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Green Taxes

Taxes have a poor image. George Washington, who became the first president riding on an antitax movement, argued that “no taxes can be devised which are not more or less inconvenient and unpleasant.”[1] President Jimmy Carter said, “The federal income tax system is a disgrace to the human race.”[2] President G.H.W. Bush declaimed, “Read my lips, no new taxes.”[3] A tax on the large estates of the very richest Americans is labeled a “death tax.” Presidential candidates have trillions of dollars of programs and subsidies but few tax dollars to pay for them.

Economists have a different view of taxes: they are the price we pay for public services. If you want a good public education for children, health care for all, environmental protection, and upgraded infrastructure, you need taxes to pay for these services. As Justice Oliver Wendell Holmes opined, “Taxes are the price of civilized society.”[4]

People often think that taxes and public services live in different worlds. While that is true for individual items, it is wrong in the aggregate. The arithmetic is simple. In the long run, taxes must equal spending. More precisely, if a country does not default on its debt, the present value of taxes must be equal to the present value of spending.

This chapter has a simple message. Some taxes are less damaging and perhaps less painful than others—and indeed some taxes can be advantageous. Here is one way of putting this point. “There are some beneficial taxes. These would be taxes on bads, which can substitute for taxes on goods.” This chapter will explain the logic behind Green taxes.

Tax Efficiency

Economists have been concerned with the efficiency of taxes for more than a century. The basic analysis is explained as follows in introductory economics. When a good or service is taxed, this raises the price to consumers and lowers the price to producers. This price shift will tend to reduce the level of output of that product. For example, it has been shown high cigarette taxes reduce smoking.

If the tax is on inputs, such as labor or capital, then it will lower the posttax earnings of those inputs and tend to reduce the supply. Conversely, companies will tend to move their operations to countries that with low taxes, so-called “tax havens,” such as Ireland. The net effect of taxes or subsidies, therefore, is to distort the level of inputs and outputs away from taxed activities and toward untaxed activities.

Taxes are not uniformly distortionary, however. Taxes on capital, particularly in a world of open borders and mobile investment, tend to be the most distortionary. As an example, suppose that corporate capital is taxed at 50% of net income, while noncorporate capital is untaxed. The results will be a reduction in the amount of corporate capital until its pretax return doubles relative to noncorporate capital. With high corporate taxes, investment in real estate (lightly taxed because of special provisions) would increase while investment in manufacturing (heavily taxed because it has few tax breaks) would decline. The economy would have too many houses and too few factories.

Taxes on labor income are less distortionary. Studies have found that people tend to maintain their work hours when taxes reduce their posttax wages. Unlike capital, people tend to stay put. People are unlikely to emigrate from the United States to Ireland in response to higher taxes, so the distortionary effects of wage taxes are smaller than those on capital income.

Even less distortionary are taxes on *rents*, which are the returns to land and similar items that are fixed in supply. Because land is completely immobile, it will work for whatever it can earn. This means that land taxes have no effect upon land supplied, and there are no distortions at all from taxes on land rents. This interesting theory has been applied to the earnings of highly paid individuals (such as baseball players and business tycoons).

Such highly paid people will work just as hard if their posttax earnings rise (as they have in the last two decades) or fall (should there be a wealth tax on billionaires).

Green Taxes

Where do environmental taxes fit into this spectrum from most distorting (such as on capital) to least distorting (such as land taxes)? Actually, they are off the spectrum. The reason is that environmental taxes reduce activities that society wants to reduce. Hence, a high environmental tax on, say, sulfur dioxide (SO_2) emissions will reduce the "production" of those emissions, which will reduce their damages. This means that Green taxes are beneficial—in other words, they increase economic efficiency—in contrast to virtually all other taxes, which reduce economic efficiency.

If they are beneficial, what is the appropriate level of Green taxes? Should they be set at the level that will maximize government revenues? Or for a fixed percent of needed revenues? Here is where the theory of optimal pollution comes into play. Our discussion of optimal pollution abatement entailed setting the price on pollution equal to its marginal damage. In the case of Green taxes, this implies that the most efficient outcome is that firms pay a tax on their pollution equal to the amount of external damage it causes. Hence, for example, suppose that public-health specialists have determined that the social cost of SO_2 emissions is $3,000 per ton. Then, as a starting point, the efficient tax on SO_2 would be $3,000 per ton.

