

ants and industry is that both parties better off.

An important result of the SO₂ trading program is that firms that generate electricity from relatively clean sources such as solar power can make money by selling their pollution allowances. In contrast, firms that generate electricity from relatively dirty sources must buy allowances. In essence, clean energy is subsidized and dirty energy is taxed—thus, a program of tradeable allowances correctly reflects the fact that clean energy has lower social costs than dirty energy.

Climate Change and the Carbon Tax

In January 2019, thousands of economists including 27 Nobel laureates signed an open letter arguing that the best way to address the problem of climate change was a carbon tax. To quote the letter:

1. A carbon tax offers the most cost-effective lever to reduce carbon emissions at the scale and speed that is necessary. By correcting a well-known market failure, a carbon tax will send a powerful price signal that harnesses the invisible hand of the marketplace to steer economic actors toward a low-carbon future.
2. A carbon tax should increase every year until emissions reductions goals are met and be revenue neutral to avoid debates over the size of government. A consistently rising carbon price will encourage technological innovation and large-scale infrastructure development. It will also accelerate the diffusion of carbon-efficient goods and services.
3. A sufficiently robust and gradually rising carbon tax will replace the need for various carbon regulations that are less efficient. Substituting a price signal for cumbersome regulations will promote economic growth and provide the regulatory certainty that companies need for long-term investment in clean-energy alternatives.
4. To prevent carbon leakage and to protect U.S. competitiveness, a border carbon adjustment system should be established. This system would enhance the competitiveness of American firms that are more energy-efficient than their global competitors. It would also create an incentive for other nations to adopt similar carbon pricing.

5. To maximize the fairness and political viability of a rising carbon tax, all the revenue should be returned directly to U.S. citizens through equal lump-sum rebates. The majority of American families, including the most vulnerable, will benefit financially by receiving more in "carbon dividends" than they pay in increased energy prices.

Using what we have learned in this chapter, we can now understand each of these points. Point 1 reminds us that carbon released into the atmosphere contributes to climate change and thus imposes an eventual cost on bystanders. But note that the economists argue that the goal of a carbon tax is not to eliminate all carbon emissions but to solve the market failure by correctly pricing carbon emissions. Remember, a price is a signal wrapped up in an incentive. Thus, by correctly pricing carbon emissions the market will send a signal about the true cost of different products and services and that signal will incentivize demanders and suppliers to reduce high-carbon products and develop substitutes. In other words, when carbon emissions are correctly priced, self-interest will align with the social interest so the invisible hand can steer economic actors in the right direction.

Point 1 also tells us that a carbon tax offers the most "cost-effective" lever to reduce carbon emissions. Point 2 explains some of the reasons why. A carbon tax operates on *many margins*. A carbon tax will encourage demanders to switch from higher-priced carbon-intensive goods and services to lower-priced, less-carbon intensive substitutes. At the same time, suppliers will be encouraged to research and develop less carbon-intensive goods and services. Over time a carbon tax will even encourage large-scale changes in how energy is generated, where people work and live and how they transport as well as produce goods and services.

Point 3 says that a carbon tax is better than command and control regulations. Remember the clothes washers that didn't work after command and control regulations on energy efficiency were imposed before the available technology was cost-effective? The same principles apply to a carbon tax. Instead of requiring that every new home install solar panels, a potentially very costly mandate imposed in California, the economists are suggesting that we apply a carbon tax and let people decide how to reduce carbon emissions in the least costly way. Command and control works on only a few margins, whereas a carbon tax works across many margins in ways that are too complex for planners to predict or plan. Recall from Chapter 7 how one response to increased oil prices was to move flower production overseas and how another response was to pave driveways with brick instead of asphalt! A carbon tax uses the forces of creative destruction, which brought us cell phones, online dating, and movies on demand, to address the challenge of climate change.

Point 4 makes an important point that we have not made before. The problem of climate change is especially difficult to solve because the external cost of carbon emissions crosses all borders and boundaries. A carbon tax is unlikely to be effective if it is imposed by the United States alone. Indeed, it could be even counterproductive if relatively low-carbon U.S. producers were taxed but even higher-carbon foreign competitors. Thus, Point 4 suggests a border adjustment scheme so that at least within the United States all producers, foreign and domestic, would be taxed on a level playing field. The United States is one of the world's largest markets, so Point 4 suggests that this will encourage other countries to adopt carbon taxes. Getting both the economics and the politics right is one of the most difficult parts of designing a global carbon tax.

