

Chapter 7, we used the concepts of producer and consumer surplus to make this principle more precise. Here we have seen that when the government imposes taxes on buyers or sellers of a good, society loses some of the benefits of market efficiency. Taxes are costly to market participants not only because taxes transfer resources from those participants to the government but also because they alter incentives and distort market outcomes.

The analysis presented here and in Chapter 6 should give you a good basis for understanding the economic impact of taxes, but this is not the end of the story. Microeconomists study how best to design a tax system, including how to strike the right balance between equality and efficiency. Macroeconomists study how taxes influence the overall economy and how policymakers can use the tax system to stabilize economic activity and to achieve more rapid economic growth. So as you continue your study of economics, don't be surprised when the subject of taxation comes up yet again.

SUMMARY

- A tax on a good reduces the welfare of buyers and sellers of the good, and the reduction in consumer and producer surplus usually exceeds the revenue raised by the government. The fall in total surplus—the sum of consumer surplus, producer surplus, and tax revenue—is called the deadweight loss of the tax.
- Taxes have deadweight losses because they cause buyers to consume less and sellers to produce less, and these changes in behavior shrink the size of the market below the level that maximizes total surplus. Because the elasticities of supply and demand measure how much market participants respond to market conditions, larger elasticities imply larger deadweight losses.
- As a tax grows larger, it distorts incentives more, and its deadweight loss grows larger. Because a tax reduces the size of the market, however, tax revenue does not continually increase. It first rises with the size of a tax, but if a tax gets large enough, tax revenue starts to fall.

KEY CONCEPT

deadweight loss, *p.* 159

QUESTIONS FOR REVIEW

1. What happens to consumer and producer surplus when the sale of a good is taxed? How does the change in consumer and producer surplus compare to the tax revenue? Explain.
2. Draw a supply-and-demand diagram with a tax on the sale of the good. Show the deadweight loss. Show the tax revenue.
3. Suppose both supply and demand in a market are relatively inelastic. Will a tax placed on the product in this market generate a relatively large or small deadweight loss? Why?
4. Why do experts disagree about whether labor taxes have small or large deadweight losses?
5. What happens to the deadweight loss and tax revenue when a tax is increased?

PROBLEMS AND APPLICATIONS

- The market for pizza is characterized by a downward-sloping demand curve and an upward-sloping supply curve.
 - Draw the competitive market equilibrium. Label the price, quantity, consumer surplus, and producer surplus. Is there any deadweight loss? Explain.
 - Suppose that the government forces each pizzeria to pay a \$1 tax on each pizza sold. Illustrate the effect of this tax on the pizza market, being sure to label the consumer surplus, producer surplus, government revenue, and deadweight loss. How does each area compare to the pre-tax case?
 - If the tax were removed, pizza eaters and sellers would be better off, but the government would lose tax revenue. Suppose that consumers and producers voluntarily transferred some of their gains to the government. Could all parties (including the government) be better off than they were with a tax? Explain using the labeled areas in your graph.
- Evaluate the following two statements. Do you agree? Why or why not?
 - "A tax that has no deadweight loss cannot raise any revenue for the government."
 - "A tax that raises no revenue for the government cannot have any deadweight loss."
- Consider the market for rubber bands.
 - If this market has very elastic supply and very inelastic demand, how would the burden of a tax on rubber bands be shared between consumers and producers? Use the tools of consumer surplus and producer surplus in your answer.
 - If this market has very inelastic supply and very elastic demand, how would the burden of a tax on rubber bands be shared between consumers and producers? Contrast your answer with your answer to part (a).
- Suppose the demand for cigarettes is relatively inelastic.
 - Would a tax on cigarettes generate a large deadweight loss? Explain.
 - Who would bear the burden of the tax, smokers or tobacco growers?
 - After ten years, would the government collect more or less revenue from the tax?
 - Is there another reason the government might choose to tax cigarettes in addition to collecting revenue?
- After economics class one day, your friend suggests that taxing food would be a good way to raise revenue because the demand for food is quite inelastic. In what sense is taxing food a "good" way to raise revenue? In what sense is it not a "good" way to raise revenue?
- Daniel Patrick Moynihan, the late senator from New York, once introduced a bill that would levy a 10,000 percent tax on certain hollow-tipped bullets.
 - Do you expect that this tax would raise much revenue? Why or why not?
 - Even if the tax would raise no revenue, why might Senator Moynihan have proposed it?
- The government places a tax on the purchase of socks.
 - Illustrate the effect of this tax on equilibrium price and quantity in the sock market. Identify the following areas both before and after the imposition of the tax: total spending by consumers, total revenue for producers, and government tax revenue.
 - Does the price received by producers rise or fall? Can you tell whether total receipts for producers rise or fall? Explain.
 - Does the price paid by consumers rise or fall? Can you tell whether total spending by consumers rises or falls? Explain carefully. (Hint: Think about elasticity.) If total consumer spending falls, does consumer surplus rise? Explain.
- Suppose the government currently raises \$100 million through a 1-cent tax on widgets, and another \$100 million through a 10-cent tax on gadgets. If the government doubled the tax rate on widgets and eliminated the tax on gadgets, would it raise more tax revenue than it does today, less tax revenue, or the same amount? Explain.
- This chapter analyzed the welfare effects of a tax on a good. Consider now the opposite policy. Suppose that the government *subsidizes* a good: For each unit of the good sold, the government pays \$2 to the buyer. How does the subsidy affect consumer surplus, producer

surplus, tax revenue, and total surplus?
Does a subsidy lead to a deadweight loss?
Explain.

10. Hotel rooms in Smalltown go for \$100, and 1,000 rooms are rented on a typical day.
 - a. To raise revenue, the mayor decides to charge hotels a tax of \$10 per rented room. After the tax is imposed, the going rate for hotel rooms rises to \$108, and the number of rooms rented falls to 900. Calculate the amount of revenue this tax raises for Smalltown and the deadweight loss of the tax. (Hint: The area of a triangle is $\frac{1}{2} \times \text{base} \times \text{height}$.)
 - b. The mayor now doubles the tax to \$20. The price rises to \$116, and the number of rooms rented falls to 800. Calculate tax revenue and deadweight loss with this larger tax. Do they double, more than double, or less than double? Explain.
11. Suppose that a market is described by the following supply and demand equations:

$$Q^S = 2P$$

$$Q^D = 300 - P$$

- a. Solve for the equilibrium price and the equilibrium quantity.
- b. Suppose that a tax of T is placed on buyers, so the new demand equation is

$$Q^D = 300 - (P + T).$$

Solve for the new equilibrium. What happens to the price received by sellers, the price paid by buyers, and the quantity sold?

- c. Tax revenue is $T \times Q$. Use your answer to part (b) to solve for tax revenue as a function of T . Graph this relationship for T between 0 and 300.
- d. The deadweight loss of a tax is the area of the triangle between the supply and demand curves. Recalling that the area of a triangle is $\frac{1}{2} \times \text{base} \times \text{height}$, solve for deadweight loss as a function of T . Graph this relationship for T between 0 and 300. (Hint: Looking sideways, the base of the deadweight loss triangle is T , and the height is the difference between the quantity sold with the tax and the quantity sold without the tax.)
- e. The government now levies a tax on this good of \$200 per unit. Is this a good policy? Why or why not? Can you propose a better policy?

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