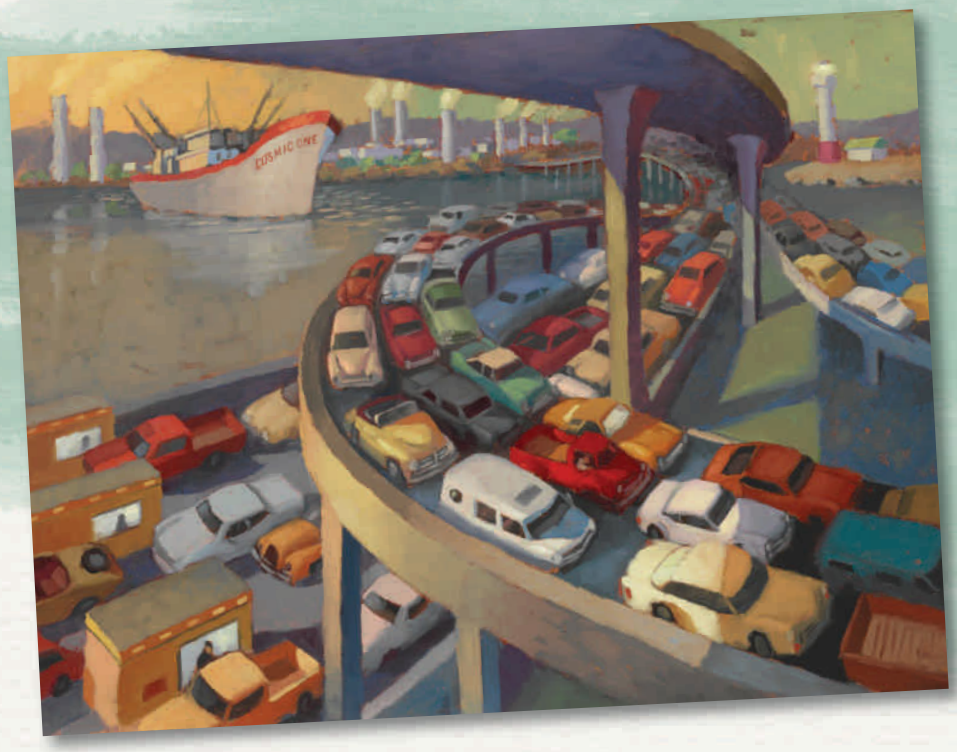


CHAPTER

12

The Design of the Tax System

Al "Scarface" Capone, the notorious 1920s gangster and crime boss, was never convicted for his many violent crimes. Yet eventually, he did go to jail—for tax evasion. He had neglected to heed Ben Franklin's observation that "in this world nothing is certain but death and taxes."

When Franklin made this claim in 1789, the average American paid less than 5 percent of his income in taxes, and that remained true for the next hundred years. Over the course of the 20th century, however, taxes became ever more important in the life of the typical U.S. citizen. Today, all taxes taken together—including personal income taxes, corporate income taxes, payroll taxes, sales taxes, and property taxes—use up about a third of the average American's income. In many European countries, the tax bite is even larger.

Taxes are inevitable because we as citizens expect the government to provide us with various goods and services. The previous two chapters shed light on one of the *Ten Principles of Economics* from Chapter 1: The government can sometimes improve market outcomes. When the government remedies an externality (such as air pollution), provides a public good (such as national defense), or regulates the use of a common resource (such as fish in a public lake), it can raise economic well-being. Yet these activities are costly. For the government to perform these and its many other functions, it needs to raise revenue through taxation.

We began our study of taxation in earlier chapters, where we saw how a tax on a good affects supply and demand for that good. In Chapter 6, we saw that a tax reduces the quantity sold in a market, and we examined how the burden of a tax is shared by buyers and sellers depending on the elasticities of supply and demand. In Chapter 8, we examined how taxes affect economic well-being. We learned that taxes cause *deadweight losses:* The reduction in consumer and producer surplus resulting from a tax exceeds the revenue raised by the government.

In this chapter, we build on these lessons to discuss the design of a tax system. We begin with a financial overview of the U.S. government. When thinking about the tax system, it is useful to know some basic facts about how the U.S. government raises and spends money. We then consider the fundamental principles of taxation. Most people agree that taxes should impose as small a cost on society as possible and that the burden of taxes should be distributed fairly. That is, the tax system should be both *efficient* and *equitable*. As we will see, however, stating these goals is easier than achieving them.

A FINANCIAL OVERVIEW OF THE U.S. GOVERNMENT

How much of the nation's income does the government take as taxes? Figure 1 shows government revenue, including federal, state, and local governments, as a percentage of total income for the U.S. economy. It shows that the role of government has grown substantially over the past century. In 1902, the government

FIGURE 1

Government Revenue as a Percentage of GDP

This figure shows revenue of the federal government and of state and local governments as a percentage of gross domestic product (GDP), which measures total income in the economy. It shows that the government plays a large role in the U.S. economy and that its role has grown over time.

Source: *Historical Statistics of the United States*; Bureau of Economic Analysis; and author's calculations.

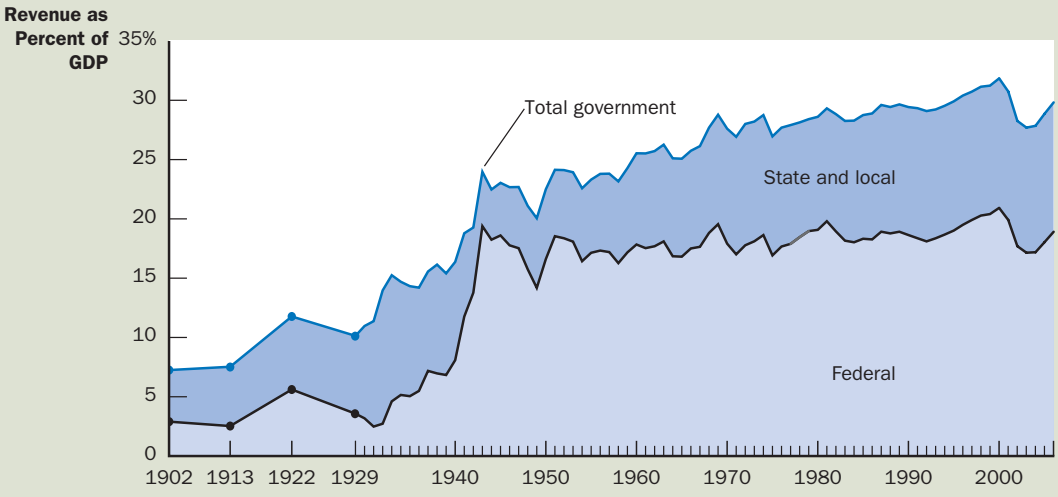


TABLE 1

Total Government Tax Revenue as a Percentage of GDP

Sweden	50%	United States	28%
France	45	Japan	27
United Kingdom	37	Mexico	20
Germany	36	Chile	19
Canada	36	China	15
Brazil	30	India	14
Russia	32		

Source: OECD, United Nations. Data are for most recent year available.

collected 7 percent of total income; in recent years, government has collected about 30 percent. In other words, as the economy's income has grown, the government's revenue from taxation has grown even more.

