THEORY OF THE FIRM

- Firms want to maximize profits.
  \[ q = q(K, L) \]

Time Periods

- Very short run: both factors fixed.
  \[ q = q(K, L) \]

- Short run: one factor fixed.
- Long run: two inputs vary.
- Very long run: technology varies – the function itself varies.

Relate to Costs of Production

- \[ TC(q) = p_K \cdot K + p_L \cdot L . \]
- In the short run, \[ TC_{SR} = p_K \cdot K + p_L \cdot L = \text{Total Fixed Cost} + \text{Total Variable Cost} = \text{TFC} + \text{TVC} . \]

Short Run Productivity Curves

- \( q_{SR} = q(K, L) = \text{Total Product of Labour} . \)

- \( AP = MP \) where \( AP \) is maximum.
- When \( AP \) is rising, \( MP \) is above it.
- When \( AP \) is falling, \( MP \) is below it.
Lecture #10 – Monday, November 17, 2003

- \( TP_L = q(\bar{K}, L) \)
- \( AP = \frac{TP}{L} \)
- \( MP = \frac{\Delta TP}{\Delta L} \)

**COST CURVES**

- \( TC_{SR} = P_K \cdot K + P_L \cdot L = TFC + TVC \)

**Example**

\( TC = 500 \times 1 + 100L \)

- U-shaped cost curves – Law of Diminishing (Marginal) Return

- \( AFC = \frac{TFC}{q} \)
- \( AVC = \frac{TVC}{q} \)
- \( \frac{TC_{SR}}{q} = \frac{TFC}{q} + \frac{TVC}{q} \Leftrightarrow SAC = AFC + AVC \)
PROFITS

- \( \pi = TR - TC \)

Nature of Costs: Accounting Costs vs. Economic Costs

- Manager’s salary
  - \( TR = $500000 \)
  - \( TC = $450000 \) – including $25000 manager’s salary.
  - “Profits” = $50000
  - Adjust: $25000
  - Economic \( \pi \): $25000

- Interest imputation adjustment
  - Adjust $10000
  - Economic \( \pi \): $15000

- \( \pi = TR - TC - TC \) where every input paid its opportunity cost
- \( \pi = 0 \) – business making its proper return (normal rate of return)
- \( \pi > 0 \) – attractive, should go into business
- \( \pi < 0 \) – economic loss

PROFIT MAXIMIZATION

Produce or Not? Loss Minimization

<table>
<thead>
<tr>
<th>Q</th>
<th>TVC</th>
<th>TR</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$</td>
<td>$</td>
<td>-$100.00</td>
</tr>
<tr>
<td>1</td>
<td>$2.00</td>
<td>$10.00</td>
<td>-$92.00</td>
</tr>
<tr>
<td>2</td>
<td>$4.00</td>
<td>$20.00</td>
<td>-$84.00</td>
</tr>
<tr>
<td>3</td>
<td>$6.00</td>
<td>$30.00</td>
<td>-$76.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q</th>
<th>TVC</th>
<th>TR</th>
<th>Profits</th>
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<tr>
<td>0</td>
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<td>$</td>
<td>-$100.00</td>
</tr>
<tr>
<td>1</td>
<td>$20.00</td>
<td>$10.00</td>
<td>-$110.00</td>
</tr>
<tr>
<td>2</td>
<td>$40.00</td>
<td>$20.00</td>
<td>-$120.00</td>
</tr>
<tr>
<td>3</td>
<td>$60.00</td>
<td>$30.00</td>
<td>-$130.00</td>
</tr>
</tbody>
</table>

- As you produce more, you reduce the loss – produce positive quantity.
- As you produce more, you increase the loss – produce nothing.

- Produce when \( TR > TVC \).
- Rule #1: Produce when \( \frac{TR}{q} > \frac{TVC}{q} \) \( \iff \) \( p > AVC \).

Profit Maximizing Quantity

- Rule #2: For \( \pi_{\text{max}} \), \( MR = MC \)

INDUSTRY STRUCTURES

Monopoly: one firm  Duopoly: two firms  Oligopoly  Monopolistic Competition  Perfect Competition: large number of firms
PERFECT COMPETITION

Assumptions
1) Every firm in competition is price taker – a firm on its own cannot influence the price.

