



EE481: Industrial Economics

Lecture 1: Introduction to Industrial Organization

Industrial Organization

Economists have developed a branch of economic analysis called ***Industrial Organization*** to trace the relationship between the structure of a market and the performance of the firms in that market.

What will you learn in this course?

- Learn how to analyze the market structure of an industry
 - Monopoly, duopoly, oligopoly, perfect competition
 - Barriers to entry
 - Product differentiation
 - Vertical integration
- Learn about different competition strategies (conducts) firms adopt to compete
 - Collusion, Merger, Advertising, R&D, Pricing behavior, etc.
- Learn how we can assess firms' performance from the society's point of view
 - Price, Production Efficiency, Equity, etc.
- Learn what the government can do in order to promote for more desirable outcomes (performance).
 - Anti-trust policy, Government Regulation

BEHAVIOR OF
(FIRMS)

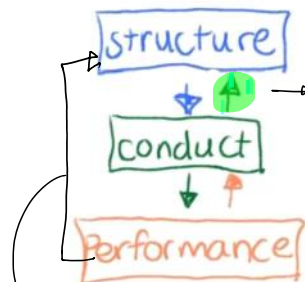
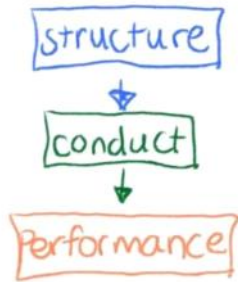
MARKET STRUCTURES

HOW TO SET THE
PRICE

DECISION TO COLLUDE
" " CHEAT

Major tools used in this course

- Structure-Conduct-Performance (SCP)
- Price Theory
 - ✓ – Game Theory
(von Neumann and Morgenstern (1944))
 - ✓ – Transaction Costs Analysis
[Ronald H. Coase (1937), Oliver Williamson (1975)]
 - ✓ – Contestable Market Analysis
[Demsetz (1968), Baumol, Panzar, and Willing (1982)]



CONDUCT OF FIRMS
IN A MARKET CAN
AFFECT MARKET STRUCTURE
(Ex: TAKEOVER
ACTIVITY)

↓ # OF FIRMS
↓
DEGREE OF MONOPOLY
POWER

PERFORMANCE
CAN DIRECTLY AFFECT
STRUCTURE TOO.

Ex: TOP PERFORMING FIRM S
WILL GAIN MKT SHARE
THE EXPENSE OF RIVALS

AT → THEY GIVES THEM MORE
MKT POWER !

Structure, Conduct, and Performance

Markets have three elements that may be the focus of public policy: structure, conduct, and performance

Structure

The ***structure*** of a market is the set of conditions and characteristics that describe and define the market type. To describe market structure, economists consider

- the number and size distribution of firms;
- The number and size of buyers of the industry's product;
- Price and cross price elasticity of demand
- the effectiveness of barriers to entry;
- the extent of product differentiation / product branding

- The degree to which an industry is vertically integrated up and down the supply chain. (e.g. forward and backward vertical integration)
- The market share of the largest businesses (measured by the concentration ratio)
- The nature of costs in the short and long run
- The turnover of customers from one seller to another (also called “market churn”) – this is affected by brand loyalty and the effects of advertising and marketing

Market Structures

	Perfect Competition	Monopolistic Competition	Oligopoly	Pure Monopoly
No. and Size of Firm	MANY	MANY	A FEW	ONE
Extent of Product Differentiation	NO	DIFFERENT	IDENTICAL OR DIFFERENT	A UNIQUE GOOD W/ NO CLOSE SUBSTITUTES
Barriers to Entry	NO	NO	MODERATE TO DIFFICULT	BLOCKED

Defining the market

- Market and the industry are terms often used interchangeably
- But.....
 - If we define a market in a narrow sense, it is likely that there will be fewer producers
 - E.g. the market for snooker tables or the market for air travel to Chiangmai
 - A broader definition of the market often gives us more choice
 - E.g. the air transport industry
 - The market for sports footwear
 - Defining the market is important when we try to measure the concentration ratio and the extent to which a market is dominated by one or a few large producers

The Conduct / Behaviour of Firms

Conduct refers to the behavior, policies, and strategies used by the firms in the industry. To describe firms' conduct, economists consider the strategies used by firms as they affect

- pricing;
- production;
- promotion; and
- distribution

- How does **market structure** affect pricing, output and other decisions of businesses within the market
- Are there dominant firms?

