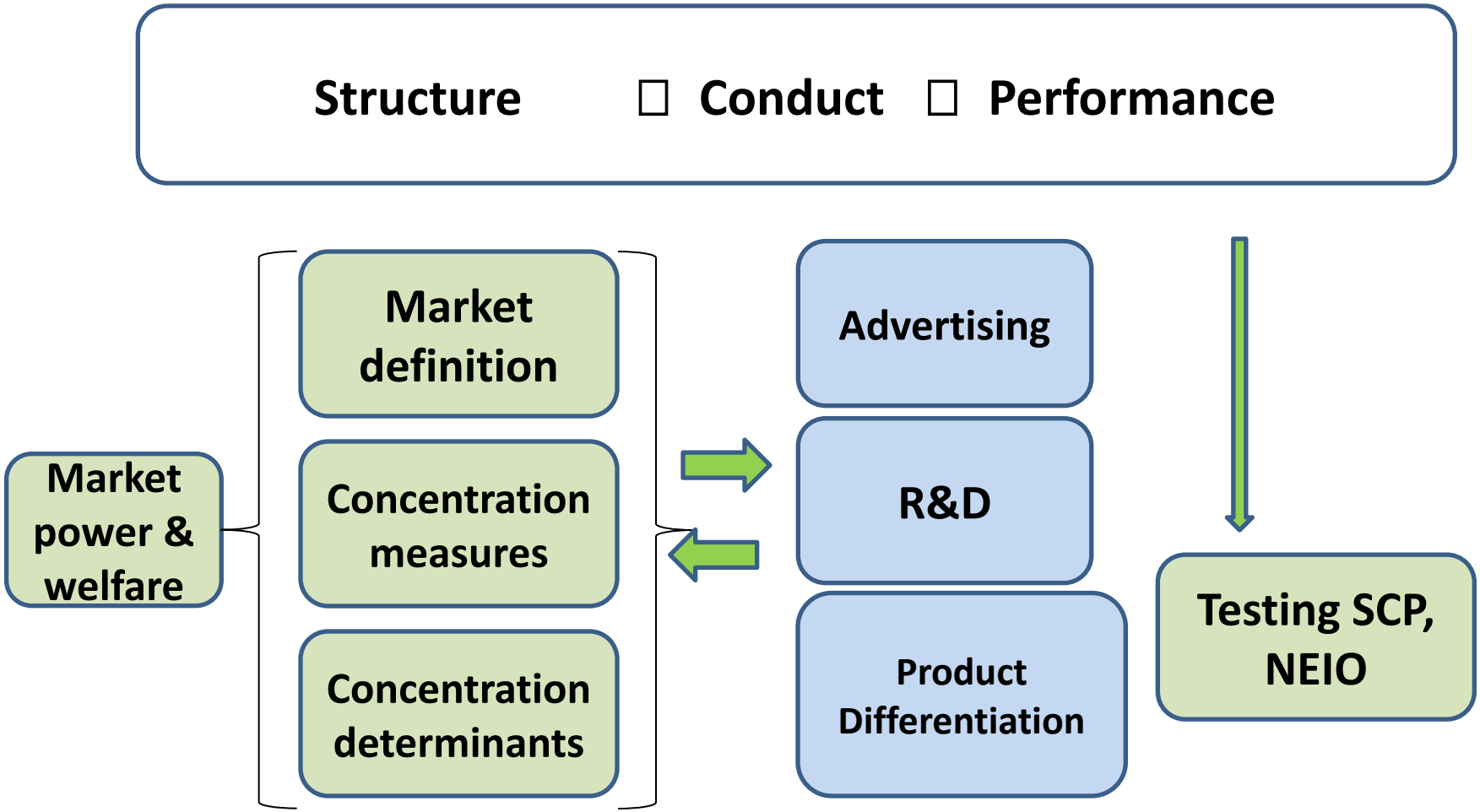
Industrial Economics A: Structure, Conduct and Performance

Lecture 1

Module logistics

- See the module outline for details.
- Some highlights:
  - Textbooks:
    - Lipczynski, Wilson and Goddard
    - Church
  - Assessment: 1.5 hour exam (70%), and an individual coursework (30%)
- The seminar will take place during teaching weeks 9 and 10 (depending on your group).

Module structure

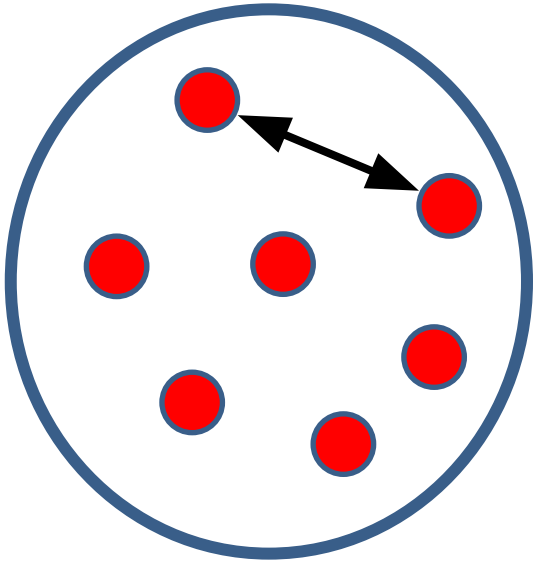


What is industrial organization?

- IO is the application of microeconomic theory to the analysis of firms, markets and industries
- In IO (unlike microeconomics), the industry structure is entirely modelled and is dynamic.
  - Number and size distribution of firms
  - Barriers to entry
  - Product differentiation
  - Vertical integration and diversification

What is industrial organization?

- IO increases our understanding of problems faced by firms:
  - **Externally**, how firms compete in the marketplace (Theory of markets)
    - Firm as a black box and focus on how firms compete with each other.
  - **Internally**, organizing production within the firm (Theory of the firm)
    - Look inside the firm and explain things firm size, the boundaries of the firm, and incentives within the firm.



IO and policymaking

- For policy makers:
  - Competition policy aims to prevent firms from abusing market power. [Sherman Act 1890, China antitrust law 2007]
  - How to measure market power and excess profit?
  - How competitive is a specific industry?
  - What types of firm behavior can make an industry less competitive?
  - What type of market structure is most conductive of innovation?

IO and policymaking: The Google antitrust case

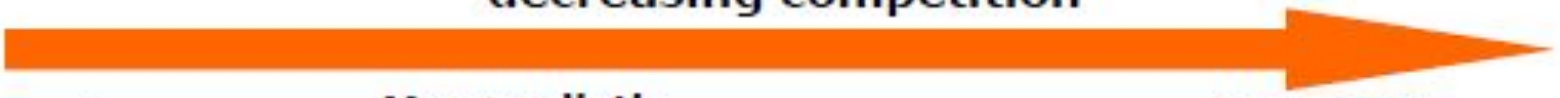
- 2010: The EU commission accuses Google of promoting its shopping service in internet search at the expense of rival services
  - Google is accused of systematically favouring its own comparison shopping product in its general search results pages
  - http://europa.eu/rapid/press-release_IP-15-4780_en.htm
- Google's response:
  - "Economic data (…), and statements from complainants all confirm that product search is robustly competitive".
  - Google claims that Google shopping is operating in a field that includes Amazon and eBay, where shoppers go to compare prices.