2) Free Entry – New firms can enter without barriers.
   - Occurs when $\pi > 0$.
   - Occurs in the long run.
   - Same cost curves (usually).

General Profit Maximization Rule in Perfect Competition
1) $MR = MC$
2) $p = MC$

Applying The Profit Maximization Rule
- Produce $q_1$ for $\pi_{max}$ ($P = MC$)
- $\pi = q_1(p - ac)$
- $\pi = 0$ ($p = ac$)
- $p > AVC$ – produce at $q_2$
Summary

- \( SRS = SMC \) above \( AVC \) (will produce along \( SMC \))

Industry Short Run Supply Schedule

- Industry Supply = \( n \times \) supply curve for one firm

\( \pi < 0 \)
- produce \( q_3 - p > AVC \)
- \( TFC > \) losses

- produce nothing – \( TFC < \) losses
Industry Equilibrium

\[ SRS = \sum SMC_i \]

Long Run Equilibrium

- \( \pi > 0 \), so new firms enter.
- \( SRS_{industry} \) shifts to the right until \( p = AVC \).

Short Run Equilibrium

- \( Q_1 = n_1 \cdot q_1 \)
- Maximum profit where \( p = MC \).

- Firms enter until \( \pi = 0 \Rightarrow p = AVC \).
- Long-run equilibrium: \( Q_2 = n_2 \cdot q_2 \).
Disturbance

- $D$ increases.
- New firms enter with same cost curves of the original firms – constant cost industry.

Lecture #12 – Monday, December 1, 2003

Long-Run Equilibrium

Constant Curve Industry

- Allocation Efficiency – $p = MC$.
- Production Efficiency – In the long run, $AC$ is minimum.

Increasing Cost Industry

- Costs (ex: labour) goes up as the industry expands.
- Production function changes.

Decreasing Cost Industry

- As industry expands, everyone’s costs decrease.
MONOPOLY

- One firm = The industry (\( d = D \)).
- The firm is not a price-taker – it can choose where to be on the demand schedule.
- Barriers to entry of new firms:
  - Rivals driven out (natural monopoly) – cost advantage of the large firm.
  - Government interventions – licences and patents.

\[ MR = MC \] is the general rule for maximum profit.

\[ MR = p_2 - \text{lower price} \times \text{previous units} \]

- Just because you got market power (price control) or monopoly position, you are not guaranteed profits.
Lecture #13 – Monday, January 5, 2004

Cartel Arrangements Under Perfect Competition

- Each firm has incentive to cheat – not maximizing profits.
- Firms will move to $q_3$, causing the industry to move to $Q_3$. This causes surplus/excess.
- $0.75q_1$ is not optimum – $MC = MR$. 
**NATURAL MONOPOLY**

- $AC$ is decreasing for all relevant range.
- If there are large number of small firms, $AC$ is high for each firm.
- Needs to over-rule the $MC = MR$ monopoly situation (not much different than perfect competition).
- Since $MC < AC$, then if $P = MC$ there will be losses.
- Set $P = AC$, then $\pi = 0$ – output at lowest possible cost.

**ALLOCATIVE EFFICIENCY**

- **Perfect Competition**
  - $CS = A + C + D$
  - $PS = B + E$
  - Total $= A + B + C + D + E$
- **Monopoly**
  - $CS = C$
  - $PS = D + E$
  - Total $= C + D + E$
  - $A + B =$ Dead Weight Loss (DWL)

**ROLE OF GOVERNMENT**

**Competition: Positive Attributes**
- Allocative efficiency: $P = MC$
- Production efficiency: minimum $AC$
- Decentralized
- Responsive
- Has incentives

**Reasons for Interventions**
- Market Failures: Externalities/3rd party effects (private costs vs. social costs), natural monopolies, market power (enterprise collude), pure public/collective consumption goods, asymmetric information/orderly markets.
- Income Distribution: Tax-subsidy scheme, minimum wages.
- Social Norms: Number of working hours.
- Merit Goods (or “Bads”): What society believes should have more than the equilibrium (or less than).

