

## Problem Set 2

### Answers and Selected Solutions

Principles of Economics

David A. Díaz

#### Elasticity

1. The ability of firms to enter and exit a market over time means that, in the long run,
  - (a) the demand curve is more elastic.
  - (b) the supply curve is more elastic.
  - (c) the demand curve is less elastic.
  - (d) the supply curve is less elastic.
2. If an increase in the price of a good has no impact on the total revenue in that market, demand must be
  - (a) price inelastic.
  - (b) price elastic.
  - (c) unit price elastic.
  - (d) all of the above.
3. Suppose we are studying the market for Jello and news came out that eating Jello is detrimental to one's health. Given this, we can say that we could, in theory,
  - (a) calculate both the price elasticity of demand for Jello and the price elasticity of supply.
  - (b) calculate the price elasticity of supply for Jello, but not the price elasticity of demand.
  - (c) calculate the price elasticity of demand for Jello, but not the price elasticity of supply.
  - (d) not calculate either the price elasticity of demand for Jello or the price elasticity of supply.

**Solution:** To calculate elasticity of demand or supply, we need two points along a given demand or supply curve, respectively. Here, the demand curve shifts, so we cannot calculate the elasticity of demand. However, we will have two points on a stationary supply curve so we can calculate the elasticity of supply.

4. Suppose that the price of cotton increases. In the market for oversized t-shirts, the total revenue received by sellers will \_\_\_\_\_ if the \_\_\_\_\_.
  - (a) increase; demand curve is inelastic

- (b) decrease; supply curve is inelastic
- (c) increase; demand curve is elastic
- (d) increase; supply curve is elastic

**Solution:** An increase in the price of an input will lead to a decrease in supply, which will increase the equilibrium price of oversized t-shirts. If the price increases, then TR will increase if demand is inelastic or decrease if demand is elastic.

5. If consumers always spend 15% of their income on food, the the income elasticity of demand for food is
  - (a) 0.15
  - (b) 1.00
  - (c) 1.15
  - (d) 1.50
  - (e) none of the above.
6. Suppose the price of beans rises from \$10 to \$12. As a result, the quantity demanded of porridge falls by 10%. What is the cross-price elasticity between the two goods?
  - (a) 1.818
  - (b) -1.818
  - (c) .55
  - (d) -.55

**Solution:**  $\varepsilon_{d_y}^{P_x} = \frac{\% \Delta Q_{d_y}}{\% \Delta P_x}$ . We are given  $\% \Delta Q_{d_y} = -10\%$ .  $\% \Delta P_x = \frac{P_1 - P_0}{(\frac{P_0 + P_1}{2})} \times 100\% = \frac{12 - 10}{(\frac{10 + 12}{2})} \times 100\% = 18.18\%$ . So,  $\varepsilon_{d_y}^{P_x} = -10\% \div 18.18\% = -.55$ .

7. Since chocolate chip cookies and oatmeal raisin cookies are substitutes, the cross-price elasticity of demand between the goods is
  - (a) negative.
  - (b) positive.
  - (c) zero.
  - (d) impossible to discern without more information.
8. For which pairs of goods is the cross-price elasticity most likely to be negative?
  - (a) pens and pencils
  - (b) car tires and coffee
  - (c) peanut butter and jelly
  - (d) new textbooks and used textbooks

**Solution:** Cross-price elasticity is negative for goods that are complements. PB & J are the only complements from the answer choices.

9. If supply is price inelastic, the value of the price elasticity of supply must be
- (a) zero.
  - (b) less than 1.
  - (c) greater than 1.
  - (d) infinite.
  - (e) none of the above.
10. Amusement park owners increase the price of ferris wheel rides on Coney Island. Total revenue from ferris wheel rides will
- (a) increase regardless of the elasticity of demand for ferris wheel rides.
  - (b) increase if demand for ferris wheel rides is elastic.
  - (c) decrease if demand for ferris wheel rides is inelastic.
  - (d) increase if demand for ferris wheel rides is inelastic.
11. If the absolute value of the price elasticity of demand is .5, then when the price of good  $X$  rises by 20%
- (a) the quantity demanded of good  $X$  rises by 40%.
  - (b) the quantity demanded of good  $X$  rises by 10%.
  - (c) the quantity demanded of good  $X$  falls by 10%.
  - (d) the quantity demanded of good  $X$  falls by 40%.

**Solution:**  $|\varepsilon_d^P| = \left| \frac{\% \Delta Q_d}{\% \Delta P} \right| = \left| \frac{\% \Delta Q_d}{+20\%} \right| = .5 \Rightarrow |\% \Delta Q_d| = 10\%$ . By Law of Demand, if prices increased, then quantity demanded must have fallen so  $\% \Delta Q_d = -10\%$ .

12. If demand is linear, then price elasticity of demand is
- (a) constant along the demand curve.
  - (b) inelastic in the upper portion and elastic in the lower portion.
  - (c) elastic in the upper portion and inelastic in the lower portion.
  - (d) elastic throughout.
  - (e) inelastic throughout.
13. If the price elasticity of supply is .8, and prices increased by 5%, then quantity supplied would
- (a) increase by 4%.
  - (b) decrease by 4%.
  - (c) increase by 6.25%.
  - (d) decrease by 6.25%.

