

# **Economics of Regulation**

**Week 2 - Antitrust & IO Theory**

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# Antitrust

- Role of government in business
  - Most basic: property rights & contractual agreement
  - Protect competition by prevent harmful behavior
    - Merger
    - Keep dominance: Google search rank
    - Price coordination
- Competition, collusion, entry/exit => industrial organization
- This class:
  1. Competition vs. monopoly
  2. Review basic IO models
  3. Antitrust laws

# Competition & Welfare

Assumption of welfare theory

- Perfect information
- No increasing return to scale or technological change
- Consumers maximize utility given a budget constraint
- All agents are price takers
- No externalities

Welfare theorem: competitive equilibria (a list of prices and list of allocation of goods) exist and it's Pareto optimal

# Competition & Welfare

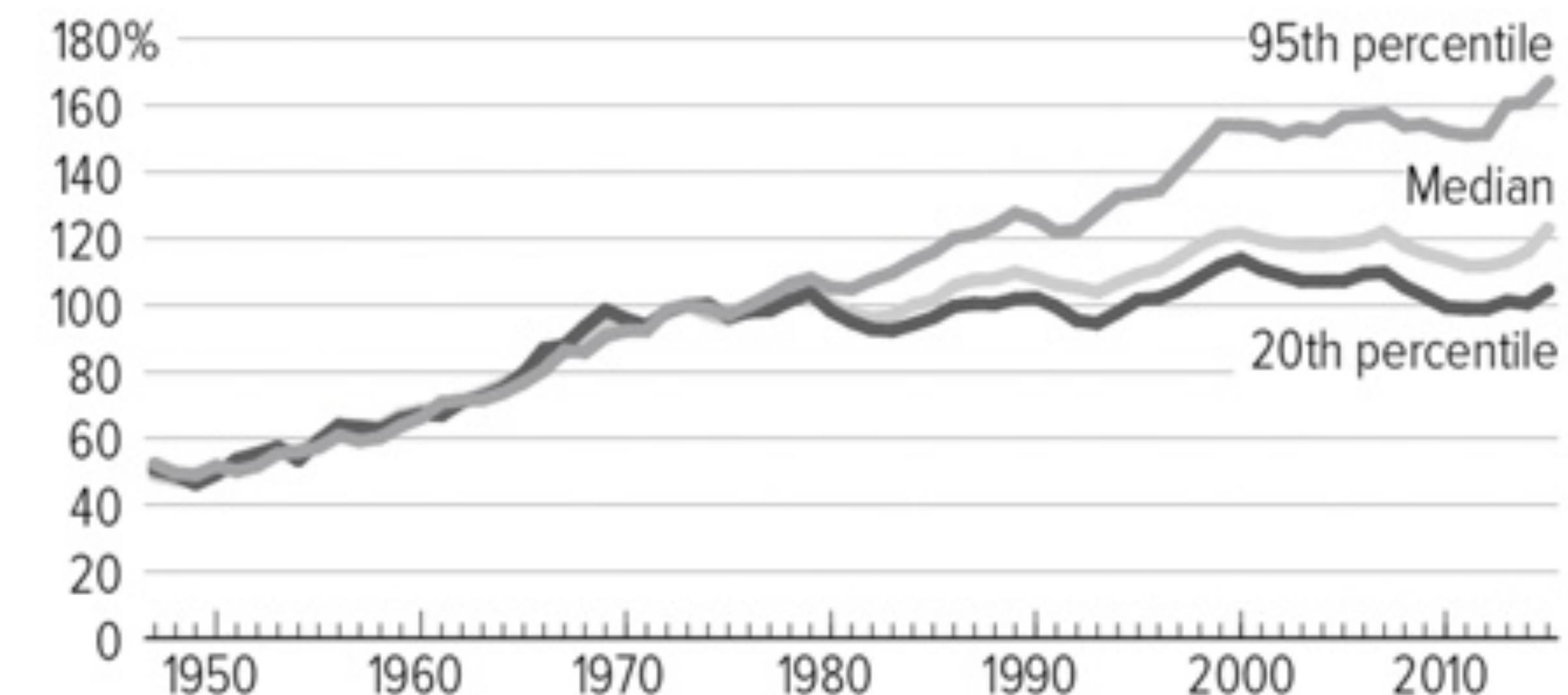
- Ideal world: no need for government regulation
- Main assumption to discuss: price-taking
- Welfare tools
  - Pareto optimality/efficiency: exist in small scale only (e.g., in-class market), but can never be achieved for regulation, which almost always makes someone worse off
  - Less stringent version: compensation principle, i.e., highest economic surplus
    - In theory, losers should be compensated by winners
    - Higher surplus from monopoly to competition: iPhone, vaccine

# Role of Economic Analysis

- Achieve a certain goal
- Economics: maximize social surplus
  - Size vs allocation of the pie
  - Surplus = total utilities (not just in dollar terms)
  - Utility of \$100 is different for the poor and the rich
- Note: maximizing social welfare in a goal held by most Economists but debatable at a philosophical level.  
e.g., kill Hitler before WWII.

