

ECON 110, Professor Hogendorn

Problem Set 3

1. *Dollar-sales-tax.* Demand is $Q_d = 40 - 3p$ and supply is $Q_s = 2p$.
 - (a) What is the equilibrium price and quantity? What is the consumer and producer surplus?
 - (b) If a \$1 *per unit* sales tax is imposed on this good, what is the new equilibrium price and quantity? What is the new consumer and producer surplus? What is the deadweight loss of the tax? How much revenue does the tax generate?

2. *MexicanFarmers.*
 - (a) Suppose that U.S. farmers are willing to supply any amount of corn at \$2 dollars per bushel. (Let this be the “world price” of corn.) Suppose that Mexican farmers have supply curve $Q_s(p) = -10 + 10p$. Let Mexican demand for corn be $Q_d(p) = 50 - 5p$. How many bushels do Mexican farmers produce? How many do Mexican consumers buy? How large are imports from the U.S.?
 - (b) Draw a graph of (a).
 - (c) Suppose Mexico imposes a tariff of 70% on corn imports from the U.S. With the tariff, how much corn do Mexican farmers produce, and how much is imported?
 - (d) Draw the tariff on your graph, and label the changes in producer and consumer surplus, the tariff revenue, and the deadweight losses.

- (e) If the goal is to help Mexican farmers, would the tariff work better if their supply were more elastic? Would the tariff then be better or worse for Mexicans as a whole? (Hint, use your graph and change the slope of the supply curve so that the same tariff causes a larger % increase in supply.)
3. *ChinaAutoPartsTariff*. Suppose China charges a 25% tariff on imported auto parts. Total Chinese imports of auto parts are \$5 billion per year. Let the world price of auto parts be \$1, and let China's domestic demand curve be $Q(p) = 40.25 - 17p$ (where we measure quantity in billions).
- (a) Draw the effect of the tariff on a graph of the Chinese auto parts market. Show what deadweight losses China causes itself. In words, how do you interpret the deadweight losses?
- (b) Assume that current imports into China of auto parts are 5 billion units. What must be the quantity supplied by Chinese producers?
- (c) Suppose that Chinese auto parts suppliers have a linear supply curve and a supply elasticity of $E_s = 1.2$ when the tariff is in effect. What would be the change in Chinese producer surplus if the tariff were removed?
4. *GermansBuyCars*. During the 2008 financial crisis, Germany was in recession. One tool the German government used to combat the recession was to offer German car buyers a €2,500 subsidy to buy a car.
- (a) Let Germans buy 600,000 cars at a price of €10,000 each. Let the price elasticity of demand be $E_d = -1.3$. Using a back-of-the-envelope calculation, find the equation for a linear demand curve $Q_d(p)$.

- (b) Suppose that supply is perfectly elastic. If the German government offers a €2,500 subsidy, payable to the car seller, the German producers will act as if their supply curves were shifted and sell more cars. Find the equation for the new supply curve and the new number of cars purchased. Graph the deadweight loss caused by the subsidy. Why does this triangle represent a loss to society?
- (c) Actually, the car subsidy required that the consumer trade in an older car that didn't meet new air pollution standards. Given this, discuss and graph whether the subsidy did in fact cause a deadweight loss of the size you showed in part (b).

Review Problems only, not to turn in:

5. *Tariff*. Let domestic demand be $q(p) = 60 - 2p$ and supply is $s(p) = p$. Let the world price be 10.
 - (a) Under free trade, what is the quantity imported and what is domestic consumer and producer surplus?
 - (b) If the government imposes a tariff of \$5 per unit imported, how much revenue is generated, and what are the new domestic consumer and producer surpluses? How big is the deadweight loss?
6. *Veerman*. Former Dutch agriculture minister Cees Veerman owns farms in Holland and France. Let's suppose that he grows turnips, and that his supply curve for turnips is

$$s(p) = 1000 + 6.44p$$

Because he is a small producer, the demand curve for Veerman's turnips is perfectly elastic; that is, he has to accept the market price. Currently that price is €250 per tonne.

- (a) Draw and label the supply and demand curves, including the quantity produced by Veerman.
- (b) Suppose the European Union offers Veerman a per-unit subsidy of €63 per tonne. The subsidy is paid directly to Veerman. Show the effects of the subsidy in your diagram, including Veerman's new quantity produced.
- (c) How much money does Veerman get in subsidy from the EU? How large is the deadweight loss?
- (d) What do you think, is the turnip subsidy progressive in the sense that lower income farmers receive a larger subsidy per euro of income? (given the information in this problem, there is no one correct answer, but you must justify your reasoning.)

7. *Sugar*. Read the following beginning to an article:

Michael Schroeder, "Sugar Growers Hold Up Push For Free Trade," *The Wall Street Journal*, February 3, 2004, pg. A13.

WASHINGTON – The sugar industry – which accounts for less than 1% of all U.S. farm sales but 17% of agriculture's political contributions since 1990 – is proving to be an obstacle to Bush administration efforts to keep the free-trade ball rolling.

The industry not only is the sticking point in the administration's plans to get congressional backing for a free-trade pact with Central America, but also is gumming up talks toward a free-trade pact with Australia.

Australia, the world's fourth-largest sugar exporter, wants to sell more sugar to the U.S. in exchange for lowering the tariffs it levies on U.S.-made goods. Australia currently sells the U.S. 87,000 metric tons of sugar a year, less than 1% of the 10 million tons of sugar consumed in the U.S. Caps on sugar imports long have kept the U.S. price of refined sugar at twice the world market price.

