Chapter 9

The Analysis of Competitive Markets
Topics to be Discussed

- Evaluating the Gains and Losses from Government Policies
- The Efficiency of a Competitive Market
- Minimum Prices
- Price Supports and Production Quotas
- Import Quotas and Tariffs
- The Impact of a Tax or Subsidy
Consumer and Producer Surplus

1. **Consumer surplus** is the total benefit or value that consumers receive beyond what they pay for the good.

2. **Producer surplus** is the total benefit or revenue that producers receive beyond what it costs to produce a good.
Consumer and Producer Surplus

Between 0 and $Q_0$, producers receive a net gain from selling each product—the producer surplus.

Consumer Surplus

Between 0 and $Q_0$, consumer A receives a net gain from buying the product—the consumer surplus.

Producer Surplus

Between 0 and $Q_0$, producers receive a net gain from selling each product—the producer surplus.
The loss to producers is the sum of rectangle $A$ and triangle $C$.

Consumers that can buy the good gain $A$.

Consumers that cannot buy, lose $B$.

The loss to producers is the sum of rectangle $A$ and triangle $C$.

Triangles $B$ and $C$ are losses to society – dead weight loss.
Price Controls With Inelastic Demand

With inelastic demand, triangle $B$ can be larger than rectangle $A$ and consumers suffer net losses from price controls.
The gain to consumers is rectangle $A$ minus triangle $B$, and the loss to producers is rectangle $A$ plus triangle $C$. 
Price Controls and Natural Gas Shortages

Measuring the Impact of Price Controls

- $A = (18 \text{ billion mcf}) \times ($1/\text{mcf}) = $18 \text{ billion}$
- $B = (1/2) \times (2 \text{ b. mcf}) \times ($0.40/\text{mcf}) = $0.4 \text{ billion}$
- $C = (1/2) \times (2 \text{ b. mcf}) \times ($1/\text{mcf}) = $1 \text{ billion}$
Price Controls and Natural Gas Shortages

Measuring the Impact of Price Controls in 1975

- Change in consumer surplus
  \[ A - B = 18 - 0.4 = $17.6 \text{ billion Gain} \]

- Change in producer surplus
  \[ A + C = 18 + 1 = $19.0 \text{ billion Loss} \]

- Dead Weight Loss
  \[ B + C = 0.4 + 1 = $1.4 \text{ billion Loss} \]
The Efficiency of a Competitive Market

- In the evaluation of markets, we often talk about whether it reaches economic efficiency
  - Maximization of aggregate consumer and producer surplus
- Policies such as price controls that cause dead weight losses in society are said to impose an efficiency cost on the economy
The Efficiency of a Competitive Market

- If efficiency is the goal, then you can argue that leaving markets alone is the answer.
- However, sometimes market failures occur:
  - Prices fail to provide proper signals to consumers and producers.
  - Leads to inefficient unregulated competitive market.
Types of Market Failures

1. Externalities
   - Costs or benefits that do not show up as part of the market price (e.g. pollution)
   - Costs or benefits are external to the market

2. Lack of Information
   - Imperfect information prevents consumers from making utility-maximizing decisions
   - Government intervention may be desirable in these cases
Price Control and Surplus Changes

When price is regulated to be no lower than $P_{min}$, the deadweight loss given by triangles $B$ and $C$ results.
Minimum Prices

- Periodically, government policy seeks to raise prices above market-clearing levels
  - Minimum wage law
  - Regulation of airlines
  - Agricultural policies

- We will investigate this by looking at the minimum wage legislation
Minimum Prices (e.g. Minimum Wages)

- Wage is set higher than market clearing wage
- Decreased quantity of workers demanded
- Those workers hired receive higher wages
- Unemployment results, since not everyone who wants to work at the new wage can
The deadweight loss is given by triangles $B$ and $C$.

Firms are not allowed to pay less than $w_{\min}$. This results in unemployment.

A is gain to workers who find jobs at higher wage.

The Minimum Wage

$w_{\min}$

$w_0$

$w$

$L_2$

$L_1$

$L_0$

$L$

$D$

$S$

Unemployment

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Minimum Prices

What if producers expand production to $Q_2$ from the increased price?

- Since they only sell $Q_3$, there is no revenue to cover the additional production $(Q_2-Q_3)$
- Supply curve measures MC of production so total cost of additional production is area under the supply curve for the increased production $(Q_2-Q_3) = \text{area } D$
- Total change in producer surplus = $A - C - D$
The change in producer surplus will be $A - C - D$. Producers may be worse off.

If producers produce $Q_2$, the amount $Q_2 - Q_3$ will go unsold.

D measures total cost of increased production not sold.