## Income Gains Widely Shared in Early Postwar Decades — But Not Since Then

Real family income between 1947 and 2015, as a percentage of 1973 level



# Complications

- Dynamics: expenditure on R&D
  - Pharmaceutical industry in Canada
- Natural monopoly: cases where Monopoly is more efficient
  - Control price
  - Public company
- Oligopoly: markets can only support several big firms with low LRAC
- Product differentiation: different tastes
- X-Inefficiency: firms are not profit maximizers: e.g., P-A problem.
- Monopoly-induced waste: Lobbying, bribery (transfer not a waste)

# Innovation

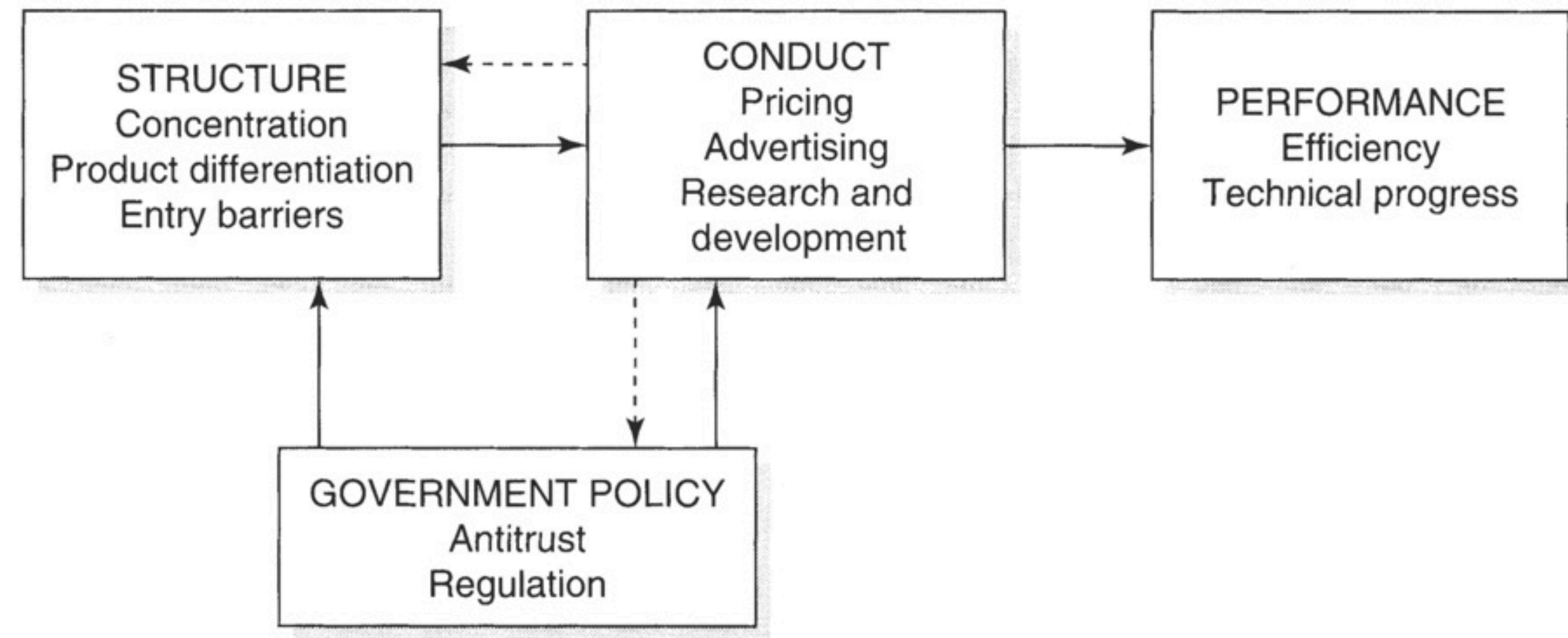
- A: Competing to become monopoly
- B: Monopoly without competitors
- Q: Who has more incentive to innovate (cost-reduction technology)?
  - Uber/Lyft
  - Vaccine
  - Via Rail/Amtrak
  - Intel vs. ARM
  - YouTube vs. TikTok
  - iPhone vs. BlackBerry/Nokia
  - iPhone vs. itself
  - Cisco/Google Talk/Skype vs. Zoom

