

## Chapter 9 Practice Problems

(answers appear on the next page)

Good: autos

Country: U.S. (assume "small")

U.S. buyers' demand curve:  $Q = 3000 - 50P$ , or equivalently:  $P = 60 - 0.02Q$

U.S. producers' supply curve:  $Q = -1500 + 100P$ , or equivalently:  $P = 15 + 0.01Q$

Note: P is measured in \$1000s

1. If the U.S. is a closed economy, determine the equilibrium P and Q.
2. Sketch the supply and demand curves.
3. If the U.S. is a closed economy, determine CS, PS, and total surplus.
4. Suppose the U.S. engages in free trade, and the world price of autos is \$20 thousand.
  - a. Determine the quantity that U.S. residents will buy.
  - b. Determine the quantity that U.S. producers will sell.
  - c. Determine the quantity of autos imported.
  - d. Determine CS, PS, and total surplus.
5. Now suppose there is a tariff of \$5 thousand on imported autos.
  - a. What is the price facing U.S. buyers and sellers?
  - b. Determine the quantity U.S. buyers will buy.
  - c. Determine the quantity that U.S. sellers will sell.
  - d. Determine the quantity of autos imported.
  - e. Determine the amount of revenue the tariff generates for the U.S. government.
  - f. Determine CS, PS, and total surplus (remember to include the tariff revenue in total surplus)
  - g. Compute the dead-weight loss of the tariff.

NOTE: Would you like some practice with the concepts from Chapters 6 and 8? You can use the same supply and demand curves, assuming a closed economy, to analyze the effects of a tax on autos. Problems 1-3 above ask you to figure out the equilibrium in a closed economy without any tax. After doing those, suppose the government imposes a tax of \$3 thousand per auto. (Assume a closed economy.) Find the new quantity, the price buyers pay, and the price sellers receive in the new equilibrium with the tax. Compute CS, PS, tax revenue, and total surplus in this new equilibrium with the tax. Finally, compare total surplus with and without the tax to determine the size of the dead-weight loss from this tax.

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1. If the U.S. is a closed economy, determine the equilibrium P and Q.

$$P = \$30 \text{ thousand, } Q = 1500.$$

To find the equilibrium price, solve the following equation for P:

$$3000 - 50P = -1500 + 100P$$

The left side of this equation is the quantity buyers demand. The right side is the quantity U.S. producers supply. Equilibrium is where the quantity demanded equals quantity supplied.

Once you find  $P = 30$ , plug that value into the demand and supply equations to determine  $Q = 1500$ .

2. Sketch the supply and demand curves.

See graph on next page.

3. If the U.S. is a closed economy, determine CS, PS, and total surplus.

$$CS = 22,500 \quad PS = 11,250 \quad TS = CS + PS = 33,750$$

4. Suppose the U.S. engages in free trade, and the world price of autos is \$20 thousand.

- a. Determine the quantity that U.S. residents will buy.

$$\text{From the demand equation: if } P = 20, Q = 2000.$$

- b. Determine the quantity that U.S. producers will sell.

$$\text{From the supply equation: if } P = 20, Q = 500.$$

- c. Determine the quantity of autos imported.

$$\text{imports} = \text{quantity demanded} - \text{quantity supplied} = 2000 - 500 = 1500$$

- d. Determine CS, PS, and total surplus.

$$CS = 40,000 \quad PS = 1250 \quad TS = CS + PS = 41,250$$

Comments: If you compare these results to your answers from question 3, you can see that free trade makes consumers better off and producers worse off, but the gains outweigh the losses, so total surplus rises.

5. Now suppose there is a tariff of \$5 thousand on imported autos.

- a. What is the price facing U.S. buyers and sellers?

$$\$25 = \text{world price} + \text{tariff} = \$20 + \$5$$

- b. Determine the quantity U.S. buyers will buy.

$$\text{Plug } P = 25 \text{ into demand equation, get } Q = 1750$$

- c. Determine the quantity that U.S. sellers will sell.

$$\text{Plug } P = 25 \text{ into supply equation, get } Q = 1000$$

- d. Determine the quantity of autos imported.

$$\text{imports} = 1750 - 1000 = 750$$

- e. Determine the amount of revenue the tariff generates for the U.S. government.

$$\$5 \text{ tariff revenue per car times } 750 \text{ imported cars} = \$3750$$

- f. Determine CS, PS, and total surplus (remember to include the tariff revenue in total surplus)

$$CS = 30,625 \quad PS = 5000 \quad TS = 30,625 + 5,000 + 3,750 = 39,375$$

- g. Compute the dead-weight loss of the tariff.

$$DWL = TS \text{ with free trade} - TS \text{ with tariff} = 41,250 - 39,375 = 1875$$

Comments: If you compare these results to your answers from question 4, you can see that the tariff makes producers better off (PS rises from 1250 to 5000), and the tariff also produces revenue for the

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government. Yet, the fall in consumer surplus (from 40,000 to 30,625) from the tariff exceeds these gains. Hence, total surplus is lower with the tariff than under free trade, the difference being 1875.

On the following graph, the vertical axis measures the price of autos (in \$1000s) and the horizontal axis measures the quantity of autos.