Table 1 compares the tax burden for several major countries, as measured by the government's tax revenue as a percentage of the nation's total income. The United States is in the middle of the pack. The U.S. tax burden is low compared to many European countries, but it is high compared to some other nations around the world. Less economically developed countries, such as India, often have relatively low tax burdens. This fact is consistent with the evidence in Figure 1 of a growing tax burden over time: As a nation gets richer, the government typically takes a larger share of income in taxes.

The overall size of government tells only part of the story. Behind the total dollar figures lie thousands of individual decisions about taxes and spending. To understand the government's finances more fully, let's look at how the total breaks down into some broad categories.

The Federal Government

The U.S. federal government collects about two-thirds of the taxes in our economy. It raises this money in a number of ways, and it finds even more ways to spend it.

Receipts Table 2 shows the receipts of the federal government in 2007. Total receipts that year were $2,568 billion, a number so large that it is hard to

TABLE 2

Receipts of the Federal Government: 2007

Tax	Amount (billions)	Amount per Person	Percent of Receipts
Individual income taxes	$1,163	$3,851	45%
Social insurance taxes	870	2,881	34
Corporate income taxes	370	1,225	14
Other	165	546	7
Total	$2,568	$8,503	100%

Source: *Economic Report of the President*, 2008, Table B-81.

comprehend. To bring this astronomical number down to earth, we can divide it by the size of the U.S. population, which was about 302 million in 2007. We then find that the average American paid $8,503 to the federal government.

The largest source of revenue for the federal government is the individual income tax. As April 15 approaches each year, almost every American family fills out a tax form to determine how much income tax it owes the government. Each family is required to report its income from all sources: wages from working, interest on savings, dividends from corporations in which it owns shares, profits from any small businesses it operates, and so on. The family's *tax liability* (how much it owes) is then based on its total income.

A family's income tax liability is not simply proportional to its income. Instead, the law requires a more complicated calculation. Taxable income is computed as total income minus an amount based on the number of dependents (primarily children) and minus certain expenses that policymakers have deemed "deductible" (such as mortgage interest payments, state and local tax payments, and charitable giving). Then the tax liability is calculated from taxable income using a schedule such as the one shown in Table 3.

This table presents the *marginal tax rate*—the tax rate applied to each additional dollar of income. Because the marginal tax rate rises as income rises, higher-income families pay a larger percentage of their income in taxes. Note that each tax rate in the table applies only to income within the associated range, not to a person's entire income. For example, a person with an income of $1 million still pays only 10 percent of the first $7,825. (Later in this chapter we discuss the concept of marginal tax rate more fully.)

Almost as important to the federal government as the individual income tax are payroll taxes. A *payroll tax* is a tax on the wages that a firm pays its workers. Table 2 calls this revenue *social insurance taxes* because the revenue from these taxes is earmarked to pay for Social Security and Medicare. Social Security is an income-support program designed primarily to maintain the living standards of the elderly. Medicare is the government health program for the elderly. Table 2 shows that the average American paid $2,881 in social insurance taxes in 2007.

Next in magnitude, but much smaller than either individual income taxes or social insurance taxes, is the corporate income tax. A *corporation* is a business that is set up as a separate legal entity. The government taxes each corporation based on its profit—the amount the corporation receives for the goods or services it sells minus the costs of producing those goods or services. Notice that corporate profits

3 TABLE

The Federal Income Tax Rates: 2007

This table shows the marginal tax rates for an unmarried taxpayer. The taxes owed by a taxpayer depend on all the marginal tax rates up to his or her income level. For example, a taxpayer with income of $25,000 pays 10 percent of the first $7,825 of income, and then 15 percent of the rest.

On Taxable Income . . .	The Tax Rate Is . . .
Up to $7,825	10%
From $7,825 to $31,850	15%
From $31,850 to $77,100	25%
From $77,100 to $160,850	28%
From $160,850 to $349,700	33%
Over $349,700	35%

are, in essence, taxed twice. They are taxed once by the corporate income tax when the corporation earns the profits; they are taxed a second time by the individual income tax when the corporation uses its profits to pay dividends to its shareholders. In 2003, the tax rate on dividend income was reduced to 15 percent, in part to compensate for this double taxation.

The last category, labeled "other" in Table 2, makes up 7 percent of receipts. This category includes *excise taxes*, which are taxes on specific goods like gasoline, cigarettes, and alcoholic beverages. It also includes various small items, such as estate taxes and customs duties.

Spending Table 4 shows the spending of the federal government in 2007. Total spending was $2,730 billion, or $9,040 per person. This table also shows how the federal government's spending was divided among major categories.

The largest category in Table 4 is Social Security, which represents mostly transfer payments to the elderly. A *transfer payment* is a government payment not made in exchange for a good or service. This category made up 21 percent of spending by the federal government in 2007.

The second largest category of spending is national defense. This includes both the salaries of military personnel and the purchases of military equipment such as guns, fighter jets, and warships. Spending on national defense fluctuates over time as international tensions and the political climate change. Not surprisingly, spending on national defense rises substantially during wars. In part because of the war in Iraq, defense spending rose from 17 to 20 percent of total federal spending from 2001 to 2007.

Health spending looms large in the federal budget. Medicare, the third category in Table 4, is the government's health plan for the elderly. The fifth category in the table is other health spending, which includes Medicaid, the federal health program for the poor, and spending on medical research, such as through the National Institutes of Health. Total health spending makes up about a quarter of the federal budget.

The fourth category in Table 4 is spending on income security, which includes transfer payments to poor families. One program is Temporary Assistance for Needy Families (TANF), often simply called "welfare." Another is the Food

TABLE 4

Spending of the Federal Government: 2007

Category	Amount (billions)	Amount per Person	Percent of Spending
Social Security	$ 586	$1,940	21%
National defense	553	1,831	20
Medicare	375	1,242	14
Income security	366	1,212	13
Health	266	881	10
Net interest	237	785	9
Other	347	1,149	13
Total	$2,730	$9,040	100%

Source: *Economic Report of the President*, 2008, Table B-81.

Stamp program, which gives poor families vouchers that they can use to buy food. The federal government pays some of this money to state and local governments, which administer the programs under federal guidelines.

Next on the list is net interest. When a person borrows from a bank, the bank requires the borrower to pay interest for the loan. The same is true when the government borrows from the public. The more indebted the government, the larger the amount it must spend in interest payments.

The "other" category in Table 4 consists of many less expensive functions of government. It includes, for example, the federal court system, the space program, and farm-support programs, as well as the salaries of members of Congress and the president.

You might have noticed that total receipts of the federal government shown in Table 2 fall short of total spending shown in Table 4 by $162 billion. In such a situation, the government is said to run a **budget deficit**. When receipts exceed spending, the government is said to run a **budget surplus**. The government finances a budget deficit by borrowing from the public. That is, it sells government debt to the private sector, including both investors in the United States and those abroad. When the government runs a budget surplus, it uses the excess receipts to reduce its outstanding debts.

budget deficit
an excess of government spending over government receipts

budget surplus
an excess of government receipts over government spending

THE FISCAL CHALLENGE AHEAD

In 2007, the federal government ran a budget deficit of $162 billion. This excess of government spending over government revenue is only the tip of an iceberg: Long-term projections of the government's budget show that, under current law, the government will spend vastly more than it will receive in tax revenue in the decades ahead. As a percentage of gross domestic product (the total income in the economy), taxes are projected to be about constant. But government spending as a percentage of GDP is projected to rise gradually but substantially over the next several decades.

