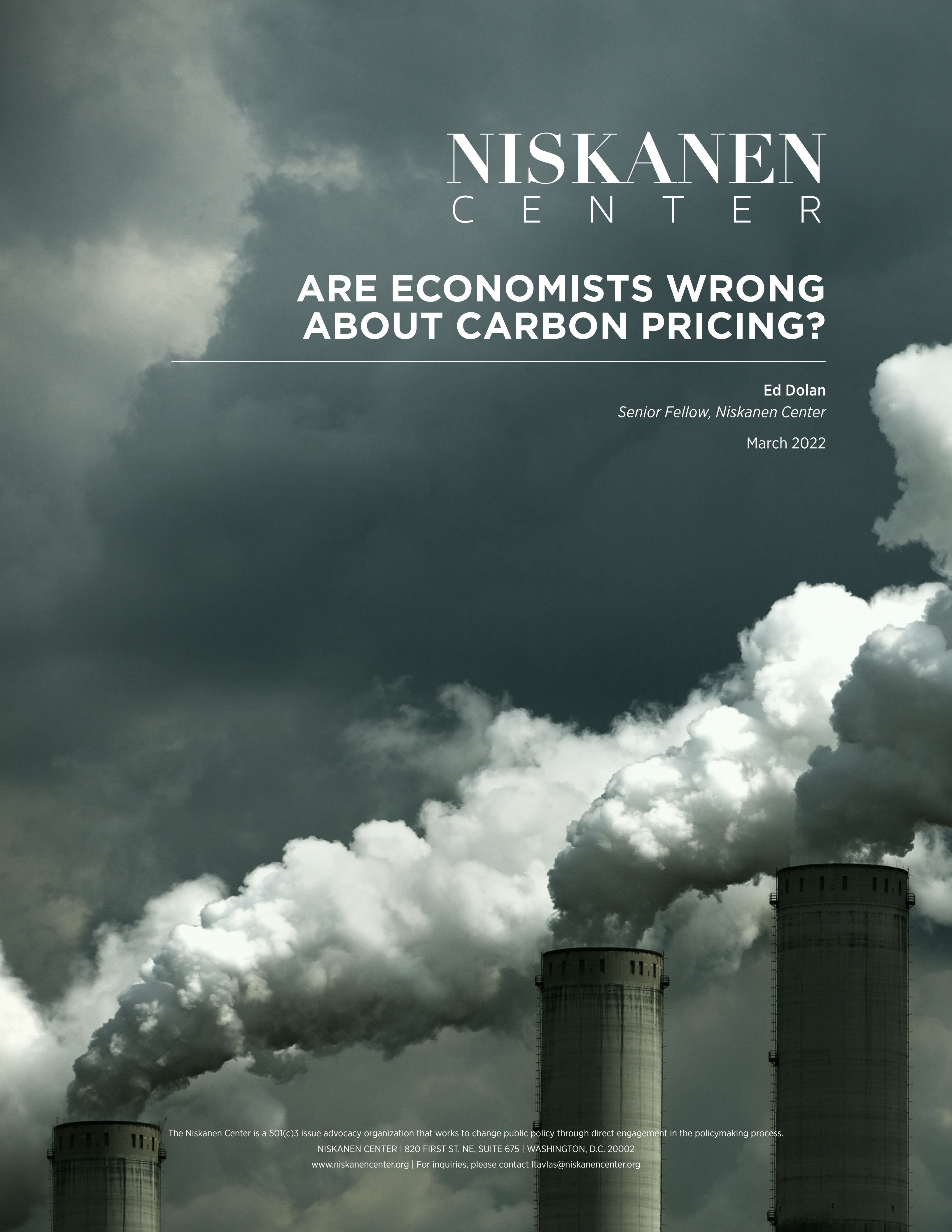

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ARE ECONOMISTS WRONG ABOUT CARBON PRICING?

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EXECUTIVE SUMMARY

Economists often find themselves on the defensive in debates over climate policy. Their favorite tools, carbon taxes and emissions trading, are viewed as dangerous political distractions. "Climate economists have blown it pretty comprehensively," writes one critic. Some of the criticism is deserved. This report identifies several areas in which economists have either missed the point or at the very least failed to make themselves understood. It offers suggestions both for modifying the market-based policies widely favored by economists and for presenting them in a way that is more in tune with the views of the larger climate community. A good part of the resistance to carbon pricing stems from the "Pigovian" model widely used to explain the policy. That model identifies an optimal carbon price and an optimal rate of emissions by balancing the harms caused by carbon emissions against the costs of abatement. The model views too little pollution as just as big an evil as too much, and depends on the rational self-interest of firms and consumers to achieve an efficient result. However, as critics point out, such a model is only as good as its assumptions. Market imperfections and behavioral issues can undermine the effectiveness of a pricing-only climate policy.