$S \rightarrow C$ (How?)

SINGLE
PRODUCT
FIRM

MULTI-
PRODUCT
FIRM

ECONOMIES OF
SCALE

ECONOMIES OF SCOPE

$$C(q_1, q_2) < C(q_1) + C(q_2)$$

UNIFORM PRICING

NON-UNIFORM PRICING

- 1ST PRICE DISCRIMINATION
- 2ND " " " "
- 3RD " " " "
- TWO-PART TARIFFS
- BUNDLING — PURE MIXED
- TIES IN SALE

Conduct / Behavior of firms

- Is there evidence of anti-competitive behaviour?
 - Collusive pricing agreements
 - Predatory pricing?
 - Vertical restraint?
- How important is non-price competition in the market?
- Is there **interdependence** between firms?
- Do businesses behave strategically to retain profits by deterring the entry of new competitors in the long run?
- Be aware that the market structure will affect the behaviour of firms

AFTER MEDTERM

THE RELATIONSHIP
BET. MANUFACTURERS
AND RETAILERS

Performance

Performance refers to the economic outcomes that result from the market structure and the firms' conduct. To evaluate an industry's performance, economists consider

- allocation efficiency; — BENEFITS TO CONSUMERS'
- production efficiency;
- equity; and
- technological advancement. (INCENTIVE TO DO R&D IN A PARTICULAR INDUSTRY)

The Firm | Definition and Objective

- **A firm** : AN ORGANIZATION THAT TRANSFORM INPUTS (RESOURCES IT PURCHASED) INTO OUTPUTS (VALUED PRODUCTS IT SELLS).
- **The objective of a Firm** : MAXIMIZE PROFITS (π) =
$$\frac{\text{TOTAL REVENUE (TR)}}{\text{TOTAL COSTS (TC)}}$$

The Firm | Ownership and Control

■ Three Basic Forms of Ownership

- Sole proprietorships - owned by 1 owner

GENERAL

LIMITED

- Partnerships - owned by multiple owners

Ex: 2

MR. A

8

MR. B

- Corporations - companies whose capital is divided into shares. A corporation raises funds through two channels

-> from shareholders (equity owners)

-> from debt holders (banks, people who buy the company's corporate bonds)

OWNERS' VS MANAGERS'

BOARD OF
DIRECTORS'

The Firm | Separation of Ownership and Control

PRINCIPAL - AGENT PROBLEM

OWNERS

MANAGERS

ASYMMETRIC
INFORMATION

The Firm | Separation of Ownership and Control

Cost Concepts | Types of Costs

PRODUCTION FUNCTION : $Q = F(L, \bar{K})$ $P_L = w$
 $P_K = r$

OBJECTIVE OF THE FIRM :

MINIMIZE $TC = w \cdot L + r \cdot K$
SUBJECT TO $Q = \bar{Q}$

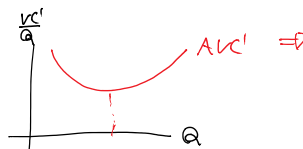
COST-MINIMIZATION
PROBLEM
FACING
A MANAGER

$$TC = FC + VC$$

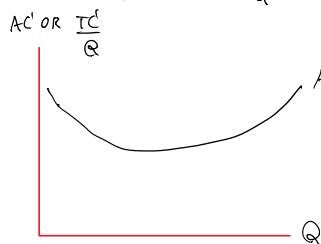
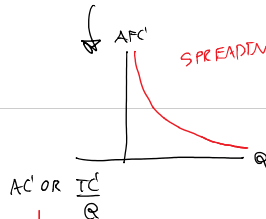
SUNK COSTS / AVOIDABLE COSTS
(NON-RECOVERABLE)