IO and policymaking: The Google antitrust case

- Google could face a 3bn euros fine.
- Related to that case, IO provides answers to the following questions.
  - How to define a market?
  - How to measure market power?
  - How to stop dominant firms from abusing market power?

Typology of market structures

Increasing *concentration* and market power – decreasing competition



Perfect Competition	Monopolistic Competition	Oligopoly	Monopoly
•Many small firms	•Many small firms	•few large firms	•One firm
•no entry barriers	•some entry barriers	•significant entry barriers	•prohibitive entry barriers
•Homogeneous products	•Differentiated products	•Differentiated / undifferentiated	•Unique
•Firm is price taker	•Firm has some control over price	•Depends	•considerable control over price
•Firm's Demand is horizontal	•Firm's Demand is downward slopping	•Downward slopping, inelastic	•Downward slopping, more inelastic

Austrian School: Schumpeter

- Dynamic theory where markets are changing due to the activities of entrepreneurial and profit-seeking innovators.
- "Creative destruction" (Schumpeter, 1928): Competition is driven by innovation
  - Innovation destroys old products and processes and replaces them with new ones.
  - Innovators earn profits and imitation gradually erodes these profits by cutting prices and raising input costs.
- Abnormal profits and market power are necessary to motivate firms to innovate, and improve products in the long run

Creative destruction: The music industry

Spotify

MP3

Compact Discs

Tape cassette

Hi-Fi stereo

LP records

Electrical gramophone

Wind-up gramophone

Pianola

Barrel organ

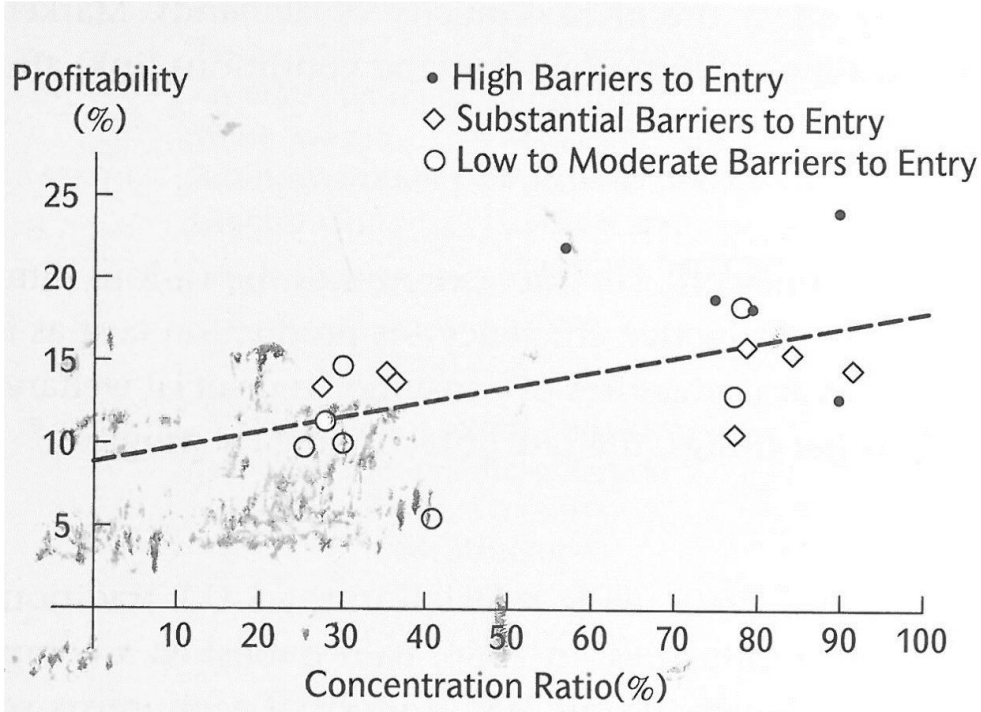
1850 **1900** **1950** **2000**

The Chicago School

- The Chicago School (1970-80s): Also argues against government intervention
  - Large firms are large because they are more efficient
  - In the long run abuse of market power is unlikely, e.g. collusive agreements are unstable
  - Markets have a tendency to revert towards competition, without the need for government intervention

The SCP paradigm

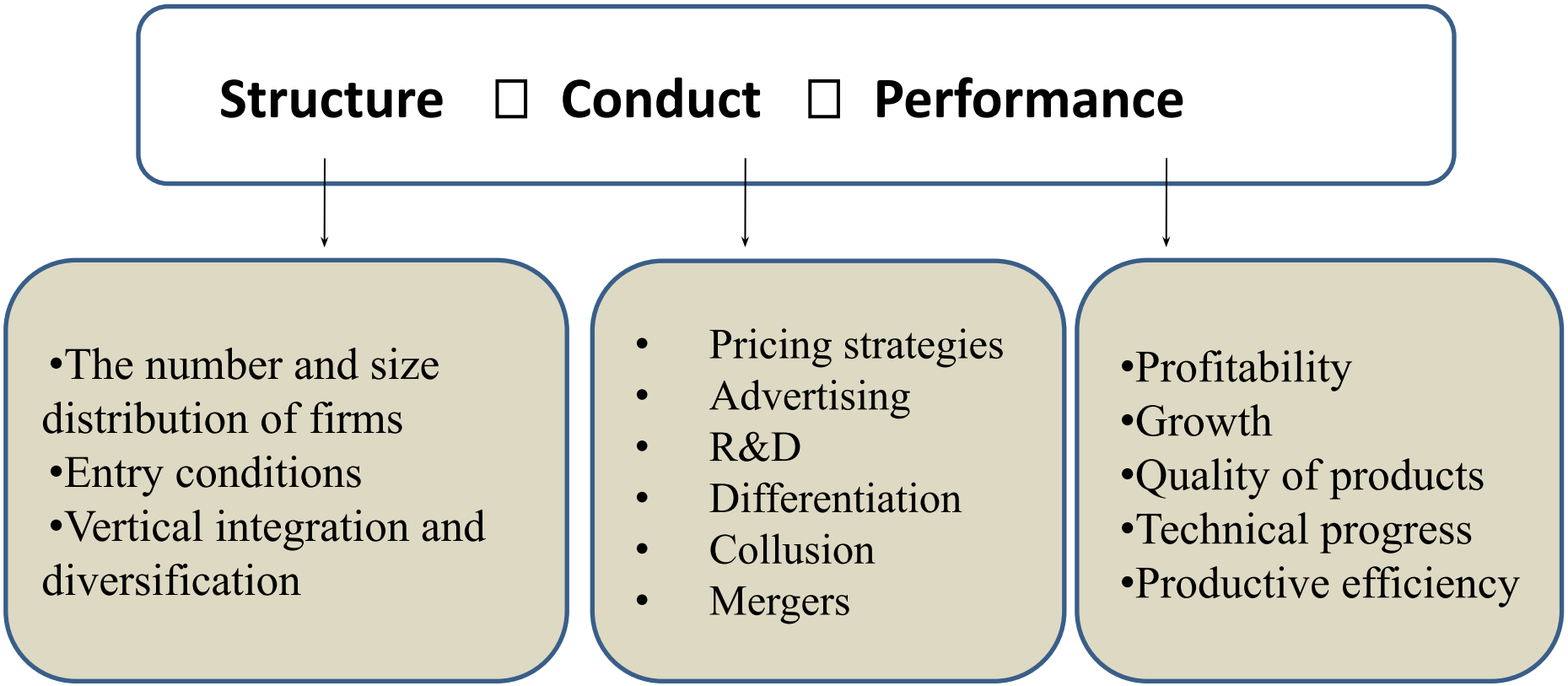
- Concentrates on empirical analysis rather than on theoretical analysis.
- Bain (1956): There is a causal relationship between concentration and profitability:



Source of data: Bain (1956).