One reason for the rise in government spending is that Social Security and Medicare provide significant benefits for the elderly, who are a growing percentage of the overall population. Over the past half century, medical advances and lifestyle improvements have greatly increased life expectancy. In 1950, a man age 65 could expect to live for another 13 years; now he can expect to live another 17 years. The life expectancy of a 65-year-old woman has risen from 16 years in 1950 to 20 years today. At the same time, people are having fewer children. In 1950, the typical woman had three children. Today, the number is about two. As a result of smaller families, the labor force is growing more slowly now than it has in the past.

Panel (a) of Figure 2 shows the demographic shift that is arising from the combination of longer life expectancy and lower fertility. In 1950, the elderly population equaled about 14 percent of the working-age population. Now the elderly are about 21 percent of the working-age population, and that figure will rise to about 40 percent over the next 50 years. This means that there will be fewer workers paying taxes to support the government benefits that each elderly person receives.

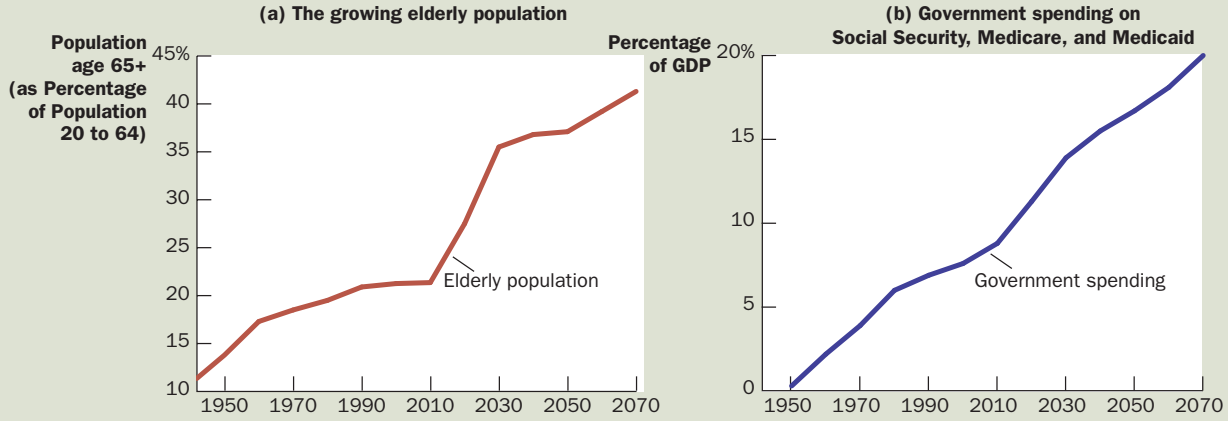
A second, related trend that will affect government spending in the decades ahead is the rising cost of healthcare. The government provides healthcare to the elderly through the Medicare system and to the poor through Medicaid. As the cost of healthcare increases, government spending on these programs will increase as well.

FIGURE 2

The Demographic and Fiscal Challenge

Panel (a) shows the U.S. population age 65 and older as a percentage of the population age 20 to 64. The growing elderly population will put increasing pressure on the government budget. Panel (b) shows government spending on Social Security, Medicare, and Medicaid as a percentage of GDP. The projection for future years assumes no change in current law. Unless changes in benefits are enacted, government spending on these programs will rise significantly and will require large tax increases to pay for them.

Source: Congressional Budget Office.



Policymakers have proposed various ways to stem the rise in healthcare costs, such as reducing the burden of lawsuits on the healthcare system, encouraging more competition among healthcare providers, and promoting greater use of information technology. Most health economists, however, believe that such measures will have only a limited impact. The main reason for rising healthcare costs is medical advances that provide new, better, but often expensive ways to extend and improve our lives.

Panel (b) of Figure 2 shows government spending on Social Security, Medicare, and Medicaid as a percentage of GDP. Spending on these programs has risen from less than 1 percent in 1950 to about 8 percent today. The combination of a growing elderly population and rising healthcare costs is expected to continue and even accelerate the trend.

How our society will handle these spending increases is an open question. Simply increasing the budget deficit is not feasible. A budget deficit just pushes the cost of government spending onto a future generation of taxpayers, who will inherit a government with greater debts. In the long run, the government needs to pay for what it spends.

Some economists believe that to pay for these commitments, we will need to raise taxes substantially as a percentage of GDP. If so, the long-term trend we saw in Figure 1 will continue. Spending on Social Security, Medicare, and Medicaid is expected to rise by about 10 percentage points of GDP. Because taxes are now 30 percent of GDP, paying for these benefits would require approximately a one-third increase in all taxes.

Other economists believe that such high tax rates would impose too great a cost on younger workers. They believe that policymakers should reduce the promises now being made to the elderly of the future and that, at the same time, people should be encouraged to take a greater role caring for themselves as they age. This might entail raising the normal retirement age, while giving people more incentive to save during their working years to prepare for their own retirement and health costs.

It is likely that the final resolution will involve a combination of measures. No one can dispute that resolving this debate is one of the great challenges ahead. ●

State and Local Government

State and local governments collect about 40 percent of all taxes paid. Let's look at how they obtain tax revenue and how they spend it.

Receipts Table 5 shows the receipts of U.S. state and local governments. Total receipts for 2005 were $2,021 billion, or $6,827 per person. The table also shows how this total is broken down into different kinds of taxes.

The two most important taxes for state and local governments are sales taxes and property taxes. Sales taxes are levied as a percentage of the total amount spent at retail stores. Every time a customer buys something, he or she pays the storekeeper an extra amount that the storekeeper remits to the government. (Some states exclude certain items that are considered necessities, such as food and clothing.) Property taxes are levied as a percentage of the estimated value of land and structures and are paid by property owners. Together, these two taxes make up more than a third of all receipts of state and local governments.

State and local governments also levy individual and corporate income taxes. In many cases, state and local income taxes are similar to federal income taxes. In other cases, they are quite different. For example, some states tax income from wages less heavily than income earned in the form of interest and dividends. Some states do not tax income at all.

State and local governments also receive substantial funds from the federal government. To some extent, the federal government's policy of sharing its revenue

5 TABLE

Receipts of State and Local Governments: 2005

Source: *Economic Report of the President*, 2008, Table B-86.

Tax	Amount (billions)	Amount per Person	Percent of Spending
Sales taxes	$ 383	$1,294	19%
Property taxes	336	1,135	17
Individual income taxes	241	814	12
Corporate income taxes	43	145	2
From federal government	438	1,480	22
Other	580	1,959	28
Total	$2,021	6,827	100%

TABLE 6

Spending of State and Local Governments: 2005

Category	Amount (billions)	Amount per Person	Percent of Spending
Education	$ 689	$2,328	34%
Public welfare	367	1,240	18
Highways	124	419	6
Other	834	2,817	42
Total	$2,014	$6,804	100%

Source: *Economic Report of the President*, 2008, Table B-86.

with state governments redistributes funds from high-income states (who pay more taxes) to low-income states (who receive more benefits). Often, these funds are tied to specific programs that the federal government wants to subsidize.

Finally, state and local governments receive much of their receipts from various sources included in the "other" category in Table 5. These include fees for fishing and hunting licenses, tolls from roads and bridges, and fares for public buses and subways.