**Solution:**  $\varepsilon_s^P = \frac{\% \Delta Q_s}{\% \Delta P} = \frac{\% \Delta Q_s}{+5\%} = .8 \Rightarrow \% \Delta Q_s = +4\%$ .

14. As individuals lose their jobs, they buy fewer romance novels. Which of the following might be the income elasticity of demand for romance novels?

(a)  $-1.32$   
(b)  **$.54$**   
(c)  $-.30$   
(d) Either (a) or (c)

15. When the price of bubble gum is \$.50, the quantity demanded is 400 packs per day. When the price falls to \$.40, quantity demanded is 600. Given this, we can say that demand for bubble gum is

(a) inelastic.  
(b) **elastic.**  
(c) unit elastic.  
(d) perfectly inelastic.  
(e) perfectly elastic.

16. Consider public policy aimed at smoking.

- (a) Studies indicate the price elasticity of demand for cigarettes is about 0.4. If a pack of smokes currently costs \$2 and the government wants to reduce smoking by 20%, by how much should it increase the price (in percentage terms)?

**Solution:**  $\varepsilon_d^P = \frac{\% \Delta Q_d}{\% \Delta P} = -.4 \Rightarrow \frac{-20\%}{\% \Delta P} = -.4 \Rightarrow \% \Delta P = +50\%$ . The government should increase cigarette prices by 50%. You can also use the elasticity formula to show that the new price should be \$3.33.

- (b) If the government permanently increases the price of cigarettes, will the policy have a larger effect on smoking one year from now or five years from now? Draw a graph to support your answer.

**Solution:** See Figure ???. Demand in the short run is inelastic, and thus the quantity demanded will not decrease much due to the higher price. In the long run, demand becomes more elastic and thus the quantity demanded will fall more.

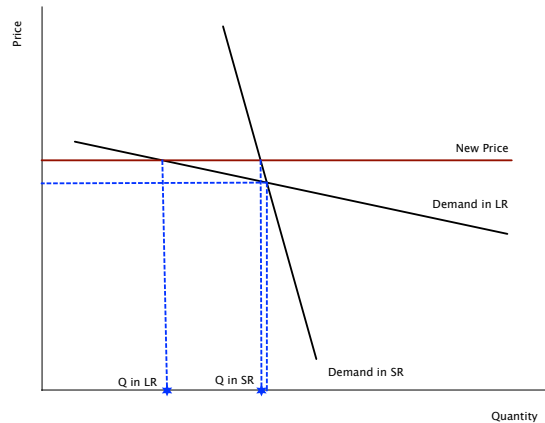


Figure 1: Demand for Cigarettes in SR and LR

- (c) Studies also find that teens have a higher price elasticity of demand than do adults. Why might this be true?

**Solution:** One of the determinants price elasticity of demand is whether a good is viewed as a luxury or a necessity. Adult smokers likely view cigarettes as more of a necessity than teens since they have been smoking for a longer amount of time and thus likely find it harder to quit. Therefore, the price elasticity of demand is likely higher for teens. Additionally, cigarettes likely consume a greater amount of the budget for teens than adults, and again this implies teens have a more elastic demand.

## Price Controls and Taxes

- Suppose a per unit tax of \$.50 is imposed on buyers of Pepsi. As a result, the price buyers end up paying is \$1.25 for each can. Moreover, the amount Pepsi-Cola receives for every can of Pepsi sold decreases by \$.15. Given this, we can say that \_\_\_\_\_ bear most of the tax burden and the equilibrium price of Pepsi before the tax was imposed was \_\_\_\_\_.
  - sellers; \$.75
  - buyers; \$.90
  - sellers; \$.90
  - buyers; \$.75

**Solution:**  $\text{Tax} = $.50 = P_B - P_S \Rightarrow P_S = \$1.25 - $.5 = $.75$ . Eq. price before tax =  $P_S + $.15 = $.90$ . Sellers pay \$.15 of the tax, buyers pay \$.35.

- Consider Figure 2.