The change in producer surplus will be $A - C - D$. Producers may be worse off.
Price Supports

- Much of agricultural policy is based on a system of price supports
  - Prices set by government above free-market level and maintained by governmental purchases of excess supply
- Government can also increase prices through restricting production, directly or through incentives to producers
Price Supports

- What are the impacts on consumers, producers and the federal budget?

Consumers

- Quantity demanded falls and quantity supplied increases
- Government buys surplus
- Consumers must pay higher price for the good
- Loss in consumer surplus equal to A+B
Price Supports

- Producers
  - Gain since they are selling more at a higher price
  - Producer surplus increases by $A+B+D$

- Government
  - Cost of buying the surplus, which is funded by taxes, so indirect cost on consumers
  - Cost to government = $(Q_2-Q_1)P_S$
Price Supports

- Government may be able to “dump” some of the goods in the foreign markets
  - Hurts domestic producers that government is trying to help in the first place
- Total welfare effect of policy
  \[ \Delta CS + \Delta PS - \text{Govt. cost} = D - (Q_2-Q_1)P_S \]
- Society is worse off overall
- Less costly to simply give farmers the money
To maintain a price $P_s$, the government buys quantity $Q_g$.

Net Loss to society is $E + B$. 

Price Supports
Supply Restrictions

Which program is more costly?

- Both programs have same loss to consumers
- Producers are indifferent between programs because end up with same amount in both
- Typically, acreage limitation programs cost society less than price supports maintained by government purchases
- However, society is better off if government would just give farmers cash
Supporting the Price of Wheat

- From previous example, the supply and demand for wheat in 1981 was
  - Supply: \( Q_S = 1,800 + 240P \)
  - Demand: \( Q_D = 3,550 - 266P \)
  - Equilibrium price and quantity was $3.46 and 2,630 million bushels
- Government raised the price to $3.70 through government purchases
Supporting the Price of Wheat

How much would the government have had to buy to keep price at $3.70?

\[ Q_{DTotal} = Q_D + Q_g = 3,550 - 266P + Q_g \]
\[ Q_S = Q_{DT} \]
\[ 1,800 + 240P = 3,550 - 266P + Q_g \]
\[ Q_g = 506P - 1,750 \]

At a price of $3.70, government would buy

\[ Q_g = (506)(3.70) - 175 = 122 \text{ million bushels} \]
By buying 122 million bushels, the government increased the market-clearing price.

The Wheat Market in 1981

$P_s = $3.70$

$P_o = $3.46$

$Q_g$

$D + Q_g$

$A$

$B$

$C$

$D$

$S$

By buying 122 million bushels, the government increased the market-clearing price.
Supporting the Price of Wheat

- We can quantify the effects on CS
  - The change in consumer surplus = (-A -B)
    - A = (3.70 - 3.46)(2,566) = $616 million
    - B = (1/2)(3.70 - 3.46)(2,630 - 2,566) = $8 million
  - ΔCS = -$624 million
Supporting the Price of Wheat

- **Cost to the government:**
  - $3.70 \times 122 \text{ million bushels} = $451.4 \text{ million}
  - Total cost of program = $624 + 451 = $1,075 \text{ million}

- **Gain to producers**
  - A + B + C = $638 \text{ million}
  - Government also paid 30 cents/bushel = $806 \text{ million}
Supply Restrictions

- Supply restricted to $Q_1$
- Supply shifts to $S'$ & $Q_1$

- CS reduced by $A + B$
- Change in PS = $A - C$
- Deadweight loss = $BC$
The Market for Human Kidneys

- The 1984 National Organ Transplantation Act prohibits the sale of organs for transplantation

- Arguments in favor of prohibiting the sale of organs:
  1. Imperfect information about donor’s health and screening
  2. Unfair to allocate according to the ability to pay
     - Holding price below equilibrium will create shortages
     - Organs versus artificial substitutes

- What has been the impact of the Act?
The Market for Human Kidneys

- We can measure this using the supply and demand for kidneys from estimated data
  - Supply: \( Q^S = 8,000 + 0.2P \)
  - Demand: \( Q^D = 16,000 - 0.2P \)

- Since the sale of organs is not allowed, the amount available depends on the amount donated
  - Supply of donated kidneys is limited to 8,000

- The welfare effect of this supply constraint can be analyzed using consumer and producer surplus in the kidney market
The Market for Human Kidneys

- **Suppliers:**
  - Those who supply them are not paid the market price, estimated at $20,000
    - Loss of surplus equal to area A = $160 million
  - Some who would donate for the equilibrium price do not donate in the current market
    - Loss of surplus equal to area C = $40 million
  - Total consumer loss of A + C = $200 million
The Market for Human Kidneys

- Recipients:
  - Since they do not have to pay for the kidney, they *gain* rectangle A ($140 million) since price is $0
  - Those who cannot obtain a kidney *lose* surplus equal to triangle B ($40 million)
  - Net increase in surplus of recipients of $160 - $40 = $120 million

- Dead Weight Loss of C + B = $80 million
The Market for Human Kidneys

- Other Inefficiency Costs
  - Allocation is not necessarily to those who value the kidneys the most
  - Price may increase to $40,000, the equilibrium price, with hospitals getting the price
Chapter 9  

The Market for Kidneys

The loss to suppliers is seen in areas A & C.

