Aim of this lecture

(1) To understand the relationship between potential competition and economic welfare.
(2) To understand the excess entry theorem and its policy implications.
Outline of the 10th Lecture

10-1 Excessive Competition
10-2 Loss by Monopoly Revisited
10-3 Excess Entry in the Cournot model
10-4 Excess Entry in Salop Model
10-5 Excess Entry in a Delivered Pricing Model
10-6 Policy Implications of Excess Entry Theorem
excess competition

Excess competition
Excess is `too much' from some viewpoint (standard). Whose viewpoint?
``From the viewpoint of joint-profit maximization"
~It is obvious. It does not imply that competition is not desirable.
``From the viewpoint of total social surplus"
~Is it possible?
Some famous economist said
``Excess competition is impossible. The severer competition is, the more efficient the economy is."
The severer the competition is, the more efficient the economy is ?!

The ideas behind this statement
(1) Fundamental Theorem of Welfare Economics
(2) Cournot Limit Theorem
(3) Natural Selection
(4) Competitive Pressure, cf Contestable Market Theory
The severer the competition is, the more efficient the economy is ?!

(1) Fundamental Theorem of Welfare Economics
(2) Cournot Limit Theorem

The larger the number of firm is, the smaller the price-cost margin is. ~welfare-improving
However, there exists entry cost, so too many firms can be welfare-reducing.
Thus, we should discuss the relationship between the optimal number of firms and equilibrium number of firms. →This is the main topic of the second part of this lecture.
The severer the competition is, the more efficient the economy is ?!

(3) Natural Selection
(4) Competitive Pressure
Competitive pressure can improve welfare ~ A typical example is Contestable Market Theory (discussed in the third lecture.)
Entry threat reduces the price.
However, it is not always true that the entry deterrence behavior by the incumbent improves welfare.
Replacement of capacity and entry deterrence

Suppose that the firm can use the capacity for 10 years. The marginal production cost is c. If two firms enter the market and build the capacity, two firms face Bertrand Competition → Gross profit is zero (net profit is negative).

⇒ Once the incumbent builds the capacity, the new entrant cannot obtain the profit so gives up entering. ~ the incumbent obtains the monopoly profit for ten years.
Replacement of capacity and entry deterrence

Suppose that the firm 1 (incumbent) invests in \( t \). If there is no potential entrant, it will again invest in \( t+10 \), in \( t+20 \), ... and obtain the monopoly profit forever.

Given this behavior of firm 1, firm 2 may invest in \( t+10-\varepsilon \). Then two firms face Bertrand competition for \( \varepsilon \). However, firm 1 will give up replacing its capacity since otherwise it obtains zero profit for \( 10-\varepsilon \). Thus, firm 2 can be the new monopolist.
Replacement of capacity and entry deterrence

Suppose that the firm 1 (incumbent) invests in $t$. Firm 2 may invest in $t+10-\epsilon$. Expecting this behavior of firm 2, firm 1 deters the entry by replacing its capacity in $t+10-2\epsilon$.

Given this behavior of firm 1, firm 2 may invest in $t+10-3\epsilon$. Expecting this behavior of firm 2, firm 1 deters the entry by replacing its capacity in $t+10-4\epsilon$.

Given this behavior of firm 1, firm 2 may invest in $t+10-5\epsilon$...
Replacement of capacity and entry deterrence

⇒ Finally, firm 1 can deter the entry by replacing period $t'$, where firm 2's investment in period $t'-\epsilon$ is not profitable ~ resulting net profit of firm 1 is almost zero.

Exactly the same logic in the Infinitely Earlier Period Model (discussed in the 6th lecture).

Inefficient investment deters the entry.
←potential competition reduces welfare. ~ excess competition
Welfare Loss in the Monopoly Market

The case of no new entrant
Welfare Loss in the Monopoly Market

The case under threat of potential entry (the worst case)
Eliminating a minor firm may improve welfare.

Asymmetric Duopoly.
Eliminating a less efficient firm can improve welfare ~ welfare improving production substitution.
← Helping a minor firm may reduce welfare (Lahiri and Ono, 1988)
However, helping a minor firm improves consumer welfare.
Welfare-improving production substitution

firm 1’s reaction curve

firm 2’s reaction curve (before)

firm 2’s reaction curve (after)
Eliminating a minor firm may improve welfare

Helping a minor firm may reduce welfare (Lahiri and Ono, 1988). However, helping a minor firm improves consumer welfare. These two hold true even if strategies are strategic complements.

Exception~ Helping a minor firm reduces both total social surplus and consumer surplus through the distortion of product positioning (Matsumura and Matsushima, 2010)

Helping the entries of minor firms improves both total social surplus and consumer surplus, while it increases HHI (Ishida et al, 2011)
The model of free entry

All firms are symmetric *ex ante*. There are sufficiently large number of potential entrants. In the first stage, each firm chooses whether or not to enter the market. It costs $F$ when a firm enters the market. It is sunk. In the second stage, after observing the number of entering firms $N$, firms face Cournot competition.
Excess Entry Theorem

Free entry equilibrium～excess profit is zero. The second best number of firms : the number of firms when the welfare-maximizing social planner can control the number of firms but cannot control the output of each firm. The first best number of firms : the number of firms when the welfare-maximizing social planner can control both the number of firms and the output of each firm.
Excess Entry Theorem

Usually, the second-best number of firms > the first best number of firms.