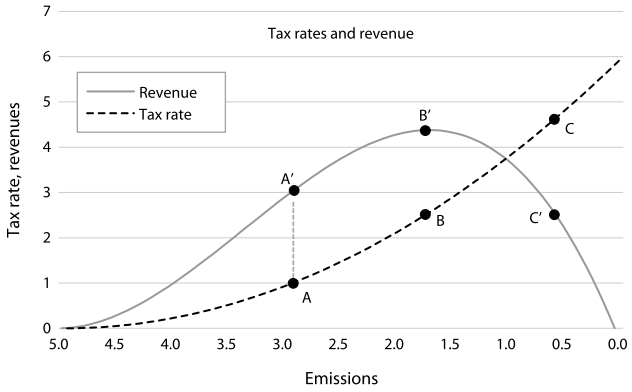

FIGURE 17-1. Taxes, damages, and emissions
Tax rates (*dashed line*) yield emissions on the horizontal axis and revenues on the vertical axis. The hill-shaped revenue curve shows that revenues have a maximum of *B'* of a little above 4 at a tax rate of about $2.5 and then decline at higher tax rates.

This leads to the central point about Green taxes. When the tax rate is set at the marginal damage of the pollutant, the tax will produce the first-best allocation of resources among goods, services, and abatement. It will internalize the externalities. Green taxes do not cause distortions. Rather, they *reduce* distortions because they reduce inefficient pollution. Suppose that an appropriate tax on sulfur emissions reduces the output or even closes a dirty coal plant. That change reflects the external costs that the sulfur emissions were imposing on the community, reduces the distortions from pollution, and improves overall welfare.

Figure 17-1 illustrates the basic analysis. It shows the tax rate and revenues on the vertical axis along with emissions on the horizontal axis. Suppose the government imposes a pollution tax of T on pollutant XO_2 equal to the marginal damage of pollution. Consider the case where the marginal damage and tax rate are equal to $1 per ton, shown as point *A* in figure 17-1. The revenues are the tax rate (T) times the posttax pollution, shown as point *A'* in figure 17-1.

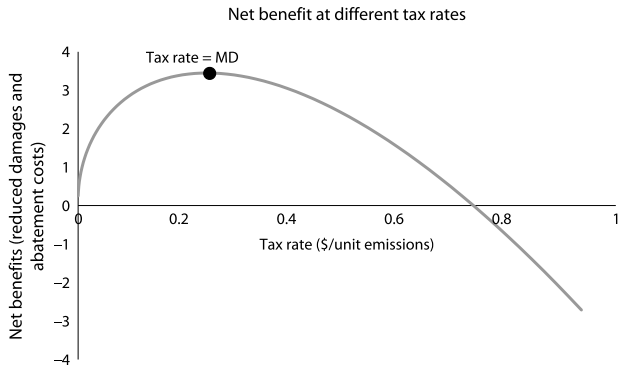

FIGURE 17-2. Net benefits are positive for Green taxes
Note that benefits rise up to the optimal tax rate for Green taxes.

Suppose that damages are higher, at point *C* in the figure. This would lead to revenues at *C'*. The surprising result is that the revenues are lower than at the lower tax and damage rate at *A*. The dome-shaped revenue curve shown as *A'B'C'* is the pollution Laffer curve (named for the economist Arthur Laffer).

For conventional taxes, raising tax rates so high as to reduce revenues—going beyond the maximum revenue point at *B'*—would be fiscal folly because it would both be highly distortionary and reduce revenues. In the case of Green taxes, the optimal tax might well be higher than the revenue-maximizing point. Consider the goal of many environmentalists that carbon emissions be reduced to zero. (Recall the goals of the Green New Deal, described in an earlier chapter, of zero net greenhouse emissions.) Perhaps a $500 carbon tax would achieve this. At a tax rate of $500, revenues would be zero. So we see a case in which the optimal Green tax would have zero revenues.