The SCP paradigm

- SCP assumes a causal relationship between structure, conduct, and performance.
- Most influential during the 1950-1970s.



The SCP paradigm

- According to SCP, relationships between structural variables and market performance hold across industries.

- The line of causality is from structure through performance. If a stable relationship is established between structure and market power, it is assumed that structure determines market power.

SCP & European banking: Structure

- 1980s: European banking was fragmented. Banks did not operate in other countries [high entry barriers]. Domestic banks did not face competition from foreign banks.
- Deregulation made EU banking more competitive
  - Second Banking Directive, 1990
  - Creation of the euro
  - As a consequence: Banks able to trade throughout Europe.
  - Lowered entry barriers.

- **Do this make the industry more competitive or less competitive?**

SCP & European banking: Structure

- 1990-2009: decline in the number of banks

Table 1 Number of banks by country (selected countries, 1990–2009)

Country	1990	1995	1998	2002	2006	2009
Austria	1,210	1,041	898	823	809	790
Belgium	157	145	123	111	105	104
Denmark	124	122	212	178	191	164
Finland	529	381	348	369	361	349
France	2,027	1,469	1,226	989	829	712
Germany	4,720	3,785	3,238	2,363	2,050	1,948
Italy	1,156	970	934	821	807	801
Luxembourg	177	220	212	184	154	147
Netherlands	111	102	634	539	345	295
Portugal	260	233	227	202	178	166
Spain	696	506	402	359	352	352
Sweden	704	249	148	216	204	180
UK	624	564	521	451	401	389
EU total	12,582	9,896	9,260	7,751	6,926	6,397

SCP & European banking: Structure

- 1990-2009: increased level of seller concentration

C3 = percentage share of the total assets held by the three largest banking institutions:

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Austria	42.28	46.12	58.71	59.64	54.26	56.40	50.14	50.14	42.84	50.12	45.57	49.84	45.05
Belgium	32.40	31.41	44.75	58.77	58.84	59.38	59.38	54.00	54.92	44.92	54.87	56.82	57.25
Bulgaria	78.59	62.84	55.10	52.88	52.88	48.57	42.49	38.37	34.01	33.38	31.14	32.59	30.37
Cyprus	64.73	61.49	60.84	61.36	52.08	50.55	53.64	66.62	65.92	72.44	77.36	72.89	71.89
Czech Rep.	50.68	49.99	46.33	51.33	55.75	54.63	53.71	54.17	41.63	42.47	41.77	42.13	40.58
Denmark	52.80	46.74	46.88	43.11	50.00	56.01	57.17	58.36	52.60	59.80	59.06	60.89	60.38
Estonia	42.25	40.39	75.83	77.06	77.98	80.54	80.58	80.69	86.99	87.11	88.17	84.99	89.29
Finland	73.67	76.35	78.06	74.08	76.14	83.78	87.60	80.54	74.51	74.69	79.52	79.45	79.4
France	24.56	27.77	28.93	34.96	34.19	35.79	31.35	31.81	30.29	32.87	33.90	35.05	36.61
Germany	18.74	16.03	21.75	22.68	24.83	24.08	21.11	21.96	22.08	25.51	27.97	32.78	36.08
Greece	48.29	45.19	43.02	39.71	41.20	41.11	39.4	38.41	24.02	36.59	35.58	38.19	37.67
Hungary	39.21	45.94	33.60	32.49	30.37	32.20	33.96	39.03	39.66	37.64	39.25	37.67	35.26
Ireland	57.68	58.00	48.35	50.95	50.64	45.96	49.87	47.69	35.84	42.16	43.44	43.03	43.95
Italy	19.05	20.26	23.80	24.24	25.55	27.97	25.55	25.28	24.51	34.25	44.09	49.38	48.47

SCP & European banking: Conduct

- Following the deregulation, many banks have consolidated (M&A), e.g.
  - Unicredito (Italy) and HVB (Germany)
  - BNP Paribas (France) Banco Nazionale de Lavoro (Italy)
  - Banco Santander (Spain) and Alliance of Leicester (UK)
- Large banks have adapted their structures, risk management and strategic planning functions to deal with pan-European activity.

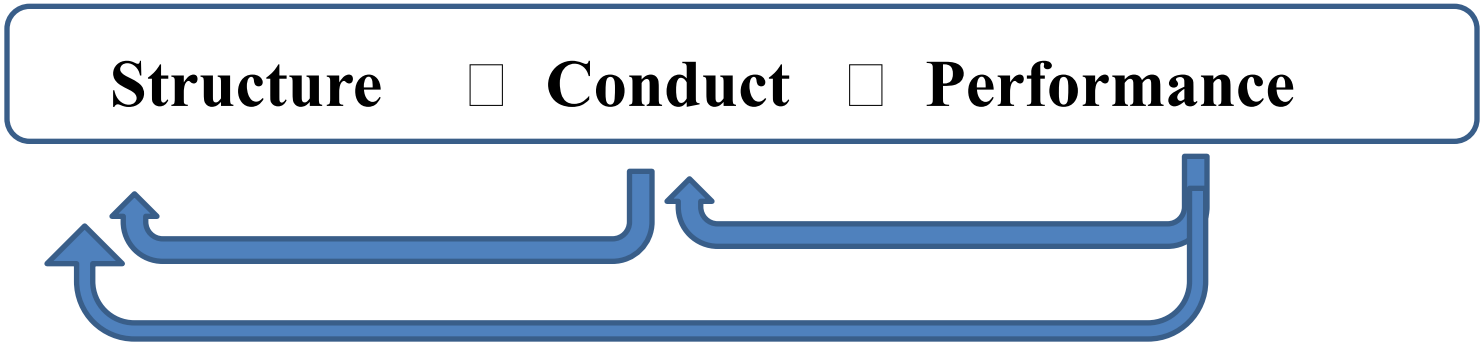
SCP & European banking: Performance

- 1990-2006: increased profitability despite the lowering of entry barriers.
- How to explain the increased profits?
  - **Increased consolidation; Product diversification; Cost-cutting**

Table 2 Return on equity, 1990–2009 (various European countries, %)