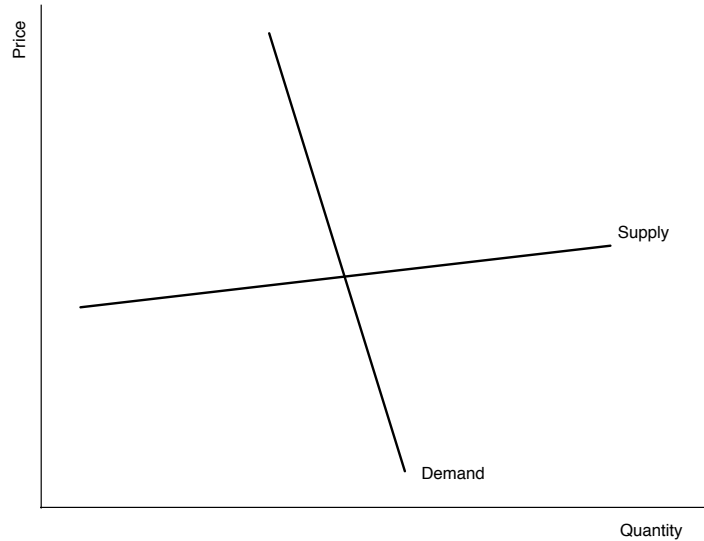


Figure 2: Market for Coke

If the government imposes a \$5 per unit tax on sellers in this market,

- (a) the burden of the tax will be split evenly between buyers and sellers in the market.
- (b) the burden of the tax will be greater for sellers than for buyers in the market.
- (c) the burden of the tax will be greater for buyers than for sellers in the market.
- (d) the split of the tax burden cannot be determined from this information.

**Solution:** Regardless of who the tax is levied against, the majority of the tax burden will fall on whoever has the more inelastic curve. From the graph, we see that demand is more inelastic and so buyers will bear a greater burden of the tax.

3. A tax of \$4 is imposed by the government. Use Table 1 to answer the question below.

Table 1: Unit Taxes

	Price with no tax	Price with \$4/unit tax on sellers
Price paid by buyers	\$55	?
Price received by sellers	\$55	\$53.50

Because of this tax, buyers are paying \_\_\_\_\_ per unit and sellers are receiving \_\_\_\_\_ per unit.

- (a) \$4 less; \$4 more
- (b) \$2 more; \$2 less
- (c) \$2.50 more; \$1.50 less
- (d) \$4 more; \$4 less

**Solution:** Sellers receive  $\$55 - \$53.50 = \$1.50$  less per unit.  $P_B = P_S + \text{tax} = \$53.50 + \$4 = \$57.50 \Rightarrow$  buyers paying  $\$57.50 - \$55 = \$2.50$  more than before.

4. For a price ceiling to be a binding constraint on the market, the government must set it
  - (a) above the equilibrium price.
  - (b) below the equilibrium price.
  - (c) precisely at the equilibrium price.
  - (d) at any price because all price ceilings are binding constraints.
5. A binding price ceiling creates
  - (a) a shortage.
  - (b) a surplus.
  - (c) an equilibrium.
  - (d) a shortage or surplus depending on whether the price ceiling is set above or below the equilibrium market price.
6. The minimum wage in Los Angeles was recently increased from \$9/hour to \$15/hour. This increase in the minimum wage will cause employment to fall by 10% if \_\_\_\_\_ and results in a(n) \_\_\_\_\_ in total wage payments.
  - (a) labor supply is inelastic; increase
  - (b) labor demand is inelastic; increase
  - (c) labor demand is elastic; decrease
  - (d) labor supply is elastic; decrease

**Solution:** An increase in the minimum wage leads to movement along the labor demand curve to determine  $Q_E$ .  $\% \Delta W = \frac{15-9}{(15+9)/2} \times 100\% = 50\% \Rightarrow |\mathcal{E}_D^W| = \frac{10\%}{50\%} = .2$  Labor demand is inelastic, so an increase in wages leads to an increase in total wage payments.

7. Which of the following is true if the government places a price ceiling on gasoline at \$1.50 per gallon and the equilibrium price is \$1.00 per gallon.
  - (a) There will be a shortage of gasoline.
  - (b) There will be a surplus of gasoline.
  - (c) A significant increase in the supply of gasoline could cause the price ceiling to become a binding constraint.
  - (d) A significant increase in the demand for gasoline could cause the price ceiling to become a binding constraint.
8. Suppose a tax is placed on DVDs. If the sellers end up bearing most of the tax burden, we know that
  - (a) demand is more inelastic than supply.
  - (b) supply is more inelastic than demand.
  - (c) the government levied the tax on buyers.

- (d) the government levied the tax on sellers.
9. A tax placed on a good that is a necessity for consumers will likely generate a tax burden that
- (a) falls more heavily on buyers.
  - (b) falls more heavily on sellers.
  - (c) falls entirely on sellers.
  - (d) is evenly distributed between buyers and sellers.
10. Which side of the market is more likely to lobby government for a price floor?
- (a) Neither buyers or sellers desire a price floor.
  - (b) Both buyers and sellers desire a price floor.
  - (c) The sellers.
  - (d) The buyers.
11. The surplus caused by a binding price floor will be greatest if
- (a) both supply and demand are elastic.
  - (b) supply is inelastic and demand is elastic.
  - (c) demand is inelastic and supply is elastic.
  - (d) both supply and demand are inelastic.
12. Refer to Figure 3, which shows the market for laptop computers.