Figure 17-2 shows the net social value or benefit as a function of the tax rate. The highest net benefit comes at the point where the tax equals the marginal benefit, at the top of the benefit curve. For Green taxes, the top of the benefit curve has a positive altitude (indicating net gain from taxes), while for normal taxes the curve is always underwater, indicating net distortions.

Congestion Pricing: Theory and Practice

One of the most interesting applications of Green taxes has been in the development of congestion pricing, the darling of economists for years. It was originated by Columbia University's William Vickrey (1914–1996). He laid out the principles in a 1952 proposal for the New York City subway and won a Nobel Prize in part for his contribution.

A key concept here is that of congestion externalities. Let us look at an example to illustrate it. When roads are empty, the first car that enters will slow nobody down, so the cost of the travel of the first car imposed on others (the external cost) is zero. However, as traffic increases, every additional car will slow down the cars that follow. Suppose that upon entering the road I increase the time spent in traffic for the 120 cars behind me by one minute. If the value of people's time is $10 per hour, then I have imposed external costs of 120 × (1/60) × $10 = $20. The more the cars and the longer they wait, the higher the imposed external costs.

Vickrey's basic idea was that people should pay for public resources—utilities, roads, airports, and other sectors—just as they pay for private goods like food, shelter, and entertainment. Moreover, the prices should reflect their external costs—the costs imposed on others. They should, according to Vickrey, vary over time depending upon the level of congestion, and they should be charged to all without exception. He envisioned what were at the time fantastic technologies for collection—those that have become commonplace with electronic tolling.

Vickrey admitted that his ideas were not well received by those who set public policy. "People see it as a tax increase, which I think is a gut reaction. When motorists' time is considered, it's really a savings." He insisted that the idea was not to reduce traffic but to increase it by spreading it more evenly over time.

Today, congestion pricing is mainly used in large urban areas such as Singapore, Milan, London, and New York. Most systems are extremely primitive and do not follow the Vickrey approach: they are just "cordon tolls," where vehicles pay a charge for entering a city. For example, London has an £11.50 ($13) daily charge for driving a vehicle within the charging zone between 07:00 and 18:00, Monday to Friday. New York has a similar system. Singapore has moved closest to the Vickrey model, installing an

advanced system with hundreds of electronic toll booths and tolls that vary by type of vehicle, time of day, and real-time congestion.

People often complain that congestion pricing has no impact. However, careful studies show that in fact pricing not only decreases traffic in peak hours but also increases traffic speeds. Perhaps most important for public support is that the revenues have been used to increase public transport, which further reduces traffic and pollution.

Congestion pricing as proposed by Vickrey was decades ahead of its time. Like other ideas that can solve key externalities, it may wait for many a year to gain the approval of Green elites and the public. However, as more cities and governmental agencies adopt it, and as populations become more comfortable and see the beneficial results, it has delivered the double benefits of reducing wasted time and energy and raising revenues for important public services.

The Potential for Green Taxes

The literature on environmental taxes is underpopulated relative to the vast literature on conventional taxes. What are the major potential sources of Green taxes? A review of work in this area suggests many areas where the externalities are underpriced. However, estimating the appropriate prices has proven extremely difficult, so we have only rough estimates.

The major fruitful areas are those where the externality (e.g., pollution) is well measured, where there is a convenient place in the production process to levy the tax, and where the administrative costs are small relative to the revenues. Particularly useful are greenhouse-gas emissions (especially carbon dioxide [CO_2]) and fuels such as gasoline, air pollution, and scarce public water. Here are the leading suspects, focusing on the United States, which has ample data and much environmental damage. Other taxes have either relatively modest tax bases or are much more difficult to implement.

CARBON TAXES

Among potential environmental taxes, by far the most important are carbon taxes. These have a large *tax base*, which refers to the value of the activity on which the tax is based. The carbon tax base is huge because annual CO_2 emissions in the United States are huge. Carbon taxes are attractive as a policy to slow climate change, as will be explained further in the treatment of climate-change policy, but they are also the preeminent environmental tax.

