

8 | TAXES AND WELFARE

Purpose: To show the effects of an excise tax on social welfare.

Computer file: **taxwelf.xls**

Instructions and background information:

In the previous problem set you showed that competitive markets ordinarily maximize the welfare from a good or service. The reason markets have this remarkable and desirable characteristic is that in the market equilibrium the sum of consumer and producer surplus is as large as possible.

A corollary to this result is that interference with the operation of a free market, if it changes price and quantity, must reduce welfare as measured by the sum of producer and consumer surplus. In this problem set you will explore the effects of an excise tax on welfare in a market for pizza. The result is that the tax causes welfare to decrease, even taking into account the gain in revenue the government gets from the tax. This decrease in welfare is usually referred to as the *deadweight loss* due to the tax.

The deadweight loss due to an excise tax is a form of economic inefficiency. It's a reduction in consumer and producer surplus, and the result is that less than the socially best amount of the good is produced, and it is sold at too high a price. Another way economists describe this result is to say that excise taxes distort the allocation of resources. This is just another way of saying that when the excise tax is imposed, too little of society's resources will be devoted to the good.

This is not to say that government should never use excise taxes to raise revenue. In many cases people are prepared to accept the deadweight loss due to taxes if the government can provide services that the market would otherwise fail to provide. These services may include things such as defense, income redistribution, some kinds of education, and legal protection.

Open the file **taxwelf.xls**. What you see are demand and supply curves for pizza in a hypothetical market. You're asked to compute the total surplus in the market for pizza in the absence of any tax or subsidy. Then you change the tax, and explore the consequences for consumer surplus, producer surplus, and total welfare. The tax is presumed to be collected by pizza firms in this case, so the imposition of the tax shows up as a shift in the supply curve for pizza.

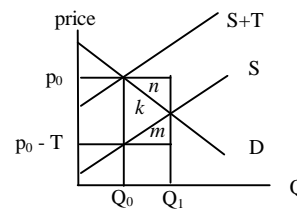
Here are some things to watch for and learn as you do the problems:

- 1) Total welfare (consumer plus producer surplus) is maximized in the market equilibrium.
- 2) The tax raises the market price of pizza to consumers. Because sellers collect the tax, their after-tax price is lower than if there were no tax.
- 3) Both buyers and sellers lose surplus as a result of the tax.
- 4) The tax revenue of the government is *less* than the loss of surplus. Consumers and producers lose more than the government gains. Therefore there is a deadweight loss in welfare from the tax.

Here are some hints to help you get the answers quicker:

- 1) You'll need a calculator to do the computations. The area of a right triangle is $(1/2) \times \text{base} \times \text{height}$.
- 2) Drawing a sketch of the graphs on a piece of scrap paper will help. Label the crucial points in your sketch by referring to the worksheet display of the graph. You'll need to know where the supply and demand curves intersect the price axis. Set quantity to zero to find these numbers.
- 3) You'll need to find the equilibrium price and quantity in the market. Use Goal Seek (or experimentation) to find the quantity of pizza that makes the difference between the buyer's price and seller's price equal to zero.

- 4) You'll need to find the loss in welfare due to an excise tax. In the diagram at the right, the loss due to the tax is the triangle k . The easiest way to find k is to notice that it is one-half of the area $k+n+m$. The area $k+n+m$ is easy to compute. It's just the rectangle that is $(Q_0 - Q_1)$ wide by $(p_0 - (p_0 - T))$ wide.



TAXES AND WELFARE

Questions

Set all variables to their baseline values.

- 1) What is the market equilibrium quantity?
- 2) What is the market equilibrium price?

Set all variables to their baseline values.

- 3) What's the amount of consumer surplus at the market equilibrium?
- 4) What's the amount of producer surplus at the market equilibrium?

Set all variables at their baseline values.

- 5) At the market equilibrium, what's the total surplus (consumer plus producer)?

With variables starting from their baseline values, set the excise tax to \$5 per pizza.

- 6) What's the new equilibrium price of pizza?
- 7) What's the new equilibrium quantity of pizza?
- 8) After the tax, what's the new buyer's price?
- 9) After the tax, what's the new consumer surplus?
- 10) After sellers pay the tax, what's their new amount of producer surplus?
- 11) What's the total tax amount paid to the government?
- 12) With the tax at \$5, and the market in equilibrium, **PRINT THE WORKSHEET.** Shade in and label the consumer surplus, producer surplus, and total tax. **TURN IN THE PRINTOUT WITH YOUR OTHER ANSWERS.** (If you save your answer sheet as a file, and submit it electronically, you should turn in the printout as requested by your instructor.)

Put the tax at \$5, and the market in equilibrium.

- 13) What's the deadweight loss in welfare due to the tax?
- 14) Print out the worksheet one more time. Shade in the area showing the deadweight loss in welfare due to the tax. **TURN IN THE PRINTOUT WITH YOUR OTHER ANSWERS.** (If you save your answer sheet as a file, and submit it electronically, you should turn in the printout as requested by your instructor.)