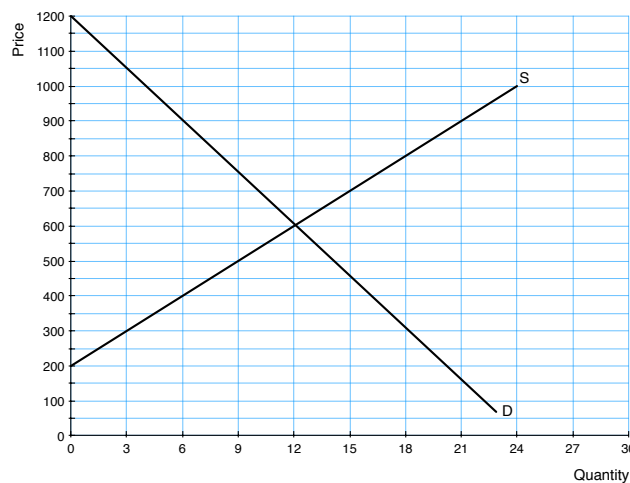


Figure 3: Market for Laptops

- If a tax of \$500 is imposed on buyers, then the share of the tax bore by consumers is
- (a) \$200.
  - (b) \$300.
  - (c) \$500.
  - (d) \$900.
13. Which of the following statements about a binding price ceiling is true?



- (a) The surplus created by the price ceiling is greater in the short run than in the long run.
  - (b) The surplus created by the price ceiling is greater in the long run than in the short run.
  - (c) The shortage created by the price ceiling is greater in the short run than in the long run.
  - (d) The shortage created by the price ceiling is greater in the long run than in the long run.
14. A tax collected from the buyers of a good shifts the
- (a) demand curve upward by the size of the per-unit tax.
  - (b) demand curve downward by the size of the per-unit tax.
  - (c) supply curve upward by the size of the per-unit tax.
  - (d) supply curve downward by the size of the per-unit tax.
15. Suppose the equilibrium price for apartments is \$500 per month and the government imposes rent controls of \$250. Which of the following is *unlikely* to occur as a result of the rent controls.
- (a) There will be a shortage of housing.
  - (b) Landlords may discriminate among apartment renters.
  - (c) Landlords may be offered bribes to rent apartments.
  - (d) The quality of apartments will improve.
  - (e) There may be long lines of buyers waiting for apartments.
16. Let's return to our study of the minimum wage.
- (a) Suppose the minimum wage is above the market equilibrium wage in the market for unskilled labor. Draw a supply-and-demand diagram showing the market wage, the number of workers that are employed, and the number of workers who are unemployed. Also show the total wage payments to unskilled workers.  
**Solution:** See Figure ??.
  - (b) What would be the effect of an increase in the minimum wage on employment? Does this change depend on the elasticity of demand, supply, both, or neither? Use a graph to support your answer.  
**Solution:** An increase in the minimum wage will lead to a decrease in the quantity of workers employed ( $Q_{E1} \rightarrow Q_{E2}$  in the graph). This quantity depends on the elasticity of demand, as both points are on the demand curve.
  - (c) What would be the effect of an increase in the minimum wage on unemployment? Does this change depend on the elasticity of demand, supply, both, or neither? Use a graph to support your answer.  
**Solution:** An increase in the minimum wage will lead to an increase in unemployment (unemployment 1  $\rightarrow$  unemployment 2 in the graph), as the quantity demanded decreases and quantity supplied increases. The change depends on the elasticity of both demand and supply.

- (d) Now consider the effect of an increase in the minimum wage on wage payments. What would happen to total wage payments if the demand for unskilled labor was inelastic? How does the elasticity of labor supply impact wage payments?

**Solution:** With inelastic labor demand, total wage payments will increase with an increase in wages, as the increase in wages offsets the decrease in the number of workers employed. The elasticity of labor supply has no effect on  $Q_E$ , and so has no effect on total wage payments.

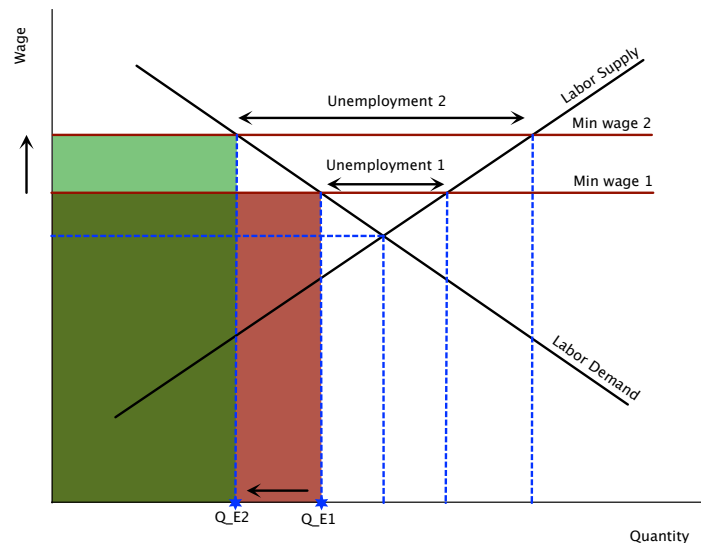


Figure 4: Labor Market with Minimum Wage

## Government Policy and Welfare

- In a market with a binding price ceiling, an increase in the ceiling will \_\_\_\_\_ the quantity supplied, \_\_\_\_\_, the quantity demanded, and reduce the \_\_\_\_\_.
  - increase; decrease; surplus
  - decrease; increase; surplus
  - increase; decrease; shortage
  - decrease; increase; shortage

**Solution:** An increase in the price ceiling will raise the market price closer to the free market equilibrium price.  $Q_s$  would increase and  $Q_d$  would decrease, which will reduce the shortage caused by the binding price ceiling.

