16
Taxes

Tools: Welfare analysis; triangles.

Key Words: Tax wedge; welfare loss; social cost; tax rate; tax base.

Big Ideas:

- Tax systems should be (i) administratively simple and transparent and (ii) have a broad tax base.
- A broad tax base minimizes the social cost of taxes.

Governments are a fact of life. They are the central player in building and enforcing the institutional arrangements that make life as we know it possible. They are also, in some cases, an obstacle to performance. The difference between good and bad economic performance is often the difference between good and bad government.

Our focus will be on the narrower issue of government revenues and expenses. Governments around the world differ in how much they spend (generally measured as ratios to GDP), what they spend it on, and how they finance their spending (taxes and borrowing).

This chapter is devoted to taxes. Taxes are mind-numbingly complicated, but these three principles describe good tax systems:

- **Tax revenue pays for spending.** A government must collect enough tax revenue to pay for its expenses, whatever they might be.

- **Broad tax base.** Most tax systems are riddled with exemptions. The problem with exemptions is that they leave non-exempt activities to finance government spending. With a narrower tax base, the rate must be higher on what's left.
- **Administratively simple and transparent.** The tax systems in some countries are so complex that people spend days or weeks of their time, or hire professionals, to figure out what they owe. Worse, some countries assess taxes in ways that seem arbitrary, leading to unpredictable tax expenses and endless disputes. The best systems are simple (it's not hard to figure out what you owe) and transparent (you know ahead of time the tax consequences of your actions).

We'll focus on the second principle, leaving the first for the next chapter and the third to speak for itself. But if you're interested in an example of a complex tax system at work, search "vodaphone taxes India."

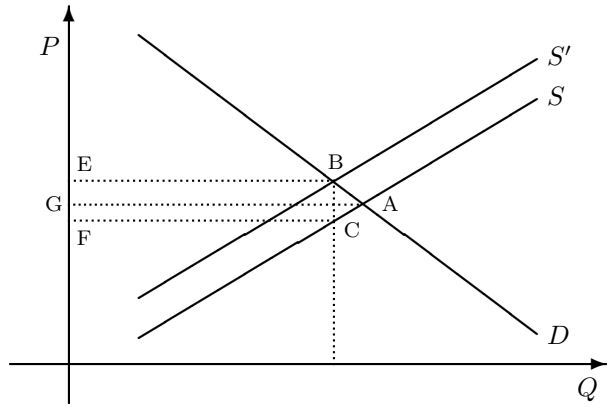
16.1 Social cost of taxes

Taxes are a necessary evil; governments, like people and businesses, must finance their spending one way or another. Governments generally do it with taxes. However, the way in which governments collect tax revenue can affect economic performance and welfare. Our issue is not that taxes take purchasing power away from individuals. They do, but if government spending must be financed, that's really a question of whether the purchasing power they take is put to good use. We'll leave you to decide that for yourself. Our issue is that taxes inevitably discourage some activities relative to others. Taxes on labor income may discourage work, taxes on capital (or investment) income may discourage saving and investment, and taxes on cigarettes may discourage smoking. We'll leave cigarettes for another time, but the general incentive effects of taxes are worth a closer look.

More formally, taxes affect ("distort") economic decisions. They insert a "wedge" (a difference or discrepancy) between private and social costs of various activities. As a result, they generally lead to decisions that are socially inefficient: We could reallocate the same resources and raise everyone's welfare. The conditions for this invisible-hand result should be familiar from your microeconomics class: clear property rights, competitive buyers and sellers (no monopolies), complete information, and absence of externalities (no direct impact of one person's actions on another's welfare). Under these conditions, we might want to set tax rates to generate the least disruption to resource allocation: to minimize the adverse incentives built into taxes.

We can get a sense for how taxes affect decisions in a traditional supply-and-demand setting like that in Figure 16.1. The demand curve (labeled D) represents purchasers of the product; for any given quantity Q, it tells us how much buyers are willing to pay — hence the value to them (at the margin) of that number of units. The supply curve (labeled S) represents sellers. With competitive sellers, it tells us how much it costs to produce a given quantity (at the margin). The market clears at point A, where supply and demand are equal.

Figure 16.1: The social cost of a tax.



The social cost of imposing a tax that shifts the supply curve from S to S' is the triangle ABC.