$$\frac{TC'(Q)}{Q} = \frac{FC'}{Q} + \frac{VC'(Q)}{Q}$$

$$AC'(Q) = AFC'(Q) + AVC'(Q)$$



SPREADING EFFECT : AFC FALLS AS Q RISES



$$AC'(Q) = AFC'(Q) + AVC'(Q)$$

SPREADING
EFFECT

DIMINISHING

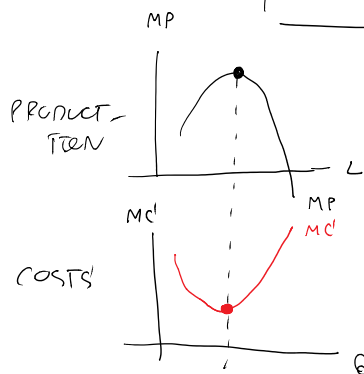
RETURN EFFECT : WHEN $MP > AP \rightarrow AP \uparrow \rightarrow AVC \downarrow$
8 WHEN $MP < AP \rightarrow AP \downarrow \rightarrow AVC \uparrow$

$$MC'(Q) = \frac{\Delta TC}{\Delta Q} = \frac{\Delta (FC' + VC')}{\Delta Q} = \frac{\Delta FC'}{\Delta Q} + \frac{\Delta VC'}{\Delta Q}$$

$$MC'(Q) = \frac{\Delta VC'}{\Delta Q}$$

LINK W/ PRODUCTION

$$MC' = \frac{\bar{w}}{MP_L}$$



RELATIONSHIP
BETWEEN
MP & MC'

