Outline

- Basic economics on demand/supply
- Intentional and un-intentional events
- Previous studies

Consumer Demand

- **Demand** is the quantity a good/service that customers are willing and able to purchase during a specified period under a given set of economic conditions.
- Derived from the utility maximization
- **Demand Curve** shows the relation between price and the quantity demanded, holding all other factors constant.
- **Strange convention** price is on y-axis.
- **Law of demand**
  - Demand curve slopes down
  - An increase in the price leads to a decrease in the quantity demanded.
  - One important empirical finding in economics.
Effects of Factors Affecting the Demand

\[ D = f(P, P_x, Y, S, Z) \]

- **Movement** along demand curve reflecting a change in price and quantity—own price effects \( P_x \)
- **Shifting** of demand curve:
  - Price of other products, \( P_x \)
  - Substitutes/complements)
  - Income, \( Y \)
  - Taste/preference, \( S \)
  - Information (BSE/AI events), \( Z \)
  - Other factors (excessive media coverage on the UK PMD)

Movement along demand curve: \( D = f(P, P_x, Y, S, Z) \)

Supply

- **Supply** quantity that a firm is willing and able to supply at a given price, holding other factors constant.
- **Factors** affecting supply:
  - Price
  - Production cost
  - Technology
  - Government policy (e.g., price support, tax/subsides)
- **Supply curve** shows the relation between price and the quantity supplied, holding all else constant.
- **No Law of Supply:** supply curve can be upward/downward sloping, vertical, or horizontal.

Change in the Supply Curve

- A change in the product price causes a **movement** along the supply curve.
- A change in any factors other than the product price causes a **shift** of the supply curve.
Market Equilibrium

Supply = Demand

Example

Only demand changes: Shifting inward

Only supply changes: Shifting inward

Example (cont’)

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Welfare

**Consumer surplus (CS)**: the area under the demand curve, above the market equilibrium price, and up to the equilibrium quantity. \( P', P', E' \).

**Producer surplus (PS)**: the area above the supply curve, under the market equilibrium price, and up to the equilibrium quantity. \( P, EQ' \).

Social welfare: \( CS + PS = P'E'E' \).

Impact of Adverse Event on Social Welfare

At \( E' \):
- Pre-event condition:
  - Demand: \( Q = 18 - P \)
  - Supply: \( Q = 24 + P \)
- Post-event condition:
  - Demand: \( Q = 24 - P \)

Problem statement: how much is the welfare change due to the event?

### Numerical Example

<table>
<thead>
<tr>
<th>Condition</th>
<th>CS</th>
<th>PS</th>
<th>SW</th>
</tr>
</thead>
<tbody>
<tr>
<td>At ( E' )</td>
<td>( P'E' = 18 )</td>
<td>( P'E' = 6 )</td>
<td>( P'E' = 24 )</td>
</tr>
<tr>
<td>At ( E'' )</td>
<td>( P'E'' = 12.5 )</td>
<td>( P'E'' = 2.5 )</td>
<td>( P'E'' = 15 )</td>
</tr>
</tbody>
</table>

\( \Delta CS = 12 \) \( \Delta PS = 3.5 \) \( \Delta SW = -9 \)
Cross price elasticity

Types of Own Price Elasticity

Elastic: the quantity demanded changes more than in proportion to a change in price, $E_p < -1$.

Inelastic: the quantity demanded changes less than in proportion to a change in price, $E_p > -1$.

Unitary: the % changes in quantity and price are the same, $E_p = -1$.

Special cases:
- Completely elastic
- Completely inelastic
Cross Price Elasticity

- **What-if Question**: If the price of product $x$ changes, how much does the quantity demanded of product $y$ will change?
- **Formula**:
  \[ E_{xy} = \frac{\frac{\partial Q_y}{\partial P_x}}{\frac{P_y}{Q_y}} \times \frac{P_y}{Q_y} \]
  - $\frac{\partial Q_y}{\partial P_x}$ if $Q_y$ is a function of $P_x$
  - $\frac{\partial Q_y}{\partial P_y}$ if $Q_y$ is a function of $P_y$ and others
- **Substitutes**: $E_{xy} > 0$; **complements**: $E_{xy} < 0$

Income Elasticity

- **Income Elasticity**: a measure of responsiveness of the quantity demanded to income.
  \[ E_i = \frac{\frac{\partial Q}{\partial I}}{\frac{Q}{I}} \]
  - $\frac{\partial Q}{\partial I}$ if $Q$ is a function of $I$ only
  - $\frac{\partial Q}{\partial I}$ if $Q$ is a function of $I$ and others
- **Normal goods**: products for which demand is positively related to income; $E_i > 0$
- **Inferior goods**: products for which consumer demand declines as income rises; $E_i < 0$

Intentional/Unintentional Events

- **Shifting demand**
- **Causing changes in supply**
Impacts of Negative Information

- Magnitudes of impacts depending on
  - Intensity of the event (frequency and severity)
  - Media coverage of event
  - Market structure
- Duration of impacts can be
  - Short term: Temporary change in demand
  - Long term: Permanent shift in demand (individual preference/taste changed)

Response

- Voluntary actions by consumers and producers/industry
  - Concerned corporations/industry formulated self regulatory policies (food recall)
  - Consumers decrease their demand for the relevant product
- Media determines its coverage (air time and duration)
- Regulatory actions
  - Ex-Post VS Ex-Ante response

Intentional Product Tampering

Goals of the intentional adulteration or corruption of goods post production

- Express hatred
- Create panic
  - Sudden drop in consumption
  - High coverage to these events
  - Spurious claims (HOAX) across the country
- Extort money through product liability lawsuits
The Earliest Case
- 02/1978: Jaffa Oranges injected with Mercury
  - Palestinian Worker injected Israeli Oranges with Liquid Mercury
  - Publicity resulted in fruit sales plummeting throughout Europe