Spending Table 6 shows the total spending of state and local governments in 2005 and its breakdown among the major categories.

By far the biggest single expenditure for state and local governments is education. Local governments pay for the public schools, which educate most students from kindergarten through high school. State governments contribute to the support of public universities. In 2005, education accounted for about a third of the spending of state and local governments.

The second largest category of spending is for public welfare, which includes transfer payments to the poor. This category includes some federal programs that are administered by state and local governments. The next category is highways, which includes the building of new roads and the maintenance of existing ones. The large "other" category in Table 6 includes the many additional services provided by state and local governments, such as libraries, police, garbage removal, fire protection, park maintenance, and snow removal.

QUICK QUIZ What are the two most important sources of tax revenue for the federal government? • What are the two most important sources of tax revenue for state and local governments?

TAXES AND EFFICIENCY

Now that we have seen how various levels of the U.S. government raise and spend money, let's consider how one might evaluate its tax policy and design a tax system. The primary aim of a tax system is to raise revenue for the government, but there are many ways to raise any given amount of money. When choosing among

the many alternative tax systems, policymakers have two objectives: efficiency and equity.

One tax system is more efficient than another if it raises the same amount of revenue at a smaller cost to taxpayers. What are the costs of taxes to taxpayers? The most obvious cost is the tax payment itself. This transfer of money from the taxpayer to the government is an inevitable feature of any tax system. Yet taxes also impose two other costs, which a well-designed tax policy tries to avoid or, at least, minimize:

- The deadweight losses that result when taxes distort the decisions that people make
- The administrative burdens that taxpayers bear as they comply with the tax laws

An efficient tax system is one that imposes small deadweight losses and small administrative burdens.

Deadweight Losses

One of the *Ten Principles of Economics* is that people respond to incentives, and this includes incentives provided by the tax system. If the government taxes ice cream, people eat less ice cream and more frozen yogurt. If the government taxes housing, people live in smaller houses and spend more of their income on other things. If the government taxes labor earnings, people work less and enjoy more leisure.

Because taxes distort incentives, they entail deadweight losses. As we first discussed in Chapter 8, the deadweight loss of a tax is the reduction in economic well-being of taxpayers in excess of the amount of revenue raised by the government. The deadweight loss is the inefficiency that a tax creates as people allocate resources according to the tax incentive rather than the true costs and benefits of the goods and services that they buy and sell.

To recall how taxes cause deadweight losses, consider an example. Suppose that Joe places an $8 value on a pizza, and Jane places a $6 value on it. If there is no tax on pizza, the price of pizza will reflect the cost of making it. Let's suppose that the price of pizza is $5, so both Joe and Jane choose to buy one. Both consumers get some surplus of value over the amount paid. Joe gets consumer surplus of $3, and Jane gets consumer surplus of $1. Total surplus is $4.

Now suppose that the government levies a $2 tax on pizza and the price of pizza rises to $7. Joe still buys a pizza, but now he has consumer surplus of only $1. Jane now decides not to buy a pizza because its price is higher than its value to her. The government collects tax revenue of $2 on Joe's pizza. Total consumer surplus has fallen by $3 (from $4 to $1). Because total surplus has fallen by more than the tax revenue, the tax has a deadweight loss. In this case, the deadweight loss is $1.

Notice that the deadweight loss comes not from Joe, the person who pays the tax, but from Jane, the person who doesn't. The reduction of $2 in Joe's surplus exactly offsets the amount of revenue the government collects. The deadweight loss arises because the tax causes Jane to alter her behavior. When the tax raises the price of pizza, Jane is worse off, and yet there is no offsetting revenue to the government. This reduction in Jane's welfare is the deadweight loss of the tax.

"I WAS GONNA FIX THE PLACE UP, BUT IF I DID THE CITY WOULD JUST RAISE MY TAXES!"

CARTOON: BERRY'S WORLD REPRINTED BY PERMISSION OF UNITED FEATURE SYNDICATE, INC.

CASE STUDY SHOULD INCOME OR CONSUMPTION BE TAXED?

When taxes induce people to change their behavior—such as inducing Jane to buy less pizza—the taxes cause deadweight losses and make the allocation of resources less efficient. As we have already seen, much government revenue comes from the individual income tax. In a case study in Chapter 8, we discussed how this tax discourages people from working as hard as they otherwise might. Another inefficiency caused by this tax is that it discourages people from saving.

Consider a person 25 years old who is considering saving $100. If he puts this money in a savings account that earns 8 percent and leaves it there, he would have $2,172 when he retires at age 65. Yet if the government taxes one-fourth of his interest income each year, the effective interest rate is only 6 percent. After 40 years of earning 6 percent, the $100 grows to only $1,029, less than half of what it would have been without taxation. Thus, because interest income is taxed, saving is much less attractive.

Some economists advocate eliminating the current tax system's disincentive toward saving by changing the basis of taxation. Rather than taxing the amount of income that people earn, the government could tax the amount that people spend. Under this proposal, all income that is saved would not be taxed until the saving is later spent. This alternative system, called a *consumption tax*, would not distort people's saving decisions.

Various provisions of the current tax code already make the tax system a bit like a consumption tax. Taxpayers can put a limited amount of their saving into special accounts—such as Individual Retirement Accounts and 401(k) plans—that escape taxation until the money is withdrawn at retirement. For people who do most of their saving through these retirement accounts, their tax bill is, in effect, based on their consumption rather than their income.

European countries tend to rely more on consumption taxes than does the United States. Most of them raise a significant amount of government revenue through a value-added tax, or a VAT. A VAT is like the retail sales tax that many U.S. states use, but rather than collecting all of the tax at the retail level when the consumer buys the final good, the government collects the tax in stages as the good is being produced (that is, as value is added by firms along the chain of production).

Various U.S. policymakers have proposed that the tax code move further in the direction of taxing consumption rather than income. In 2005, economist Alan Greenspan, then Chairman of the Federal Reserve, offered this advice to a presidential commission on tax reform: "As you know, many economists believe that a consumption tax would be best from the perspective of promoting economic growth—particularly if one were designing a tax system from scratch—because a consumption tax is likely to encourage saving and capital formation. However, getting from the current tax system to a consumption tax raises a challenging set of transition issues." ●

Administrative Burden

If you ask the typical person on April 15 for an opinion about the tax system, you might get an earful (perhaps peppered with expletives) about the headache of

filling out tax forms. The administrative burden of any tax system is part of the inefficiency it creates. This burden includes not only the time spent in early April filling out forms but also the time spent throughout the year keeping records for tax purposes and the resources the government has to use to enforce the tax laws.

Many taxpayers—especially those in higher tax brackets—hire tax lawyers and accountants to help them with their taxes. These experts in the complex tax laws fill out the tax forms for their clients and help them arrange their affairs in a way that reduces the amount of taxes owed. This behavior is legal tax avoidance, which is different from illegal tax evasion.

Critics of our tax system say that these advisers help their clients avoid taxes by abusing some of the detailed provisions of the tax code, often dubbed "loopholes." In some cases, loopholes are congressional mistakes: They arise from ambiguities or omissions in the tax laws. More often, they arise because Congress has chosen to give special treatment to specific types of behavior. For example, the U.S. federal tax code gives preferential treatment to investors in municipal bonds because Congress wanted to make it easier for state and local governments to borrow money. To some extent, this provision benefits states and localities, and to some extent, it benefits high-income taxpayers. Most loopholes are well known by those in Congress who make tax policy, but what looks like a loophole to one taxpayer may look like a justifiable tax deduction to another.