The politics of a carbon tax are also discussed in Points 2 and 5. Point 2 argues that a carbon tax should be “revenue neutral.” The signatories to the letter don’t necessarily agree on whether the government should spend more or less money on defense or Medicare or the National Institutes of Health. What they do agree on is that a carbon tax is the best way to reduce atmospheric carbon emissions. To get everyone on board, therefore, the economists suggest that all the money raised by the carbon tax should be returned to the residents of the United States. One possibility, for example, is to reduce income taxes by a dollar for every dollar raised by the carbon tax—tax burning not earning. Another possibility is to give each U.S. citizen an equal “carbon dividend.” Here the economists’ signatories are making a political point. A carbon-dividend might be a good way of selling the carbon tax to a large number of voters, especially as the dividend would be more than most voters would pay in tax.

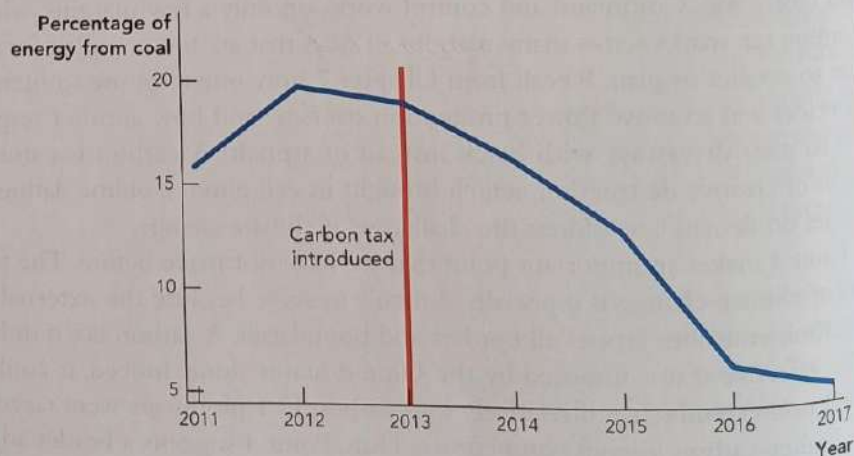


In 1952 coal smog engulfed London, killing thousands of people.

Carbon Taxes Around the World Coal powered the industrial revolution, and for more than 150 years coal was a major source of energy for the United Kingdom. On April 21, 2017, however, the United Kingdom went 24 hours without any electricity generated from coal—the first time this had happened since the 1880s. Coal use had been slowly declining in the United Kingdom since its peak in the 1950s, but as late as 2012, coal still accounted for nearly 20% of U.K. energy use. In 2013, however, the United Kingdom introduced a carbon tax and coal use began a rapid and dramatic decline as shown in Figure 10.5. By 2017, coal accounted for only 5% of energy use. By 2025, it’s expected that coal will be phased out entirely.

Phasing out coal will not only reduce carbon emissions—it will also increase health, as coal burning emissions

FIGURE 10.5



Coal's Share of Primary Energy Use in the U.K. 2011–2017

Data from: Digest of UK Energy Statistics (DUKES), 2018 and <https://ourworldindata.org/death-uk-coal>

are especially toxic. Indeed, some types of pollution are so toxic that they can reduce productivity, meaning that taxing them could result in net gains to production! (See the video at right for more recent evidence on the economic costs of pollution.)

The United Kingdom's carbon tax raised the price of coal relative to other energy sources such as solar, wind, and natural gas. Natural gas is a carbon-emitting fuel, but it emits carbon at half the rate of coal for the same amount of energy, so switching to natural gas reduced the tax on electricity generators and the tax on the environment.

Other countries around the world have also introduced carbon taxes. Canada has a carbon tax and the revenues from the tax are rebated back to Canadian citizens. Mexico, Australia, and Norway also have carbon taxes, and China is planning to slowly introduce the largest tradeable allowance program for carbon (cap and trade) in the world beginning in 2020. Although there is no federal carbon tax in the United States, California has a tradeable allowance program, and there are several regional programs, including the Regional Greenhouse Gas Initiative that covers nine states in the Northeast.