PRODUCTION COST

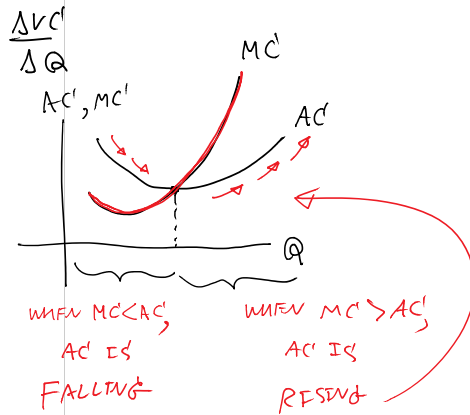
Cost Concepts | Types of Costs

Cost Concepts | Types of Costs

Cost Concepts | Types of Costs

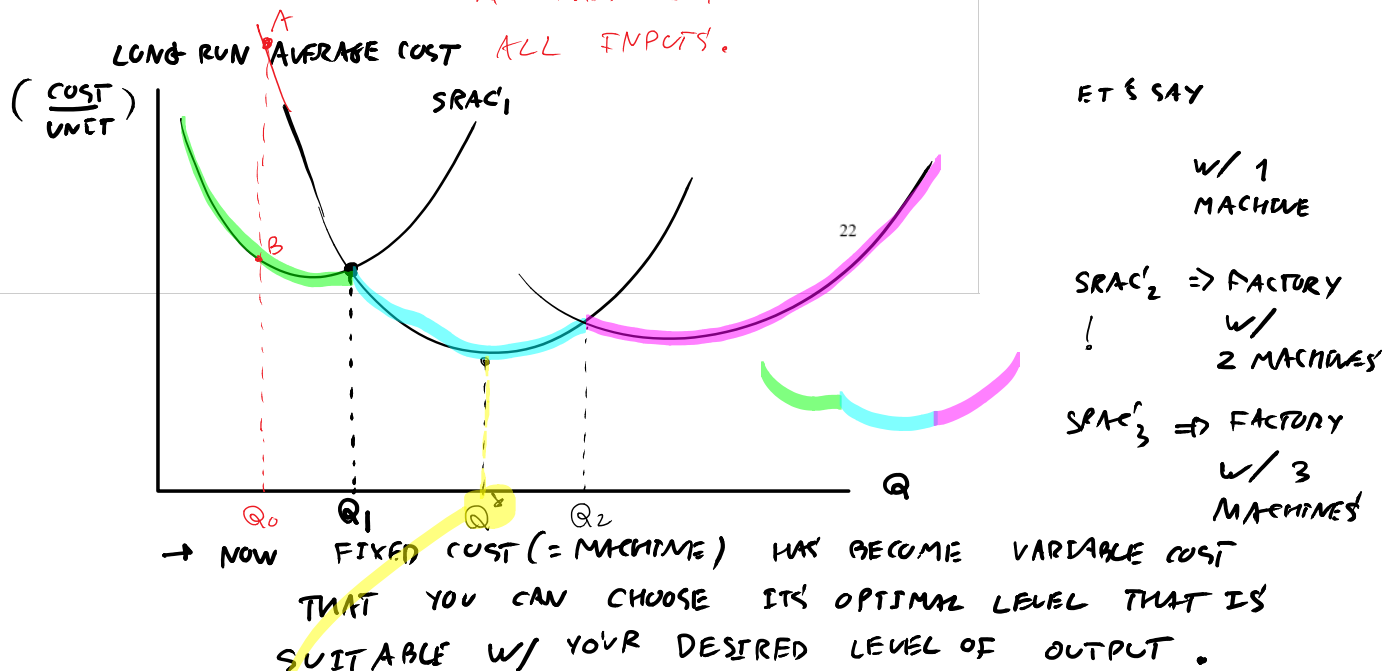
Output	F	$AFC = \frac{F}{Q}$	VC	$AVC = \frac{VC}{Q}$	TC	$ATC = \frac{TC}{Q}$	$MC = \frac{\Delta VC}{\Delta Q}$
0	100	-	0	-	100	-	-
1	100	100	10	10	110	110	10
2	100	50	19	9.5	119	59.5	9
3	100	33.3	25	8.3	125	41.7	6
4	100	25	32	8	132	33	7
5	100	20	40	8.0	140	28	8
6	100	16.7	49	8.6	149	24.8	9
7	100	14.2	60	9.1	160	22.9	11
8	100	12.5	73	9.8	173	21.6	13
9	100	11.1	88	10.8	188	20.9	15

21



The Short Run Vs. The Long Run

- The Short Run : PERIOD OF TIME THAT IS SO BRIEF SUCH THAT AT LEAST ONE FACTOR INPUT CANNOT BE VARIED.
- The Long Run : PERIOD OF TIME THAT IS POSSIBLE FOR A MANAGER TO ALTER AMOUNTS OF ALL INPUTS.



25.08.16

SUMMARY : LONG RUN AVERAGE COST IS AN ENVELOPE OF SHORT RUN AVERAGE COST CURVES.

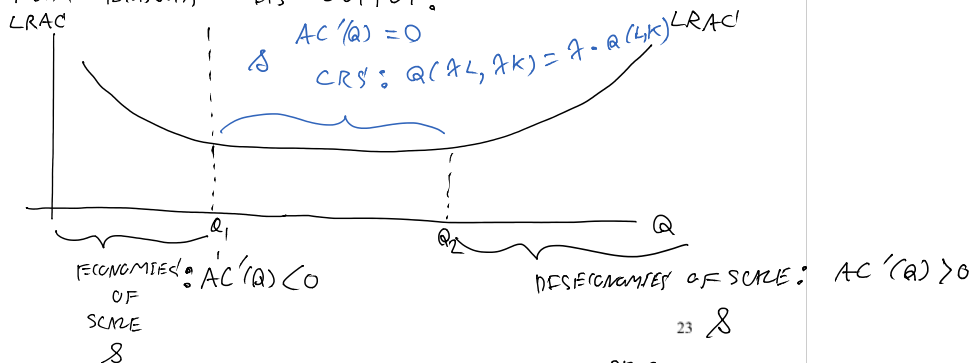
MES (MINIMUM EFFICIENT SCALE)

= REQUIRED LEVEL OF OUTPUT THAT MINIMIZES UNIT COST IN THE LONG RUN.

