Definitions and Concepts:
- **Price Control** – legal restriction on the price at which trade can take place.
- **Price Ceiling** – a maximum legal price at which trade can take place.
- **Price Floor** – a minimum legal price at which trade can take place.
- **Possible motives for implementing “price controls”:**
  (i) To either increase or decrease the price at which a particular good is traded (in an attempt to make the resulting price “better” for participants on one particular side of the market)
  (ii) To manipulate the “overall level of overall prices in an economy” (i.e., to “combat inflation”)

Examples of “price controls” in the U.S.:
- (i) “rent controls” intended to make housing more affordable for renters in some major metropolitan areas (price ceiling => intended to improve the outcome for consumers of housing); “minimum wage laws” intended to give low wage workers higher wage rates (price floor => intended to improve the outcome for sellers of labor)
- (ii) price controls imposed in an attempt to prevent the “overall price level form rising too quickly” during WW-I, WW-II, Korean War, and during Nixon Administration

Nixon’s Price Controls implemented from 1971-1974:
- Administered by the “Cost of Living Council”
- By 1973 “shortages” were artificially created in many markets: ranchers stopped shipping cattle to markets; farmers drowned chickens; supermarket shelves were emptied
- System finally abolished in 1974. George Shultz (head of the “Office of Management and Budget”) commented to Nixon that, “At least we have now convinced everyone else of the rightness of our original position that wage-price controls are not the answer.”
• “Per Unit Tax” (or “Quantity Tax”) – a tax under which either: buyers have to pay a certain amount to the government for every unit purchased, or sellers have to pay a certain amount to the government for every unit sold (e.g., total per unit taxes on gasoline of roughly $0.628 per gallon)

• Possible motives for imposing a per unit tax on a good:
  (i) Generate tax revenue for the government.
  (ii) Discourage trade of the good.

• Incidence of a Tax – a measure of “who bears the burden of the tax” in terms of “decreased welfare.”

• Per Unit Tax Imposed on Buyers => Demand Effected => at the “point of sale” any buyer is now willing to pay exactly $T less than before => Demand curve shifts down by $T

• Per Unit Tax Imposed on Sellers => Supply Effected => at the “point of sale” any seller must now be given exactly $T more than before => Supply curve shifts up by $T

• Effect of imposing a Per Unit Tax: Imposing a Per Unit Tax will
  ▪ Decrease the quantity traded of the good
  ▪ Decrease Total Consumers’ Surplus
  ▪ Decrease Total Producers’ Surplus
  ▪ Increase the price paid by consumers
  ▪ Decrease the price received by sellers
  ▪ Create a positive Deadweight Loss (since less than the efficient amount of trade will take place)

• Comparison of “Per Unit Tax of $T imposed on Buyers” to “Per Unit Tax of $T imposed on Sellers”:
  ▪ The final impact of imposing a Per Unit Tax of $T “on buyers” is identical in every aspect to imposing a Per Unit Tax of $T “on sellers”
  ▪ This follows from the recognition that under either policy, the resulting level of trade is “the unique level of trade at which buyer’s reservation price exceeds seller’s reservation price by exactly the magnitude of the tax”…
  ▪ Intuition: In a market with “no tax,” market forces induce buyers and sellers to trade all units for which there is “a positive gain.” That is, all units for which: $r_b - r_s \geq 0$ or equivalently $r_b \geq r_s$. When a per unit tax of $T$ is imposed in a market (on either buyer or seller), market forces will induce buyers and sellers to trade all units for which there will be a “positive gain” from trade after the government takes its cut of $T$. That is, all units for which: $r_b - r_s \geq T$ or equivalently $r_b - T \geq r_s$ (note: when a tax of $T$ is imposed on a buyer, the “net benefit” of obtaining an item valued at $r_b$ is only $r_b - T$ ) or equivalently $r_b \geq r_s + T$ (note: when a tax of $T$ is imposed on a seller, the “net cost” of relinquishing an item valued at $r_s$ becomes $r_s + T$).
When imposing a Per Unit Tax, the “two potential goals” of “generating tax revenue” and “discouraging consumption of a good” are often at odds with one another.

- **Intuition:** Recall that the government only gets the tax revenue of $T$ per unit on those units that are traded with the tax in place.
  