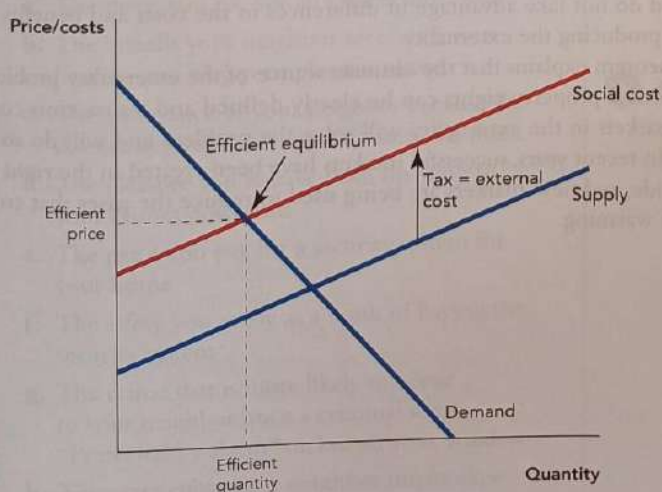


Comparing a Carbon Tax with Tradeable Allowances (Cap and Trade)

There is a close relationship between using carbon taxes and tradeable allowances to solve the externality problem. A tax set equal to the level of the external cost is equivalent to tradeable allowances, where the number of allowances is set equal to the efficient quantity. To achieve the efficient equilibrium in Figure 10.6, for example, the government can either use taxes to raise the price to the efficient price or it can use allowances to reduce the quantity to the efficient quantity. The equilibrium is identical no matter which method is used.

A major difference between taxes and tradeable allowances (cap and trade) is not economic but political. With a tax, firms must pay the government for each

FIGURE 10.6



Comparing Tradeable Allowances and Pigouvian Taxes If we knew the exact positions of the supply and demand curves, then we could always use tradeable allowances to hit the efficient quantity or a tax to hit the efficient price and the equilibrium would be identical.

ton of pollutant that they emit. With tradeable allowances, firms must either use the allowances that they are given or, if they want to emit more, they must buy allowances from other firms. Either way, firms that are given allowances in the initial allocation get a big benefit compared with having to pay taxes. Thus, some people say that allowances equal corrective taxes plus corporate welfare.

That's not necessarily the best way of looking at the issue, however. First, allowances need not be given away; they could be auctioned to the highest bidder, as under some proposed tradeable allowance programs for carbon dioxide—this would also raise significant tax revenue. Making progress against global warming, moreover, may require building a political coalition. A carbon tax pushes one very powerful and interested group, the large energy firms, into the opposition. If tradeable allowances are instead given to firms initially, there is a better chance of bringing the large energy firms into the coalition. Perhaps it's not fair that politically powerful groups must be bought off, but as Otto von Bismarck, Germany's first chancellor, once said, "Laws are like sausages, it is better not to see them being made." We can only add that producing both laws and sausages requires some pork.

CHECK YOURSELF

- Government sets a total quantity of tradeable pollution allowances and auctions them off. After the auction, the price for an individual allowance is high. Over time, the price falls dramatically. What does this tell you?
- The local government has decided to set and apportion tradeable allowances for pollution in your neighborhood. Name three groups that would press for a large total quantity of allowances. Name three groups that would press for a smaller total quantity of allowances. Considering these groups, how likely is it that government would set a total quantity of allowances that would achieve an efficient equilibrium?

Takeaway

In a free market, the quantity of goods sold maximizes consumer plus producer surplus. When the consumers and producers bear all the significant costs and benefits of trading, the market quantity is also the efficient quantity. But when there are external costs or benefits, the market quantity is not the efficient quantity. If it doesn't bear all the costs of pollution, an electricity generator will emit too much pollution. If a person doesn't receive all the benefits of a flu shot, he or she will choose too few flu shots.

There are three types of government solutions to externality problems: taxes and subsidies, command and control, and tradeable allowances. Market prices do not correctly signal true costs and benefits when there are significant external costs or benefits. Taxes and subsidies can adjust prices so that they do send the correct signals. When external costs are significant, the market price is too low, so an optimal tax raises the price. When external benefits are significant, the market price is too high, so an optimal subsidy lowers the price.

Command and control solutions can work but are often high-cost because they are inflexible and do not take advantage of differences in the costs and benefits of eliminating and producing the externality.

The Coase theorem explains that the ultimate source of the externality problem is too few markets. If property rights can be clearly defined and transaction costs reduced, then markets in the externality will solve the problem and will do so at the lowest cost. In recent years, successful markets have been created in the right to emit sulfur dioxide, and new markets are being used to reduce the gases that contribute to global warming.