The social cost of carbon (SCC) is another point of contention. Economists define the SCC as the discounted present value of all future harms done by greenhouse gas emissions and make the SCC the carbon-price benchmark. However, measuring the SCC turns out to be more difficult than it might seem. Economic, demographic, technological, and scientific uncertainties mean that it is impossible to make a credible point-estimate of the SCC. At best, models only identify a broad range of plausible values. In addition, several critical steps in measuring the SCC are implicitly or explicitly subjective, rather than scientific. Those include the choice of a discount rate, which is a measure of how much people in the present care about the future; the degree to which policy should focus on unlikely but catastrophic risks; and "equity weighting," which means determining the relative importance of climate harms to particular people or nations.

To avoid the problems of the SCC, an increasing number of economists advocate a "target-consistent" approach to policy. The idea is first to establish a clear goal, such as holding warming to less than 1.5 degrees above preindustrial levels, and then to work backward to devise a set of cost-effective policies to reach the target. Carbon pricing is a strong candidate for inclusion in such a set of policies. The target-consistent approach is a natural fit when the chosen policy goal is deep decarbonization – achieving net-zero emissions by a chosen date.

The alleged political toxicity of carbon taxes is a final concern of the critics. It is true that carbon pricing proposals meet with considerable political resistance, but so do almost any effective policies. Abandoning pricing in favor of subsidies, performance standards, and regulations does not change the fact that reducing emissions entails real costs. At best, such policies only move the costs around, shifting them from consumers to taxpayers or from one industry to another; at worst, they increase the economic costs of decarbonization without overcoming the political barriers. A strong case can be made that an "all of the above" strategy that includes both market-based and administrative measures represents the best way forward in both economic and political respects.

Framing the issue

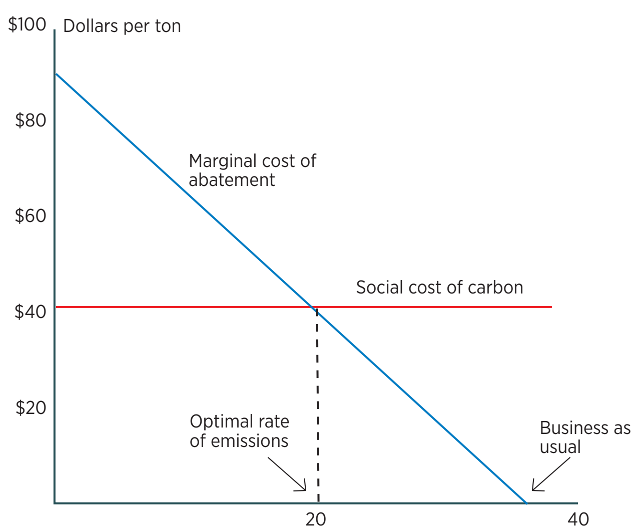
Is it possible that economists have it wrong when they advocate carbon taxes and emissions trading as central elements of climate policy? It is not hard to find dedicated climate activists, some of whom are economists themselves, who answer with a simple "yes." David Roberts writes that "climate economics and climate economists have blown it pretty comprehensively."[1] Noah Smith says that "climate economics has almost completely failed to be useful to the national policy discourse."[2] Tom Brookes and Gernot Wagner tell us that "the neoclassical orthodoxy in economics is fundamentally unequipped to deal with today's biggest problems."[3]

This report gives a more nuanced answer. Yes, some of what economists have had to say about carbon pricing has been simplistic and some of it counterproductive. But the critics of carbon pricing have written a lot of nonsense, too. What follows identifies some points that economists have gotten wrong and ends with several suggestions for what they – *we,* I should say, being an economist myself – can do better.

The Pigovian model

Much of what economists get wrong about climate policy, or are perceived as getting wrong, stems from the core model that they use in framing the issue. That model is a lineal descendant of one developed more than 100 years ago by the British economist Arthur Cecil Pigou.[4] Figure 1 gives a simple version of the *Pigovian* model, as it is called.

Figure 1: The Pigovian Model



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1. David Roberts, "A rant about economist pundits, and other things, but mostly economist pundits," Volts, October 8, 2021.

2. Noah Smith, "Why has climate economics failed us?" Noahpinion, April 13, 2021.

3. Tom Brookes, Gernot Wagner, "Economics Needs a Climate Revolution," Project Syndicate, June 28, 2021.

4. Editors of Encyclopaedia Britannica, "Arthur Cecil Pigou," Britannica, December 22, 2022.

The negatively sloped line in the diagram shows the *marginal cost of abatement* (MCA), that is, the cost of cutting emissions of CO2 and equivalent greenhouse gasses by one additional ton. It intersects the horizontal axis at a point labeled "business as usual," which corresponds to the rate of emissions in the absence of restrictive regulations or pricing. Any reduction in emissions below the business-as-usual rate entails a cost, which increases ton-by-ton as the rate of emissions decreases – that is, as the amount of abatement increases. Although the first steps at abatement don't cost much, squeezing out each of the last few tons, as the MCA curve approaches the vertical axis, is much more expensive.

The horizontal line in the figure represents the *social cost of carbon* (SCC) – the harm done by emitting one more ton of CO2 or equivalent. (More on the SCC shortly.) Sometimes the SCC schedule is drawn with a positive slope, but that is not important for the basic version of the model.