For the United States, here are the approximate estimates of the yield on a carbon tax. Emissions in 2019 were about 5 billion tons of CO_2 for industrial uses and another 1 billion tons of CO_2-equivalent for other gases, such as methane. We can use the U.S. government estimate of the marginal damage, which is $40 per ton. If emissions are unchanged, then total revenues would be 6 billion tons × $40/ton = $240 billion. However, emissions are likely to decline; at this price, emissions would decline by about 25% to 4.5 billion tons per year. This would produce about $180 billion per year, slightly under 1% of gross domestic product (GDP) or 8% of federal revenues at 2019 levels of economic activity.

If policy-makers want to increase the tax over time, say to $100 per ton, that level would increase revenues to about $400 billion per year. Peak revenues would be about $500 billion. Hence, carbon taxes could produce a substantial revenue stream—at least until they become so stringent that they shut down virtually all emissions and revenues.

We close with a reminder that carbon taxes are just a gleam in the eyes of environmentalists and fiscal specialists. The actual revenues in the United States and most other countries today is exactly zero.

Sulfur Dioxide and Other Air Pollution

Another potential source of revenue would be different conventional air pollutants. These would include not only SO_2 but oxides of nitrogen, carbon monoxide, and particulate emissions.

The United States currently gives away pollution permits, but fiscal specialists suggest they should be sold through auctions since these are valuable public property like oil or timber. The potential revenues from a SO_2 auction or tax can be estimated by examining emissions and trading

prices for SO_2. We can calculate the implicit revenues as the revenues if the emissions permits were auctioned, which would be equal to the emissions times the trading prices. From 1994 to 2007, the average implicit revenues were almost $5 billion per year. After that, the price fell sharply because actual emissions were far below the regulated limits, so the implicit revenues collapsed.

These numbers are lower than the ideal, however, because the trading prices were much lower than the estimates of the marginal damage. The marginal damages were estimated to be around $3,000 per ton of SO_2, whereas the average price in the 1994–2007 period was $300 per ton. It seems likely that emissions would have declined sharply sooner with such high sulfur prices. At current emissions and the $3,000 price, the yield would be close to $10 billion annually.

The lesson here is that there are substantial potential revenues from SO_2 taxes, but they are far below those gained by a carbon tax.

The data on other pollutants are more difficult to ascertain because they are more sparse. Nitrogen oxides also have a trading program, and the implicit revenues here were in the range of $1 billion per year in the 2005–2010 period, after which there was a sharp decline in prices. The costliest pollution controls have been regulation of tailpipe emissions in automobiles, where the compliance costs were around $26 billion per year in 2010. If the regulatory approaches had been replaced by emissions taxes, these might have raised revenues in the tens of billions per year, but estimates here are inexact.

TRANSPORTATION EXTERNALITIES AND THE GASOLINE TAX

Automobiles are much despised by environmentalists. According to one study, externalities from automobiles include health damages, traffic congestion, accidents, air pollution, noise, climate change, habitat fragmentation, visual intrusion, degradation of nature and landscape, water pollution, soil pollution, energy dependency, and obesity.[5] While it might be possible to put Green taxes on each of these separately, it is probably convenient to tax an activity that has such a large army of harmful side effects.

The best approach would probably be to tax passenger-miles. This is difficult and intrusive, so most countries focus on taxing fuels—gasoline and diesel. These are plausibly related to CO_2 emissions, but the linkages to the other spillovers are more tenuous. Studies have found the total external effects to be between $1 and $4 per gallon, which is well above the U.S. fuel taxes and close to the taxes in Europe.

There are huge revenue possibilities in motor-fuel taxes. At present, the average tax rate in the United States is about $0.50 per gallon, which yields about $80 billion per year in taxes on motor fuels. If this were increased to $3 per gallon, this would yield about $370 billion a year.