The resources devoted to complying with the tax laws are a type of deadweight loss. The government gets only the amount of taxes paid. By contrast, the taxpayer loses not only this amount but also the time and money spent documenting, computing, and avoiding taxes.

The administrative burden of the tax system could be reduced by simplifying the tax laws. Yet simplification is often politically difficult. Most people are ready to simplify the tax code by eliminating the loopholes that benefit others, but few are eager to give up the loopholes that benefit them. In the end, the complexity of the tax law results from the political process as various taxpayers with their own special interests lobby for their causes.

Marginal Tax Rates versus Average Tax Rates

average tax rate
total taxes paid divided by total income

marginal tax rate
the extra taxes paid on an additional dollar of income

When discussing the efficiency and equity of income taxes, economists distinguish between two notions of the tax rate: the average and the marginal. The **average tax rate** is total taxes paid divided by total income. The **marginal tax rate** is the extra taxes paid on an additional dollar of income.

For example, suppose that the government taxes 20 percent of the first $50,000 of income and 50 percent of all income above $50,000. Under this tax, a person who makes $60,000 pays a tax of $15,000: 20 percent of the first $50,000 ($0.20 \times \$50{,}000 = \$10{,}000$) plus 50 percent of the next $10,000 ($0.50 \times \$10{,}000 = \$5{,}000$). For this person, the average tax rate is $15,000 / $60,000, or 25 percent. But the marginal tax rate is 50 percent. If the taxpayer earned an additional dollar of income, that dollar would be subject to the 50 percent tax rate, so the amount the taxpayer would owe to the government would rise by $0.50.

The marginal and average tax rates each contain a useful piece of information. If we are trying to gauge the sacrifice made by a taxpayer, the average tax rate is more appropriate because it measures the fraction of income paid in taxes. By contrast, if we are trying to gauge how much the tax system distorts incentives,

the marginal tax rate is more meaningful. One of the *Ten Principles of Economics* in Chapter 1 is that rational people think at the margin. A corollary to this principle is that the marginal tax rate measures how much the tax system discourages people from working. If you are thinking of working an extra few hours, the marginal tax rate determines how much the government takes of your additional earnings. It is the marginal tax rate, therefore, that determines the deadweight loss of an income tax.

Lump-Sum Taxes

Suppose the government imposes a tax of $4,000 on everyone. That is, everyone owes the same amount, regardless of earnings or any actions that a person might take. Such a tax is called a **lump-sum tax**.

lump-sum tax
a tax that is the same amount for every person

A lump-sum tax shows clearly the difference between average and marginal tax rates. For a taxpayer with income of $20,000, the average tax rate of a $4,000 lump-sum tax is 20 percent; for a taxpayer with income of $40,000, the average tax rate is 10 percent. For both taxpayers, the marginal tax rate is zero because no tax is owed on an additional dollar of income.

A lump-sum tax is the most efficient tax possible. Because a person's decisions do not alter the amount owed, the tax does not distort incentives and, therefore, does not cause deadweight losses. Because everyone can easily compute the amount owed and because there is no benefit to hiring tax lawyers and accountants, the lump-sum tax imposes a minimal administrative burden on taxpayers.

If lump-sum taxes are so efficient, why do we rarely observe them in the real world? The reason is that efficiency is only one goal of the tax system. A lump-sum tax would take the same amount from the poor and the rich, an outcome most people would view as unfair. To understand the tax systems that we observe, we must therefore consider the other major goal of tax policy: equity.

Quick Quiz What is meant by the *efficiency* of a tax system? • What can make a tax system inefficient?

TAXES AND EQUITY

Ever since American colonists dumped imported tea into Boston harbor to protest high British taxes, tax policy has generated some of the most heated debates in American politics. The heat is rarely fueled by questions of efficiency. Instead, it arises from disagreements over how the tax burden should be distributed. Senator Russell Long once mimicked the public debate with this ditty:

> Don't tax you.
> Don't tax me.
> Tax that fella behind the tree.

Of course, if we are to rely on the government to provide some of the goods and services we want, taxes must fall on someone. In this section, we consider the equity of a tax system. How should the burden of taxes be divided among the population? How do we evaluate whether a tax system is fair? Everyone agrees

that the tax system should be equitable, but there is much disagreement about what equity means and how the equity of a tax system can be judged.

The Benefits Principle

benefits principle
the idea that people should pay taxes based on the benefits they receive from government services

One principle of taxation, called the **benefits principle**, states that people should pay taxes based on the benefits they receive from government services. This principle tries to make public goods similar to private goods. It seems fair that a person who often goes to the movies pays more in total for movie tickets than a person who rarely goes. Similarly, a person who gets great benefit from a public good should pay more for it than a person who gets little benefit.

The gasoline tax, for instance, is sometimes justified using the benefits principle. In some states, revenues from the gasoline tax are used to build and maintain roads. Because those who buy gasoline are the same people who use the roads, the gasoline tax might be viewed as a fair way to pay for this government service.

The benefits principle can also be used to argue that wealthy citizens should pay higher taxes than poorer ones. Why? Simply because the wealthy benefit more from public services. Consider, for example, the benefits of police protection from theft. Citizens with much to protect benefit more from police than do those with less to protect. Therefore, according to the benefits principle, the wealthy should contribute more than the poor to the cost of maintaining the police force. The same argument can be used for many other public services, such as fire protection, national defense, and the court system.

It is even possible to use the benefits principle to argue for antipoverty programs funded by taxes on the wealthy. As we discussed in Chapter 11, people prefer living in a society without poverty, suggesting that antipoverty programs are a public good. If the wealthy place a greater dollar value on this public good than members of the middle class do, perhaps just because the wealthy have more to spend, then according to the benefits principle, they should be taxed more heavily to pay for these programs.

The Ability-to-Pay Principle

ability-to-pay principle
the idea that taxes should be levied on a person according to how well that person can shoulder the burden

Another way to evaluate the equity of a tax system is called the **ability-to-pay principle**, which states that taxes should be levied on a person according to how well that person can shoulder the burden. This principle is sometimes justified by the claim that all citizens should make an "equal sacrifice" to support the government. The magnitude of a person's sacrifice, however, depends not only on the size of his tax payment but also on his income and other circumstances. A $1,000 tax paid by a poor person may require a larger sacrifice than a $10,000 tax paid by a rich one.

vertical equity
the idea that taxpayers with a greater ability to pay taxes should pay larger amounts

horizontal equity
the idea that taxpayers with similar abilities to pay taxes should pay the same amount

The ability-to-pay principle leads to two corollary notions of equity: vertical equity and horizontal equity. **Vertical equity** states that taxpayers with a greater ability to pay taxes should contribute a larger amount. **Horizontal equity** states that taxpayers with similar abilities to pay should contribute the same amount. These notions of equity are widely accepted, but applying them to evaluate a tax system is rarely straightforward.

Vertical Equity If taxes are based on ability to pay, then richer taxpayers should pay more than poorer taxpayers. But how much more should the rich pay? Much of the debate over tax policy concerns this question.

