Exam Review
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Deadweight Loss
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Tax Revenue
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AS.180.102 (04): Elements of Microeconomics
Chapter 8 - The Costs of Taxation

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October 11, 2024

Exam Review
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Deadweight Loss
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Tax Revenue
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Reminders

- Midterm grades and answer key posted - PLEASE REVIEW THE ANSWER KEY
  - Question 5B has been regraded and canvas scores will be updated today - more on this to come
  - Answer key will be posted today
  - Instructions for requesting a change in score will be posted today. This is ONLY if you see something graded incorrectly. Discussion as to how the answer key is written will not be accepted
- My office hours are Wednesday at 2:30 - we can change this if this is a bad time for all of you
- Next week is fall break - No class on Thursday or section on Friday

Question 2A

The market for cod liver oil pills is characterized by the following demand and supply equations: $Q_D = 100 - 4P$ and $Q_S = -20 + 2P$, where P is the price per bottle and Q is the quantity of bottles.

1. What are the equilibrium price and quantity?
2. If consumers want to purchase 60 more bottles at any given price, what are the new equilibrium price and quantity?

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Question 2A

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$$
\begin{aligned}
Q_d &= Q_s \\
100 - 4P &= -20 + 2P \\
120 &= 6P \\
P &= 20 \\
Q &= 100 - 4(20) = 20
\end{aligned}
$$

Question 2A

The market for cod liver oil pills is characterized by the following demand and supply equations: $Q_D = 100 - 4P$ and $Q_S = -20 + 2P$, where P is the price per bottle and Q is the quantity of bottles.

1. What are the equilibrium price and quantity?
2. If consumers want to purchase 60 more bottles at any given price, what are the new equilibrium price and quantity?

$$
\begin{aligned}
Q_d &= Q_s \\
60 + 100 - 4P &= -20 + 2P \\
180 &= 6P \\
P &= 30 \\
Q &= 160 - 4(30) = 40
\end{aligned}
$$

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Question 4A

Let total market demand for labor be represented by $Q_{LD} = 1,000 - 50w$ where Q_{LD} is total employment and w is the hourly wage.

- What is the market clearing wage when total labor supply is represented by $Q_{LS} = 100w - 800$?
- How many workers are employed?

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Question 4A

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- What is the market clearing wage when total labor supply is represented by $Q_{LS} = 100w - 800$?
- How many workers are employed?

1. $1000 - 5w = 100w - 800 \rightarrow w = 12$
2. $Q_{LD} = 1000 - 50(12) = 400$

Question 4A

Let total market demand for labor be represented by $Q_{LD} = 1,000 - 50w$ where Q_{LD} is total employment and w is the hourly wage.
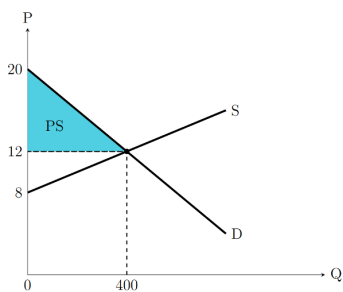
- How much producer surplus is received at the equilibrium wage?

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Question 4A

Let total market demand for labor be represented by $Q_{LD} = 1,000 - 50w$ where Q_{LD} is total employment and w is the hourly wage.

- How much producer surplus is received at the equilibrium wage?

1. $(20 - 12) \cdot 400 \cdot \frac{1}{2} = 1600$

Question 4A

Let total market demand for labor be represented by $Q_{LD} = 1,000 - 50w$ where Q_{LD} is total employment and w is the hourly wage.

- Suppose the government imposes a minimum wage of \$16. What is the new level of employment?
- How much producer surplus is received under the minimum wage?

Question 4A

Let total market demand for labor be represented by $Q_{LD} = 1,000 - 50w$ where Q_{LD} is total employment and w is the hourly wage.

- Suppose the government imposes a minimum wage of $16. What is the new level of employment?
- How much producer surplus is received under the minimum wage?

1. $Q_{LD} = 1000 - 50(16) = 200$
2. $(20 - 16) \cdot 200 \cdot \frac{1}{2} = 400$

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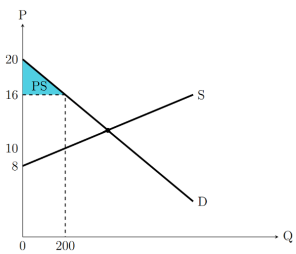
Question 5B

True or False. A firm that faces a demand curve that is inelastic at its current output level can always increase its revenue by raising its price and selling less assuming they would still be selling a non-zero quantity.