So, as with the carbon tax, there is gold in the gasoline hills. Unlike a carbon tax, however, the gasoline tax is not an ideal Green tax. It would reduce environmental problems closely related to petroleum consumption (such as air pollution). But other issues (such as congestion or obesity) are unlikely to be effectively targeted by higher pump prices.

AUCTIONS OF SCARCE PUBLIC RESOURCES

Multiple other potential areas could be favorably affected by Green taxes (or more generally by resource pricing). The most obvious—and one I would implement virtually overnight—is congestion pricing in airports. If you have ever flown through busy airports such as Kennedy, O'Hare, or LAX, you have endured the long lines of airplanes waiting to take off. "Hi folks, this is your captain. We are number 34 to take off, so we'll wait at the gate and let you roast for 45 minutes. I'll keep you updated."

This malady is easy to cure. Just auction off the 60 slots for departures between 5:00 and 6:00 p.m. at O'Hare airport. The small planes or uneconomical flights to Milwaukee would choose not to fly, while the jumbo jet to London could easily absorb the charge. You can take the train to Milwaukee with little time penalty, but alternative modes from Chicago to London are hard to find.

Suppose airports raised $1 billion a year. The net effect would be less time on the ground and the ability for airports to modernize their facilities. Call this the *infrastructure relief fee*.

Other areas could benefit from the pricing of environmental resources. One is scarce water in the western United States. Water is modern gold there, and the nation is virtually giving it away to irrigate low-value agricultural products. If scarce public water were auctioned off to the highest bidder, the most valuable uses would have the necessary water while the low-value ones would find other uses for their land.

More generally, an interesting observation occurs if we look across the landscape. *Public resources are virtually all underpriced.* This includes not only the air, water, climate, subsoil minerals, grazing rights, and public lands but also less obvious items like landing slots, public highways, parks, and water. Applying the principles of Green taxes here will upgrade their use and raise revenues.

However, as a realistic second point, the fiscal yield on these public resources is likely to be modest, and the opposition is sure to be fierce. Securing the ability to price public resources will be house-to-house combat with the antitax groups as well as those who are short-sighted or want to keep their "free" public resources for themselves.

SIN TAXES

A final area that is important but not really environmental involves "sin taxes"—taxes on harmful products like tobacco, firearms, gambling, and alcohol. While these do involve some externalities (such as secondhand smoke, murder, financial ruin, and road accidents), the primary societal rationale on these is to discourage self-destructive behavior.

Sin taxes are currently substantial for tobacco, less so for alcohol, and virtually nonexistent for firearms and gambling. Taxes at rates of 50% for both discouragement and to reflect social costs would bring in substantial additional revenues here.

TABLE 17-1. Estimates of current and potential Green taxes for the United States

	Current revenues	Potential revenues
Externality	[Billions of 2018 $ per year]	
Climate change		

TABLE 17-1. Estimates of current and potential Green taxes for the United States

	Current revenues	Potential revenues
Externality	[Billions of 2018 $ per year]	
CO_2	0	159
Other GHGs	0	36
Ozone depletion	~0	1
SO_2	0	10
NOx	0	5
Other air pollutants	0	na
Water	0	[20]
Congestion	0	[20]
Motor Fuels	80	370
Tobacco	31	60
Alcohol	16	50
Firearms	2	40
Gambling	14	70
TOTAL	144	801
Total as % of federal expenditures	**4%**	**24%**

Numbers in brackets are estimates based on estimates of costs.

Source: Figures on the yield on existing Green taxes are generally from the Bureau of Economic Analysis and the Department of the Treasury.

Note: The numbers in brackets are rough estimates because reliable estimates are not available.

SUMMARY ON THE POTENTIAL FOR GREEN TAXES

Table 17-1 shows a rough estimate of existing Green taxes along with their potential. Currently, Green taxes amount to $144 billion, or about 4% of federal revenues. The main areas for expansion are carbon taxes, fuel taxes, and sin taxes. At plausible rates to reflect the social costs, Green taxes could raise close to one-quarter of current federal revenues.

TABLE 17-2. Environmental taxes by category

Sector	Share of Green taxes in OECD, 1995 (%)
Transportation fuels	64
Motor vehicles	26
Heating fuels	5
Electricity	3
Waste	1
Other	1

The figure shows the major areas of Green taxes in OECD countries.

