Regulation Policy and Economics of Regulation Class No. 3 (file 3): Index of Competitiveness in Market and Economic Welfare

Objectives of Today's Class

(1) To understand the relationship between indices based on market shares including HHI and competitiveness in market

(2) To understand characteristics of various competition models

Outline of Class No. 3

3-1 HHI and Competitiveness
3-2 Number of Firms and Competitiveness
3-3 Demand Elasticity and Competitiveness
3-4 Market Definition
3-5 H-Statistics and Monopoly
3-6 Conjectural Variation and Market Conduct
3-7 Relative Performance Approach and Market Conduct
3-8 Merger Examination and Remedy

HHI (Herfindahl-Hirschman Index)

HHI $=\sum_{i=1}^{n}$(firm i's market share)^2

A higher HHI $\rightarrow$ Higher market concentration

Shares indicated in percentage usually

Perfect monopoly with 10000

To be indicated without multiplying by 10000 in this lecture

This index is being widely used in various countries as data for merger investigations and screening subjects to control.

HHI (Herfindahl-Hirschman Index)

(1) An increase of the number of the firms decreases HHI.

n firms, HHI=○ in symmetric equilibrium

HHI (Herfindahl-Hirschman Index)

(2) An increase of asymmetries among the firms (increases, decrease) HHI.

Duopoly, Firm 1's share b≧1/2

HHI=

Number of Firms and Competitiveness

The larger the number of firms, the more competitive a market becomes.～Realm of Cournot's Limit Theorem

Is that correct? → The cause-and-effect relation may be adverse.

Competition is not fierce.→ A large number of firms come through.

Competition is fierce. → Only a small number of firms can survive.

The fiercer competition, the higher welfare economics becomes. ～ based on the analogy of the first theorem of welfare economics → Is this correct?

In case there exist entry costs, it is not always better to have a larger number of firms. （file 9）

Asymmetry Between Firms and Economic Welfare

Number of firms fixed, huge difference between firms
→HHI increase

Does this worsen economic welfare？

E.g., Duopoly; Cournot competition under fixed marginal cost , strategic substitute

Firm 1's marginal cost at c-d

Firm 2's marginal cost at c+d

Aggregate surplus; an increasing function of d

With HHI's increase, an aggregate surplus grows larger.

Asymmetry Between Firms and Economic Welfare

First-stage condition for profit maximization

$P+P'Y_1 = c-d \quad P+P'Y_2 = c+d$

⇒ $2P+P'Y = 2c \sim Y$, not dependent on d being

Y_1 being an increasing function of d, Y_2 being a decreasing function of d

The production quantity of a firm with lower costs increases more, while that of one with higher costs decreases more.

⇒ Costs get reduced as a whole.

⇒ Increase in an aggregate surplus ∼ welfare-improving production substitution

Price Elasticity of Demand and Competitiveness

Flexible price elasticity of demand

→ Slight gap between prices and marginal costs

→ More competitive

（E.g.）With the price increase of city gas, fuel oil takes in the demand, thus the price elasticity of demand is flexible.

→ City gas market is competitive.

Is this correct?

Price Elasticity of Demand and Competitiveness

An adverse cause-and-effect relation? If not competitive, the price can be raised to the level of great enough price elasticity of demand.

(E.g.) City gas market is monopolistic. If the price of gas exceeds that of fuel oil beyond the gap of x yen per calorific power, all demand gets taken by fuel oil. → Monopolistic gas companies set their price x yen higher than fuel oil.

～Price elasticity of demand is infinite in equilibrium.

And yet it cannot necessarily be said to be competitive.

⇒A meaningful evaluation of price elasticity can only be made in the state of Price = Ceiling Price.

Market Definition

HHI totally differs by denominators.

Geographical market definition

（E.g. 1) In measuring the share of Tokyo Electric Power, to look at either the whole of Japan as one market or the Kanto area alone （E.g. 2） To regard the Asian market as a single entity, or to see the Japanese market only

Bundle of products

（E.g. 1） Are ADSL and FTTH in the same market?

（E.g. 2） Are mobile phones and fixed-line phones in the same market?

（E.g. 3） Are light automobiles and standard-sized automobiles in the same market?

（E.g. 4） Is an electric power market a single market? Or grasp this as an energy market and bundle electric power with fuel oil and gas in the same market?

Market Definition

It is not an alternative issue of either the same market or different one, choosing 1 or 0.

Even though goods are not exactly homogeneous, if there is strong substitutability among them, they are under continuous competitive pressure.

Electric power is pressured by the city gas market, the degree of which depends on elasticity of substitution of demand for electricity and gas. It is not a problem regarding the same or different market; both are pressured continuously depending on the degree of elasticity.

→ Being unable to capture this is one of the faults of HHI's.