- The correct answer is TRUE. There is always a higher price at which you can increase price to and revenue will be higher
- FALSE was accepted as a regrade **IF** correct explanation was given about moving into the elastic portion of the demand curve

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Deadweight Loss

Definition

The fall in surplus as a result of a market distortion such as a tax.
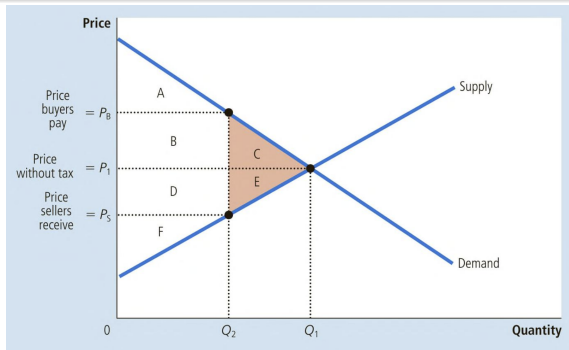
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Calculating DWL

We have the following demand and supply curves:

- $Q_S = 2P$
- $Q_D = 300 - P$
1. What is equilibrium price and quantity?

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Calculating DWL

We have the following demand and supply curves:

- $Q_S = 2P$
- $Q_D = 300 - P$

1. What is equilibrium price and quantity?
   - $P^* = 100$, $Q^* = 200$
2. A tax of \$60 is placed on consumers. What is the new P, $P + T$, and Q_T?

Calculating DWL

We have the following demand and supply curves:

- $Q_S = 2P$
- $Q_D = 300 - P$

1. What is equilibrium price and quantity?
    - $P^* = 100$, $Q^* = 200$

2. A tax of \$60 is placed on consumers. What is the new P, $P + T$, and Q_T?
    - $Q_D = 300 - (P + 60) = 2P = Q_S$
    - $P = 80$
    - $(P + T) = 140$
    - $Q_T = 160$

3. What is the size of the deadweight loss?

Calculating DWL

We have the following demand and supply curves:

- $Q_S = 2P$
- $Q_D = 300 - P$

1. What is equilibrium price and quantity?
   - $P^* = 100$, $Q^* = 200$

2. A tax of \$60 is placed on consumers. What is the new P, $P + T$, and Q_T?
   - $Q_D = 300 - (P + 60) = 2P = Q_S$
   - $P = 80$
   - $(P + T) = 140$
   - $Q_T = 160$

3. What is the size of the deadweight loss?
   - $DWL = \frac{1}{2} \cdot B \cdot H = \frac{1}{2} \cdot (200 - 160) \cdot (140 - 80) = 1200$

Deadweight Loss and Elasticity

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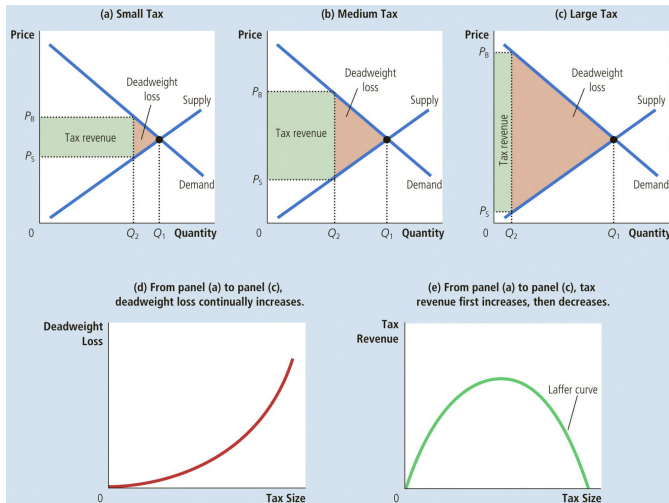Deadweight Loss
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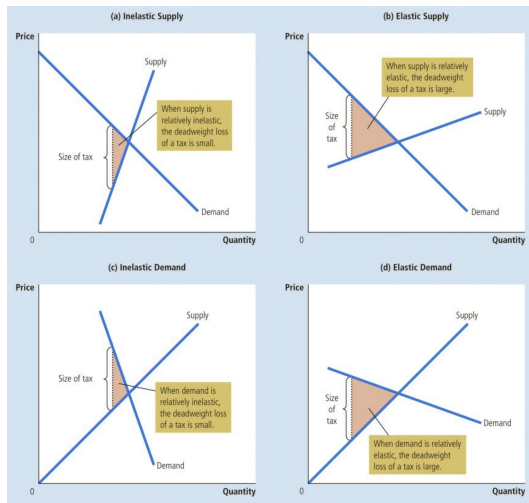
Deadweight Loss and Elasticity - Application

- Recall $Q_S = 2P$ and $Q_D = 300 - P$
- Equilibrium: $P^* = 100$ and $Q^* = 200$
- With \$60 tax: $Q_T = 160$, $P = 80$, $(P + T) = 140$, $DWL = 1200$

1. What is the new DWL if $Q_S = 3P$?
   - Equilibrium: $P^* = 75$, $Q^* = 150$
   - Prices after tax:
     - ⋆ $300 - (P + 60) = 3P$
     - ⋆ $P = 60$
     - ⋆ $(P + T) = 120$
     - ⋆ $Q_T = 120$
   - DWL: $\frac{1}{2} \cdot (150 - 120) \cdot 60 = 900$

Tax Revenue

(a) Small Tax

(b) Medium Tax

(c) Large Tax

(d) From panel (a) to panel (c), deadweight loss continually increases.