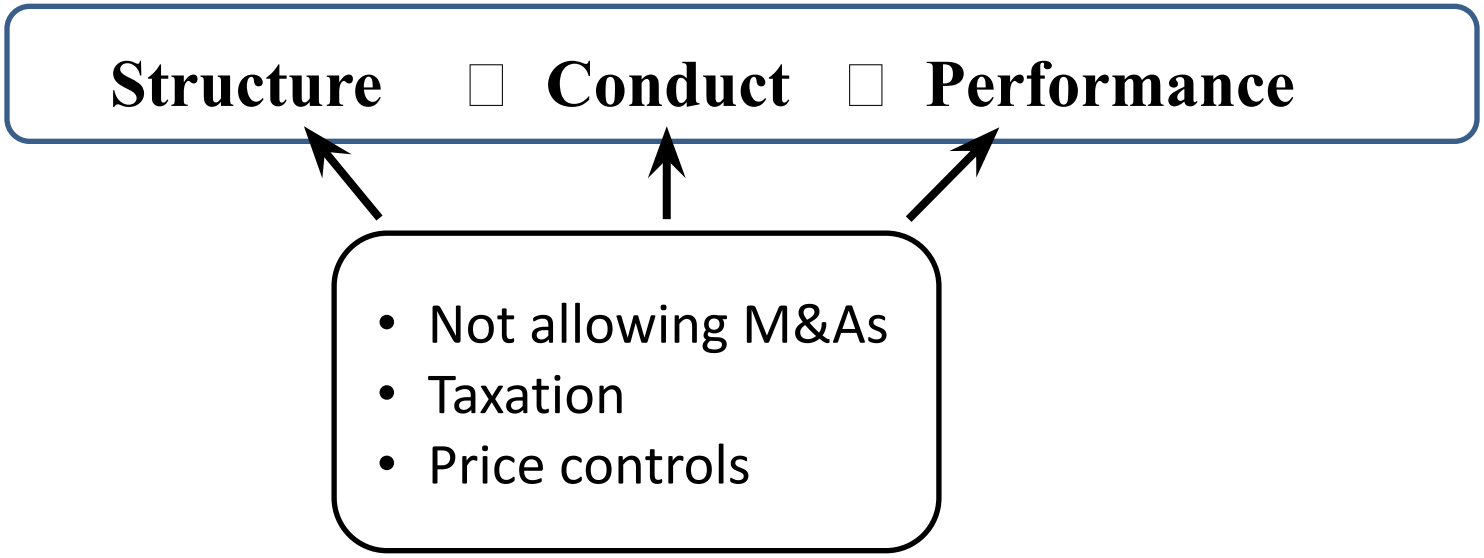
Country	1990	1995	1998	2001	2006
Austria	8.63	8.15	9.48	11.29	16.31
Belgium	8.29	12.89	14.76	15.31	19.36
Denmark	3.34	18.5	14.6	16.53	16.84
Finland	5.61	7.93	9.86	17.21	10.92
France	10.15	3.63	9.93	11.76	14.77
Germany	11.93	12.57	17.38	5.12	11.02
Italy	16.4	5.91	13.17	14.01	10.5
Luxembourg	6.17	19.95	24.67	18.5	19.22
Netherlands	12.3	15.81	14.3	15.23	16.96
Portugal	12.54	7.65	7.56	6.31	13.4
Spain	13.58	9.17	11.07	9.26	15.22
Sweden	3.65	22.08	17.33	19.48	15.7
UK	14.45	28.59	28.31	20.05	16.1

SCP: Reverse causality?



- Conduct to structure? R&D, advertising, differentiation
- Performance to structure? Growth and changing market shares
- Performance to conduct? Profitability and capacity to invest in R&D, or cut prices

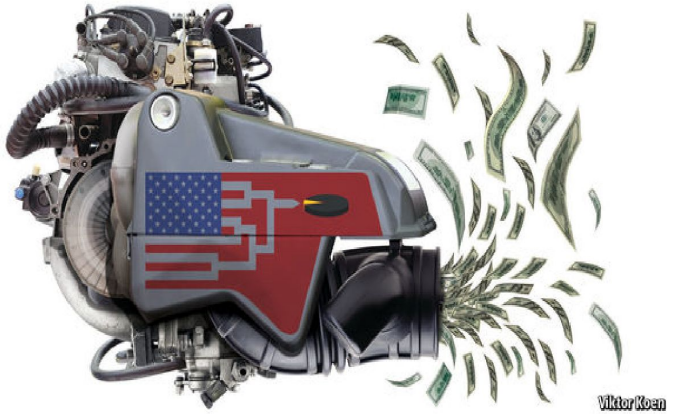
Competition policy and SCP



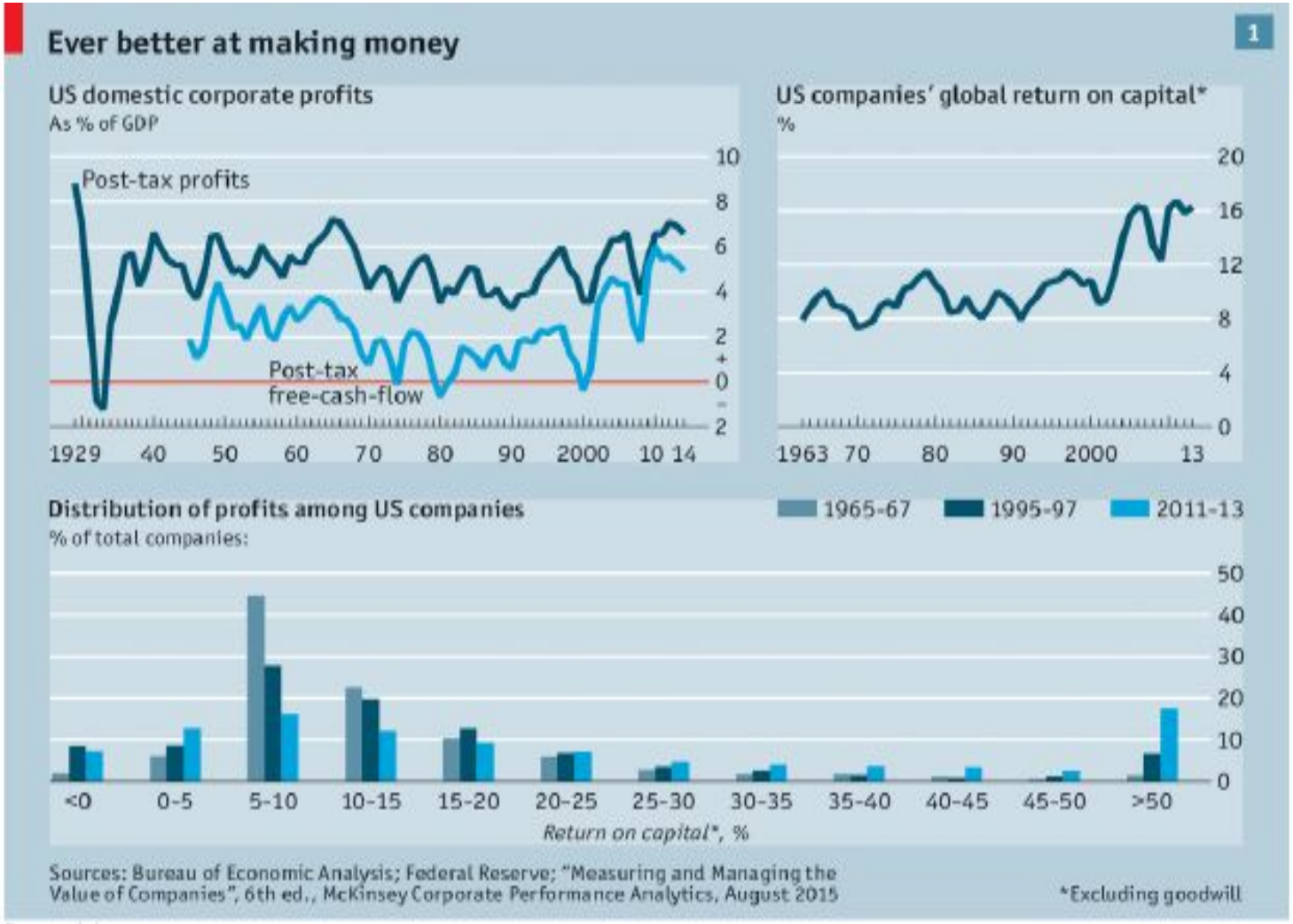
- Public policies that aim to prevent the abuse of market power
  - Preventing mergers beyond a certain scale [STRUCTURE]
  - Price controls, restrictions on collusion [CONDUCT]
  - Policies that also affect firms' PERFORMANCE

Profits in America and the practical relevance of IO

- *Source*: 'Too much of a good thing'. *The Economist*, 2016.
- Profits have risen in most rich countries over the past ten years.
- E.g. America Airlines: Used to make losses; but made $24bn profit in 2015.
- How? The falling price of fuel has not been passed on to the consumers.
- Why not? Consolidations has left the industry with 4 dominant firms with many shareholders in common.