The Famous Case
- 1982 in Chicago: Tylenol Cyanide Deaths
  - 7 people died between September 29th and October 1st because of Cyanide poisoning after having taken Tylenol.
  - Received more television news air time than any incident since the assassination of President Kennedy
  - The "FEDERAL ANTI-TAMPERING ACT" enacted after Tylenol poisoning
  - Cost J&J $100 million

Chilean Fruit Scandal
- Fruits that are exported from Chile to the U.S. and Japan were injected with Cyanide in March 1989.
- Protest against the living condition of poor in Chile.
- FDA investigation confirmed the claims leading to full inspection of fruits and vegetables from Chile.
Other Historical Events

- Girl Scout cookies & needles: April 1984
- Candy Cyanide poisoning in Japan: 1984
- Excedrin cyanide deaths in NY: Feb 1986
- Lipton Cup-A-Soup cyanide: 1986
- Tylenol Cyanide: 1986
- Chilean Fruit Scandal: Mar 1989
- Goody's Headache Powder cyanide: 1992

Non-intentional Adverse Events

- Main industry impacted by non-intentional adverse events are
  - Food
    - Products recalled: Hamburgers, Fruit Juices, Prepared Meals, Fruits and Vegetables
  - Pharmaceutical
  - Automobile

Microbiological Contamination and Food Recall

- Microbiological contamination arises due to virus, bacteria or parasites
- Causes immediate health concern among consumers, especially among elderly, infants, children, and those with weak immune systems
- Food Safety Inspection Services (FSIS) started collecting data in 1982.
- Generally recalls started in 1983 and became more common after 1988 indicating growth in medical science in ability to identify these diseases
- Products recalled: Hamburgers, Fruit Juices, Prepared Meals, Fruits and Vegetables
Types of Food Recalls by FDA

- Class I recalls are for dangerous or defective products that predictably could cause serious health problems or death. Examples include a food found to contain botulinal toxin, food with undeclared allergens, a label mix-up on a drug, or a defective artificial heart valve.

- Class II recalls are for products that might cause a temporary health problem, or pose only a slight serious threat. An example is a drug that is under-strength but does not treat life-threatening situations.

- Class III recalls are for products that are unlikely to cause any adverse health reaction, but violate FDA labeling or manufacturing regulations. Examples include a container defect (plastic material delaminating or a lid that does not seal), off-taste, color, leaks in a bottled drink, and lack of English labeling in a retail food.

Types Associated with Food Borne Diseases

- Costs to individuals:
  - Income and productivity loss
  - Pain and suffering
  - Leisure time losses
  - Travel expenditures
  - Medical expenditures

- Costs to corporations/industry:
  - Product recall cost
  - Product liability costs
  - Reduced product demand
  - Product brand and corporation/industry image

- Other societal costs:
  - Outbreak Investigation
  - Disease Surveillance
  - Clean up costs

http://vm.cfsan.fda.gov/~lrd/recall2.html
Impacts of Food Recalls

- Small vs. large companies:
  - Small ones are affected more by food recall
  - Big Companies are not affected as much due to
    - Diversification
    - Procedures for emergency management
- Product recall significantly impacts product demand
  - Inducing consumption substitution within and cross product categories

Costs Associated with Drug Recalls

- Direct costs of drug recall
- Indirect costs
  - Product liability suits
  - Loss of faith in firms’ products
  - Costs of rebuilding the image
  - Spillover effects on manufacturing of substitute products
  - More stringent regulations by FDA in future
  - Insurance expenditures

Auto Recalls

- Costs involved with recalls
  - Direct costs of recall
  - Indirect costs:
    - sales loss
    - goodwill loss: resale value is significantly impacted
  - Industry wide impact of recall as competitors are also affected
  - Self regulation within an industry

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Agrochemicals

- Pesticides/Fungicides affects environment or health
  - Captan and Iprodione: Human Carcinogens
  - DDT: Environment
  - Endosulfan: Hormonal imbalance
  - Alar: Human Carcinogens

Example: Alar & Apples

- Alar pesticide is used in apples and peanuts
- High level of exposure can cause cancer
- Very high media coverage
  - Advertisement by National Resource Defense Council
  - Two episodes of 60 minutes
  - Cover of the Time Magazine
  - Major newspapers

Example: Alar & Apples (cont’)

- Consumers
  - School dropped apples from their menu
  - Parents poured apple juice down the drains

  Apple sales plummeted

- Producers
  - Advertised in leading newspaper with technical details of very small level
  - Advertising Expenditure $3 million
### Relevant Previous Studies

- **Impacts of adverse events on price, consumption**

- **Impacts of media coverage of adverse events**

- **Effects of market power influencing the price transmission (retail-farm price margin)**

### The Impacts on Demand: BSE Cases


- In March 1996 UK suggested a link between BSE and the invariable fatal human disease.
- Beef consumption dropped by 40%
- Price changes:
  - Temporary changes in prices of sheep and pigs: 19% and 21% increases in 1996. Fell back to the pre-crisis levels by 2000.
  - Cattle price fell by 21% in 1996 and remained low in 2000, suggesting a long lasting shift in consumer preferences.
- Loss of all export markets
- Imposition of a Culling Order (Over 30 month cull, selective cull, offspring cull), 49 million cattle destroyed.

**Studies on the BSE cases in Japan, Canada, US**

### Market Power and Impacts of Food Scares


**Message:** Prices at the farm level fell by more than retail prices in the wake of food scares (the BSE crisis) due to market power of food retailers and, thus, the retailer-producer price margin increases.