Modern versions of the Pigovian approach are built around elaborate *integrated assessment models* (IAMs). An IAM is a system of equations that spans multiple disciplines, including economics, demographics, climatology, energy science, and more. Basic assumptions regarding savings rates, population growth, sensitivity of global temperatures to CO2 concentrations, and so on are fed into the IAMs, and results analogous to the MCA and SCC curves of the Pigovian model come out. (For further details on IAMs, see this useful explainer from Carbon Brief.)[5]

Two important points follow from even the simplest version of the Pigovian model and are consistent with modern IAMs.

The first is that too little pollution is just as bad as too much. In Figure 1, for example, it is inefficient to emit more than 20 gigatons per year, the rate where the harm done by each additional ton of CO2 becomes greater than the cost of keeping that ton out of the atmosphere. At the same time, it is also inefficient to reduce emissions below 20 gigatons, since to the left of that quantity, further abatement costs more, at the margin, than the decrease in harm accomplished by an additional ton of abatement. The intersection of the two lines thus represents an economically optimal rate of emissions.

The second point is that polluters will find it in their own self-interest to hold emissions to the optimal rate if they are required to pay a price equal to the SCC, or $40 per ton in this example. That price could be imposed in the form of a carbon tax of $40 per ton or a quantitative cap of 20 gigatons per year, subject to trading of emission permits among polluters. In the latter case, the price of permits in the market where they are traded is assumed to have an equilibrium value equal to the social cost of carbon.[6]

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5. Simon Evans, Zeke Hausfather, "Q&A: How 'integrated assessment models' are used to study climate change," Carbon Brief, February 10, 2018.

6. For the most part, this report will discuss carbon pricing in the abstract with only occasional attention to whether it is implemented in the form of a tax or emissions trading (cap-and-trade). In practice, hybrid policies are possible, such as caps that are adjusted if permit prices move outside a designated band. Also, policies that are purely administrative in form can be interpreted as implicit prices. For example, a performance standard might limit a steel mill to a set rate of CO2 emissions per ton of output, with a fine imposed for violating the standard. In that case the fine would be the "price."

Both of these points are entirely correct, given the validity of the assumptions that underly the model. Yet, for a variety of reasons, the model is remarkably unhelpful to the public debate over climate policy.

Beware the assumptions

Let's start with the assumptions that underlie the basic model. The argument for optimal carbon pricing holds with full force only in an idealized neoclassical world that is initially in a state of competitive equilibrium except for this one distortion, carbon pollution. Furthermore, it applies only if a carbon price equal to the SCC is applied uniformly to all emission sources. Neither condition holds in reality.

For example, there is no single authority with the power to impose a uniform carbon price throughout the whole world. However, any difference among national carbon prices incentivizes producers to move dirty production offshore to countries that have more permissive regulations. The solution that economists favor is to impose a *border adjustment mechanism* – a tax on imports in proportion to their carbon content and a corresponding rebate for exports. However, although there is consensus on the need for border adjustment mechanisms, there are many different ways to design one. None of them would perfectly level the playing field. Short of a worldwide carbon price, a patchwork of national pricing policies, even with border adjustments, would inevitably leave residual inefficiencies. (For further discussion of border adjustments, see this report by Shuting Pomerleau.)[7]

There are many other ways in which the real world departs from neoclassical assumptions. For example, a simple carbon tax could lead to less-than-optimal results if some polluting industries are less competitive than others, or if taxes and regulations unrelated to climate affect the behavior of polluters. In almost every case, some kind of tweak has been suggested that would at least approximately restore efficiency. However, as Roberts reminds us, "with every tweak, optimal efficiency recedes in the rearview mirror."[8]

Behavioral considerations

A further assumption that underlies the Pigovian model, and most of neoclassical economics, is that all actors behave rationally in pursuit of their economic self-interest. Given a choice between paying a certain price per ton of emitted CO2 or reducing emissions, producers and consumers are assumed to pick the less expensive alternative. Their self-interest thus guides them to operate at the intersection of the SCC and MCA curves.

In the real world, however, choices are likely to conform only to a weaker standard known as *bounded rationality*. When facing complex decisions, whether climate-related or simple choices of daily life, people find it difficult to obtain and process the information needed for fully rational choice. They are subject to behavioral biases like the sunk-cost fallacy, familiarity effects, and loss

7. Shuting Pomerleau, "Border Adjustments in a Carbon Tax," Niskanen Center, July 30, 2020.

8. Roberts, "Economist Pundits."

aversion. As a result, price signals that are intended to induce emission-reducing choices, such as switching energy sources, upgrading capital equipment, or simply reducing consumption of carbon-intensive goods and services, may be less effective than suggested by the Pigovian model.