Now suppose we charge a tax of a fixed amount per unit. From the perspective of buyers, the supply curve has shifted up by the amount of the tax to S'. Note that there is now a difference between the social cost (the marginal cost of production in terms of resources used) and the private cost (the price paid by buyers): a wedge, in other words. The market now clears at B for buyers and C for sellers. This difference leads buyers and sellers to reduce the quantity of resources allocated to this product, leaving them to be used elsewhere in the economy. Buyers, of course, buy fewer units, because the price has gone up. Sellers offer fewer units for sale because the price to them has fallen.

The social cost of the tax (the reduction in welfare it causes) is the area inside the triangle ABC. The upper part of the triangle is the loss of consumer surplus (the difference between what buyers pay and what the product is worth to them). The lower part of the triangle is the loss of producer surplus (the difference between what sellers receive and the cost of production). The sum is the social cost of the tax, which economists refer to as the

"deadweight loss" or "excess burden." You may recall a similar argument against monopolies. Both result in fewer resources devoted to the product than we would like.

If you're not familiar with this kind of analysis, here's a more complete accounting of the welfare loss. It's not essential to our story; feel free to skip to the next paragraph. In the figure, the loss of consumer surplus is the area EBAG, the cost to them of charging a higher price. The loss of producer surplus is FCAG. Adding them together gives us an area much larger than the triangle ABC. The difference is the rectangle EBCF, which is the amount of revenue collected by the government. This revenue doesn't disappear, so it's not a welfare loss. That leaves us with the triangle ABC as the welfare loss.

There's a fine point here about who pays the tax. We could charge sellers or buyers with the same result. Governments sometimes prefer taxes on firms to taxes on people, in part because it makes the tax less visible to voters, but the impact on resource allocation should be the same.

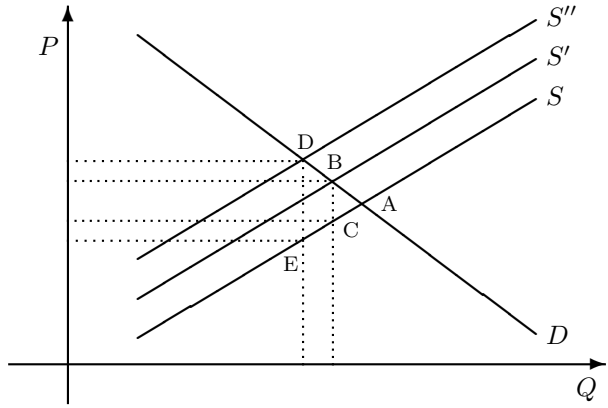
16.2 The benefits of a broad tax base

One objective of a good tax system is to minimize the social cost of taxes: to raise tax revenue with as little impact as possible on resource allocation. We sometimes say we're looking for a resource-neutral tax system — or as close to neutral as we can get. This is a complicated issue, both in theory and in practice, but one principle is that we want a broad tax base.

The argument for a broad tax base goes like this. Think about two ways of raising the same tax revenue: a low tax rate on a broad base and a higher rate on a narrower base. Which is better? We'll give an answer using our supply and demand analysis. Suppose we have two similar markets, each like the one we described in Figure 16.1. In the broad-base system, we tax the products in both markets at the same rate. The social cost is, therefore, double what we saw earlier: the triangle ABC for each market.

Now consider a narrow-base system that taxes one market at twice the rate. We'll use Figure 16.2 to see how this works. There, we have drawn three supply curves: S refers to supply without the tax; S' refers to supply with a small tax (the broad-base system); and S'' refers to supply with a tax rate double that in S' (the narrow-base system). What is the social cost of the narrow base? Since the rate is higher, the welfare triangle is larger; it consists of the area ADE. If you look at this long enough, you'll realize that the area of ADE is four times that of ABC, which makes the social cost twice as large as in the broad-base system.

Figure 16.2: The social cost of doubling a tax.



We double the tax rate by shifting the supply curve from S to S''. Note the social cost: the triangle ADE is four times as big as ABC.

The point, in general, is that broad-based tax systems are better because they allow you to raise a given amount of revenue with a lower rate and (therefore) smaller social cost. You'll hear lots of arguments for tax exemptions, but you rarely hear that they result in higher taxes on other things, which is the primary argument against them.

A corollary of this principle is that with similar goods — by which we mean goods with similar supply and demand curves — we should aim for similar tax rates. The reasoning is the same, although it's harder to show in a diagram. If we have goods whose demand curves have different slopes, similar logic would lead us to tax them differently, but that's a subtle point we'd prefer to leave for another time.

16.3 Applications

Here are some practical applications of the broad-tax-base/tax-similar-goods-the-same principle.