Economies of Scale : slope of AC curve

- ECONOMIES OF SCALE IS A LONG-RUN CONCEPT.
- ECONOMIES OF SCALE OCCUR WHEN AVERAGE COST FALLS AS

THE FIRM EXPANDS ITS OUTPUT.



INCREASING RTS

$$Q(\lambda L, \lambda K) > \lambda Q(L, K)$$

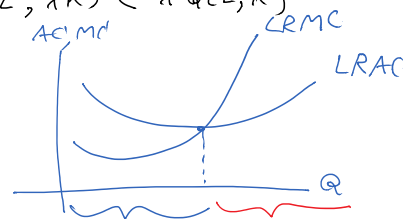
DECREASING RETURN TO SCALE:

$$Q(\lambda L, \lambda K) < \lambda Q(L, K)$$

$$\text{ECONOMIES OF SCALE} = \frac{AC'}{MC'}$$

$$\text{IF } MC' < AC', \frac{AC'}{MC'} > 1$$

(ECONOMIES OF SCALE)



$$\text{IF } MC' > AC',$$

$$\frac{AC'}{MC'} < 1$$

DISECONOMIES OF SCALE

Economies of Scope

There are positive spillovers (cost-saving, cost-sharing) effects when 1 firm produces more than 1 type of products.

$$SC = \frac{[C'(q_1, 0) + C'(0, q_2) - C'(q_1, q_2)]}{C'(q_1, q_2)}$$

IF $SC > 0$, ECONOMIES OF SCOPE EXIST.

NOW, WE HAVE A PROBLEM OF HOW TO MEASURE "ECONOMIES OF SCALE" WHEN A FIRM PRODUCES MORE THAN ONE PRODUCT. (CASE OF MULTIPRODUCT FIRMS)

$$\frac{TC}{q_1}, \frac{TC}{q_2}, \text{ OR } \frac{TC}{q_1 + q_2}$$

25

WHICH ONE SHOULD BE USED TO DEFINE AVERAGE COST?

WAY OUT: LET'S CALCULATE "RAY AVERAGE COST (RAC)"

- ASSUME PRODUCTION OF THE DIFFERENT PRODUCTS $i = 1, 2, 3, \dots, N$

IN FIXED PROPORTIONS, LET THESE PROPORTIONS BE

$$\lambda_1, \lambda_2, \lambda_3, \dots, \lambda_N \text{ WHERE } \sum_{i=1}^N \lambda_i = 1$$

- LET $q_1, q_2, q_3, \dots, q_N$ DENOTE THE PRODUCTION OF THE DIFFERENT PRODUCTS

- THEN DEFINE $\lambda_i = \frac{q_i}{q}$ AS THE PROPORTION OF PRODUCT i IN THE TOTAL PRODUCTION.

$$\text{SO, } q_i = \lambda_i \cdot q \cdot \#$$

EXAMPLE

IT COSTS 100 \$ TO RENT A MACHINE THAT CAN PRODUCE EITHER RED BALLONS OR BLUE BALLONS.

q_1 = # OF RED BALLONS

q_2 = # OF BLUE BALLONS

$$\text{SUPPOSE } C'(q_1, q_2) = 100 + q_1 + 2q_2$$

$$\text{MARGINAL COST OF PRODUCING RED BALLONS} = \frac{\partial C'(q_1, q_2)}{\partial q_1} = 1$$

$$\text{BLUE BALLONS} = \frac{\partial C'(q_1, q_2)}{\partial q_2} = 2$$

NOW, LET'S FIND RAC:

$$\text{SUPPOSE } \lambda_1 = 0.5, \lambda_2 = 0.5$$

$$\text{THEN } C'(q_1, q_2) = C'(0.5q, 0.5q)$$

$$= 100 + 0.5q + 2 \cdot 0.5q$$

$$= 100 + 1.5q$$

$$RAC(q) = \frac{100 + 1.5q}{q} = \frac{100}{q} + 1.5$$

IN THIS CASE $RAC(q)$ FALLS AS q EXPANDS. (WHY?)