Economists should pay attention to behavioral issues, and some do. When they do, they find that behavioral biases do not cut uniquely against carbon pricing. They may also inhibit responses to regulations and subsidies. For example, choices rooted in bounded rationality are known to slow consumers' adoption of green technologies such as more efficient lightbulbs and refrigerators. That can be true even when performance standards encourage production of more efficient models and when the new models would yield large savings in consumer energy bills even without explicit carbon pricing. In such cases, price signals combined with regulations can work better than either policy does alone.

The importance of technology

Another limitation of the Pigovian model, and of some IAMs, is the assumption of a fixed menu of technologies, embodied in the MCA curve. All sources of emission are assumed to have full knowledge of these technologies and their costs. Without that information, they would not be able to adjust emissions properly in response to the prevailing price.

Some critics seize on this assumption as a key limitation, not just of the Pigovian model, but of carbon pricing in general. For example, Danny Cullenward and David Victor, authors of *Making Climate Policy Work*, write that "market signals, at best, are good at encouraging optimization when technologies are commercially mature."[9]

It is a misconception, however, to think that that carbon pricing is irrelevant to a world of rapidly changing technology. Economists would do well to give more emphasis to the issue. In reality, technology is neither fixed (as it is in some simplified models), nor is it something that "just happens" in laboratories and research centers. Rather, technological change is to a substantial degree endogenous to the economy.

Market prices themselves have obvious impacts on the development and spread of new technologies. The recent improvement and spread of fracking (a technology that in concept is more than a century old) in response to high oil and gas prices is an example, although not one that has been especially beneficial to the environment. A carbon price could be similarly effective, but in this case as a way of incentivizing production of low-carbon, rather than high-carbon, technologies. However, since individual firms cannot always capture the full benefits of new technologies, especially at the level of basic scientific research, innovation is another area in which a mix of price incentives and direct research subsidies might work better than either by itself.

9. Danny Cullenward, David G. Victor, *Making Climate Policy Work* (Polity Press, Cambridge 2020).

The social cost of carbon

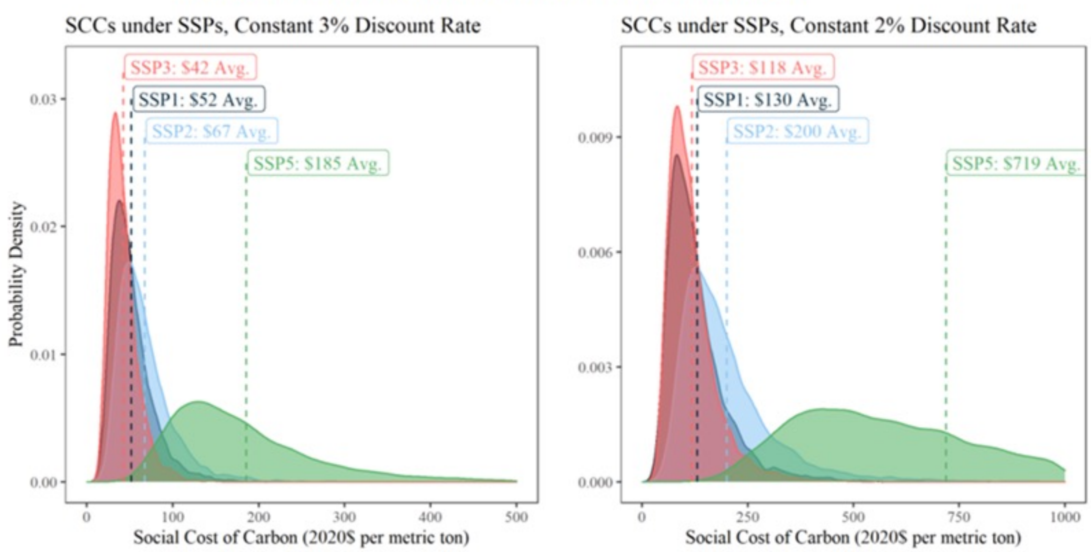
The Pigovian model assumes not just a knowledge of the economic and technological determinants of abatement costs, but also of the social cost of carbon. In practice, however, estimating the value of the SCC remains remarkably difficult, despite the best efforts of many talented economists. This section explains why and the next section introduces an alternative approach to the implementation of carbon pricing that is less dependent on the SCC.

Measuring the SCC

A recent paper by Kevin Rennert of Resources for the Future and 10 distinguished colleagues gives an overview of the state of the art in SCC estimation.[10] It lays out the challenges of compiling the data needed as inputs for an integrated assessment model, including rates of population growth, economic growth, and technological change; models to estimate the impact of those variables on emissions; more models to assess the impact of emissions on climate variables such as rainfall, storms, and ocean levels; and still more models to estimate the value of the economic harms caused by changes in those climate variables, including falling crop yields, storm damage, droughts, and extinctions.

Few if any of the data needed as inputs are known with any degree of certainty. As a result, Rennert et al. wisely do not attempt to give point-estimates for the social cost of carbon. Instead, as illustrated below in Figure 2 (their Figure 11), they report a number of alternative probability density functions, that is, ranges of values within which the estimated variable is more or less likely to fall. Each of the differently colored distributions is based on a different set of assumptions for emissions pathways, climate impacts, and so on.

