

Two Tools for Two Jobs: The Difference Between Carbon Taxes and Energy Technology Incentives

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The two tools are complementary, like a saw and sandpaper. One leads taxpayers to shave their energy use. The other drives innovation in promising clean energy technologies.

KEY TAKEAWAYS

- The main job of carbon taxes is to cut pollution. The main job of energy technology tax incentives is to foster innovation. And the fact that each does a little of the other's job causes confusion among policymakers and the public.
- Carbon taxes are great for inspiring energy users to adjust, tinker, and thereby discover incremental innovations—but they can't cut pollution dramatically.
- Energy technology tax incentives are better for speeding radical innovations like electric vehicles into widespread use. They can expand markets for promising technologies, accelerating improvements and driving down costs.
- Carbon taxes should be permanent, because any amount of carbon pollution will always be bad. But energy technology tax incentives should be temporary, because radical innovations no longer deserve extra help once they are mainstream.

OVERVIEW

Turbocharged by the Green New Deal, the debate over federal climate policy has accelerated in the first half of 2019. This development is welcome. Even though we have begun to feel the impacts of climate change, humanity still has time to head off its most severe consequences. But that will only happen if the United States and other nations enact smart policies soon.

Unfortunately, figuring out which policies are smart isn't easy. The global energy system, the main source of the carbon emissions that fuel climate change, is enormous and intricate. Policymakers will have to use a wide array of tools to steer it to a low-carbon future—and it is easy for them to appear to be doing the right thing when they might not be.

Tax policy could be a powerful tool for fighting climate change, but it is also a source of great confusion. That's not surprising, since the U.S. tax code is a maze to navigate for many purposes. But the confusion around using it for this particular purpose is not due to something arcane. It is very basic and ought to be cleared up.

It comes down to this: A climate-fighting tax policy should rely on two primary tools that perform two different jobs, both of which are important—a carbon tax and energy technology tax incentives. The main job of carbon taxes is to cut pollution.^[1] Carbon emitters should be forced to pay for every ton, providing an incentive to emit fewer tons. And the main job of energy technology tax incentives is to foster innovation.^[2] Users of new goods and services that have the potential to reduce emissions significantly should get a tax break if these products are on an innovation pathway likely to realize that potential.

A SAW VS. SANDPAPER

The awkward fact that each of the tools does a little of the other's job accounts for a lot of the confusion among policymakers and the public. This overlap stems from the fact that the two tools are complementary, like a saw and sandpaper. A very dexterous person might be able to use a saw to smooth a rough edge, and a very strong person might cut a plank with sandpaper. But normal people would prefer to use them in tandem to achieve a single purpose, like making a shelf.

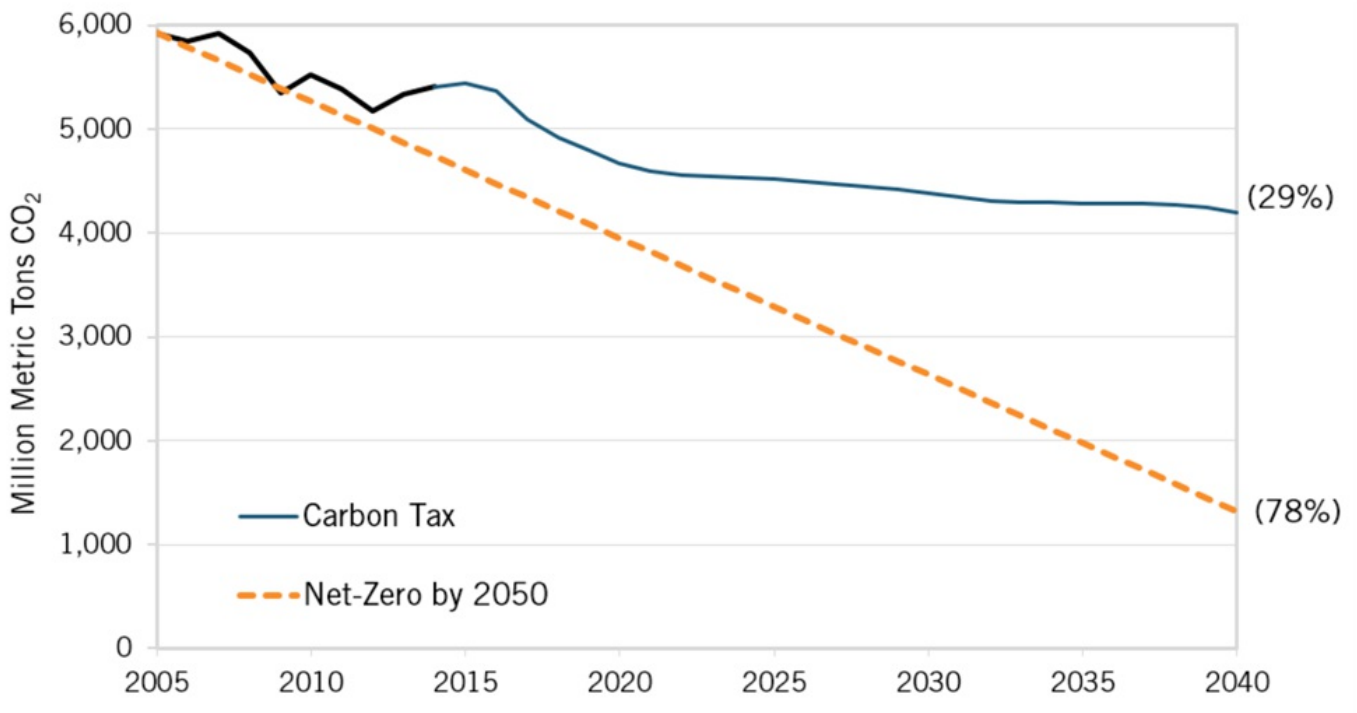
Carbon taxes work a little like sandpaper. They create friction that leads would-be taxpayers to shave their energy use and to substitute lower-carbon for higher-carbon forms of energy. For instance, a utility might switch from coal to natural gas to avoid paying carbon taxes, even if coal is cheaper, because gas produces half as much carbon pollution per unit of electricity. A rational company or person will conserve energy or switch fuels in response to carbon taxes if doing so costs less than paying the tax on each ton of emissions they avoid.^[3]