TABLE 7

Three Tax Systems

	Proportional Tax		Regressive Tax		Progressive Tax	
Income	Amount of Tax	Percent of Income	Amount of Tax	Percent of Income	Amount of Tax	Percent of Income
$ 50,000	$12,500	25%	$15,000	30%	$10,000	20%
100,000	25,000	25	25,000	25	25,000	25
200,000	50,000	25	40,000	20	60,000	30

Consider the three tax systems in Table 7. In each case, taxpayers with higher incomes pay more. Yet the systems differ in how quickly taxes rise with income. The first system is called **proportional** because all taxpayers pay the same fraction of income. The second system is called **regressive** because high-income taxpayers pay a smaller fraction of their income, even though they pay a larger amount. The third system is called **progressive** because high-income taxpayers pay a larger fraction of their income.

proportional tax
a tax for which high-income and low-income taxpayers pay the same fraction of income

regressive tax
a tax for which high-income taxpayers pay a smaller fraction of their income than do low-income taxpayers

progressive tax
a tax for which high-income taxpayers pay a larger fraction of their income than do low-income taxpayers

Which of these three tax systems is most fair? There is no obvious answer, and economic theory does not offer any help in trying to find one. Equity, like beauty, is in the eye of the beholder.

CASE STUDY HOW THE TAX BURDEN IS DISTRIBUTED

Much debate over tax policy concerns whether the wealthy pay their fair share. There is no objective way to make this judgment. In evaluating the issue for yourself, however, it is useful to know how much families with different incomes pay under the current tax system.

Table 8 presents some data on how all federal taxes are distributed among income classes. To construct this table, families are ranked according to their income and placed into five groups of equal size, called *quintiles*. The table also presents data on the richest 1 percent of Americans.

The second column of the table shows the average income of each group. The poorest one-fifth of families had average income of $15,900, and the richest one-fifth had average income of $231,300. The richest 1 percent had average income of over $1 million.

The next column of the table shows total taxes as a percentage of income. As you can see, the U.S. federal tax system is progressive. The poorest fifth of families paid 4.3 percent of their incomes in taxes, and the richest fifth paid 25.5 percent. The top 1 percent paid 31.2 percent of their incomes.

The fourth and fifth columns compare the distribution of income and the distribution of taxes. The poorest quintile earns 4.0 percent of all income and pays 0.8 percent of all taxes. The richest quintile earns 55.1 percent of all income and pays 68.7 percent of all taxes. The richest 1 percent (which, remember, is 1/20 the size of each quintile) earns 18.1 percent of all income and pays 27.6 percent of all taxes.

This table on taxes is a good starting point for understanding the burden of government, but the picture it offers is incomplete. Although it includes all the

TABLE 8

The Burden of Federal Taxes

Source: Congressional Budget Office. Figures are for 2005.

Quintile	Average Income	Taxes as a Percentage of Income	Percentage of All Income	Percentage of All Taxes
Lowest	$15,900	4.3%	4.0%	0.8%
Second	37,400	9.9	8.5	4.1
Middle	58,500	14.2	13.3	9.3
Fourth	85,200	17.4	19.8	16.9
Highest	231,300	25.5	55.1	68.7
Top 1%	1,558,500	31.2	18.1	27.6

taxes that flow from households to the federal government, it fails to include the transfer payments, such as Social Security and welfare, that flow from the federal government back to households.

Studies that include both taxes and transfers show even greater progressivity. The richest group of families still pays about one-quarter of its income to the government, even after transfers are subtracted. By contrast, poor families typically receive more in transfers than they pay in taxes. The average tax rate of the poorest quintile, rather than being 4.3 percent as in the table, is approximately *negative* 30 percent. In other words, their income is about 30 percent higher than it would be without government taxes and transfers. The lesson is clear: To understand fully the progressivity of government policies, one must take account of both what people pay and what they receive. ●

Horizontal Equity If taxes are based on ability to pay, then similar taxpayers should pay similar amounts of taxes. But what determines if two taxpayers are similar? Families differ in many ways. To evaluate whether a tax code is horizontally equitable, one must determine which differences are relevant for a family's ability to pay and which differences are not.

Suppose the Smith and Jones families each have income of $80,000. The Smiths have no children, but Mr. Smith has an illness that causes medical expenses of $30,000. The Joneses are in good health, but they have four children. Two of the Jones children are in college, generating tuition bills of $40,000. Would it be fair for these two families to pay the same tax because they have the same income? Would it be fair to give the Smiths a tax break to help them offset their high medical expenses? Would it be fair to give the Joneses a tax break to help them with their tuition expenses?

There are no easy answers to these questions. In practice, the U.S. income tax is filled with special provisions that alter a family's tax based on its specific circumstances.

Tax Incidence and Tax Equity

Tax incidence—the study of who bears the burden of taxes—is central to evaluating tax equity. As we first saw in Chapter 6, the person who bears the burden of

a tax is not always the person who gets the tax bill from the government. Because taxes alter supply and demand, they alter equilibrium prices. As a result, they affect people beyond those who, according to statute, actually pay the tax. When evaluating the vertical and horizontal equity of any tax, it is important to take these indirect effects into account.

Many discussions of tax equity ignore the indirect effects of taxes and are based on what economists mockingly call the *flypaper theory* of tax incidence. According to this theory, the burden of a tax, like a fly on flypaper, sticks wherever it first lands. This assumption, however, is rarely valid.

For example, a person not trained in economics might argue that a tax on expensive fur coats is vertically equitable because most buyers of furs are wealthy. Yet if these buyers can easily substitute other luxuries for furs, then a tax on furs might only reduce the sale of furs. In the end, the burden of the tax will fall more on those who make and sell furs than on those who buy them. Because most workers who make furs are not wealthy, the equity of a fur tax could be quite different from what the flypaper theory indicates.

CASE STUDY WHO PAYS THE CORPORATE INCOME TAX?

The corporate income tax provides a good example of the importance of tax incidence for tax policy. The corporate tax is popular among voters. After all, corporations are not people. Voters are always eager to have their taxes reduced and have some impersonal corporation pick up the tab.

But before deciding that the corporate income tax is a good way for the government to raise revenue, we should consider who bears the burden of the corporate tax. This is a difficult question on which economists disagree, but one thing is certain: *People pay all taxes*. When the government levies a tax on a corporation, the corporation is more like a tax collector than a taxpayer. The burden of the tax ultimately falls on people—the owners, customers, or workers of the corporation.

Many economists believe that workers and customers bear much of the burden of the corporate income tax. To see why, consider an example. Suppose that the U.S. government decides to raise the tax on the income earned by car companies. At first, this tax hurts the owners of the car companies, who receive less profit. But over time, these owners will respond to the tax. Because producing cars is less profitable, they invest less in building new car factories. Instead, they invest their wealth in other ways—for example, by buying larger houses or by building factories in other industries or other countries. With fewer car factories, the supply of cars declines, as does the demand for autoworkers. Thus, a tax on corporations making cars causes the price of cars to rise and the wages of autoworkers to fall.

The corporate income tax shows how dangerous the flypaper theory of tax incidence can be. The corporate income tax is popular in part because it appears to be paid by rich corporations. Yet those who bear the ultimate burden of the tax—the customers and workers of corporations—are often not rich. If the true incidence of the corporate tax were more widely known, this tax might be less popular among voters.