Figure 2: Illustrative Estimates of the Social Cost of Carbon



NISKANEN CENTER | Rennert et al., 2021, p. 40 P220212-2

10. Kevin Rennert, Brian C. Prest, et al., "The Social Cost of Carbon: Advances in Long Term Probabilistic Projections of Population, GDP, Emissions, and Discount Rates," Brookings Papers on Economic Activity: BPEA Conference Drafts, September 9, 2021.

Estimates of this kind are helpful to analysts who are used to thinking in terms of probability density functions, but it is less clear how much they contribute to the public discussion of climate policy. To the extent that policymakers and pundits pay any attention to them at all, they are likely to focus on the average SCC values for each distribution, as given in the boxed labels, treating them as point-estimates, which they are not. Even the averages in Figure 2 range from a low of $42 per ton to a high of $719 per ton, depending on the underlying assumptions for the various distributions. That makes it easy for anyone to pick a value for the SCC that fits their prior leanings toward more or less aggressive climate policies.

The discount rate

One source of the wide range of SCC estimates deserves special attention. Because CO2 remains in the atmosphere for centuries, it is not enough to measure the immediate impact of emissions. Instead, the SCC needs to reflect cumulative harms that each ton emitted today will have on people now living and on generations to come. To do that, economists *discount* the present value of future harms at a specified percentage rate. For example, if the chosen discount rate is 3 percent, $100 in damages next year is set equal to $97 this year; $100 in damages two years from now counts as about $94; and $100 damages in 100 years is equivalent to less than $5 today.

But what is the appropriate discount rate? It matters a lot. The estimated value of the SCC is more sensitive to the discount rate than to any other parameter. For example, comparing the left-hand and right-hand charts in Figure 2 shows that even when all other inputs are held constant, reducing the discount rate by just 1 percentage point, from 3 percent to 2 percent, roughly triples the estimated average value of the SCC.

Rennert et al., like most economists, use market interest rates from the recent past as their starting point for determining an appropriate discount rate. That is a reasonable approach when the question is how much lenders ask in compensation for deferring the receipt of a payment, or how much borrowers are willing to pay to get access to funds sooner than they otherwise would. The authors then explore various approaches to estimate how rates are likely to evolve over the lengthy time horizons relevant to climate policy. For various reasons, they conclude that it is appropriate to use discount rates that decline gradually over time. That and all of their assumptions about market interest rates are based on sound economic and financial principles, but they miss two points that, in practice, make the discount rates used in SCC calculations largely irrelevant to the policy debate.

One point is that climate policy is about public goods, not private goods. Discount rates are a sensible way to analyze private decisions like designing a factory or funding one's 401k retirement account. In such cases, individuals can adjust their behavior in response to the prevailing market interest rate. Some people will be inclined to spend freely now to build plants with lower future operating costs or to fund their 401ks generously. Others will do the opposite. Their cumulative choices will affect the supply and demand in financial markets, which in turn will help determine market interest rates.

In contrast, the benefits of climate mitigation are public goods shared equally by everyone on the planet. No individual choice is possible. There is no argument that prevailing interest rates represent a market-mediated aggregation of individual views regarding the tradeoff between the present and the future, because there is no feedback from individual choices to market rates. Whatever discount rate is chosen by policy makers on the basis of prevailing market rates, it will be too short-sighted for some and too far-sighted for others.

The other point is that SCC calculations pay too much attention to market discount rates that are thought likely to prevail in the future. Future rates will, of course, be important to young workers in 2100, or whenever, who are then deciding how much to save for their own future retirements. But the relevant question for today's climate policy decisions is not what our descendants will think about their own then-relatively-near futures. What matters for formulating policy now is how much we in the present care about a future so distant that most of us will not live to see it.

Integrated assessment models are sometimes based on the behavior of a hypothetical rational individual with an unlimited lifespan, or the equivalent assumption that each generation values the welfare of the next equivalently to their own. In reality, however, that is not how we as humans think about the effects that decisions we take today will have on the balance between material wealth and environmental quality a century or more from now. When we do think about such things, we do not use the calculative part of our brains at all. Rather, we think emotionally, with perhaps some fuzzy influence from rationally articulated ethical principles.

Equity and risk weighting

The discount rate is not the only factor that makes it difficult to estimate of the social cost of carbon in a way that would allow truly objective policymaking. Risk weighting and equity weighting also pose problems.

The need for risk weighting arises because discussions of future climate trends are full of *tail risks* – the risks of unlikely but truly catastrophic climate effects. Gernot Wagner and Martin Weitzman give a good account of tail risks in their 2015 book *Climate Shock*.[11] Tail risks raise "unknown unknowns" – situations in which not only the outcomes, but even the probability distributions of those outcomes are poorly understood. Wagner and Weitzman argue that tail risks should play an important role in our decisions as to how aggressive our climate policies should be, but just how important remains a matter of opinion.