SSNIP Test

To finalize HHI, a market needs to be defined.

Provided that the price goes up 5% in the long term, when an unignorable degree of substitution of demand takes place, the subjects are considered to be in the identical market. ～ There is no theoretical grounding as to what conditions to be established. Since a definition needs to be based on terms of some kind, numerical values may change depending on cases.

In essence, a price to constitute the base must be a competitive one, not the current price. (cf. the previous sheet)

～Still, in actuality, it's difficult to find out a cost-based price.

H-Statistics

H-statistics: the sum of price elasticity of production factors of a firm's income ～ To measure the increment of a firm's income when costs go up

An index to indicate an increase percentage of the income when the prices of all production factors go up 1%.

The statistics is determined dependent on the two causes:

- How much the price goes up when the cost increases
- How much the demand goes down when the price moves up

H-Statistics

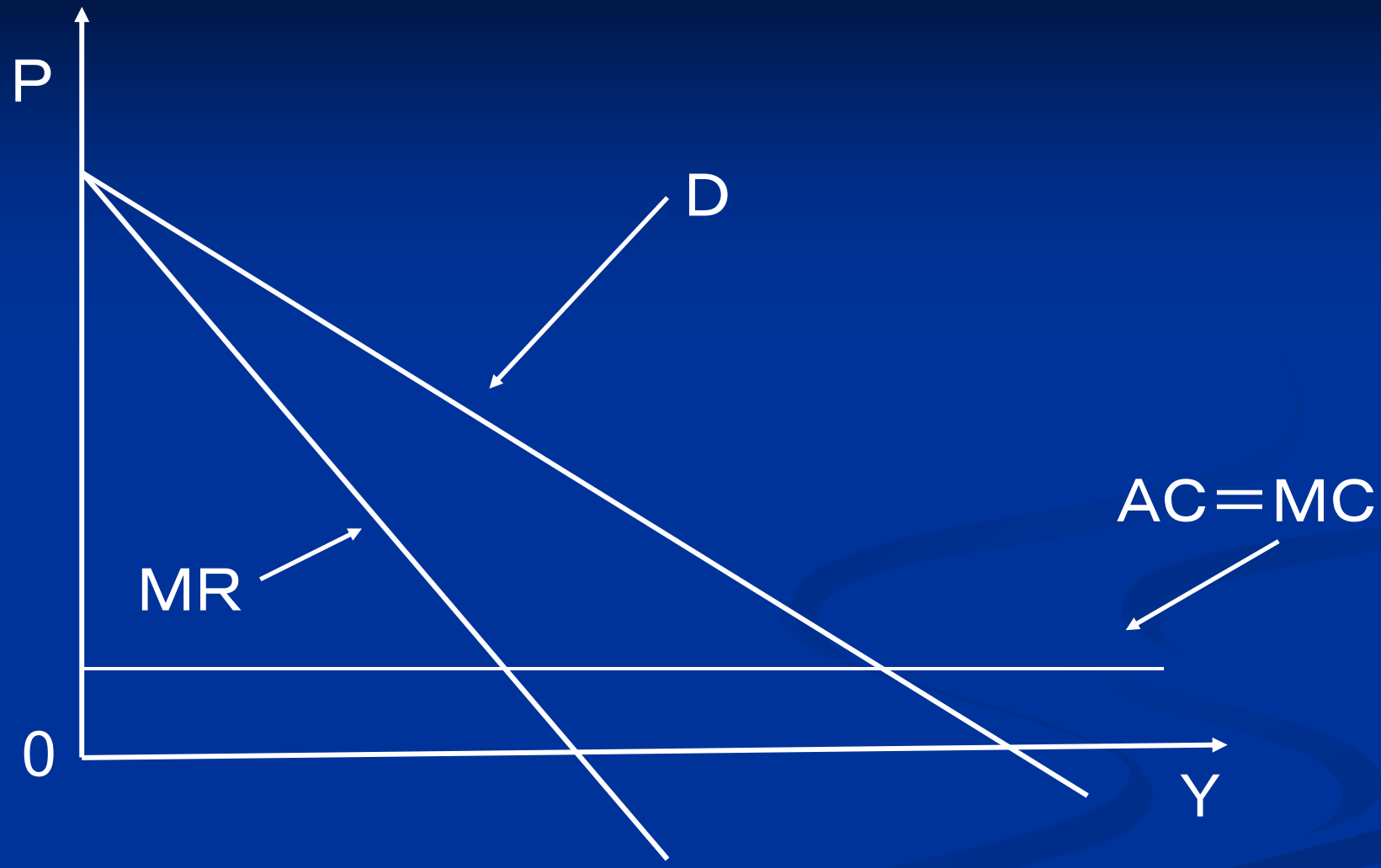
Monopoly

Right marginal cost with linear demand function, constant marginal cost (constant yield as to the size)