Source: OECD, *Environmentally Related Taxes in OECD Countries*, Paris, 2001.

Green taxes have the potential for a substantial amount of revenue if they are implemented in key areas. These taxes not only help pay for necessary government activities but also have the advantage of improving the functioning of the economy and society. Perhaps more important is that they can help achieve society's Green objectives (such as cleaning the air or slowing climate change) while minimizing bureaucratic regulatory approaches.

Green Taxes in Practice

If we look at Green taxes in practice, they are a hodgepodge of taxes of convenience in different sectors. Table 17-2 shows the averages for different countries along with the major sectors.[6]

A few points stand out. As table 17-2 shows, most environmental taxes are levied on road transport, either motor fuels or vehicles. These comprise about 90% of environmental taxes in all advanced countries, and an even larger share in the United States. But a further look shows that environmental taxes are a small part of revenues: environmental taxes comprise only 5% of all taxes for advanced countries.

Third, most environmental taxes are not pure environmental charges since they do not directly tax the externality. For example, a gasoline tax does reduce gasoline consumption, but it does not directly tax many of the externalities associated with transportation.

So where do we stand? How are governments using these taxes? Here are the basic results.

ON CARBON TAXES

The chapters on climate change later in this book will suggest that the marginal damage and optimal carbon tax is in the neighborhood of $40 per ton of CO_2. The World Bank estimates that the average carbon tax (or price) in major countries is about $2 per ton.[7] This includes both explicit taxes and the market price from carbon-trading regimes. The United States is not using a carbon tax at all, with its zero tax rate. Hence, this tax is essentially unused.

FOR SULFUR DIOXIDE

The United States and some other regions use a cap-and-trade system to limit SO_2 emissions. While the trading prices in the early years (after 1990) were substantial, in recent years they have fallen sharply. The actual price is far below the estimated marginal damage. Finally, since the allowances are given away to firms rather than auctioned, no revenues are collected. Hence, the major pollutant of SO_2 is not subject to Green taxation.

OZONE-DEPLETING CHEMICALS

One of the few true Green taxes is the U.S. tax on ozone-depleting chemicals like chlorofluorocarbons. The tax is proportional to the ozone-depleting potential of the product. While these have a genuine Green design, the tax rates are much lower than the marginal social cost.

Impact on Inequality

A standard concern with Green taxes is that they are regressive—that is, they have a larger impact on relatively poor households. The reason for the regressivity is that low-income households spend a larger fraction of their incomes on energy and other environmentally sensitive goods and services. The distributional impact of Green policies more generally was addressed for pollution control in chapter 4.

While Green taxes tend to be regressive, fiscal specialists offer a simple remedy. The revenues can be partially rebated to households in a manner that offsets the regressivity. An outstanding study by Gilbert Metcalf investigated possible combinations of Green taxes and rebates to determine a package that would be neutral across income groups. He found that a package of Green taxes would have a negligible impact on the income distribution if the funds are rebated to households through reductions in the payroll tax and personal income tax.[8]

Conclusion on Green Taxation

Green taxes are one of the clearest and cleanest examples of how Green thinking can improve the health and prosperity of countries. Green tax reform allows countries to pursue the twin objectives of raising revenues efficiently while improving the environment.

However, countries have seldom realized the promise of Green taxation and have largely ignored this powerful new set of taxes. Aside from gasoline taxation (worthwhile, but only indirectly related to environmental objectives), there are essentially no Green taxes. The most useful single environmental tax is a carbon tax—a tax that would move toward a central environmental objective, is easy to measure and enforce, and has the potential for large revenues. Other examples—such as taxes on conventional air pollutants, congestion, water, and other resources—are useful but more complicated and have smaller revenue consequences.

The summary here is that Green taxes are one of the most promising innovations of recent years. They are the holy trinity of environmental policy: they pay for valuable public services, they meet our environmental objectives efficiently, and they are nondistortionary. Few policies can be endorsed with such enthusiasm.