The underground economy. One of the difficulties of an underground economy is that unofficial businesses typically do not pay taxes, thereby forcing all of the tax burden onto the rest of the economy. That violates our principle (low rate on broad base) and also the corollary (tax similar goods

at similar rates). We've shown that this leads to an inefficient allocation of resources.

William Lewis (*The Power of Productivity*) argues that in Brazil, it may also lower productivity. His argument has several steps. Brazil has a relatively large government for a country at its stage of development (40 percent of GDP, which is above the US and significantly above what we see in most developing countries). Financing government spending requires, therefore, relatively high tax rates, which creates a substantial incentive for tax avoidance. Small firms (the story goes) are generally less productive than large firms (economies of scale), but many survive because they are able to avoid taxes. Thus the tax system protects inefficient small firms, thereby lowering overall productivity. In Lewis's story, this is a direct result of large government.

Value-added taxes (VAT). Before the VAT became popular, countries often had piecemeal tax systems in which goods were taxed at every stage of production. This led, in some cases, to very high taxes on intermediate and final products simply because the taxes at each stage added up. This violates our principle, specifically the corollary, because a product made by a single vertically-integrated firm is taxed at a lower rate than the same product made by several firms, one at each stage.

Consider a product that has five stages of production, each performed by a different firm. If each stage is charged a moderate tax of ten percent, what is the total tax paid in the production of the product? Let's say that total value added is five, with one unit of value added at each stage. The first-stage firm produces one unit of value. This costs the second-stage firm 1.10 since it must pay the ten percent tax. This firm also adds one unit of value, and sells its output for a price (including taxes) of

$$(1.10 + 1) \times 1.10 \quad = \quad 2.31,$$

so the implicit tax rate over the two stages is $0.31/2 = 15.5$ percent. If you work through all five stages, you'll find that the price of the final product, including all the taxes paid, is 6.71 after the last stage, so the effective tax rate is 34.2 percent [$= (6.71 - 5.00)/5.00$]. Note the large difference in tax rates across the five stages of production. The final stage only gets taxed once, so it pays a tax rate of 10%, but the first stage gets taxed five times, so it's taxed at a rate of 61 percent [$1.10^5 = 1.61$]! In contrast, a vertically-integrated firm pays only ten percent, at each stage and overall.

These differences in tax rates potentially lead to inefficient production, as firms look for substitutes for highly-taxed inputs, or integrate vertically. This is one of the arguments for a value-added tax system. With a VAT,

firms pay tax on only the value-added of their stage of production, which eliminates differences in tax rates paid by different stages. A value-added tax system is equivalent to one in which we tax only the final good; we just arrange to collect the tax in pieces.

Taxes on capital income. A high tax rate on capital income might be expected to discourage saving and investment, leading the economy to have less capital than otherwise. This, in turn, would reduce wages, since the marginal product of labor is lower if we have less capital. So, what is an appropriate tax rate on capital income? Some economists argue that taxes on capital income should be zero. People would eventually pay tax on capital income indirectly when they consume the proceeds, but they should not be taxed before then. The logic is similar to the argument for a value-added tax, since taxes on capital income are effectively taxes on future consumption and accumulate in a similar way.

Let's think about how households allocate their income over time. Suppose that we have two dates (labeled "0" and "1"). If a household earns labor income (Y_0, Y_1) at the two dates and receives a (real) interest rate r on saving, then saving is $Y_0 - C_0$, and consumption at date 1 must be $C_1 = (1 + r)(Y_0 - C_0) + Y_1$. We can put the two together in the present-value relation:

$$C_0 + C_1/(1 + r) \quad = \quad Y_0 + Y_1/(1 + r).$$

This tells us, in essence, that the price of date-1 consumption is $1/(1 + r)$. If we had more periods, we'd have a similar relation, with prices $1/(1 + r)$, $1/(1 + r)^2$, $1/(1 + r)^3$, etc., for consumption at dates 1, 2, 3, etc.

Now think about taxes. If we tax interest income, this changes the price of future consumption. For a given real interest rate r, a higher tax rate increases the price of future consumption, which you might expect to encourage current consumption. If the tax rate on capital income is τ, then the after-tax interest rate is $(1 - \tau)r$ and the price of consumption n periods in the future is $1/[1 + (1 - \tau)r]^n$. This may not seem like a big deal, but with the mythical power of compound interest, it can increase the price of future consumption substantially. Consider a numerical example with $r = 0.04$ (four percent a year) and a tax rate of $\tau = 0.25$ (25 percent). With no tax, the price of consumption one period in the future is 0.9615 $[= 1/(1 + r)]$. With the tax, this increases to 0.9709 $[= 1/[1 + (1 - \tau)r]]$, a modest difference. But if the number of periods is large, the difference can also be large. Suppose $n = 25$; think of a 30-year-old consultant saving for retirement. Then, the tax raises the price of future consumption by 27 percent, from 0.3751 to and 0.4776. You can imagine that this could lead people to consume more now and less later since future consumption has

become relatively more expensive. It might also lead them to work less if working now is intended to finance future consumption.