- (a) Assume that all U.S. imports of sugar come from Australia for the purposes of this problem, and assume that sugar is subject to a *tariff*. Draw a supply and demand diagram of the U.S. market for sugar, showing the tariff and the amount of imports and sugar consumed. You don't have to draw the diagram perfectly to scale, but try to capture all of the information in the final paragraph above.
 - (b) Label the effects of the tariff, showing changes in producer and consumer surplus, deadweight losses, etc. With reference to these effects, describe why the sugar industry works hard to maintain the trade barrier and why the government, on behalf of the country in general, is working to end it.
8. *Silicon Valley*. In Silicon Valley, there are many information technology (IT) firms clustered in one place. This is usually attributed to positive externalities in production: when firm produces a product, the skilled workers can exchange ideas with one another, with venture capitalists, and so on. Thus, firms in Silicon Valley are more productive than similar firms elsewhere.
- (a) Graph the supply and demand curves for one IT good (e.g. web servers) in Silicon Valley. Show the positive externality in production.
 - (b) Label the graph to show the external benefits and the deadweight loss in both the free-market and the socially optimal situations.
 - (c) If the California government were to intervene in this market, what should it do?

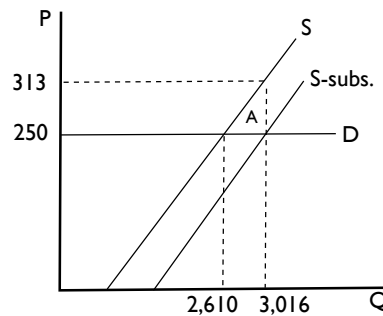
Answers to Review Problems:

5. *Tariff_a.*

- (a) $q(10) = 60 - 2 \cdot 10 = 40$ and $s(10) = 10$, so imports are 30. The choke price is 30, so consumer surplus is $\frac{1}{2}(30 - 10)40 = 400$. Domestic producer surplus is $\frac{1}{2}10 \cdot 10 = 50$. Total surplus is 450.
- (b) The price with the tariff is 15, so $q(15) = 60 - 2 \cdot 15 = 30$ and $s(15) = 15$. Imports fall to 15 units, and government revenue is $15 \cdot 5 = 75$. The new consumer surplus is $\frac{1}{2}(30 - 15)30 = 225$ and the new domestic producer surplus is $\frac{1}{2}15 \cdot 15 = 112.5$. The total surplus is 412.5, so the deadweight loss is 37.5.

6. *Veerman.*

- (a) Veerman takes the €250 price as given:

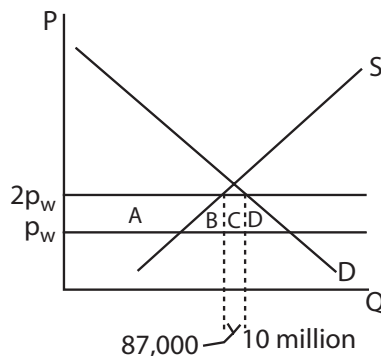


- (b) In the graph above, Veerman's supply curve is effectively shifted down by €63 because this represents a decrease in costs to him. As a result, his quantity increases.
- (c) The total subsidy to Veerman is €63 times the quantity 3,016, a total of €190,008. The area marked *A* in the diagram is deadweight loss. In that area, the costs to Veerman, represented by line *S*, are greater than the value of 250 that consumers place on turnips. The area of *A*, one-half the base times the height, is $\frac{1}{2}(3016 - 2610) \times 63 = 12,789$.

- (d) We know the turnip subsidy is the same regardless of the quantity of turnips produced. So the answer to the question depends on whether small turnip producers have *proportionately* larger or smaller incomes than large turnip producers. I think there are several reasons to support the regressive story: (1) large turnip producers have large amounts of land, which is probably associated with large income from other sources; (2) there are probably fixed costs associated with turnip production (tractors and equipment, farm buildings, etc.), and large turnip producers can spread this overhead across their output, thus lowering their average cost. But other stories could be told to justify a progressive argument.

7. *Sugar_a.*

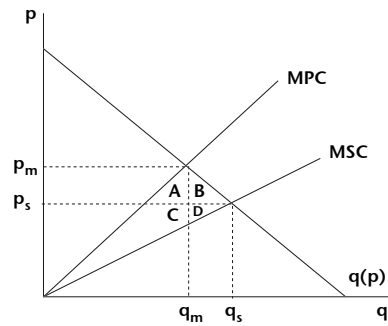
- (a)



- (b) The effect of the tariff is to reduce consumer surplus by $A + B + C + D$. A is an increase in producer surplus, C is the tariff revenue, and B and D are deadweight losses. The sugar industry gains a great deal from the tariff, since A is quite large, but for the country as a whole the tariff is bad. True, A and C are just transfers between the government's various constituents, but B and D are lost entirely to the U.S. economy. The country as a whole is better off with no tariff.

8. *SiliconValley_a.*

(a)



(b) At the free market equilibrium, external benefits are $A + C$, and there is a deadweight loss $B + D$.

At the social optimum, external benefits are $A + B + C + D$.

(c) It could provide a subsidy so that the price of output fell to p_s in the graph. This would increase quantity demanded to q_s and correct for the externality.