Profits in America

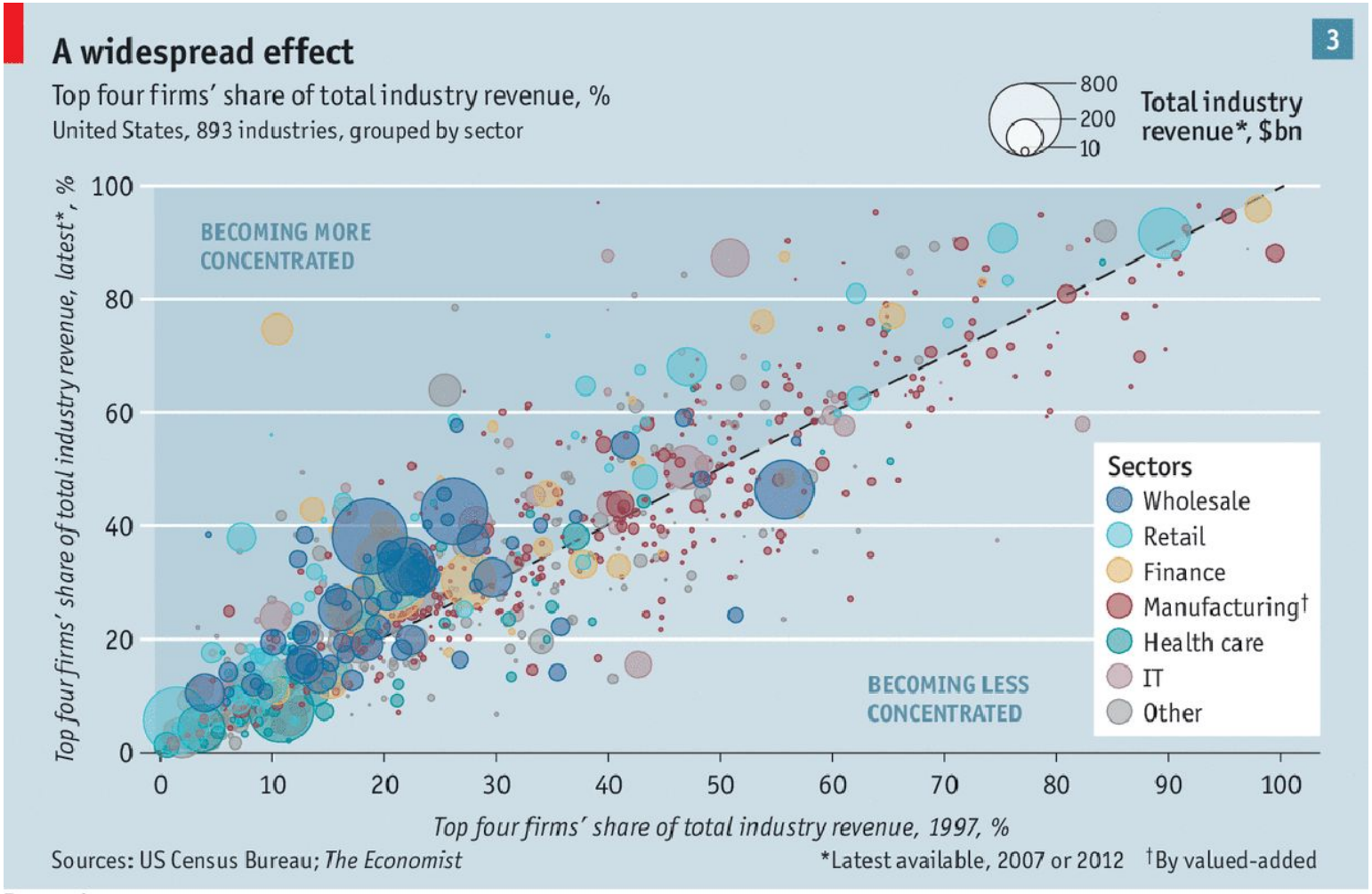


Profits in America
- Historical developments

- In the 1990s American firms faced a wave of competition from low-cost competitors abroad.
- In 1998, Joel Klein (DoJ), declared that “our economy is more competitive today than it has been in a long, long time.”
- How to explain the recent increase in corporate earnings?
  - Since 2008 American firms have engaged in mergers worth $10 trillion, allowing the merged companies to increase market shares and cut costs.
- Two-thirds of the industry sectors became more concentrated between 1997 and 2012. The average share of the top 4 firms has risen from 26% to 32%.

Profits in America

Profits in America



Profits in America

- About 25% of America's abnormal profits are spread across a wide range of sectors.
- Another 25% comes from the health-care industry (pharmaceutical and medical-equipment). Patent rules allow temporary monopolies on new drugs and inventions. Much of health-care purchasing is controlled by insurance firms. Four of the largest, Anthem, Cigna, Aetna and Humana, are planning to merge into two larger firms.
- The remaining 50% abnormal profits are in the technology sector, where firms such as Google and Facebook enjoy market shares of 40% or more.

Production and costs

Production and costs

- Long run production function:

$$q = f(L, K)$$

- Short run production function, K fixed, and assuming L is variable in the short run:

$$q = g(L)$$

- In some cases, L can also be fixed in the short run.