  (i) If a tax effectively “discourages consumption,” then people are no longer buying a large quantity of the good once the tax is in place => very little revenue will be generated…

  (ii) If a tax generates a “whole lot of revenue,” then people must still be buying a large quantity of the good even with the tax in place => consumption of the good must not have been discouraged by the tax…
Outcome in the presence of a “Price Ceiling”:

- “free market outcome”: 6,750 units traded, each at a price of $3.70; CS=(a+b+e); 
  PS=(c+d+f); DWL=(0).
- Suppose society decides this price is “too high” and imposes a “price ceiling” of $2.35, $c_p=2.35$.
  ▪ Consumers want to buy 9,700 units, but firms only wish to sell 4,800 => 4,800 units traded (less trade)
  ▪ Trade takes place at $2.35$ (lower price, for those who do get to purchase the item)
  ▪ PS=(d) => decrease in PS of (c+f)
  ▪ CS=(a+b+c) => change of (c-e) (total change in CS may be either positive or negative; recall, consumers are the “ones the policy is intended to help”)
  ▪ DWL=(e+f); positive DWL, implying an inefficiency
- Result: lower social welfare; all sellers clearly worse off; some buyers better off, but some buyers worse off (those who no longer get the item); total Consumers’ Surplus may be either smaller or larger than before
Outcome in the presence of a “Price Floor”:

- “free market outcome”: 3,750 units traded, each at a price of $5.80; CS=(a+b+e); PS=(c+d+f); DWL=(0).
- Suppose society decides this price is “too low” and imposes a “price floor” of $8.00.
  - Sellers want to supply 4,500 units, but buyers only demand 2,500 => 2,500 units traded (less trade)
  - Trade takes place at $8.00 (higher price, for those who do get to sell the item)
  - CS=(a) => decrease in CS of (b+e)
  - PS=(b+c+d) => change of (b-f) (total change in PS may be either positive or negative; recall, sellers are the “ones the policy is intended to help”)
  - DWL=(e+f): positive DWL, implying an inefficiency
- Result: lower social welfare; all buyers clearly worse off; some sellers better off, but some sellers worse off (those who no longer sell the item); total Producers’ Surplus may be either smaller or larger than before

![Graph showing supply and demand with a price floor at 8.00]
Note that the “impact of a price control” on market participants depends critically upon “price elasticities”…

Example: consider a price floor imposed in a market to “give sellers a higher price” (e.g., “minimum wage)

**Case (i) – “relatively elastic demand”:**

- Change in Producers’ Surplus is (“green area” minus “brown area”) => Change is clearly a **Decrease in Total Producers’ Surplus**
- That is, the minimum wage increases the wage rate from $5.80 to $8.00 for only 750 workers, while causing 3,000 workers to “no longer have jobs”
- Policy does “more harm than good” for those it was “intended to help”…
Case (ii) – “relatively inelastic demand”:

- Change in Producers’ Surplus is (“green area” minus “brown area”) => Change is clearly an Increase in Total Producers’ Surplus
- That is, the minimum wage increases the wage rate from $5.80 to $8.00 for 3,600 workers, while only causing 150 workers to “no longer have jobs”
- Perhaps a good policy… (at least it seems to be helping the people it is intended to help…)
Per unit tax of $T$ imposed on Buyers:

- Outcome at “point of sale” determined by focusing on “green curve” and “red curve”
- 4,200 units traded <= unique quantity at which “buyer’s reservation price” is exactly $T=$1 above “seller’s reservation price”
- Price at the “point of sale” is $1.90
- Sellers receive $1.90 on each unit sold
- Buyers must pay $T=$1 on top of the $1.90 purchase price, for a total of $2.90 on each unit purchased
- CS decreases by (a)+(b)+(c) <= Incidence for buyers
- PS decreases by (d)+(e)+(f) <= Incidence for sellers
- Government tax revenue of (a)+(b)+(d)+(e) (equal to $(1)(4,200)=$4,200). Note, government tax revenue is less than $5,000, since they only collect the $1 of tax on units which are traded when the tax is in place.
- Less than efficient level of trade => DWL of (c)+(f)
Per unit tax of $T$ imposed on Sellers:

Outcome with tax in place:
- Outcome at “point of sale” determined by focusing on “orange curve” and “blue curve”
- 4,200 units traded <= unique quantity at which “buyer’s reservation price” is exactly $T=$1 greater than “seller’s reservation price”
- Same quantity is traded with the tax imposed on sellers as when the tax was imposed on buyers => all other aspects of the outcomes are identical! That is:
  - Sellers receive $1.90 while buyers pay $2.90 on each of the 4,200 units traded
  - The decrease in CS, decrease in PS, amount of government tax revenue, and magnitude of DWL are all the same as when the tax was imposed on buyers instead of sellers
  - It makes NO DIFFERENCE in terms of welfare (to buyers, sellers, or society) if this per unit tax is imposed on buyers or imposed on sellers!
**Who bears the burden of a tax?** Consider the following two cases:

(i) **Elastic Supply with Inelastic Demand**

- Big increase in price for buyers, but small decrease in price for sellers
- Big decrease in CS, but small decrease in PS

(ii) **Inelastic Supply with Elastic Demand**

- Small increase in price for buyers, but big decrease in price for sellers
- Small decrease in CS, but big decrease in PS
Will a tax generate a lot of revenue and/or discourage trade? Consider the following two cases:

(iii) Elastic Supply with Elastic Demand

- Big decrease in consumption, but very little tax revenue generated

(iv) Inelastic Supply with Inelastic Demand

- A great deal of tax revenue generated, but a very small decrease in consumption
Problem:

1. Consider a market with demand given by the inverse demand function \( P_D(q) = 60 - \frac{1}{200}q \) and supply given by the inverse supply function \( P_S(q) = 10 + \frac{1}{200}q \).