- A market is currently at equilibrium. A price ceiling above the equilibrium price is imposed, leading to \_\_\_\_\_ in producer surplus and \_\_\_\_\_ in total surplus.
  - a decrease; an increase
  - an increase; an increase
  - a decrease; a decrease
  - no change; no change

3. Marianne pays Natalie \$50 to mow her lawn every week. When the government levies a mowing tax of \$10 on Natalie, she raises her price to \$60. Marianne continues to hire her at the higher price. What is the change in producer surplus, consumer surplus, and deadweight loss?
- (a) \$0, \$0, \$10
  - (b) \$0, -\$10, \$0
  - (c) +\$10, -\$10, +\$10
  - (d) +\$10, -\$10, \$0

**Solution:** With the tax, Natalie raises her price to \$60, but only receives \$50 since \$10 is going to the government. Marianne pays the new higher price of \$60 and thus bears the entire burden of the tax. For Marianne, her  $CS = WTP - P_B$ , and since the price she faces increased by \$10 her CS decreases by that amount. For Natalie, her  $PS = P_S - \text{seller cost}$ . Since she still receives \$50, her surplus is unaffected. Finally, TS is unaffected as well because the loss in surplus to Marianne is offset by the increase in revenue the government receives from the tax.

Refer to Figure 5 for questions 4 and 5.

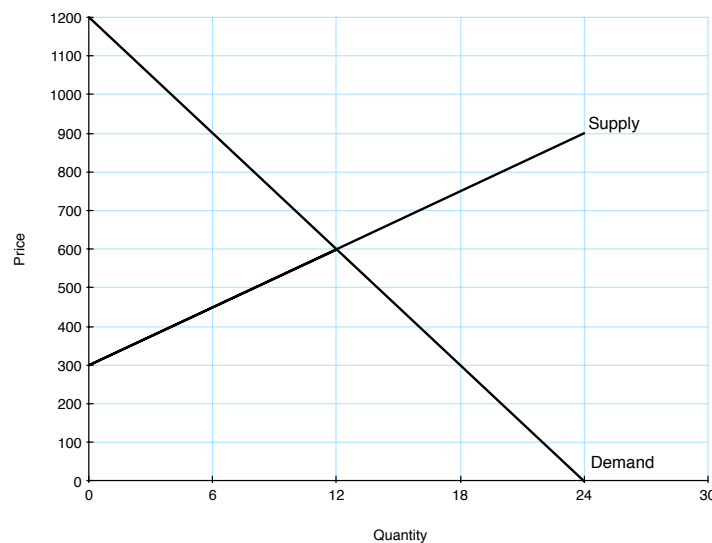


Figure 5: Market for Surface Tablets

4. If the government imposes a price floor of \$900, then consumer surplus would \_\_\_\_\_ by \_\_\_\_\_.
- (a) increase; \$900
  - (b) decrease; \$2700
  - (c) increase; \$2700
  - (d) decrease; \$900

**Solution:** CS before the price floor is imposed is given area between the demand curve and  $P^* = 600$  up to  $Q^* = 12$ .  $CS_0 = 1/2 \cdot (600) \cdot (12) = \$3,600$ . CS after the price floor is imposed is given by area between the demand curve and  $P_F = \$900$  up to new quantity  $Q_F = 6$ .  $CS_1 = 1/2 \cdot (300) \cdot (6) = \$900$ . CS decreased by \$2,700.

5. As a result of this price floor, the total revenue earned by firms \_\_\_\_\_ because \_\_\_\_\_.
- (a) increased; supply is inelastic
  - (b) decreased; demand is inelastic
  - (c) increased; demand is inelastic
  - (d) decreased; demand is elastic

**Solution:**  $TR_0 = P^* \times Q^* = \$600 \times 12 = \$7,200$ .  $TR_1 = P_F \times Q_F = \$900 \times 6 = \$5,400$ . TR decreased, so it must be that demand is elastic between these points.

6. Deadweight losses due to a tax are greatest when
- (a) both supply and demand are relatively inelastic.
  - (b) both supply and demand are relatively elastic.
  - (c) supply is elastic and demand is inelastic.
  - (d) demand is elastic and supply is inelastic.
7. Which of the following would likely cause the greatest deadweight loss?
- (a) A tax on cigarettes.
  - (b) A tax on salt.
  - (c) A tax on cruise tickets.
  - (d) A tax on gasoline.
8. Since the supply of unimproved land is relatively inelastic, a tax on unimproved land would generate a
- (a) large deadweight loss and the burden of the tax would fall on the renter.
  - (b) small deadweight loss and the burden of the tax would fall on the renter.
  - (c) large deadweight loss and the burden of the tax would fall on the landlord.
  - (d) small deadweight loss and the burden of the tax would fall on the landlord.
9. When a tax on a good starts small and is gradually increased, tax revenue will
- (a) rise.
  - (b) fall.
  - (c) first rise and then fall.
  - (d) first fall and then rise.
  - (e) None of the above.