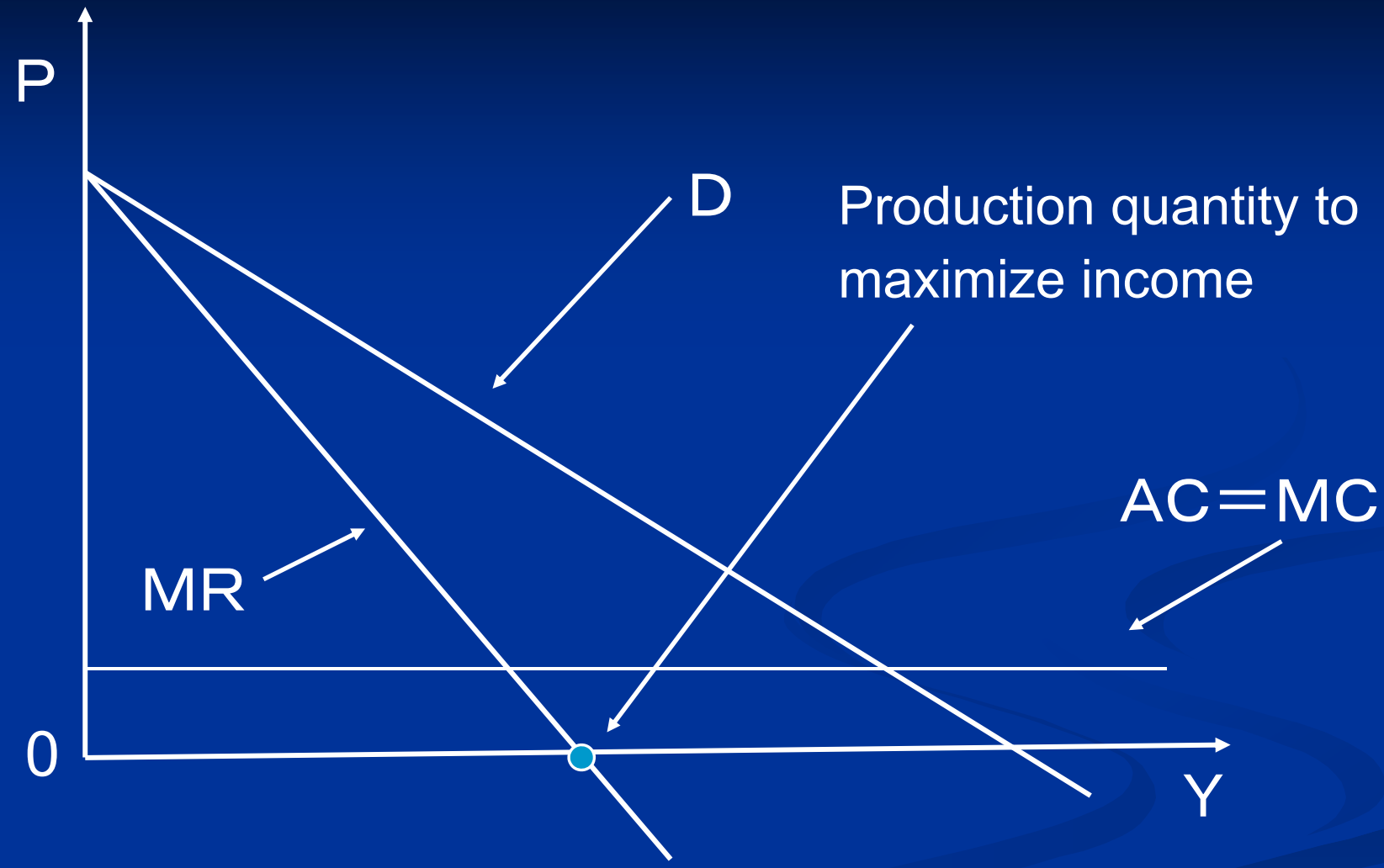
With 1% increase in costs, the price will (increase, decrease).

Thereby the income will (increase, decrease).

Monopoly



Monopoly



H-Statistics

Monopoly →H-statistics being negative

（Reason） Increase in marginal cost → Climb in price→ Decrease in income

←As the monopoly firm puts out at a point above 1 in price elasticity of demand, any climb in the price necessarily decreases the income.

Perfect competition; all firms are homogeneous, and free to enter or exit. Positive entry cost. U-shaped curve of average cost.

→H-statistics being 1

（Reason） 1% increase in cost → Minimum optimum production scale being constant→1% climb in price→1% increase in income (per firm)

Merits/Demerits of H-Statistics

Merits

Measurable without knowledge on the structure of market such as cost function

Easy to measure

Demerits

Various factors show up mingled together (not a structural test).