   1A. How much trade would take place in this market if a Per Unit Tax of $5 were imposed on sellers in this market? Explain.

   1B. How much tax revenue would be generated by imposing a Per Unit Tax of $10 on buyers in this market? Explain.

Multiple Choice Questions:

1. A ______ refers to a legal restriction on the price at which trade can take place.
   A. Deadweight Loss
   B. Per Unit Tax
   C. Price Control
   D. Tax Incidence

2. One could potentially argue in favor of imposing a Per Unit Tax, based upon the recognition that such taxes generally
   A. generate tax revenue for the government.
   B. discourage the sale/consumption of a good.
   C. increase Total Consumers’ Surplus, by increasing consumption.
   D. More than one of the above answers is correct.

3. In the United States, Price Controls were imposed on a wide range of goods in an unsuccessful attempt to combat inflation by
   A. President John Kennedy, after the Bay of Pigs Invasion.
   B. President Richard Nixon, in the early 1970’s.
   C. President George Bush, shortly after the 9/11 Terrorist Attacks.
   D. President Donald Trump, immediately after taking office.

4. If demand is “very elastic” and supply is “very inelastic,” then imposing a Per Unit Tax will result in
   A. a big decrease in price received by sellers, but only a small increase in price paid by consumers.
   B. only a small decrease in price received by sellers, but a big increase in price paid by consumers.
   C. no change in the price received by sellers or the price paid by consumers.
   D. None of the above answers are correct.

5. Imposing a price floor will generally
   A. make all sellers of the good better off.
   B. increase the quantity traded of the good.
   C. make all buyers of the good worse off.
   D. More than one of the above answers is correct.
For questions 6 through 9, consider a market with demand and supply as illustrated below:

6. In comparison to the “free market outcome,” imposing a price ceiling of $8.00 in this market would:
   A. increase Total Consumers’ Surplus by “areas (d)+(e).”
   B. decrease Total Producers’ Surplus by “areas (d)+(e).”
   C. increase Total Social Surplus by “areas (d)+(e).”
   D. More than one of the above answers is correct.

7. If a per unit tax of $2 was imposed on buyers in this market, then ______ units of the good would be traded.
   A. less than 320
   B. exactly 320
   C. more than 320 but fewer than 400
   D. exactly 400

8. Consider the following two proposed Per Unit Taxes: “Tax (A): a $4 Per Unit Tax imposed on buyers” and “Tax (B): a $4 Per Unit Tax imposed on sellers.” “Tax (A)” would generate tax revenue of ________ while “Tax (B)” would generate tax revenue of ________.
   A. exactly $1,600; exactly $1,600
   B. more than $1,600; less than $1,600
   C. less than $1,280; more than $1,280
   D. exactly $1,280; exactly $1,280

9. Imposing a price floor of $8.00 in this market would
   A. have no impact on the market outcome whatsoever.
   B. create a Deadweight Loss equal to “areas (c)+(d).”
   C. make all buyers worse off.
   D. make some sellers worse off and some sellers better off.
Answer to Problem:

1A. When a Per Unit Tax of $T$ is imposed in a market, the resulting level of trade will be the unique level at which \( r_b - r_s = T \). Recognize that the “inverse demand function” specifies the “height of the demand curve” and therefore “buyer’s reservation price.” Likewise, the “inverse supply function” specifies the “height of the supply curve” and therefore “seller’s reservation price.” From here it follows that the level of trade with the tax in place must satisfy \( P_D(q) - P_S(q) = T \). Substituting the specified functional forms into this equation yields: \((60 - \frac{1}{200} q) - (10 + \frac{3}{200} q) = T\). From here, it follows that \( q \) must satisfy: \( 50 - \frac{4}{200} q = T \) \( \Rightarrow \frac{4}{200} q = 50 - T \). Thus, with a Per Unit Tax of $T$ imposed in this market, the resulting level of trade is: \( q_T = 50(50 - T) \). With \( T = 5 \) this implies \( q_T = 2,250 \).

1B. From the answer to part (1A) above, it follows that with a Per Unit Tax of $T = 10$ imposed on buyers, \( q_T = 50(50 - 10) = (50)(40) = 2,000 \) units will be traded. Thus, this tax would generate tax revenue of \( (T)(q_T) = (10)(2,000) = 20,000 \).

Answers to Multiple Choice Questions:

1. C
2. D
3. B
4. A
5. C
6. B
7. C
8. D
9. A