(e) From panel (a) to panel (c), tax revenue first increases, then decreases.

Tax Revenue - Application

- Recall $Q_S = 2P$ and $Q_D = 300 - P$
- Equilibrium: $P^* = 100$ and $Q^* = 200$
- With \$60 tax: $Q_T = 160$, $DWL =$ **1,200**
- Gives Tax Revenue: $160 \cdot \$60 =$ **\$9,600**

Tax Revenue - Application

- Recall $Q_S = 2P$ and $Q_D = 300 - P$
- Equilibrium: $P^* = 100$ and $Q^* = 200$
- With \$60 tax: $Q_T = 160$, $DWL = \mathbf{1{,}200}$
- Gives Tax Revenue: $160 \cdot \$60 = \mathbf{\$9{,}600}$
1. What about a tax of \$150?

Tax Revenue - Application

- Recall $Q_S = 2P$ and $Q_D = 300 - P$
- Equilibrium: $P^* = 100$ and $Q^* = 200$
- With \$60 tax: $Q_T = 160$, $DWL = \mathbf{1{,}200}$
- Gives Tax Revenue: $160 \cdot \$60 = \mathbf{\$9{,}600}$

1. What about a tax of \$150?
   - Q_T: $2P = 300 - (P + 150) \rightarrow P = 50 \rightarrow Q_T = 100$
   - Tax Revenue: $100 \cdot \$150 = \mathbf{\$15{,}000}$
   - DWL: $\frac{1}{2} \cdot (200 - 100) \cdot 150 = \mathbf{7{,}500}$

Tax Revenue - Application

- Recall $Q_S = 2P$ and $Q_D = 300 - P$
- Equilibrium: $P^* = 100$ and $Q^* = 200$
- With \$60 tax: $Q_T = 160$, $DWL =$ **1,200**
- Gives Tax Revenue: $160 \cdot \$60 =$ **\$9,600**

1. What about a tax of \$150?
   - Q_T: $2P = 300 - (P + 150) \rightarrow P = 50 \rightarrow Q_T = 100$
   - Tax Revenue: $100 \cdot \$150 =$ **\$15,000**
   - DWL: $\frac{1}{2} \cdot (200 - 100) \cdot 150 =$ **7,500**
2. What about a tax of \$240?
   - Q_T: $2P = 300 - (P + 240) \rightarrow P = 20 \rightarrow Q_T = 40$

Tax Revenue - Application

- Recall $Q_S = 2P$ and $Q_D = 300 - P$
- Equilibrium: $P^* = 100$ and $Q^* = 200$
- With \$60 tax: $Q_T = 160$, $DWL = $ **1,200**
- Gives Tax Revenue: $160 \cdot \$60 = $ **\$9,600**

1. What about a tax of \$150?
   - Q_T: $2P = 300 - (P + 150) \rightarrow P = 50 \rightarrow Q_T = 100$
   - Tax Revenue: $100 \cdot \$150 = $ **\$15,000**
   - DWL: $\frac{1}{2} \cdot (200 - 100) \cdot 150 = $ **7,500**

2. What about a tax of \$240?
   - Q_T: $2P = 300 - (P + 240) \rightarrow P = 20 \rightarrow Q_T = 40$
   - Tax Revenue: $40 \cdot \$240 = $ **\$9,600**

Tax Revenue - Application

- Recall $Q_S = 2P$ and $Q_D = 300 - P$
- Equilibrium: $P^* = 100$ and $Q^* = 200$
- With \$60 tax: $Q_T = 160$, $DWL = \mathbf{1{,}200}$
- Gives Tax Revenue: $160 \cdot \$60 = \mathbf{\$9{,}600}$

1. What about a tax of \$150?
   - Q_T: $2P = 300 - (P + 150) \rightarrow P = 50 \rightarrow Q_T = 100$
   - Tax Revenue: $100 \cdot \$150 = \mathbf{\$15{,}000}$
   - DWL: $\frac{1}{2} \cdot (200 - 100) \cdot 150 = \mathbf{7{,}500}$

2. What about a tax of \$240?
   - Q_T: $2P = 300 - (P + 240) \rightarrow P = 20 \rightarrow Q_T = 40$
   - Tax Revenue: $40 \cdot \$240 = \mathbf{\$9{,}600}$
   - DWL: $\frac{1}{2} \cdot (200 - 40) \cdot 240 = \mathbf{19{,}200}$

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Tax Revenue - Application