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THIS WORKER PAYS PART OF THE CORPORATE INCOME TAX.

QUICK QUIZ Explain the *benefits principle* and the *ability-to-pay principle*. • What are *vertical equity* and *horizontal equity*? • Why is studying tax incidence important for determining the equity of a tax system?

In The News

Questions and Answers about Tax Reform

The most recent attempt at major tax reform was in 2005, when President Bush appointed a bipartisan advisory panel to study the issue. This Q&A explains what the panel tried to achieve. Answers are from Edward Lazear and James Poterba, the two economists on the panel. Because Congress failed to adopt the panel's recommendations, the tax code is much the same now as it was in 2005, and the issues the panel raised remain relevant.

Q: *What should the goal of a tax system be?*

A: A tax system should generate the government's required revenue with as little economic distortion as possible, while distributing tax burdens fairly. It should not discourage work, saving or entrepreneurship more than is necessary, and it should not discourage individuals from acquiring the skills and education that will increase their productivity. It should not discourage investment, or favor investments in one asset over those in another. In short, an efficient tax system alters economic decision-making as little as possible.

Q: *What is wrong with the current system?*

A: The more than 15,000 changes to the tax code in the last 19 years have undermined many achievements of the 1986 tax reform. They have created a tax code that is riddled with targeted incentives, phase-out rules, phantom tax rates, and complex and sometimes inconsistent provisions that leave most taxpayers unable to understand the rules under which they are taxed, let alone able to complete their own tax return.

Q: *What should reform try to accomplish?*

A: Although many see simplification as the primary goal of tax reform, promoting economic growth is a more important objective. Even in the relatively short run, the economic costs of a tax system that slows growth are likely to exceed compliance costs. U.S. households spend roughly 1% of GDP in complying with the income tax system. Halving the costs of compliance would be equivalent to raising GDP by one half of one percent—no minor accomplishment. The increase in GDP that might result from a tax reform that reduces tax burdens on investment and shifts the tax system toward a consumption tax are much larger.

Q: *How might tax reform promote economic growth?*

A: A substantial body of economic research suggests that tax wedges between the before-tax and the after-tax return on saving and investment are particularly detrimental to long-term economic growth. The current tax system taxes corporate income once at the corporate level and again at the investor level. The Treasury Department estimates that, on average, the total tax burden on a new corporate investment project is 24%. By comparison, investments in the non-corporate sector, which are taxed only once, face a 17% tax burden. Investments in owner-occupied housing, which yield untaxed returns in the form of implicit rental income, are untaxed. Taxing different invest-

CONCLUSION: THE TRADE-OFF BETWEEN EQUITY AND EFFICIENCY

Almost everyone agrees that equity and efficiency are the two most important goals of the tax system. But often, these two goals conflict, especially when equity is judged by the progressivity of the tax system. People disagree about tax policy often because they attach different weights to these goals.

The recent history of tax policy shows how political leaders differ in their views on equity and efficiency. When Ronald Reagan was elected president in 1980, the marginal tax rate on the earnings of the richest Americans was 50 percent. On interest income, the marginal tax rate was 70 percent. Reagan argued that such

ments differently distorts capital formation and slows growth.

The Treasury Department estimates that eliminating the tax burden on new investment, for example by adopting a consumption tax, would eventually raise GDP by between 5% and 7%. GDP growth is essential to improving the standard of living for all Americans, and it is closely tied to productivity growth. The surest way to raise wages is to raise productivity.

Q: *What specifically do you propose?*

A: The Tax Panel endorses two reform proposals that would improve economic growth, simplify the tax code, and roughly preserve the current distribution of tax burdens. Both would repeal the individual and corporate Alternative Minimum Tax. The first is the Simplified Income Tax. It preserves the income tax framework but cuts marginal rates to 15%, 25% and 33%. It provides for a large amount of tax-free saving, consolidates credits, and rationalizes the system of business taxation. The second reform proposal, the Growth and Investment Tax, builds on the Simplified Income Tax system, and by allowing full expensing of capital, shifts the tax system toward a consumption tax base.

Productivity growth depends on investment in human and physical capital. Investment in human capital means acquiring skills through formal education and learning on the job. Investment in physical capital means adding to the stock of plant, equipment, technological know-how and other intangibles that make workers productive. Both proposals encourage investment in skills by reducing marginal tax rates on labor supply for most earners. They encourage investment in physical capital by reducing taxes on business investment. Treasury estimates that moving from the current structure to the Growth and Investment Tax would lower the average tax burden on all investment from 17% to 6%. This would encourage new investment and significantly increase productivity and wage growth.

Q: *How do these proposals reduce tax rates without reducing tax revenue?*

A: Both proposals trim many of the deductions that currently narrow the income tax base, while retaining incentives for charitable giving, homeownership and the purchase of health insurance. Both proposals allow taxpayers a deduction for charitable contributions in excess of 1% of taxable income. Both proposals replace the current itemized deduction for interest on a mortgage of up to $1 million, plus a $100,000 home equity loan, with a 15% tax credit on interest for loans up to 125% of an area's median home price.

Employer-provided health insurance is currently untaxed regardless of its cost. This encourages the purchase of excessively generous insurance policies. To preserve incentives for employers to provide families with basic insurance coverage, both plans tax employer-provided health insurance, but only on the amount of insurance valued at more than $11,500 for a married couple and $5,000 for a single individual.

Both plans eliminate the federal tax deduction for payments of state and local income and property taxes.

Q: *How about vertical equity?*

A: The plans leave the burden of paying for the work of government virtually unchanged. There is a very slight increase in the burden carried by the rich, but the standard of living of this group would still rise in the long run, as a result of the plans' favorable effects on long-term economic growth.

Source: Answers are excerpts from "A Golden Opportunity," by Edward P. Lazear and James M. Poterba, *The Wall Street Journal*, November 1, 2005. More information on the tax reform advisory panel can be found at http://www.taxreformpanel.gov/.

high tax rates greatly distorted economic incentives to work and save. In other words, he claimed that these high tax rates cost too much in terms of economic efficiency. Tax reform was, therefore, a high priority of his administration. Reagan signed into law large cuts in tax rates in 1981 and then again in 1986. When Reagan left office in 1989, the richest Americans faced a marginal tax rate of only 28 percent.

The pendulum of political debate swings both ways. When Bill Clinton ran for president in 1992, he argued that the rich were not paying their fair share of taxes. In other words, the low tax rates on the rich violated his view of vertical equity. In 1993, President Clinton signed into law a bill that raised the tax rates on the richest Americans to about 40 percent. When George W. Bush ran for president, he reprised many of Reagan's themes, and as president he reversed part of the

Clinton tax increase, reducing the highest tax rate to 35 percent. During the 2008 presidential campaign, Republican John McCain advocated making the Bush tax cuts permanent, while Democrat Barack Obama proposed increasing the top marginal tax rate.

Economics alone cannot determine the best way to balance the goals of efficiency and equity. This issue involves political philosophy as well as economics. But economists do have an important role in this debate: They can shed light on the trade-offs that society inevitably faces when designing the tax system and can help us avoid policies that sacrifice efficiency without any benefit in terms of equity.