If people consume more now and less later, then they are saving less. And if they are saving less, the economy will have less capital. The cost has the same source as in our earlier analysis: The private benefits of saving are less than the social benefits, so we do too little of it. That's why some economists favor a consumption tax: a tax on only that part of income that is consumed. In practice, many countries offer something of this sort through tax-sheltered retirement and saving programs, which avoid the period-by-period tax on investment income of our example.

If a government promises not to tax capital too heavily in the future, will investors believe it? This version of the time-consistency problem can be severe. If investors doubt the commitment, they will refrain from investment even if current tax rates are low. The issue arises whenever governments are seen as willing to exhaust their borrowing capacity. As we have seen in other examples, overcoming the challenge of time consistency depends on the nature and quality of a society's institutions. In the late 17th century, for example, the empowerment of the British parliament helped persuade a rising commercial class that the King would not arbitrarily seize their wealth. The flow of savings and investment helped Britain grow earlier and faster than other modern economies. In many highly indebted countries today, concerns about future tax burdens can reduce saving and investment now, or encourage other means of tax avoidance, possibly making the government's current budget situation worse.

Changing tax rates. Economist Edward Prescott writes (*Wall Street Journal*, December 20, 2005):

> Let's drop the word "cuts" [when we talk about taxes]. The problem with advocating a cut in something is that you are necessarily going to stir up political trouble from someone who will want to increase it again. So, even if you are fortunate enough to get your cut enacted, it is likely a matter of time before the political pendulum swings back and someone else gets their increase.

The argument against large changes in tax rates over time follows from the corollary: "Tax similar markets at similar rates." In this case, the two markets are "today" and "tomorrow." We could add the cost of the uncertainty created by the process of changing tax rates.

Deficits. The same argument gives us some insight into deficits. We should finance whatever the government spends with relatively stable tax rates. Why? Because low taxes now and high taxes later, or the reverse, violates our principle. Suppose, then, that the government is running a deficit. Should it raise taxes? It should aim at a stable level of tax rates that finances government spending. Typically, you would expect this to lead to deficits in recessions, when the tax base is small, and surpluses in booms. In practice, this is more complicated because we don't know either the level of spending (what's the present value of future commitments to Social Security and Medicare?) or the base on which tax rates will be applied (will the economy grow three or four percent a year over the next decade). The principle remains: finance government spending with stable tax rates.

Executive summary

1. All taxes have incentive effects. In the absence of externalities and monopolies, the tax systems that lead to the most efficient allocations of resources (a) apply low tax rates to a broad base and (b) tax similar products at similar rates.
2. The cost of exemptions is that non-exempt products must pay higher rates as a result.

Review questions

1. Welfare triangle review. In Figure 16.1, identify the following:
   (a) The loss of consumer surplus. Why does the tax leave consumers with less surplus?
   (b) The loss of producer surplus. Why does the tax leave producers with less surplus?
   (c) Government revenue.
   (d) The total welfare loss.

   Answer.
   (a) The area EBAG. consumer surplus before the tax is the area between the demand curve and the line GA indicating the market price. Some consumers are willing to pay more; the difference is their surplus. When the price paid by consumers rises as a result of the tax, some of this surplus goes away.
   (b) The area FCAG. Producer surplus before the tax is the area between the supply curve (the cost of production) and the line GA indicating the market price. When the price received by producers falls as a result of the tax, some of this surplus goes away.

(c) The area EBCF. this is the tax (EF) times the equilibrium quantity (FC).

(d) The area ABC. This is consumer surplus plus producer surplus minus government revenue.

See also the discussion at the end of Section 16.1.

2. Tax systems. Comment on the welfare impact of these aspects of the US tax system:

(a) Sales tax exemption for food and clothing.

(b) Sales tax exemption for goods purchased over the internet.

(c) Sales tax exemption for medical care.

(d) Income tax exemption for health insurance.

(e) Sales tax exemption for education supplied by nonprofit institutions.

(f) Elimination of the capital gains tax.

Answer.

(a) Probably bad because it means tax rates on other things must be higher, which generates larger welfare losses. Remember: broad base, low rates. One common justification is that it favors poor people, since food and clothing are necessities, but it's probably not an effective way to do this. The best way is simply to give them money.