Excess entry theorem: the equilibrium number of firms > the second-best number of firms.
Excess Entry theorem

The optimal number of the firms

the equilibrium number of firms

W

0

The number of the firms
Long-Run Equilibrium under Cournot Competition

AC > MC

P > MR

equilibrium output of each firm
In the second stage, given N, the output of each firm, $y(N)$ is determined.

$W = \int_0^{y(N)} P(Q) dQ - NC(y(N)) - NF$

**Question:** Derive $\partial W/\partial N$
the number of firms and welfare

In the second stage, given \( N \), the output of each firm, \( y(N) \) is determined. 

\[
W = \int_0^{y(N)} P(Q) dQ - NC(y(N)) - NF 
\]

Answer: \[
\frac{\partial W}{\partial N} = P(y + y'N) - C - NC'y' - F 
\]
In the second stage, given $N$, the output of each firm, $y(N)$ is determined.

$$W = \int_0^{y(N)} P(Q) dQ - NC(y(N)) - NF$$

Question: At the free entry equilibrium, the profit of each firm is zero. Then $\partial W / \partial N$
the number of firms and welfare

In the second stage, given $N$, the output of each firm, $y(N)$ is determined.

$$W = \int_0^{y(N)} P(Q) dQ - NC(y(N)) - NF$$

$$\partial W / \partial N = P(y + y'N) - C - NC'y' - F$$

Answer: At the free entry equilibrium, the profit of each firm is zero. Then $\partial W / \partial N = (P - C')y'N$

Since the market competition is imperfect, $P - C' > 0$.

→ If $y' < 0$, $\partial W / \partial N < 0$ at the free entry equilibrium ~ excess entry theorem

$y' < 0 \Leftrightarrow$ an increase of the number of firms reduces the output of each firm, quite a natural situation
Intuition behind the excess entry theorem

A decrease in the number of entering firms
cost-reduction ~ average cost × the output of each firm
cost-increase ~ marginal cost of each firm × the
difference of the output of each firm
average cost > marginal cost
cost-reduction dominates cost-increases ~ welfare
improving production substitution from new entrant to
the existing firms
Intuition behind the excess entry theorem

Since the price is always equal to the average cost, marginal reduction of the consumption does not affect the welfare.

⇒ marginal reduction of the number of firms from the equilibrium level always improves welfare.
excess entry theorem in location models

Additional effect of the number of firms to welfare ~ transport costs.
An increase in the number of firms reduces the transport cost (love of variety)
policy implication of excess entry theorem

(1) Entry restriction

Problem (a) Expecting the future entry restriction regulation, each firm has a stronger incentive to enter the market. e.g., Large-scale Retail Stores Law accelerated entries.

Problem (b) The social planners do not know the optimal number of firms.

(2) The competition accelerating policies

→The number of firms become smaller ~ the social planner need not know the optimal number of firms.
market integration

Market 1

Market 2
Question: Draw the demand curve for the integrated market.
Suppose that before the integration, the demand function of each market is given by $P = a - Y$. The demand function of the integrated market is given by $P = a - \frac{1}{2}Y$. 
Demand

demand for market 1 (before integration)

demand for the integrated market
Short-Run Effect of Market Integration

Consider Cournot Competition.

Suppose that two markets are symmetric. Before the integration, both markets have the same number of firms which are identical. The price in the integrated market is lower than that before integration.

Integration accelerates competition.

The first order condition

\[ P + P'Y_1 - C_1' = 0 \]
Consider Cournot Competition.
Suppose that two markets are symmetric. Before the integration, both markets have the same number of firms which are identical. The total number of firms is smaller than that before integration. ←Since the integration accelerates competition.

It improves welfare since before the integration the number of firms is excessive (excess entry theorem). Desirable policies under excess entry theorem is competition accelerating policies. ~ Matsumura (2006)
Changes of Price and Welfare

![Diagram showing changes of price and welfare over time.]

- Price (P) decreases initially and then stabilizes.
- Welfare (W) increases initially and then plateaus.

Oligopoly Theory
Another Model

- Salop Model (Circular-City, Bertrand Competition, Mill Pricing, linear transport cost, inelastic demand, free entry, positive entry cost, identical firms)

- Public investment reduces transport cost and it accelerates competition

(Short-Run) Public Gain = the reduction of transport costs

(Long-Run) Public Gain > the reduction of transport costs (additional gain of reducing the number of firms).
Ino and Matsumura (2012)

Introducing Stackelberg leader in free entry markets. The number of the leaders are fixed, and the number of followers is determined by the free-entry condition.

Strongly persistent leadership model ~ The leader chooses its output and then followers enter the market.
Weakly persistent leadership model ~ Entry then Stackelberg
Ino and Matsumura (2012)

In both model, Stackelberg always yields greater welfare than Cournot. →Beneficial concentration.
Fixed number of the firms

In the first stage $m$ leaders choose their output independently.

After observing the leaders' output, $N-m$ followers choose their output independently.

$m=0$ or $m=N \rightarrow$ Cournot model

$m=1$ standard Stackelberg model

$m=2,3,...,N-1$ multiple leadership $\sim$ a variant of Stackelberg model

Stackelberg models yield higher HHI than the Cournot model
Daughety (1990, AER)

constant marginal cost
Stackelberg yields larger welfare
→ beneficial concentration

Welfare at Cournot Equilibrium
$m+n=N$ is given exogenously

increasing marginal cost

Welfare at Cournot Equilibrium