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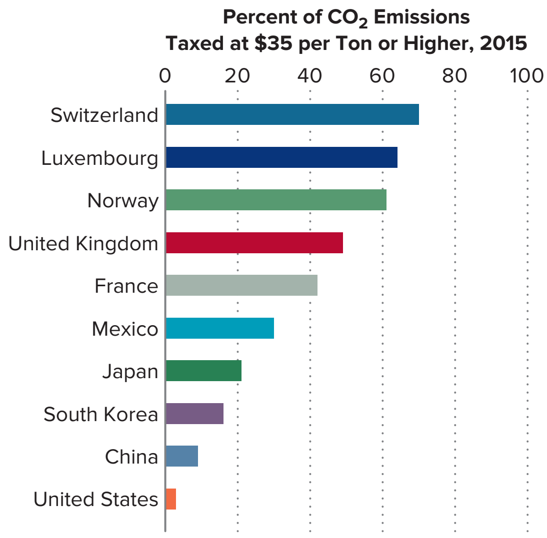
GLOBAL PERSPECTIVE 4.1

PERCENTAGE OF CO_2 EMISSIONS TAXED, SELECTED NATIONS, 2015

Countries vary widely in the percentage of their total carbon dioxide (CO_2) emissions that they tax at a price of $35 per ton or higher. The percentages vary across countries due to both differences in the tax rate per ton and differences in which industries (agricultural, industrial, transportation, etc.) are subject to CO_2 taxes in each country.



Source: compareyourcountry.org, Organization for Economic Co-operation and Development (OECD).

not reflect external costs, shifts leftward (upward) to the total-cost supply curve, S_t. The equilibrium price increases, equilibrium output falls from Q_e to the socially optimal amount Q_o, and the initial overallocation of resources shown in Figure 4.6a is corrected. Observe that the efficiency loss shown by triangle *abc* in Figure 4.6a disappears after the overallocation is corrected in Figure 4.6b.

Pigovian tax A tax or charge levied on the production of a product that generates negative externalities. If set correctly, the tax will precisely offset the overallocation (overproduction) generated by the negative externality.

Pigovian Taxes Another way to approach negative externalities is for government to levy taxes or charges on the related good. These targeted tax assessments are often called **Pigovian taxes** in honor of Arthur Pigou, the first economist to study externalities. Example: The U.S. government has placed a tax on CFCs, which deplete the stratospheric ozone layer protecting Earth from excessive solar ultraviolet radiation. Facing this tax, manufacturers must decide whether to pay the tax or expend additional funds to purchase or develop substitute products. In either case, the tax raises the marginal cost of producing CFCs, shifting the supply curve for this product leftward (upward).

In Figure 4.6b, a tax equal to T per unit increases the firm's marginal cost, shifting the supply curve from S to S_t. The equilibrium price rises, and the equilibrium output declines from Q_e to the economically efficient level Q_o. The tax eliminates the initial overallocation of resources and the associated efficiency loss.

Many governments have imposed Pigovian pollution taxes on carbon dioxide (CO_2) in order to raise the marginal cost of burning fossil fuels and thereby offset the negative externalities imposed by carbon dioxide emissions. Global Perspective 4.1 shows the percentage of carbon-dioxide emissions that are taxed at a rate of $35 per ton or higher in each of ten countries.

Subsidies and Government Provision Where spillover benefits (positive externalities) are large and diffuse, as in our earlier example of inoculations, government has three options for correcting the underallocation of resources:

- ***Subsidies to buyers*** Figure 4.7a replicates the supply-demand situation for positive externalities that you first encountered in Figure 4.5b. Government could correct the underallocation of resources to inoculations by subsidizing consumers of the product. It could give each new mother in the United States a discount coupon to be used for a series of inoculations for her child. The coupon would reduce the "price" to the mother by, say, 50 percent. As Figure 4.7b shows, this program would shift the demand curve for inoculations from too-low D to the appropriate D_t. The number of inoculations would rise from Q_e to the economically optimal Q_o, eliminating the underallocation of resources and the associated efficiency loss.