Short run production

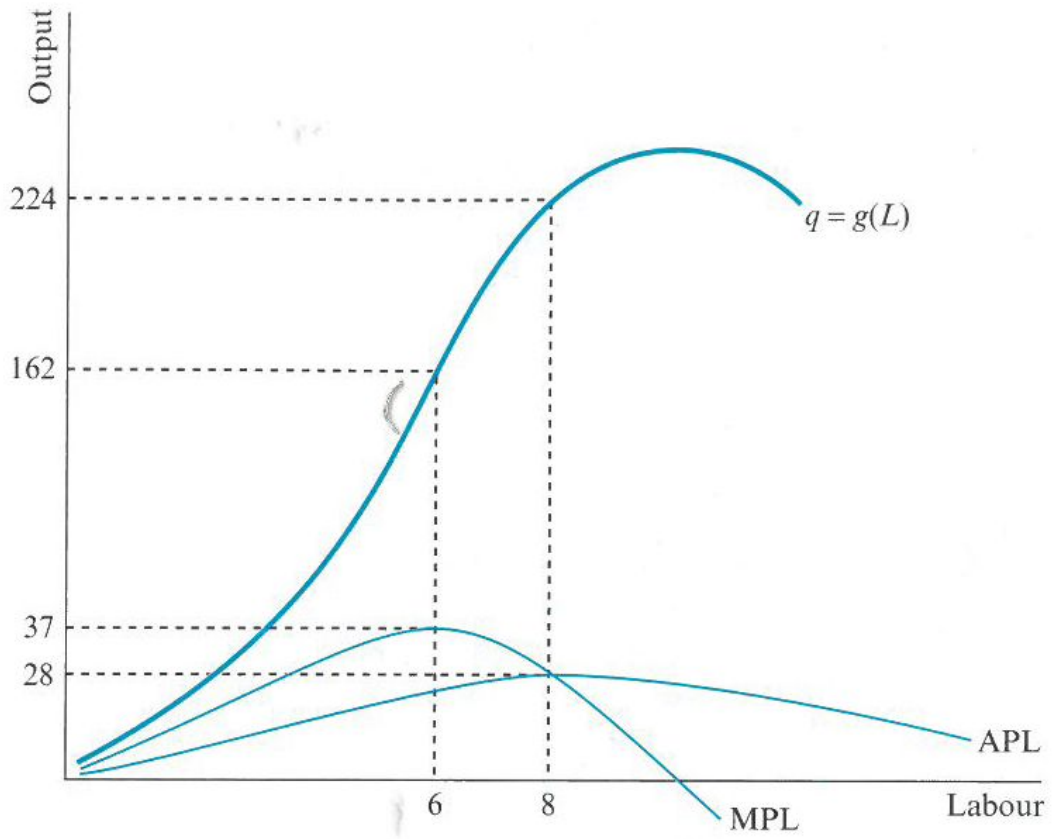


Figure 2.1 Short-run relationship between total, marginal and average product of labour

Short run costs

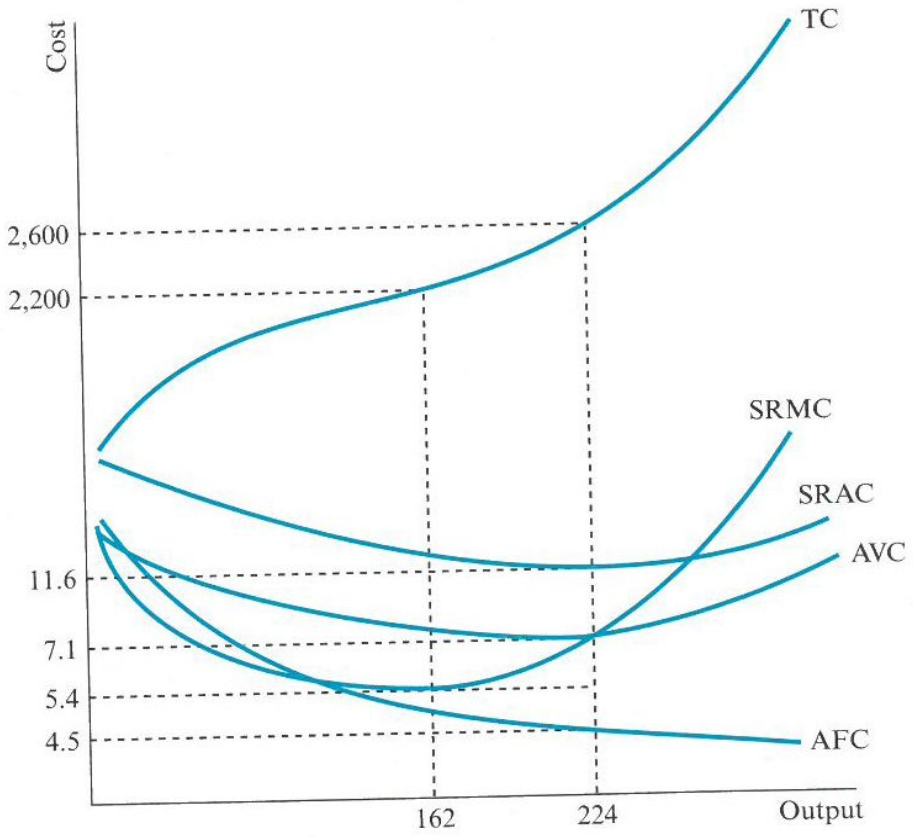
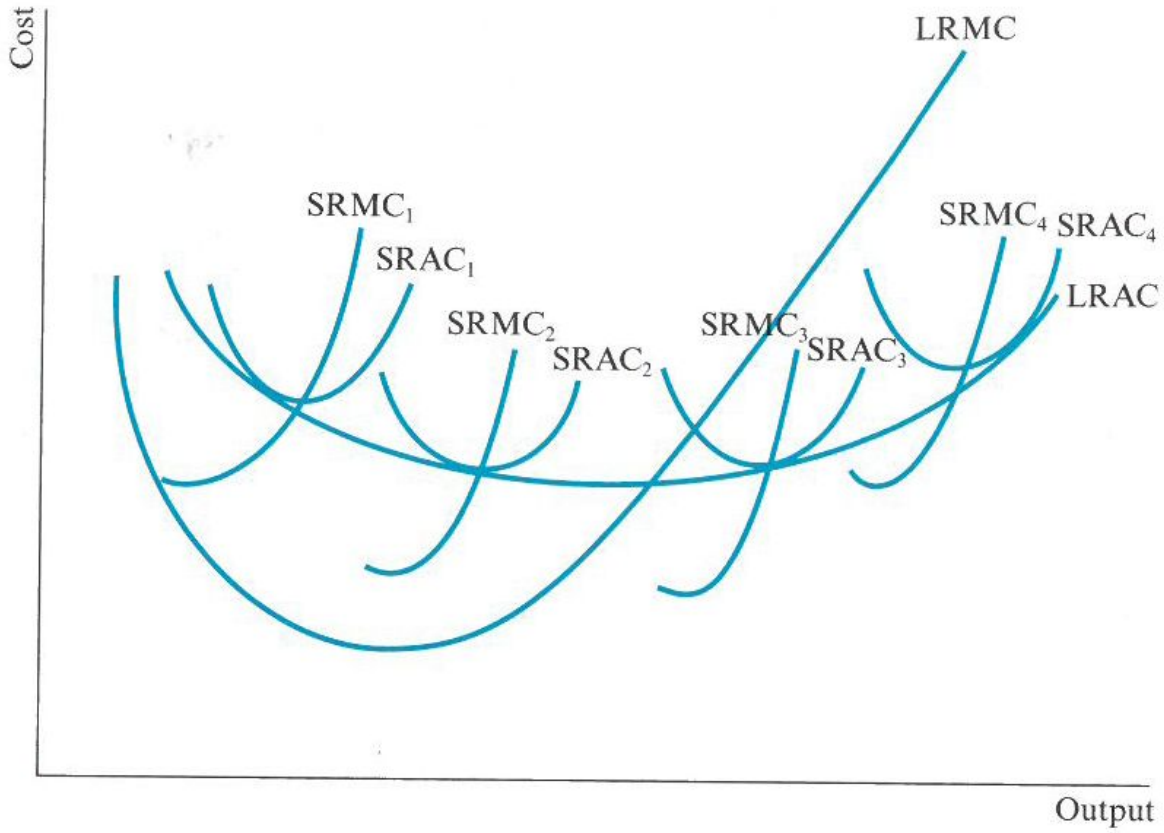


