CHAPTER 5
Elasticity
What you will learn in this chapter:

- Definition of **elasticity**
  - price elasticity of demand
  - income elasticity of demand and
  - price elasticity of supply
- Factors that influence the size of elasticities
- How elasticity affects the incidence of a tax, and who bears its burden?
Defining and Measuring Elasticity

The **price elasticity of demand** is the ratio of the percent change in the quantity demanded to the percent change in the price as we move along the demand curve.

\[
\text{Price elasticity of demand} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}
\]
The World Demand for Oil

Price of oil (per barrel)

$21

20

0

Quantity of oil (millions of barrels per day)

B

A

D

9.9

10
Using the **Midpoint Method** to Calculate Elasticities

\[
\text{% change in } X = \frac{\text{Change in } X}{\text{Average value of } X} \times 100
\]

Average value of \( X \) = \( \frac{\text{Starting value of } X + \text{final value of } X}{2} \)

Price elasticity of demand = \[
\frac{\frac{Q_2 - Q_1}{(Q_1 + Q_2)/2}}{\frac{P_2 - P_1}{(P_1 + P_2)/2}}
\]
### Some Estimated Price Elasticities of Demand

<table>
<thead>
<tr>
<th>Good</th>
<th>Price elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inelastic demand</strong></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td>0.1</td>
</tr>
<tr>
<td>Beef</td>
<td>0.4</td>
</tr>
<tr>
<td>Stationery</td>
<td>0.5</td>
</tr>
<tr>
<td>Gasoline</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Elastic demand</strong></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>1.2</td>
</tr>
<tr>
<td>Restaurant meals</td>
<td>2.3</td>
</tr>
<tr>
<td>Airline travel</td>
<td>2.4</td>
</tr>
<tr>
<td>Foreign travel</td>
<td>4.1</td>
</tr>
</tbody>
</table>

**Price elasticity of demand < 1**

**Price elasticity of demand > 1**
Interpreting the Price Elasticity of Demand: How Elastic is Elastic?

Two Extreme Cases of Price Elasticity of Demand

- perfectly inelastic
- perfectly elastic
An increase in price ...

...leaves the quantity demanded unchanged.
(b) Perfectly elastic demand:
Price Elasticity of Demand = Infinity

Price of pink tennis balls
(per dozen)

At any price above
$5, quantity
demanded is zero.

At exactly
$5, consumers
will buy any
quantity.

At any price below
$5, quantity
demanded is
infinite.

Quantity of pink tennis balls
(dozens per year)
Interpreting the Price Elasticity of Demand: How Elastic Is Elastic?

Demand is:
- **elastic** if the price elasticity of demand is greater than 1,
- **inelastic** if the price elasticity of demand is less than 1, and
- **unit-elastic** if the price elasticity of demand is exactly 1.
(a) Unit-Elastic Demand:
Price Elasticity of Demand = 1

Price of crossing

A 20% increase in the price ...

$1.10
0.90

...generates a 20% decrease in the quantity of crossings demanded.

Quantity of crossings (per day)

0
900
1,100

D₁
A 20% increase in the price...

...generates a 10% decrease in the quantity of crossings demanded.
A 20% increase in the price...

...generates a 40% decrease in the quantity of crossings demanded.
(a) Total Revenue by Area

Price of crossing

$0.90

Total revenue = price x quantity = $900

Quantity of crossings (per day)
Elasticity and Total Revenue

- **A price effect**: After a price increase, each unit sold sells at a higher price, which tends to raise revenue.

- **A sales effect**: After a price increase, fewer units are sold, which tends to lower revenue.
(b) Effect of a Price Increase on Total Revenue

Price of crossing

$1.10

0.90

Price effect of price increase: higher price for each unit sold

Sales effect of price increase: fewer units are sold

Quantity of crossings (per day)

0

900

1,100

C

B

A

D
Elasticity and Total Revenue

- If demand for a good is *elastic*, an increase in price reduces total revenue. (Sales effect > Price effect).

- If demand for a good is *inelastic*, a higher price increases total revenue. (Price effect > Sales effect).

- If demand for a good is *unit-elastic*, an increase in price does not change total revenue. (Sales effect = Price effect).
The Price Elasticity of Demand Changes Along the Demand Curve

### Demand Schedule and Total Revenue for a Linear Demand Curve

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity demanded</th>
<th>Total revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>$0</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>16</td>
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<tr>
<td>3</td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Demand is elastic: a higher price reduces total revenue.

Demand is inelastic: a higher price increases total revenue.
What Factors Determine the Price Elasticity of Demand?

- Whether Close Substitutes Are Available
- Whether the Good Is a Necessity or a Luxury
- Time
Other Demand Elasticities

Cross-Price Elasticity

- Substitutes
- Complements

Income elasticity of demand

- Normal Goods
- Inferior Goods
Price Elasticity of Supply

The **price elasticity of supply** is a measure of the responsiveness of the quantity of a good supplied to the price of that good.

\[
\text{Price elasticity of supply} = \frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}}
\]
(a) Perfectly Inelastic Supply: 
Price Elasticity of Supply = 0

Price of beachfront land (per foot)

An increase in price...

...leaves the quantity supplied unchanged.

Quantity of beachfront land (feet)
(b) Perfectly Elastic Supply:
Price Elasticity of Supply = Infinity

Price of pizza

At any price above $12, quantity supplied is infinite.

At any price below $12, quantity supplied is zero.

At exactly $12, producers will produce any quantity.

Quantity of pizza

S₂
Factors that Determine the Price Elasticity of Supply

- The Availability of Inputs
- Time
Elasticity determines tax incidence: An Excise Tax Paid Mainly by Consumers

Price of gasoline (per gallon)

$1.95

Excise tax = $1 per gallon

Tax burden falls mainly on consumers.

Quantity of gasoline (gallons)
Elasticity determines tax incidence: An Excise Tax Paid Mainly by Producers

Excise tax = $5 per parking space

Tax burden falls mainly on producers.
The End of Chapter 5

Coming attraction:

Chapter 6: Consumer and Producer Surplus