AS RAC FALLS WHEN q RISES, THEN ECONOMIES OF SCALE PRESENT IN THIS MULTIPRODUCT FIRM. #



$$\mathcal{S} = \frac{C'(q)}{q_1 \frac{\partial C'}{\partial q_1} + q_2 \frac{\partial C'}{\partial q_2}}$$

VS.

$$\mathcal{S} = \frac{AC(q)}{MC(q)} = \frac{C'(q)}{q MC'(q)}$$

EoS RECIPE FOR MULTIPRODUCT CASE

EoS RECIPE FOR SINGLE PRODUCT CASE

$$\mathcal{S} > 1, \text{ EoS} \quad \text{☺}$$

$$\mathcal{S} > 1 \rightarrow \text{EoS} \quad \text{☺}$$

$$\mathcal{S} < 1, \text{ DISECONOMIES OF SCALE} \quad \text{☹}$$

$$\mathcal{S} < 1 \rightarrow \text{NO EoS} \quad \text{☹}$$

EX: FIND $\mathcal{S}$ FROM THE INFORMATION ABOVE:

$$\begin{aligned} \mathcal{S} &= \frac{C(q_1, q_2)}{q_1 \frac{\partial C}{\partial q_1} + q_2 \frac{\partial C}{\partial q_2}} = \frac{100 + q_1 + 2q_2}{q_1 \cdot 1 + q_2 \cdot 2} = \frac{100}{q_1 + 2q_2} + \frac{q_1 + 2q_2}{q_1 + 2q_2} \\ &= \frac{100}{q_1 + 2q_2} + 1 \end{aligned}$$

$$\text{SO, } \mathcal{S} > 1 \Rightarrow \text{EoS PRESENTS. \#}$$

NEXT

If Good 1 is produced "SEPARATELY", $C(q_1, 0) = 100 + q_1$

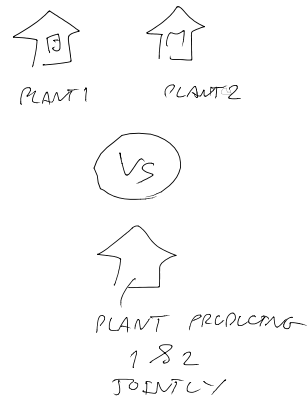
If $\text{dom } z \text{ is } \text{---}$, $c(0, g_2) = 100 + 2g_2$

THEN COSTS OF PRODUCING GOOD 1 AND GOOD 2 SEPARATELY

$$= (100 + g_1) + (100 + 2g_2) = \underline{200 + g_1 + 2g_2}.$$

COST WHEN PRODUCING THEM TOGETHER = $\frac{100 + g_1 + 2g_2}{2} \rightarrow C(g_1, g_2)$

$$\begin{aligned} S^d &= \frac{[C(q_1, 0) + C(0, q_2) - C(q_1, q_2)]}{C(q_1, q_2)} \\ &= \frac{[(100 + \cancel{q_1}) + (\cancel{100} + \cancel{2q_2}) - (\cancel{100} + \cancel{q_1} + \cancel{2q_2})]}{(100 + q_1 + 2q_2)} \\ &= \frac{100}{100 + q_1 + 2q_2} \end{aligned}$$



SINCE $SIC > 0$ EVERYWHERE, IT IS CHEAPER TO PRODUCE THE TWO GOODS TOGETHER RATHER THAN SEPARATELY

REASONS FOR ECONOMIES OF SCOPE

- JOINT USE OF COMMON INPUTS
- KNOWLEDGE SHARING BETWEEN THE TWO PRODUCTS

→ THE WAY TO PRODUCE GOOD 1 IN A CHEAPER WAY CAN POSITIVELY CONTRIBUTE TO THE WAY TO PRODUCE GOOD 2.

MARKETING & DISTRIBUTION CHANNELS

EST

Reference and Further Reading

- Carlton, D.W. and J.M., Perloff.
Modern Industrial Organization. 4th Edition.
Pearson Addison Wesley Press, 2005.
- Church, J. and R. Ware.
Industrial Organization: A Strategic
Approach. International Edition. McGraw-Hill
Press, 2000.