10. When a tax distorts incentives to buyers and sellers so that fewer goods are produced and sold, the tax has
- (a) increased efficiency.
  - (b) decreased equity.
  - (c) generated no tax revenue.
  - (d) caused a deadweight loss.
11. If the government wishes to impose a \$5 per unit tax on sellers, but wishes to minimize the deadweight losses resulting from the tax, it should impose the tax on a market
- (a) with elastic demand and inelastic supply.
  - (b) with inelastic demand and elastic supply.
  - (c) with inelastic demand and inelastic supply.
  - (d) with elastic demand and elastic supply.
12. Suppose a price ceiling of \$300 is imposed in the market shown in Figure 6.

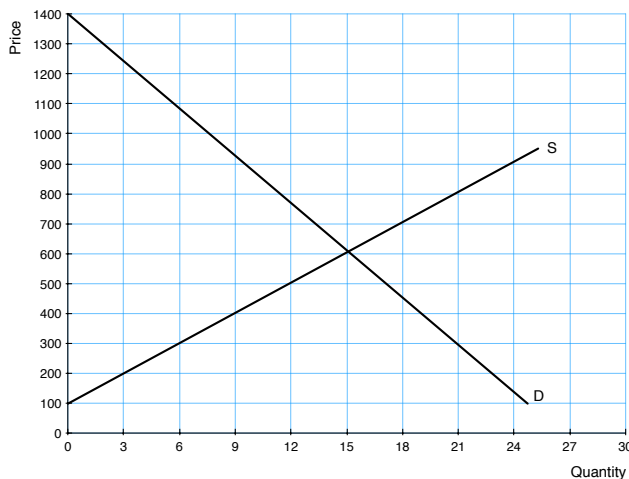


Figure 6: Market for Surface Tablets

- As a result, there is a \_\_\_\_\_ and deadweight losses of \_\_\_\_\_.
- (a) shortage of 15 units; \$7,200
  - (b) surplus of 6 units; \$7,200
  - (c) shortage of 6 units; \$3,600
  - (d) surplus of 15 units; \$3,600
  - (e) None of the above.
13. The many identical residents of Salisbury love drinking Cheerwine. Each resident has a certain willingness to pay for each can they consume as shown in Table 2.

Table 2: WTP for Cheerwine

Can	WTP
1st can	\$5
2nd can	\$4
3rd can	\$3
4th can	\$2
5th can	\$1
>5 cans	\$0

- (a) The cost of producing Cheerwine is \$1.50. The competitive suppliers sell at this price and have a perfectly elastic supply curve. How many cans will each person consume? What is the total surplus per person in this market?

**Solution:** Consumers purchase Cheerwine as long as their  $WTP \geq \$1.50 \Rightarrow Q_D = 4/\text{person}$ .  $PS = \$0$  if supply is perfectly elastic, so  $TS = CS = WTP - P$  for each can purchased  $\Rightarrow TS = (\$5 - 1.50) + (\$4 - 1.50) + (\$3 - 1.50) + (\$2 - 1.50) = \$8/\text{person}$ .

- (b) Producing Cheerwine creates pollution. Each can has an external cost of \$1. Taking this additional cost into account, what is the total surplus per person?

**Solution:** Each can consumed has an external cost of \$1. If each citizen buys four cans, the total external cost/person =  $\$1/\text{can} \times 4 \text{ cans/person} = \$4/\text{person}$ .  $TS/\text{person} = \$8 - \$4 = \$4$ .

- (c) Mayor Woodson imposes a \$1 tax on Cheerwine. What is the consumption per person now? Calculate consumer surplus, the external cost, government revenue, and total surplus per person.

**Solution:** Since supply is perfectly elastic, the entire burden of the tax will be borne by consumers, so the new price consumers pay is  $\$1.50 + \$1 = \$2.50$ . Consumers will each only buy 3 cans of Cheerwine now and

$$TS/\text{person} = \underbrace{(\$5 - 2.50) + (\$4 - 2.50) + (\$3 - 2.50)}_{\text{Consumer surplus/person}} - \underbrace{\$1 \times 3}_{\text{TEC/person}} + \underbrace{\$1 \times 3}_{\text{Tax revenue}} = \$4.50.$$

By internalizing the externality, we got rid of the DWL and increased TS.

## Externalities

- David's cat causes Carlos to sneeze. David values his cat's companionship at \$400 a year. Carlos has to pay for tissues and allergy medication due to the cat that cost him \$500 a year. According to the Coase Theorem,

- David should pay Carlos \$400 so he may keep his cat.
- David should pay Carlos \$500 for his tissues and medication.
- Carlos should pay David \$410 to give away his cat.
- None of the above.

**Solution:** David is willing to pay up to \$400 to Carlos to keep his cat, or he must receive more than \$400 in order to give his cat away. Carlos is willing to pay up to \$500 to David to get rid

of the cat, or he must receive at least \$500 to be okay with it. Option C is the only one that works for both parties.