Some actions that carbon taxes trigger are innovative.^[4] For example, if the price is right, factory managers will be motivated to change their methods to reduce energy waste. That is called process innovation. Consumers, meanwhile, will become more likely to buy fuel-efficient cars. If enough of them do so, then automakers may respond by developing even more fuel-efficient models. That is called product innovation.

These kinds of innovations are incremental. Each new process or product is slightly better than its predecessor. Each builds on the innovator’s existing knowledge base. A carbon tax is a great tool for inspiring energy users to tweak, adjust, tinker, and thereby discover incremental innovations that no one making energy policy in Washington would ever think of.

Conservation, fuel-switching, and incremental innovation stimulated by carbon taxes could reduce pollution considerably. A 2016 study by the U.S. Department of Energy estimated that if a tax had started at 20 dollars per ton of carbon emitted in 2017 and then increased to about \$60 per ton in 2040, it would have cut emissions by about 30 percent.^[5] (See figure 1.)

Figure 1: Impact on CO2 emissions of \$20 per ton carbon tax, rising to \$60 in 2040



What carbon taxes can’t do is cut pollution dramatically—which will ultimately be required to stabilize the climate.^[6] (The orange line in figure 1 depicts the path to eliminate carbon emissions by 2050.) The reason is that radical innovations must also be brought into widespread use to achieve such cuts, and carbon taxes are poor tools for making that happen. Imagine trying to cut a log with sandpaper. The woodworker (and the sandpaper) would wear out before the log does. Even using the coarsest sandpaper wouldn’t help.

WHEN TO USE WHICH TOOL

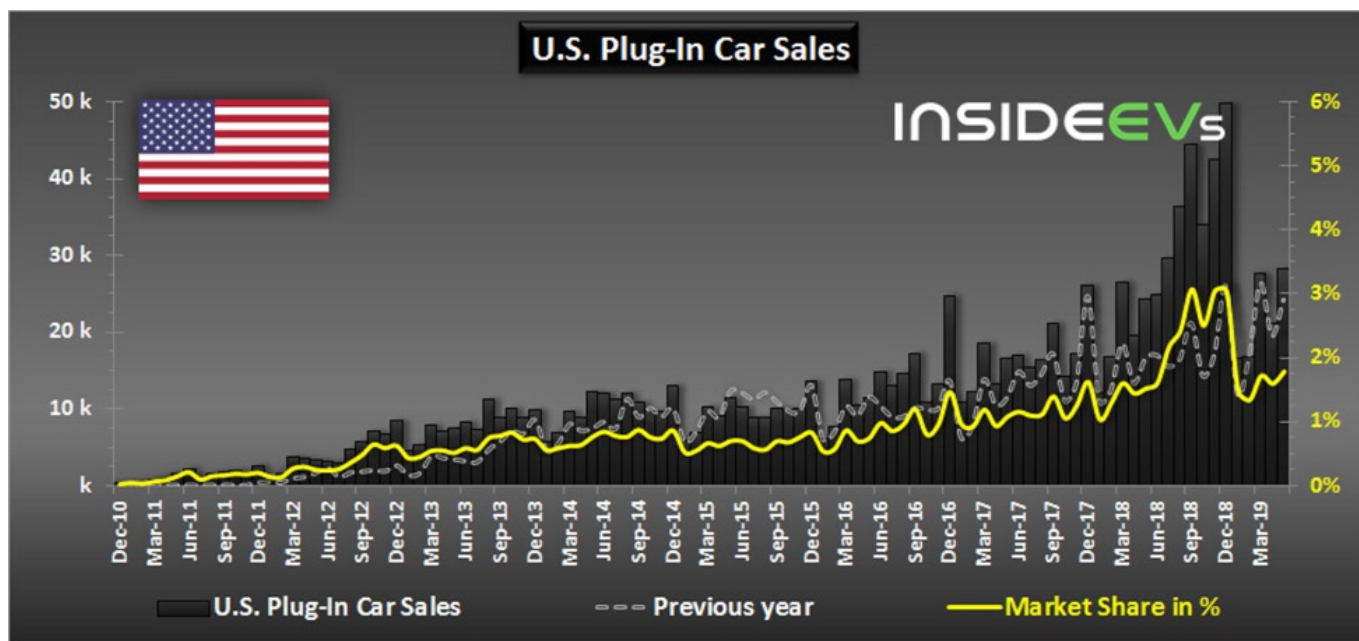
Automobile innovation provides a real-world example of these limits to carbon taxes. Gasoline taxes, which function like carbon taxes, have for decades been much higher in Europe than in the United States. Facing fuel prices that were often twice as steep, Europeans bought smaller and more efficient cars than Americans did, and drove them less.