SUMMARY

- The U.S. government raises revenue using various taxes. The most important taxes for the federal government are individual income taxes and payroll taxes for social insurance. The most important taxes for state and local governments are sales taxes and property taxes.
- The efficiency of a tax system refers to the costs it imposes on taxpayers. There are two costs of taxes beyond the transfer of resources from the taxpayer to the government. The first is the deadweight loss that arises as taxes alter incentives and distort the allocation of resources. The second is the administrative burden of complying with the tax laws.
- The equity of a tax system concerns whether the tax burden is distributed fairly among the population. According to the benefits principle, it is fair for people to pay taxes based on the benefits they receive from the government. According to the ability-to-pay principle, it is fair for people to pay taxes based on their capability to handle the financial burden. When evaluating the equity of a tax system, it is important to remember a lesson from the study of tax incidence: The distribution of tax burdens is not the same as the distribution of tax bills.
- When considering changes in the tax laws, policymakers often face a trade-off between efficiency and equity. Much of the debate over tax policy arises because people give different weights to these two goals.

KEY CONCEPTS

budget deficit, *p. 246*
budget surplus, *p. 246*
average tax rate, *p. 252*
marginal tax rate, *p. 252*
lump-sum tax, *p. 253*
benefits principle, *p. 254*
ability-to-pay principle, *p. 254*
vertical equity, *p. 254*
horizontal equity, *p. 254*
proportional tax, *p. 255*
regressive tax, *p. 255*
progressive tax, *p. 255*

QUESTIONS FOR REVIEW

1. Over the past century, has the government's tax revenue grown more or less slowly than the rest of the economy?
2. What are the two most important sources of revenue for the U.S. federal government?
3. Explain how corporate profits are taxed twice.
4. Why is the burden of a tax to taxpayers greater than the revenue received by the government?
5. Why do some economists advocate taxing consumption rather than income?
6. What is the marginal tax rate on a lump-sum tax? How is this related to the efficiency of the tax?
7. Give two arguments why wealthy taxpayers should pay more taxes than poor taxpayers.
8. What is the concept of horizontal equity and why is it hard to apply?

PROBLEMS AND APPLICATIONS

1. In a published source or on the Internet, find out whether the U.S. federal government had a budget deficit or surplus last year. What do policymakers expect to happen over the next few years? (Hint: The website of the Congressional Budget Office is http://www.cbo.gov.)
2. The information in many of the tables in this chapter can be found in the *Economic Report of the President*, which appears annually. Using a recent issue of the report at your library or on the Internet, answer the following questions and provide some numbers to support your answers. (Hint: The website of the Government Printing Office is http://www.gpo.gov.)
   a. Figure 1 shows that government revenue as a percentage of total income has increased over time. Is this increase primarily attributable to changes in federal government revenue or in state and local government revenue?
   b. Looking at the combined revenue of the federal government and state and local governments, how has the composition of total revenue changed over time? Are personal income taxes more or less important? Social insurance taxes? Corporate profits taxes?
   c. Looking at the combined expenditures of the federal government and state and local governments, how have the relative shares of transfer payments and purchases of goods and services changed over time?
3. The chapter states that the elderly population in the United States is growing more rapidly than the total population. In particular, the number of workers is rising slowly, while the number of retirees is rising quickly. Concerned about the future of Social Security, some members of Congress propose a "freeze" on the program.
   a. If total expenditures were frozen, what would happen to benefits per retiree? To tax payments per worker? (Assume that Social Security taxes and receipts are balanced in each year.)
   b. If benefits per retiree were frozen, what would happen to total expenditures? To tax payments per worker?
   c. If tax payments per worker were frozen, what would happen to total expenditures? To benefits per retiree?
   d. What do your answers to parts (a), (b), and (c) imply about the difficult decisions faced by policymakers?

4. Suppose you are a typical person in the U.S. economy. You pay 4 percent of your income in a state income tax and 15.3 percent of your labor earnings in federal payroll taxes (employer and employee shares combined). You also pay federal income taxes as in Table 3. How much tax of each type do you pay if you earn $20,000 a year? Taking all taxes into account, what are your average and marginal tax rates? What happens to your tax bill and to your average and marginal tax rates if your income rises to $40,000?
5. Some states exclude necessities, such as food and clothing, from their sales tax. Other states do not. Discuss the merits of this exclusion. Consider both efficiency and equity.
6. When someone owns an asset (such as a share of stock) that rises in value, he has an "accrued" capital gain. If he sells the asset, he "realizes" the gains that have previously accrued. Under the U.S. income tax, realized capital gains are taxed, but accrued gains are not.
   a. Explain how individuals' behavior is affected by this rule.
   b. Some economists believe that cuts in capital gains tax rates, especially temporary ones, can raise tax revenue. How might this be so?
   c. Do you think it is a good rule to tax realized but not accrued capital gains? Why or why not?
7. Suppose that your state raises its sales tax from 5 percent to 6 percent. The state revenue commissioner forecasts a 20 percent increase in sales tax revenue. Is this plausible? Explain.
8. The Tax Reform Act of 1986 eliminated the deductibility of interest payments on consumer debt (mostly credit cards and auto loans) but maintained the deductibility of interest payments on mortgages and home equity loans. What do you think happened to the relative amounts of borrowing through consumer debt and home equity debt?
9. Categorize each of the following funding schemes as examples of the benefits principle or the ability-to-pay principle.
   a. Visitors to many national parks pay an entrance fee.
   b. Local property taxes support elementary and secondary schools.
   c. An airport trust fund collects a tax on each plane ticket sold and uses the money to improve airports and the air traffic control system.
10. Any income tax schedule embodies two types of tax rates: average tax rates and marginal tax rates.
    a. The average tax rate is defined as total taxes paid divided by income. For the proportional tax system presented in Table 7, what are the average tax rates for people earning $50,000, $100,000, and $200,000? What are the corresponding average tax rates in the regressive and progressive tax systems?
    b. The marginal tax rate is defined as the extra taxes paid on additional income divided by the increase in income. Calculate the marginal tax rate for the proportional tax system as income rises from $50,000 to $100,000. Calculate the marginal tax rate as income rises from $100,000 to $200,000. Calculate the corresponding marginal tax rates for the regressive and progressive tax systems.
    c. Describe the relationship between average tax rates and marginal tax rates for each of these three systems. In general, which rate is relevant for someone deciding whether to accept a job that pays slightly more than her current job? Which rate is relevant for judging the vertical equity of a tax system?
11. Use the data in Table 8 to answer these questions about the U.S. tax system:
    a. For each quintile, compute the federal taxes paid by the typical taxpayer.
    b. As a taxpayer moves from each quintile to the next higher quintile, compute the change in income and the change in taxes.

c. Use the information in part (b) to compute the marginal tax rate as a person moves from one quintile to the next.
d. For any given taxpayer, which is higher—the marginal tax rate or the average tax rate?
e. What happens to the average tax rate and the marginal tax rate as income rises? Which changes more?

12. Each of the following expenditures is a deduction for the purposes of calculating a person's federal income tax liability:
a. Mortgage interest
b. State and local taxes
c. Charitable contributions

If the income tax base were broadened by eliminating these deductions, tax rates could be lowered, while raising the same amount of tax revenue.

For each of these deductions, what would you expect the likely effect on taxpayer behavior to be? Discuss the pros and cons of each deduction from the standpoint of efficiency, vertical equity, and horizontal equity. Would you keep or eliminate the deduction?