2. If the production of a good yields a positive externality, then the social benefit curve lies \_\_\_\_\_ the demand curve, and the socially optimal quantity is \_\_\_\_\_ the market equilibrium quantity.
- (a) above; greater
  - (b) above; less
  - (c) below; greater
  - (d) below; less
3. The market equilibrium is not efficient when the consumption of a good creates external costs, which cause social costs to be
- (a) less than the private cost.
  - (b) greater than the private cost.
  - (c) less than the total cost.
  - (d) greater than the total cost.

**Solution:** Social cost = private cost + external cost.

4. Which of the following statements is TRUE?
- (a) The government should tax goods with either positive or negative externalities.
  - (b) The government should tax goods with negative externalities and subsidize goods with positive externalities.
  - (c) The government should subsidize goods with either positive or negative externalities.
  - (d) The government should tax goods with positive externalities and subsidize goods with negative externalities.
5. According to the Coase Theorem, private parties can solve the problem of externalities if
- (a) each affected party has equal power in the negotiations.
  - (b) the party affected by the externality has the initial property right to be left alone.
  - (c) there are no transaction costs.
  - (d) the government requires them to negotiate with each other.
  - (e) there are a large number of affected parties.
6. Refer to Figure 7.

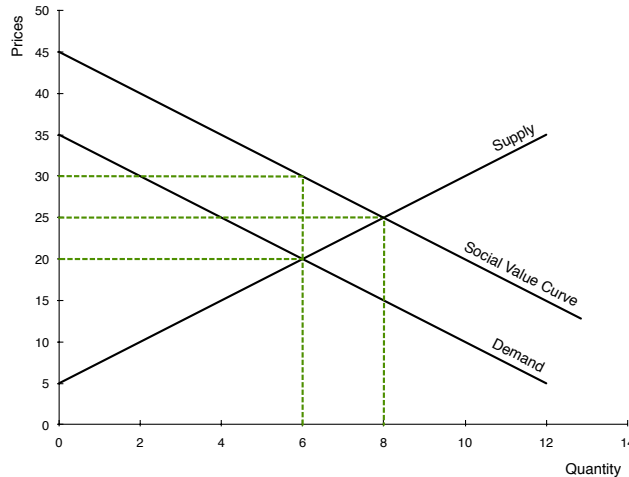


Figure 7: A Market Externality

If the quantity exchanged in the market increased from the 6 units to 8 units, then the total external benefit realized would increase by \_\_\_\_\_, while deadweight losses would decrease by \_\_\_\_\_.

- (a) \$20; \$20
- (b) \$10; \$20
- (c) \$10; \$10
- (d) \$20; \$10

7. In the absence of intervention, negative externalities lead markets to produce
  - (a) efficient output levels, and positive externalities lead markets to produce greater than efficient output levels.
  - (b) smaller than efficient output levels, and positive externalities lead markets to produce greater than efficient output levels.
  - (c) greater than efficient output levels, and positive externalities lead markets to produce smaller than efficient output levels.
  - (d) greater than efficient output levels, and positive externalities lead markets to produce efficient output levels.
8. In order to eliminate the deadweight losses associated with a negative market externality, the government should impose a per unit tax \_\_\_\_\_.
  - (a) equal to the total external cost
  - (b) less than the total external cost
  - (c) greater than the per unit external cost.
  - (d) equal to the per unit external cost.
  - (e) None of the above.
9. Negative externalities lead markets to produce
  - (a) efficient output levels, and positive externalities lead markets to produce greater than efficient output levels.



- (b) smaller than efficient output levels, and positive externalities lead markets to produce greater than efficient output levels.
- (c) greater than efficient output levels, and positive externalities lead markets to produce smaller than efficient output levels.
- (d) greater than efficient output levels, and positive externalities lead markets to produce efficient output levels.
10. Suppose a positive externality is present in the market for cookies. What is the relationship between the typical market equilibrium quantity and the socially optimal quantity of cookies to produced?
- (a) They are equal.
- (b) The market equilibrium quantity is greater than the socially optimal quantity.
- (c) The market equilibrium quantity is less than the socially optimal quantity.
- (d) There is not enough information to answer the question.
11. Consider Figure 8, which reflects the market for Surface Tablets in United States.