But until very recently, no carmaker offered electric vehicles (EVs) for sale in Europe. EV technology was so crude that even a huge fuel price advantage fell far short of making up for EVs' poor performance and high sticker price. The log of EV innovation was simply too thick for the carbon tax sandpaper to cut. It smoothed the edges of internal combustion engine technology (and shaped driving behavior) instead.

Energy technology tax incentives are a better tool for the job of speeding radical innovations like EVs into widespread use. Applied appropriately, they work a little like saws, cutting deeply in relatively narrow grooves. Incentives expand markets for promising technologies that do not yet offer a value proposition as compelling to customers as their incumbent competitors'. As these markets grow in response, the new technologies' developers earn enough to improve the technologies' performance, streamline production, and cut prices until, ideally, they are as good as or better than the old ones.

EVs have been the target of tax incentives in recent years, and the EV market is beginning to respond in the hoped-for way. EVs' share of the U.S. market surpassed 3 percent for the first time in late 2018, with sales reaching 50,000 per month. (See figure 2.) Such levels encourage automakers to build larger and more efficient EV factories, expand the range of models they offer, and invest in research and development to further improve this new technology. (Other policies, such as auto pollution control regulations, zero-emissions vehicle mandates, and public funding for EV charging infrastructure—as well as private risk-taking, such as investments in Tesla—have also been important in driving the EV market.)

Figure 2: U.S. plug-in car sales ^[7]



When parity between new and old technologies is achieved, the incentive should be removed. Whereas carbon taxes should be permanent, because any amount of carbon pollution will always be bad for the climate, energy technology tax incentives should be temporary, because radical

innovations no longer deserve extra help once they are no longer radical, but mainstream.

Tax incentives will only work for innovations, like the EV, that are mature enough to respond quickly to the market signals that the incentives provide. If an innovation cannot be mass-produced at much lower cost as the market grows, even as its performance is improved—or to put it another way, if the innovation is not primed to move rapidly down its “learning curve”—then the incentive will fail.^[8] Tax incentives for EVs had very little impact when they were first offered in the United States in 1992, because the technology simply wasn’t ready. Even a sharp saw cannot cut a log made of stone.

BOTTOM LINE

Neither carbon taxes nor energy technology tax incentives is a magic wand.^[9] Policymakers will have to dig into toolkits beyond tax policy, such as public funding for research, development, and demonstration (RD&D) in order to stimulate the creation and initial applications of radical innovations.^[10] But both of these tools have important jobs to do in the fight against climate change. And they can do more working together than working separately—maturing radical innovations and encouraging incremental ones.

ENDNOTES

- [1] “Carbon Taxes,” Resources for the Future, accessed June 25, 2019, <https://www.rff.org/energy-and-climate/carbon-pricing/carbon-tax/>.
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- [4] Joe Kennedy, “How Induced Innovation Lowers the Cost of a Carbon Tax” (ITIF, June 25, 2018), <https://itif.org/publications/2018/06/25/how-induced-innovation-lowers-cost-carbon-tax>.
- [5] U.S. Department of Energy, “Energy CO2 Emissions Impacts of Clean Energy Technology Innovation and Policy” (Washington, DC: January 2017), [https://www.energy.gov/sites/prod/files/2017/01/f34/Energy CO2 Emissions Impacts of Clean Energy Technology Innovation and Policy.pdf](https://www.energy.gov/sites/prod/files/2017/01/f34/Energy_CO2_Emissions_Impacts_of_Clean_Energy_Technology_Innovation_and_Policy.pdf).
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- [10] Colin Cunliff, “FY 2020 Energy Innovation Funding: Congress Should Push the Pedal to the Metal” (ITIF, April 2, 2019), <https://itif.org/publications/2019/04/02/fy-2020-energy-innovation-funding-congress-should-push-pedal-metal>.

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