Equity weighting concerns the way in which we think about the harms of climate change and the benefits of mitigation as they affect particular individuals and nations. For example, it is often argued that a 0.1° increase in global temperatures will cause more harm to people living on a budget of $2 a day than to those who have incomes of $200 a day. The latter can afford to buy food even if drought makes it more expensive to grow or to install solar-powered air conditioning for their homes. The former cannot. It is further argued that the costs of climate mitigation should be borne disproportionately by more developed nations, not just because they are richer, but also because they are responsible for the past centuries of industrial emissions that are causing today's and tomorrow's suffering. It is easy to speak about equity in general, but when it comes to assigning

11. Gernot Wagner, Martin Weitzman, *Climate Shock: The Economic Consequences of a Hotter Planet* (Princeton UP, 2015).

numerical weights to the costs and benefits of a given policy for a Pakistani farmer compared to the impact of the same policies on an American corporate executive, who can pretend to objectivity? Wagner, in a 2021 paper with several associates, argues vigorously that estimates of the SCC are incomplete without risk-weighting and equity-weighting.[12] Rennert et al. agree, in principle, but do not attempt the task themselves. In a recent paper, Nicholas Stern, Joseph E. Stiglitz, and Charlotte Taylor note that efforts to "improve" IAMs by incorporating inherently subjective factors like risk-weighting and equity-weighting tend to make the resulting SCC estimates less robust, in the sense that the plausible range of estimates becomes even wider than before.[13]

Taking all this into account, then, it is reasonable to conclude that differences about climate policy over distant time horizons cannot be fully reconciled through measurement and calculation, but only through politics. In some countries, people will reach those decisions democratically; in others at the whim of an authoritarian ruler; and in still others, by default, through failure to reach a consensus to do anything one way or other. The only thing that is certain is that when those decisions are made, no representatives of the distant future will be in the room to present their views.

The target-consistent alternative

None of what has been said about the SCC means that carbon pricing itself should be abandoned as a central tool of carbon policy. Instead, what is needed is a different approach to pricing, one that begins with a politically determined target and works backward from there to develop practical policies for reaching it. Economists call that a *target-consistent* approach.

Without using the term, world leaders have already taken a target-consistent approach in the Paris Agreement. Its stated goal is "to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels." There is a somewhat looser consensus that to achieve that goal, global greenhouse gas emissions should fall to net-zero by about 2050.

It is worth noting that despite this *de facto* acceptance, the target-consistent approach has its critics. For example, in a policy forum published in *Science*, Joseph Aldy and three colleagues argue that it replaces scientific assessments of damages with subjective judgments, and that being political rather than scientific, it is fundamentally arbitrary. However, that objection misses a key point that is discussed at length by Stern, Stiglitz, and Taylor. They, and others who favor a target-consistent approach, point out that "scientific" estimates of the SCC derived from elaborate IAMs are themselves rife with subjective judgements, including but not limited to the choice of a discount rate and decisions regarding risk-weighting and equity weighting (including the subjective decision in some SCC estimates to leave those considerations out altogether). They favor an approach that begins with fundamentally political targets not because that is a better way to conduct policy, but because it is, in practice, the only possible way. Burying subjective judgements deep in the equations of an integrated assessment model yields only an illusion of scientific objectivity.

12. Gernot Wagner, David Anthoff, et al., "Eight priorities for calculating the social cost of carbon," *Springer Nature Limited* 590 (February 2021): 548-550.

13. Nicholas Stern, Joseph E. Stiglitz, and Charlotte Taylor, "The Economics of Immense Risk, Urgent Action and Radical Change: Towards New Approaches to the Economics of Climate Change," National Bureau of Economic Research Working Paper 28472, rev. Feb. 2022.

Deep decarbonization

To give some examples of how the target-consistent approach to climate policy could be implemented, it will be helpful to introduce yet another issue raised by critics of the Pigovian model. That model was originally developed to deal with pollution whose effects are limited in time and space, such as smoke from factory chimneys. It is reasonable to model the harm from such pollution as a function of the rate of emissions. In contrast, the critics point out, carbon dioxide persists in the atmosphere for centuries. The harm that it causes is thus a function not of the rate of emissions, but rather, of its accumulated atmospheric concentration.

Accordingly, the critics continue, setting an SCC-based price that permits any level of CO2 emissions indefinitely, even if it is much lower than today's, is inappropriate, since doing so would imply indefinite increase of the atmospheric concentration. Anthony Patt and Johan Lilliestam express this in a vivid metaphor: "Carbon taxes stimulate a search for low-hanging fruit. That ceases to matter when we know we must eventually pick all of the apples on the tree."[14]

By "picking all the apples," they mean reducing emissions to net-zero – a goal known as *deep decarbonization*. Deep decarbonization requires a policy that, instead of targeting an optimal rate of emissions, focuses on a *carbon budget* – the total number of gigatons of CO2 that can still be emitted before atmospheric CO2 reaches a target concentration that corresponds to an acceptable change in global temperature.

The problem of deep decarbonization lends itself naturally to a target-consistent approach. A target for the maximum acceptable temperature would be selected politically, preferably on a global scale through some process like the Paris Agreement. Technical analysts would then translate that into a target pathway for emissions that was consistent with the temperature goal.