Figure 2.2 Short-run total cost, marginal cost, average variable and fixed cost and short-run average cost

Long run costs

- In the long-run, firms can change their usage of all the inputs, including capital, number and size of factories etc.
- LRAC: Lowest cost of producing any given output level when the firm can vary both K and L.
  - Draw SRAC for all possible levels of K. The curve that enfolds these curves from below is the LRAC.
  - Compared to SRAC, LRAC decline longer before finally increasing
- LRMC: long-run marginal cost

Long run costs



Application to oil pipelines

- Costs associated with construction and operation:
  - Planning and design
  - Acquisition of clearing the right-of-way
  - Construction costs
  - Steel for the pipeline
  - Pumps (One time fixed costs)
  - Electricity to power the pumps (variable costs)
  - Labor (monitoring personnel) (fixed cost)

Application to oil pipelines

- Electricity costs vary with throughput, but the number of personnel does not.
- The salary of personnel is avoidable if the pipeline shuts down.

- What are the variable costs?
- What are the fixed costs?

Economies of scale

- Economies of scale impact the LRAC

Economies of scale

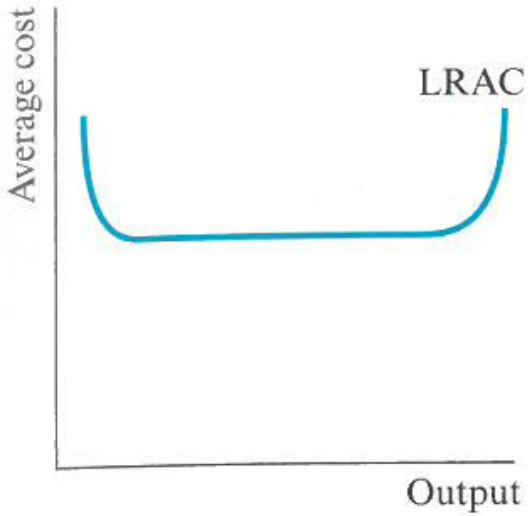
- Indivisibilities
- Learning economies
- Purchasing economies
- Transports economies

Diseconomies of scale

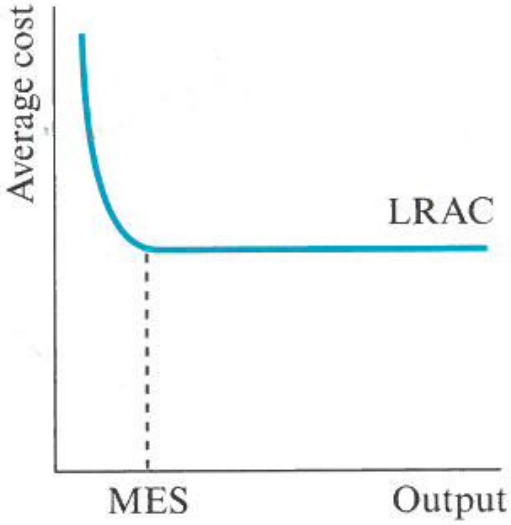
- Long chains of command
- Strained communications
- Bureaucracy

- **Minimum efficient scale** = output level beyond which firms can make no further savings in LRAC through further expansion.

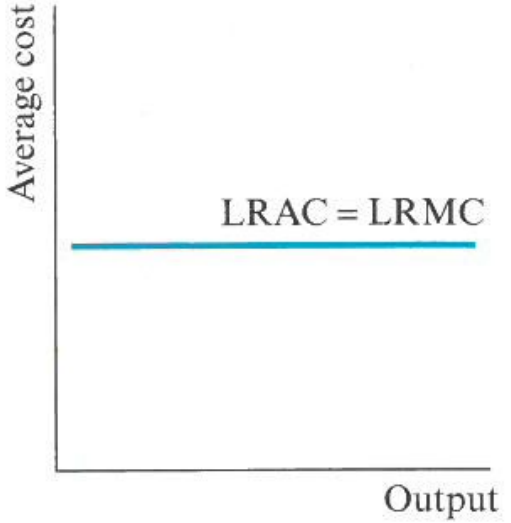
Economies of scale



Elongated U-shape: constant returns to scale over a wide range of outputs



L-shape: constant returns to scale (and no diseconomies of scale) beyond minimum efficient scale (MES)



Horizontal: constant returns to scale over all outputs

Empirical studies of economies of scale

- Some firms have U-shaped LRAC
- However, manufacturing firms often have L-shaped LRAC
- Estimates of MES:

TABLE 2.3 Estimates of Minimum Efficient Scale (MES)

Product	*MES* (physical output per year)	*MES* as a Percent of U.K. Market	Percent Increase in Unit Cost Incurred by a Plant of 50% *MES*
Oil	10 million tons	10	5
Chemicals			
Ethylene	300,000 tons	9	25
Dye	large	100	22
Sulfuric acid	1 million tons	30	1
Beer (brewery)	at least 1 million barrels	3	9
Steel production	9 million tons	33	5–10

Source: Pratten (1971) as reported in Siberston (1972, 380).

Empirical studies of economies of scale

- Survivorship studies: If a particular plant size is efficient, eventually all plants in that industry should approach that size.
- Example from the beer industry:

TABLE 5-3 Surviving Breweries by Capacity: 1959–2006

Listed Capacity Barrels (in thousands)	*1959*	*1967*	*1975*	*1983*	*1989*	*1998*	*2001*	*2006*
10–100	68	36	10	15	8	77	81	83
101–500	91	44	19	12	7	19	19	19
501–1,000	30	35	13	2	3	1	1	4
1,001–2,000	18	18	13	13	5	4	2	2
2,001–4,000	8	10	12	9	6	7	5	3
4,001+	2	4	15	23	20	20	20	22

Economies of scope

- Economies of scope are the cost savings that arise when a firm produces two or more outputs using the same set of resources.
- Example 1: Manufacturing process
  - Oil refineries produce gasoline and kerosene as part of the refining process
- Example 2: Knowledge gained from developing, producing, or marketing one product can be applied to another product
  - R&D investment for a specific software can benefit other categories of softwares

Economies of scope

- Example 3: Umbrella advertising
  - Advertising one Samsung product will lead to more demand for other Samsung products (even if they are not related).
  - New products are easier to introduce when there is an established brand with the desired image.
  - Virgin: 400+ companies, active in railways, airlines, soda, mobile, media etc.