Practicable tests are limited.

Test Practicable Using H-Statistics

Monopoly→H-statistics being negative～If H-statistics were non-negative, it's not monopoly. (The opposite isn't true.)

False usage of H-statistics ～Monopoly if H-statistics are negative, perfect competition if they are 1, midway between these two if they are between 0 and 1.

- Even in perfect competition, without free entry/exit, and firms are not homogeneous, then H-statistics are capable to take any value less than 1.
- Even though it's not perfect competition, H statistic can become 1.
- H-statistics strongly depend on factors unrelated to competitiveness; conversely they sometimes do not respond to indices indicating competitiveness.

Conjectural Variation

Conjectural variation

Each firm takes action with an assumption that, when one's firm increases its production quantity by the unit, the whole production quantity of an entire market goes up by an increment of r.

In case of Cournot, r=1. Conjectural Variation Model ~ A generic model that includes Cournot as a particular case (?)

But are cases other than r=1 meaningful?

（E.g.）Duopoly, market of homogenous goods; both firms' marginal cost being identical due to the fixed marginal cost (c)

Firm 1's first-order condition $P+P'rY_1 = c$

Derivation of the equilibrium: solve $P+P'rY_1 = c$, $P+P'rY_2 = c$

Conjectural Variation Model

Assume $r \neq 1$.

Alteration of Firm 1's production quantity changes Firm 2's production quantity, too.

→It is incongruous for Firm 2 to change its production quantity before it checks that of Firm 1's.

Alteration of Firm 2's production quantity changes Firm 1's production quantity, too.

→It is incongruous for Firm 1 to change its production quantity before it checks that of Firm 2's.

⇒This is logically failed as a static model.

Why is Conjectural Variation Model in Use Though It's Failed?

（1）An unmodeled dynamic model

～It bears dynamic interaction in mind.

→If so, it is logical to come up with a dynamic model.

（2）Expression of market competitiveness

Solution of Conjectural Variation Model

First-order condition of Firm 1 in CV Model $P+P'r Y_1 =c$

First-order condition of Firm 1 in Cournot Model

$P+P' Y_1 =c$ corresponding to $r = 1$

Bertrand Model ~ First-order condition in perfect competition model

$P =c$ corresponding to $r = 0$

First-order condition in Joint Profit Maximization(cartel)

$P+P'(Y_1+ Y_2) =c$ corresponding to $r = 2$

To correspond to the models for respective competitiveness; the smaller the value of r, the fiercer the competition; the modeling possible without specifying competitiveness. ～ And which has the particular advantage in actual-proof-oriented theses.

Relative Profit

What if each firm aims to maximize own profit relative to its rivals?

→ To produce more aggressively

Equilibrium: first-order condition for maximization

$P+P'Y_1-C_1' -P'Y_2=0$

→In a symmetric equilibrium ($Y_1=Y_2$), price ＝ marginal cost (realm of perfect competition)

⇒A typical example of the competition becoming fierce even in an oligopolistic market in the context of competition over quantity

This state is evolutionary stable (Vega-Redondo, 1997)

Relative Profit

$U_1=\pi_1-\alpha\pi_2$

α=1 Perfect competition

α=0 Cournot

α=-1 Collusion

Capable to continually express competitiveness from perfect competition to a cartel

Examples of practical application

Stability of cartel being monotonically decreasing with α

Standard of R&D being nonmonotonic, U-shaped, with α

Degree of product differentiation being monotonically decreasing with α

Number of firms and prices in a free-entry market being monotonically decreasing with α

Justification for Relative Profit/Evaluation

(1) Evaluation of CEOs in market
(2) Evolutionary approach
(3) Jealousy, altruism (result of experimental economics and psychology of economic behavior)
(4) Strategic commitment ~ Application of Fershtman and Judd (1987)
(5) Application to the field of political science
(6) Discussion on status

Merger Examination

Based on a market definition, an examination of merger gets implemented investigating a market share and HHI increase, etc., for the period after the consolidation.

→ Why do they adhere to such an outdated procedure？

Why are they peculiar about share-based indices?

(1) To cut back costs involved in the examination by simplifying an inspection proceeding on post-consolidation market shares and small matters

(2) Since other factors besides shares are being observed closely, there is little real damage in actual applications.

Remedy

There are cases mergers get approved with conditions, or as the result of up-front handling on the firms' part. Many of those conditions (remedies) have problems.

Problematic remedies

(1) Remedy having an objective/effect to close a gap between firms

(a) There are many instances that a gap between/among firms improves economic welfare.

(b) There is a risk of enhancing the stability of cartel.

(2) Vertical separation such as spin-off of a sales subsidiary

This not only loses profits of vertical merger but may also cause damage to consumers.

→ To be taken up in the discussion on essential facilities