In an earlier commentary, I described in detail how such an approach could be implemented using either carbon taxes or emissions-trading as the principal policy instrument.[15]

For the tax-based version, following a procedure outlined by Noah Kaufman and co-authors, the first step would be to set a target date by which emissions would fall to net zero while keeping within the carbon budget.[16] From that, analysts would calculate a declining, target-consistent time-path, not necessarily linear, for emission rates. Next a, corresponding time-path would be developed for a rising tax rate per ton of CO2, based on estimates of elasticities, technological change, and other parameters. The results would be continuously monitored and the tax rates appropriately adjusted if emissions did not track the required time-path.

The emission-trading version of deep decarbonization would, at least conceptually, be much simpler. The only analytical step needed would be to translate the politically-determined temperature target into a carbon budget. Once the carbon budget was set, it would be broken into a fixed number of permits, each allowing the emission of, say, 1,000 tons of CO2 or equivalent. Those

14. Anthony Patt, Johan Lilliestam, "The Case against Carbon Prices," Joule 2, no. 12, (December 2018): 2494-2498.

15. Ed Dolan, "The Role of Carbon Pricing in Deep Decarbonization," Niskanen Center, August 26, 2021.

16. Noah Kaufman, Alexander R. Barron, etc., "A near-term to net zero alternative to the social cost of carbon for setting carbon prices," *Nature Climate Change* 10: 1010-1014, August 17, 2020.

permits would then be distributed, by auction, grandfathering, equal allocation to all citizens, or some mixture of those procedures. Permits could be freely traded, and no more permits would ever be issued (except perhaps in recognition of documented direct-air capture of CO2). Once all the permits were used up, emissions would have to fall to net-zero. The price of permits over time would be entirely determined by market forces, with some parties buying permits to use immediately for profitable emission-intensive activities, and others buying them to hold unused in anticipation of future increases in permit prices.

In either variant, carbon pricing could be supplemented by administrative measures such as research subsidies or performance standards. The argument for a mixed strategy that includes both pricing and administrative measures is as strong when the target is deep decarbonization as when the target is a Pigovian optimal rate of emissions.

Where does that leave the SCC?

This section has argued that a negotiated, target-consistent approach to climate policy is more realistic than one that aims for an objectively optimal policy and begins with an estimate of the social cost of carbon. However, even under a target-consistent approach, the SCC still has a role to play.

For one thing, as Aldy et al. point out, there are many cases in which regulatory agencies feel they need to take costs and benefits into account. Estimates of the SCC, even if imperfect, make it possible for environmental regulations to meet the minimum legal standards for cost-benefit analysis.

Second, the IAMs used by climate economists generate detailed estimated ranges for future global temperatures, sea levels, population, economic growth, and other variables. Policy analysts, legislators, and voters can then combine that information with more subjective factors like discount rates, equity weights, and risk weights in negotiating appropriate temperature targets. Even if it is neither possible nor desirable for target selection to be fully objective and apolitical, it should be informed by the best available science, not based on wishful thinking or irrational fears.

In short, research devoted to the social cost of carbon is not a wasted effort, but neither can it provide a complete guide to climate policy.

Political toxicity

The discussion of Pigovian optimization vs. a target-consistent approach to climate policy makes it clear than political considerations are inevitably central to climate policy. This section examines a related issue: the alleged "political toxicity" of carbon pricing. Opposition to carbon pricing, based on either core values, or political strategy, or both, has become widespread on the political left, where any form of carbon pricing is viewed as a "dangerous political distraction."[17] Ideologically motivated opposition to carbon taxes and permit trading is also be found on the right, especially in libertarian circles.[18]

17. Patt and Lilliestam, "The Case against Carbon Prices."

18. Ed Dolan, "What's Wrong with Libertarian Environmentalism," Niskanen Center, November 10, 2020.

Anyone who has worked on climate policy will agree that carbon taxes, cap-and-trade, and other forms of carbon pricing meet significant political opposition. But political resistance is not unique to carbon pricing. In reality, almost any climate policy with a potential for real impact, whether it involves pricing or not, encounters serious headwinds. The reason is simple: Every known strategy for mitigating or adapting to climate change has opportunity costs. Fiddling with the details of policy design can affect who bears those costs, but it can't make them go away. Whoever ends up bearing them is likely to resist.

Consider, for example, the views of carbon-price skeptic Richard A. Rosen, who argues that prices in the mainstream range of $50 to $100 a ton are likely to reduce emissions by no more than 10 percent.[19] Instead, he thinks "taxes in the $1,000 per ton range," which would surely be politically impossible, would be needed to squeeze out the last amounts of emissions. Rather than imposing carbon prices in that range, he recommends administrative measures such as portfolio standards for electric power, CAFE standards for vehicles, electric vehicle mandates, and stricter energy standards for buildings.