(b) Also bad, and for the same reason. It leads to such things as sales tax on internet purchases from Barnes & Noble (since they have local outlets) but not on Amazon (since they do not).

(c) Ditto.

(d) Ditto.

(e) Remember the principle: tax similar products the same way. There's no economic logic for taxing a product differently just because its producer it has a different legal structure. Remember: the NYSE was a nonprofit until recently.

(f) To the extent that it's a tax on capital or investment income, this could be a good thing. Further, capital gains reflect inflation as well as investment income, which can result in potentially very high tax rates on real returns. The solution here, though, is to index the tax system (or keep inflation low enough that it doesn't have much effect). An important caveat is that there are no adverse incentive effects involved in taxing capital gains that have already occurred; the incentive argument works only going forward.

3. Taxes without spending? Suppose a hypothetical government has no expenditures to finance. What tax rates should it set?

   Answer. Zero! Why? Nonzero taxes (even negative taxes or subsidies) generate adverse incentives; the prices people pay for products do not reflect their social cost of production. Possible exception: externalities, although even here there may be better choices than taxes.

4. Small government. Since government spending must be financed with taxes, and taxes distort the allocation of resources, should we have a small government?

   Answer. This is a complex issue, but here's one take on it. First, you need a government. There are clearly important and necessary roles for government: providing national and personal security, defining and enforcing property rights, supporting competitive markets, and so on. Without an effective government, you simply can't have a productive economic system. Second, there's tremendous variety across countries in the kinds of services provided by government. In many countries, governments supply educational services, social insurance, and pensions, although the degree of government involvement varies. The evidence is mixed. Among countries with high GDP per person, those with large governments are not notably less productive than those with small governments. Sweden, for example, is a productive and prosperous country despite very high government spending. Among developing countries, the evidence is stronger: Those with smaller ratios of spending to GDP have grown faster, on average, over the last forty years. This may reflect the direct effects of government or other factors — it's hard to say.

5. Progressive taxes. Questions often come up about the progressivity of tax systems. They aren't really review questions, but this seems as good a place to put them as any.
   (a) How does a progressive tax square with taxing similar things at similar rates?
   (b) Since rich people own most of the assets, shouldn't we tax investment income as a way to redistribute income?
   (c) If we rely heavily on VAT, as many countries do, how do we make the overall tax system progressive?

   Answer.
   (a) It doesn't. For reasons we've seen, progressive taxes distort resource allocation more than a flat tax that collects the same amount of revenue. But they also redistribute income from rich to poor. If you want the latter, you're stuck with some of the former.
   (b) Maybe. It still has adverse incentive effects, but it's true that wealth is much more unequally distributed than income.

(c) A VAT is, by design, a flat tax: products and people are treated the same way. In practice there's some variation in rates by products, but it's harder to treat buyers differently. Most countries introduce progressivity through the income tax and means-tested benefits.

If you're looking for more

The analysis of welfare triangles is standard economics. See, for example, these links from Wikipedia:

http://en.wikipedia.org/wiki/Economic_surplus
http://en.wikipedia.org/wiki/Deadweight_loss

There's also a Khan Academy video ("Taxation and dead weight loss").

Real-world tax systems can be incredibly complicated. Some good overviews are:

- The OECD's program on taxation has an extensive set of data and analysis for developed countries:

  http://www.oecd.org/tax/.

- The World Bank's Doing Business website includes information about tax rates and associated administrative costs for mid-sized firms. Be careful, however, of the definitions. Total tax, for example, is reported as a percentage of profit, even though some of the taxes apply to labor.

- The Economist Intelligence Unit's Country Commerce and Country Finance reports contain information about both business and individual taxes. Here's what they say about corporate taxes in the US: "Tax jurisdiction in the United States is divided among the federal government, the 50 states plus the District of Columbia, and local counties and municipalities. ... There are no uniform rules on the definition of taxable income or on the apportionment of income among the various tax jurisdictions. Hence, the advice of a tax lawyer is practically indispensable to any newcomer to multistate business."

- Myron Scholes, Mark A. Wolfson, Merle Erickson, Edward Maydew, and Terrence Shevlin's *Taxes and Business Strategy (4e)* is a wonderful, practical book on tax issues. (Earlier editions are cheaper, and probably as good for our purposes.)

Symbols used in this chapter

Table 16.1: Symbol table.

Symbol	Definition
P	Price
Q	Quantity
S	Supply
D	Demand
Y	Labor income
C	Consumption
r	Real interest rate
τ	Tax rate (proportional)

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