LAST WORD

Visible Pollution, Hidden Costs

How Can Governments Reduce Air Pollution at the Lowest Possible Cost If Only the Polluters Themselves Know the Costs of Abatement?

Governments around the world are interested in reducing air pollution, especially that which results from the carbon dioxide (CO_2) gas that is released into the atmosphere when fossil fuels like coal and gasoline are burned. But the costs of abatement vary widely depending on what policy a government chooses to pursue. An outright ban on burning fossil fuels, for instance, would be extremely costly as it would shut down tens of thousands of existing businesses, plunging their employees into unemployment.

Thus, governments have pursued less draconian methods of reducing air pollution. If implemented correctly, these alternatives, such as carbon taxes and emissions limits, can generate major reductions at a reasonable cost, thereby avoiding the severe economic dislocation what would come with a sudden outright ban on the burning of fossil fuels.

Sensible pollution-abatement polices account for marginal benefits and marginal costs. Society will want as much of an activity like burning gasoline to power ambulances as is associated with the allocatively efficient output level that takes into account all costs (including negative externalities) as well as all benefits. A draconian policy that bans gasoline would go too far; we need ambulances and are willing to tolerate some air pollution in order to transport people rapidly and affordably to hospitals.

The trick for government, then, is to figure out how to achieve the allocatively efficient output level at the lowest possible cost. As you know from this chapter, that can be accomplished by figuring out the marginal cost of pollution abatement for each source of pollution and comparing it with the marginal benefit associated with mitigating that source of pollution. The government should then take steps to shut down all the polluting activities for which the marginal benefit of abatement exceeds the marginal cost of abatement.

That's a great strategy, but can the government implement it? The answer is yes, but the government needs to overcome an important obstacle. The costs of pollution abatement are not obvious. Would it, for instance, be less costly to eliminate 1 million tons per year of CO_2 emissions by shutting down a small factory in Memphis or by paying to retire highly inefficient older vehicles in Denver? To the extent those costs are known, they are often known to the emitters themselves, but not to the government.

The government therefore encounters an asymmetric information problem. How can it reduce pollution at the lowest cost when it is the polluters themselves that are the only ones likely to know what those costs are? One way is to compel the information. Mandatory vehicle smog checks are a good example. Ninety percent of auto emissions are generated by just 25 percent of vehicles, so it is worthwhile for governments to impose the inspection costs needed to identify the high emitters.

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Tradeable emissions permits ("cap and trade") are another way to overcome the asymmetric information problem. These work by giving polluters a financial incentive to reveal their emission reduction costs and, better yet, follow through on emissions reductions. Suppose the U.S. government knows that the allocatively optimal amount of CO_2 emissions is 4 billion tons per year, but that 5 billion tons are currently being emitted. The government will cap the total amount of emissions by printing up and handing out to polluters only 4 billion tons' worth of tradable emissions permits. Each permit may be for, say, 1 ton of CO_2 emissions, and emitting that amount of CO_2 is legal only if you have a permit.

The government will have to hand out the permits without knowing whether they are going to the emitters that have the lowest costs of abatement. But then the government can let the invisible hand do its work. The permits are tradeable, meaning that they can be bought and sold freely. An emissions-trading market will pop up and what you'll find is that the firms with the highest costs of emissions reduction will purchase permits away from the firms with the lowest costs of emission reduction.

The high-cost firms benefit because it is less expensive for them to buy permits to keep on polluting than it is to reduce their own pollution. And the low-cost firms benefit because they can make more money selling their permits than it will cost them to reduce their emissions (which they must do after they sell away their permits). Both sides win, the externality is reduced at the lowest cost, and society achieves the allocatively efficient level of pollution.

Tradeable pollution permits have worked successfully in several regions for several different types of emissions. They are an economically sophisticated way of overcoming the asymmetric information problem in pollution abatement in order to reduce emissions at the lowest possible cost.