What do Rosen's estimates imply, if taken at face value? In what kind of world would a carbon price of $100 have little effect on emissions, and even a price of $500 have a disappointingly small effect? One possibility is a world in which abatement is in fact cheap, but in which corporate polluters are willing to leave good money on the table, preferring to pay a tax of $500 per ton even though they could mitigate emissions for, say, $200 or $300 a ton. The other possibility is one where polluters prefer to pay a price or mitigate emissions, whichever costs less, but in which abatement is in fact very expensive.

It is hard to believe in the first world. In other contexts, corporations seem ready, at the drop of a hat, to move operations to tax havens if that will cut their tax burden even a little. They are seen as quick to offshore their operations to China, and then from China to Vietnam, to save a dollar or two an hour on wages. Why would they not display the same greedy pursuit of profit, and the same sharp-pencil operational planning, in deciding their emissions strategies? If they did, they would choose abatement over paying even a modest carbon price, if the costs of abatement were in fact low.

That leaves the second world: One in which a $500 per ton carbon price has only a moderate effect on emissions because cutting emissions really does have high opportunity costs. Those costs could take many forms, reflecting a need for labor, capital, and materials, for purposes like electrifying cars, building transmission lines, or switching to low-emission substitutes for conventional concrete. Whatever the particulars, those costs would have to be covered, somehow. The choice of carbon prices vs. administrative measures like performance standards and subsidies only determine by whom.

But if the opportunity costs of carbon abatement are high, then someone or other is going to find them politically toxic, no matter how they are packaged. Consider, for example, a plan endorsed by Roberts in 2020 as something that could "unite the left."[20] That plan was built around the slogan

19. Richard A. Rosen, "Carbon Taxes: A Good Idea But Can They Be Effective?" Institute for New Economic Thinking, June 28, 2021.

20. David Roberts, "At last, a climate policy platform that can unite the left," Vox, July 9, 2020.

SIJ, for "standards, investment, and justice." Each part of such a plan would be costly. In Roberts' version, "standards" included a goal of 100 percent zero-emission vehicles by 2030. Could that goal be reached without raising the price of new cars? "Investments" included better transmission lines and more vehicle charging stations – great ideas, but with price tags in the billions and probable NIMBY opposition anywhere such facilities were built. "Justice" included union labor on all government-financed projects plus a rise in the minimum wage. Without saying anything against higher wages, it is still true that one person's higher wage is someone else's toxically high cost.

Even if the costs of SIJ didn't take the form of higher consumer gas prices and electric bills, they would have to come to earth somewhere. If SIJ took the form of mandates, that would raise costs for corporations, which would draw all the more opposition if they were blocked from passing them through to consumers. If it took the form of subsidies and direct public investment, the costs would be felt as higher taxes on personal incomes and corporate profits. How is it that if the costs of carbon prices are seen as politically toxic, the costs of SIJ are supposed to go unnoticed, not just by voters in general elections, but by the corporate lobbyists and high-income taxpayers who exercise a powerful influence over the actions of regulatory agencies and the votes of members of Congress – even Democratic members?

Yes, the political toxicity of climate policy is a real thing, but it is not limited to carbon pricing. It applies to all climate policy. Hiding costs under an SIJ formula isn't a way around that. The best hope of political success, if there is any at all, will be a plan that delivers the biggest return in emissions reduction for whatever cost it entails. The best way to do that would be with an "all of the above" strategy that includes a prominent place for carbon pricing.

What can economists do to be useful?

This long essay has mostly been devoted to areas where climate economists have gone wrong. To wrap things up on a positive note, I would like to speak in my own voice as a member of the economics profession. Here are some ideas for what economists can do to be useful:

- Talk less about efficiency, and more about effectiveness – as in how carbon pricing can help almost all other climate policies work more effectively.
- Talk less about optimal carbon pricing and the social cost of carbon, and more about targets, carbon budgets, and deep decarbonization.
- Talk about how carbon pricing and administrative measures can be complementary. Examples: Use performance standards to overcome behavioral resistance to more efficient refrigerators. Reform utility regulation to speed electrification of the economy. (See here for more examples.)[21]
- Talk more about the importance of innovation and technological change. This is another place were carbon pricing and administrative measures can work in tandem, for example, in basic research, where it is hard for a single firm to capture the full benefits of new discoveries.

21. Ed Dolan, "The Underappreciated Versatility of Carbon Pricing," Niskanen Center, October 4, 2021.

- Talk realistically about political resistance to effective climate policy. Overcoming political toxicity requires more than finding ways to hide decarbonization costs. A good case can be made that the best way forward is through a target-consistent strategy that uses all the tools in the policy toolbox – including but not limited to carbon pricing – in order to minimize the real costs of achieving chosen goals.

What economists should *not* do is withdraw from the debate. As Matt Yglesias has pointed out, we economists are kind of annoying.[22] But that said, our skills are genuinely useful. And when it comes to climate change, we are much more supportive of climate action than the public or elected officials. We ask only to be treated as part of the solution, not as part of the problem.

22. Matthew Yglesias, "Economists aren't the problem on climate change," Slow Boring, October 15, 2021.