Demand elasticity

- Price elasticity of demand:

$$PED = \frac{\%change\ in\ q\ demanded}{\%change\ in\ price}$$

$$PED = \frac{\Delta Q/Q}{\Delta P/P}$$

- Note that PED<0
- If $|PED| > 1$, the revenue decreases as P increases. [elastic demand]
- If $|PED| = 1$, the revenue remains unchanged as P increases.
- If $|PED| < 1$, the revenue increases as P increases. [inelastic demand]

Demand elasticity

- Marginal revenue:

$$MR = \frac{\Delta TR}{\Delta Q} = \frac{\Delta(PQ)}{\Delta Q} = P\frac{\Delta Q}{\Delta Q} + Q\frac{\Delta P}{\Delta Q} = P + Q\frac{\Delta P}{\Delta Q}$$
$$= P + P\left(\frac{\Delta P}{\Delta Q}\frac{Q}{P}\right) = P\left(1 + \frac{\Delta P}{\Delta Q}\frac{Q}{P}\right)$$
$$= P\left(1 + \frac{1}{PED}\right) = P\left(1 - \frac{1}{|PED|}\right)$$

- If $|PED| > 1$, MR>0. When the demand is elastic, MR>0
- If $|PED| < 1$, MR<0. When the demand is inelastic, MR<0

Demand elasticity

Table 2.2 Demand, revenue, price elasticity and profit maximization: numerical example

(1) Market price (£ per unit of output) P	(2) Quantity demanded (Units per week) Q	(3) Total revenue (£ per week) TR	(4) Average revenue (= Price, £ per unit of output) AR	(5) Marginal revenue (£ per unit of output) MR	(6) Price elasticity of demand |PED|	(7) Short-run marginal cost (£ per unit of output) SRMC	(8) Total cost (£ per week) TC	(9) Profit (£ per week) π
2.2	0	0					1.0	−1.0
2.0	1	2.0	2.0	2.0	21.00	0.5	1.5	0.5
1.8	2	3.6	1.8	1.6	6.33	0.2	1.7	1.9
1.6	3	4.8	1.6	1.2	3.40	0.5	2.2	2.6
1.4	4	5.6	1.4	0.8	2.14	0.8	3.0	2.6
1.2	5	6.0	1.2	0.4	1.44	1.1	4.1	1.9
1.0	6	6.0	1.0	0.0	1.00	1.4	5.5	0.5
0.8	7	5.6	0.8	−0.4	0.69	1.7	7.2	−1.6
0.6	8	4.8	0.6	−0.8	0.47	2.0	9.2	−4.4
0.4	9	3.6	0.4	−1.2	0.29	2.3	11.5	−7.9
0.2	10	2.0	0.2	−1.6	0.16	2.6	14.1	−12.1
0.0	11	0.0	0.0	−2.0	0.05	2.9	17.0	−17.0

Illustrative calculations at (P = 1.8, Q = 2), Columns 3 to 6:

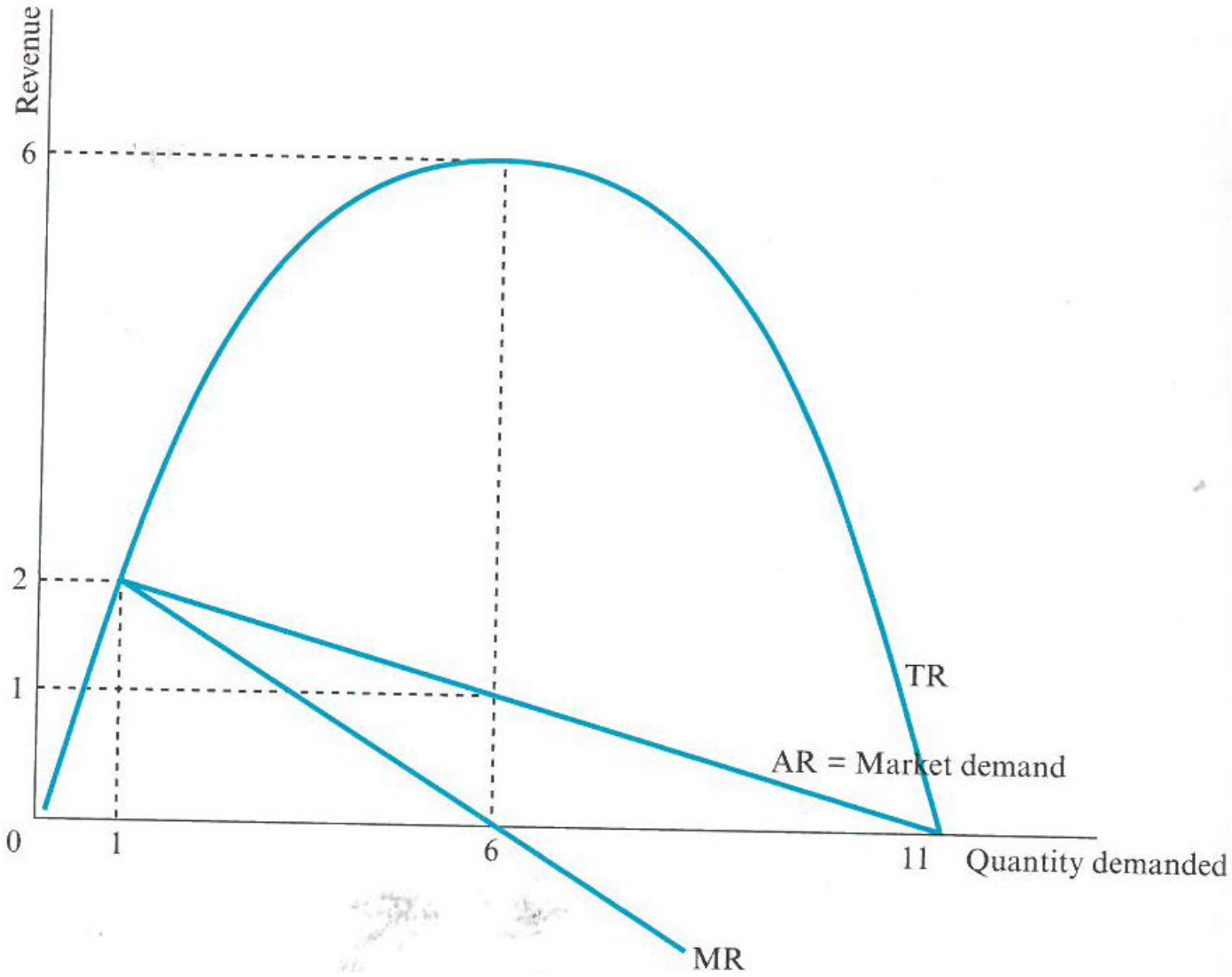
$\text{TR} = PQ = 1.8 \times 2 = 3.6$

$\text{AR} = \text{TR}/Q = 3.6/2 = 1.8$

$\text{MR} = \Delta\text{TR} = \text{TR}(Q = 2) - \text{TR}(Q = 1) = 3.6 - 2.0 = 1.6$

$$\text{PED} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = \frac{2-1}{1.8-2.0} \times \frac{1.9}{1.5} = -6.33 \quad \Rightarrow \quad |\text{PED}| = 6.33$$

Demand elasticity



Cross-price elasticity of demand

$$CES = \frac{\text{proportionate change in quantity supplied of good 1}}{\text{proportionate change in price of good 2}}$$

$$CES = \frac{\Delta Q_1}{\Delta P_2} \frac{P_2}{Q_1}$$

- CES>0. Goods 1 and 2 are substitute. As the price of Good 2 increases, consumers switch from Good 2 to Good 1.
- CES<0. Goods 1 and 2 are complement. As the price of Good 2 increases, demand for Good 1 decreases.
- CED=0. Goods 1 and 2 are independent.

Summary

- IO views industries as dynamic entities
- Practical relevance of IO (competition policy; high levels of concentration)
- Theoretical IO: Austrian school, Chicago school…
- SCP: empirical approach; conceptual limitations
- Review of production and costs concepts