<table>
<thead>
<tr>
<th>Exclude</th>
<th>Non-Excludable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rivalrous</td>
<td>Ordinary Goods</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Non-rivalrous Quasi-Public Goods
- Roads, bridges, museums
- \( MC = 0 = p \)

Public Goods
- National defence, public protection, public information

- Government would intervene with every categories except the “Exclude-Rivalrous” category.

**Instruments For Intervention**
- Regulation.
- Expenditure.
- Taxation/subsidy.

**Taxation/3rd Party Effect**
- Market failure: social equilibrium vs. private equilibrium
- Government could tax and repay those who were harmed.

**TRADE**

**Why Trade?**
- Get beyond the PPF by specialization.

**Absolute Advantage**
- Assumptions:
  - Two countries: Canada, Russia.
  - Two goods: wheat, vodka.
  - Labour is the only input.
  - No transportation costs.
  - Ignore exchange rates.
  - Both countries initially producing both goods.

- Production information:
<table>
<thead>
<tr>
<th></th>
<th>Output per 1 Labour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wheat (bushels)</td>
</tr>
<tr>
<td>Canada:</td>
<td>30 (1/6V)</td>
</tr>
<tr>
<td>Russia:</td>
<td>10 (2V)</td>
</tr>
</tbody>
</table>

- Canada has absolute advantage in the production of wheat.
- Russia has absolute advantage in the production of vodka.

- Reallocation of labour:
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Wheat (bushels)</td>
</tr>
<tr>
<td>Vodka (bottles)</td>
</tr>
</tbody>
</table>
Opportunity cost for a bottle of vodka in Canada is $6W$; opportunity cost for a bottle of vodka in Russia is $1/2W$ – opportunity cost for a bottle of vodka is much lower in Russia.

Opportunity cost for a bushel of wheat in Canada is $1/6V$; opportunity cost for a bushel of wheat in Russia is $2V$ – opportunity cost for a bushel of wheat is much lower in Canada.

### Comparative Advantage

- **Change the data:**

<table>
<thead>
<tr>
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<th>Vodka (bottles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada:</td>
<td>30 (2/3V)</td>
<td>20 (3/2W)</td>
</tr>
<tr>
<td>Russia:</td>
<td>10 (1V)</td>
<td>10 (1W)</td>
</tr>
</tbody>
</table>

- Opportunity cost is not the same.

- **Reallocation of labour:**

<table>
<thead>
<tr>
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<th>Vodka (bottles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada (2L$_V$ → 2L$_W$):</td>
<td>+60</td>
<td>-40</td>
</tr>
<tr>
<td>Russia (5L$_W$ → 5L$_V$):</td>
<td>-50</td>
<td>+50</td>
</tr>
<tr>
<td>World:</td>
<td>+10</td>
<td>+10</td>
</tr>
</tbody>
</table>

- **Price ratios:**
  - In Canada, $\frac{P_W}{P_V} = \frac{\frac{1}{30}L}{\frac{1}{20}L} = \frac{2}{3}$.
  - In Russia, $\frac{P_W}{P_V} = \frac{\frac{1}{10}L}{\frac{1}{10}L} = \frac{1}{1}$.

- Wheat is cheaper in Canada. So an entrepreneur would buy wheat from Canada and sell in Russia.

### Terms of Trade

<table>
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<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Canada: At least $2V$ for $3W$

Canada: At least $1V$ for $1W$
Lecture #15 – Monday, January 19, 2004

THEORY OF TRADE – 2\textsuperscript{nd} MODEL

- Imports = \( AB \).
- Imports + tariffs = \( CD \).

Impacts of Trade
- Consumers win on import, producers lose.
- Producers win on export, consumers lose.

Efficiency and Transfer Effects
- Exports – Efficiency Effect:

\[ \text{value of export by world} \]
\[ \text{given up by consumers} \]
\[ \text{net gain} \]
\[ \text{cost of domestic production} \]

- Exports – Transfer Effect:

\[ \text{producers’ gain} \]
\[ \text{consumer loss} \]
\[ \text{net gain} \]
- Imports – Efficiency Effect:

- Imports – Transfer Effect: