Congress, then the suspended or modified regulations are reinstated.

Suspend, modify, or eliminate regulations that become redundant if a carbon tax is put into place. Policies that address market failures outside of carbon emissions should be retained or modified to more efficiently target the market failure.

Benefits

The modification or suspension of existing regulations in the presence of a carbon tax is both economically and politically sound. If a regulation becomes redundant or inefficient in the presence of a carbon price, retaining the regulation is not helpful for efficiently achieving climate goals. Additionally, swapping regulations for a carbon tax could help to create a broader political coalition than a carbon tax would on its own. These proposals would make climate policy as efficient and effective as possible after a carbon price is implemented.

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