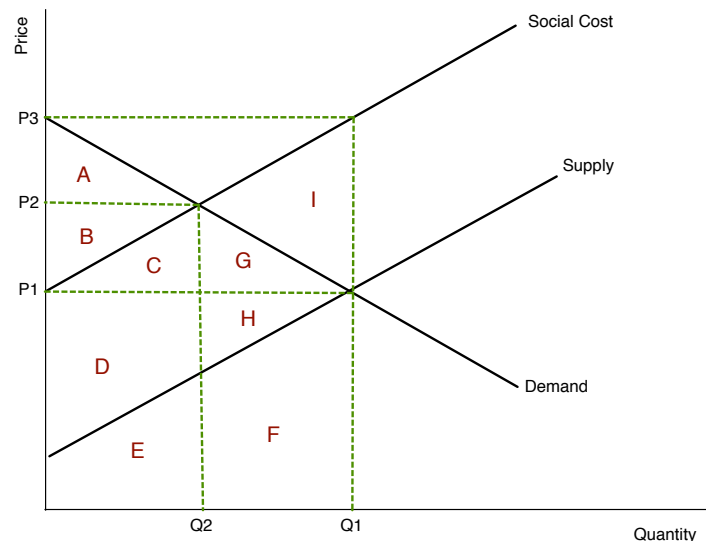


Figure 8: Market for Surface Tablets

- (a) What price and quantity combination represents the market price and number of units produced?
- Solution:** The market will produce where supply and demand meet.  $(P^*, Q^*) = (P1, Q1)$ .
- (b) At the market quantity, what area (or combination of areas) represents the total external cost to society?
- Solution:** The total external cost is given by area  $(D+C+G+H+I)$ .
- (c) What is the social optimum quantity of Surface Tablets that should be produced?
- Solution:** Should produce where the demand and social cost curves meet.  $Q^{**} = Q2$ .
- (d) At the social optimum, what area (or combination of areas) represents the total surplus realized by society?

**Solution:** Total surplus at the social optimum is given by areas (A+B).

- (e) A policy advisor suggests that in order to reach the social optimum point, a per-unit tax of  $(P_3 - P_2)$  should be imposed. Do you agree or disagree? Why?

**Solution:** Disagree. The size of the per-unit tax should be equal to the size of the per-unit externality, which is the distance  $(P_3 - P_1)$  between the social cost and supply curves.

## Public Goods

1. Which of following is an example of a common resource?

- (a) Residential housing
- (b) National defense
- (c) Restaurant meals
- (d) Fish in the ocean

**Solution:** Common resources are non-excludable and rival. Housing and meals are rival and excludable. National defense is non-excludable and non-rival.

2. A neighborhood street is considering purchasing and installing doggy clean up stations in order to keep their lawns clean. Table 3 shows the willingness to pay of each family for each additional station.

Table 3: Willingness to Pay for Doggy Stations

Stations	Weiners Family	George Family	Heron Family
1st station	\$500	\$600	\$400
2nd station	400	450	300
3rd station	300	350	150
4th station	150	200	50
5th station	100	150	0

If each doggy station costs \$500, how many stations should the street install in order to maximize total surplus?

- (a) 2 stations
- (b) 0 stations
- (c) 3 stations
- (d) 1 stations
- (e) > 3 stations

**Solution:** See example from class notes. Should build the station as long as the total  $WTP \geq \text{price/station}$ .

3. Public goods are

- (a) efficiently provided by market forces.

- (b) underprovided in the absence of government.
  - (c) overused in the absence of government.
  - (d) a type of natural monopoly.
4. Which of the following examples demonstrates the free rider problem?
- (a) Josh downloads the podcast *Serial*, but never contributes to NPR, its producer.
  - (b) Liz Lemon is upset that she and Jack Donaghy pay the same amount at the toll booth, even though she only uses the road for 5 miles, while he uses it for 25 miles.
  - (c) Due to a lack of clearly defined property rights, ocean creatures tend to be overfished.
  - (d) Kristina, Jane, and Andrea rent three movies and enforce that the costs are split evenly, even though Jane is only willing to pay her share for two movies.

**Solution:** Free riders enjoy benefits without having to pay. In (b) Liz and Jack pay, (c) demonstrates issues with common resources, and (d) illustrates a forced rider.

5. An AM transmission of a baseball game is a \_\_\_\_\_ because it is \_\_\_\_\_.
- (a) private good; rival and excludable
  - (b) club good; rival and non-excludable
  - (c) public good; non-rival and non-excludable
  - (d) common resource; non-rival and excludable
6. If one person's consumption of a good diminishes other people's use of the good, the good is said to be
- (a) a common resource.
  - (b) a good produced by a natural monopoly.
  - (c) rival in consumption.
  - (d) excludable.
7. Suppose each of 20 neighbors on a street values street repairs at \$3,000. The cost of street repair is \$40,000. Which of the following statements is true?
- (a) It is not efficient to have the street repaired.
  - (b) It is efficient for each neighbor to pay \$3,000 to repair the section of street in front of his/her home.
  - (c) It is efficient for the government to tax the residents \$2,000 each and repair the road.
  - (d) None of the above is true.
8. Public goods are difficult for a private market to provide due to
- (a) the public goods problem.
  - (b) the rivalness problem.
  - (c) the Tragedy of the Commons.
  - (d) the free-rider problem.

9. A positive externality affects market efficiency in a manner similar to a
- (a) private good.
  - (b) public good.
  - (c) common resource.
  - (d) rival good.
10. When markets fail to allocate resources efficiently, the ultimate source of the problem is usually
- (a) that prices are not high enough so people overconsume.
  - (b) that prices are not low enough so firms overproduce.
  - (c) that property rights have not been well established.
  - (d) government regulation.