If kidneys are zero cost, consumer gain would be A minus B.

A and D measure the total value of kidneys when supply is constrained.

The table shows:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>8,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>12,000</td>
<td>$40,000</td>
</tr>
</tbody>
</table>

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Production Quotas

- The government can also cause the price of a good to rise by reducing supply
  - Limitations of taxi medallions in New York City
  - Limitation of required liquor licenses for restaurants
Import Quotas and Tariffs

- Many countries use import quotas and tariffs to keep the domestic price of a product above world levels
  - Import quotas: Limit on the quantity of a good that can be imported
  - Tariff: Tax on an imported good
- This allows domestic producers to enjoy higher profits
- Cost to consumers is high
Import Quotas and Tariffs

- With lower world price, domestic consumers have incentive to purchase from abroad
  - Domestic price falls to world price and imports equal difference between quantity supplied and quantity demanded
- Domestic industry might convince government to protect industry by eliminating imports
  - Quota of zero or high tariff
Quota of zero pushes domestic price to $P_0$ and imports go to zero.

In a free market, the domestic price equals the world price $P_W$.

Loss to consumers is $A+B+C$. Gain to producers is $A$. Dead weight loss: $B+C$.
Import Tariff (General Case)

- The increase in price can be achieved by a tariff
- \( Q_S \) increases and \( Q_D \) decreases
- Area A is the gain to domestic producers
- The loss to consumers is \( A + B + C + D \)
- DWL = B + C
- Government Revenue is D = tariff * imports
Import Quota (General Case)

- If a quota is used, rectangle D becomes part of the profits to foreign producers.
- Consumers lose A+B+C+D.
- Producers gain A.
- Net domestic loss is B + C + D.
The Impact of a Tax or Subsidy

- The burden of a tax (or the benefit of a subsidy) falls partly on the consumer and partly on the producer.
- How the burden is split between the parties depends on the relative elasticities of demand and supply.
The Effects of a Specific Tax

- For simplicity we will consider a specific tax on a good
  - Tax of a particular amount per unit sold
  - Federal and state taxes on gas and cigarettes
- For our example, consider a specific tax of $t per widget sold
Incidence of a Specific Tax

**Price**

- $P_b$ price buyers pay
- $P_0$ price producers get

- **Tax = $1.00**

**Quantity**

- $Q_1$
- $Q_0$

**Graph Explanation:**

- **A** represents the area lost by buyers.
- **B** represents the deadweight loss.
- **C** represents the area lost by sellers.
- **D** represents the tax revenue gained by the government.

- **Government gains $A + D$ in tax revenue.**
- **Buyers lose $A + B$.**
- **Sellers lose $D + C$.**
- **The deadweight loss is $B + C$.**
Impact of Elasticities on Tax Burdens

Burden on Buyer

Burden on Seller

Impact of Elasticities on Tax Burdens

Burden on Buyer

Burden on Seller
A Tax on Gasoline

Measuring the Impact of a 50 Cent Gasoline Tax

- Intermediate-run $E_P$ of demand = -0.5
  - $Q^D = 150 - 50P$
- $E_P$ of supply = 0.4
  - $Q^S = 60 + 40P$
- $Q^S = Q^D$ at $1$ and 100 billion gallons per year (bg/yr)
A Tax on Gasoline

With a 50 cent tax:

\[ Q^D = Q^S \]

\[ 150 - 50P_b = 60 + 40P_S \]

\[ 150 - 50(P_S + 0.50) = 60 + 40P_S \]

\[ P_S = 0.72 \]

\[ P_b = P_S + 0.50 = 1.22 \]

\[ Q^D = Q^S = 89 \text{ bg/yr} \]
A Tax on Gasoline

- With a 50 cent tax:
  - Q falls by 11%
  - Price to consumers increases by 22 cents per gallon
  - Producers receive about 20 cents per gallon less
  - Both producers and consumers were opposed to the tax
  - Government revenue would be significant at $44.5 billion per year
The Impact of a 50 Cent Gasoline Tax

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity (billion gallons per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.22</td>
<td>60</td>
</tr>
<tr>
<td>$1.00</td>
<td>89</td>
</tr>
<tr>
<td>$0.72</td>
<td>100</td>
</tr>
</tbody>
</table>

The buyer pays 22 cents of the tax, and the producer pays 28 cents.

Consumer Loss = A + B
Producer Loss = C + D

Government revenue = A + D
= 0.50(89) = $44.5 billion.