# Appropriability & Ability

- Appropriability: ability to capture profit from innovation: e.g. patent
  - Vaccine: Push for COVID-19 vaccine patent waiver
- Ability to innovate
  - Large firms have more financial resources
  - Large organization problems: Zoom, Intel

# Industrial Organization

- Reality between perfect competition & monopoly: imperfect competition



**Figure 3.8**

The Structure-Conduct-Performance Paradigm of Industrial Organization

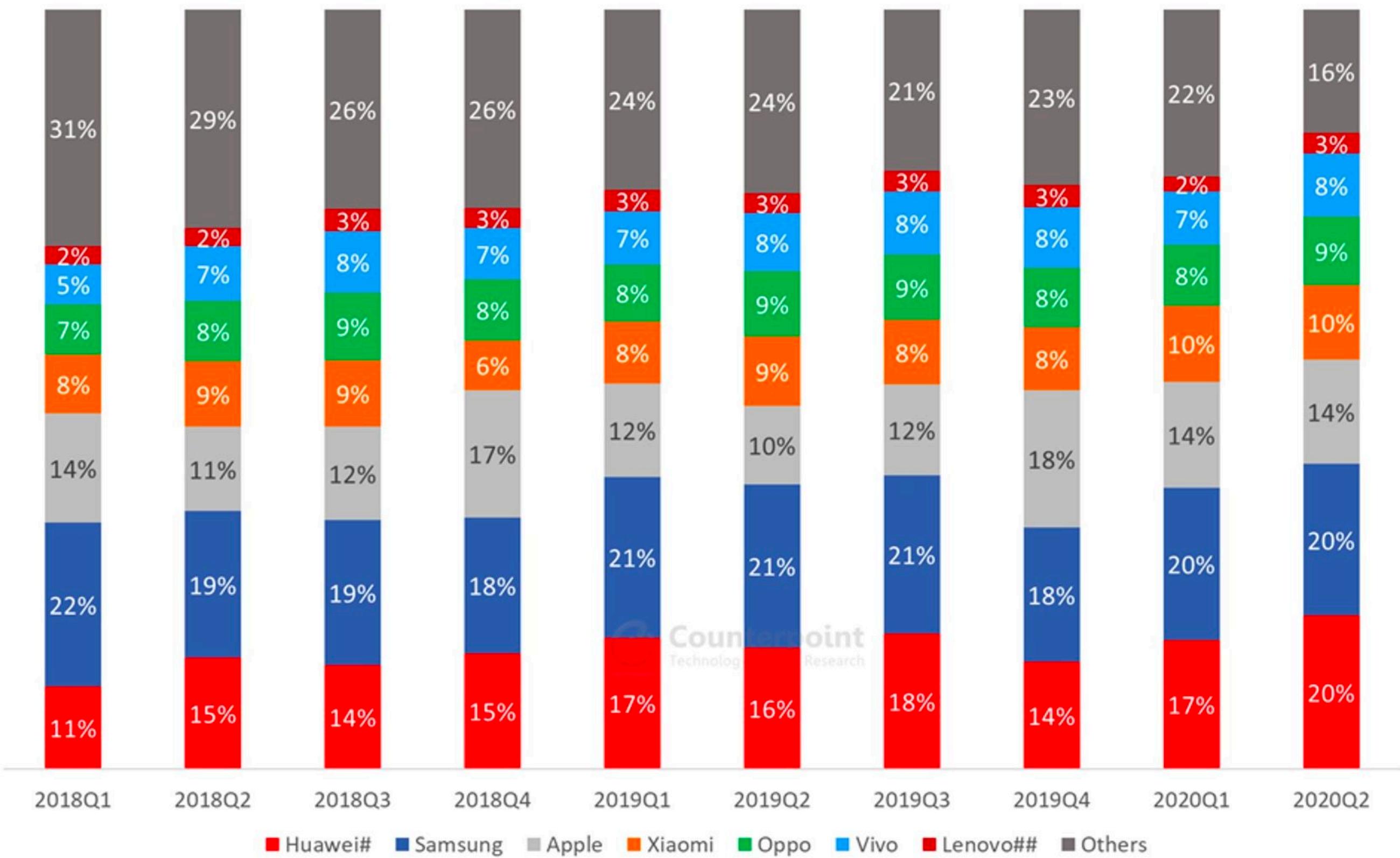
# Market Definition

- Epic Games (Fortnite) vs. Apple (last week): Apps can only be installed thru App Store, who charges 30% for both app downloads and in-app purchases; Developers cannot notify users for purchases at lower prices on its own website
- Decision
  - Apple has violated competition law: anti-steering provisions
  - Market defintion
    - Epic: App distribution market on iPhone
    - Apple: Gaming industry
    - Judge: mobile gaming industry, Apple is not a monopoly

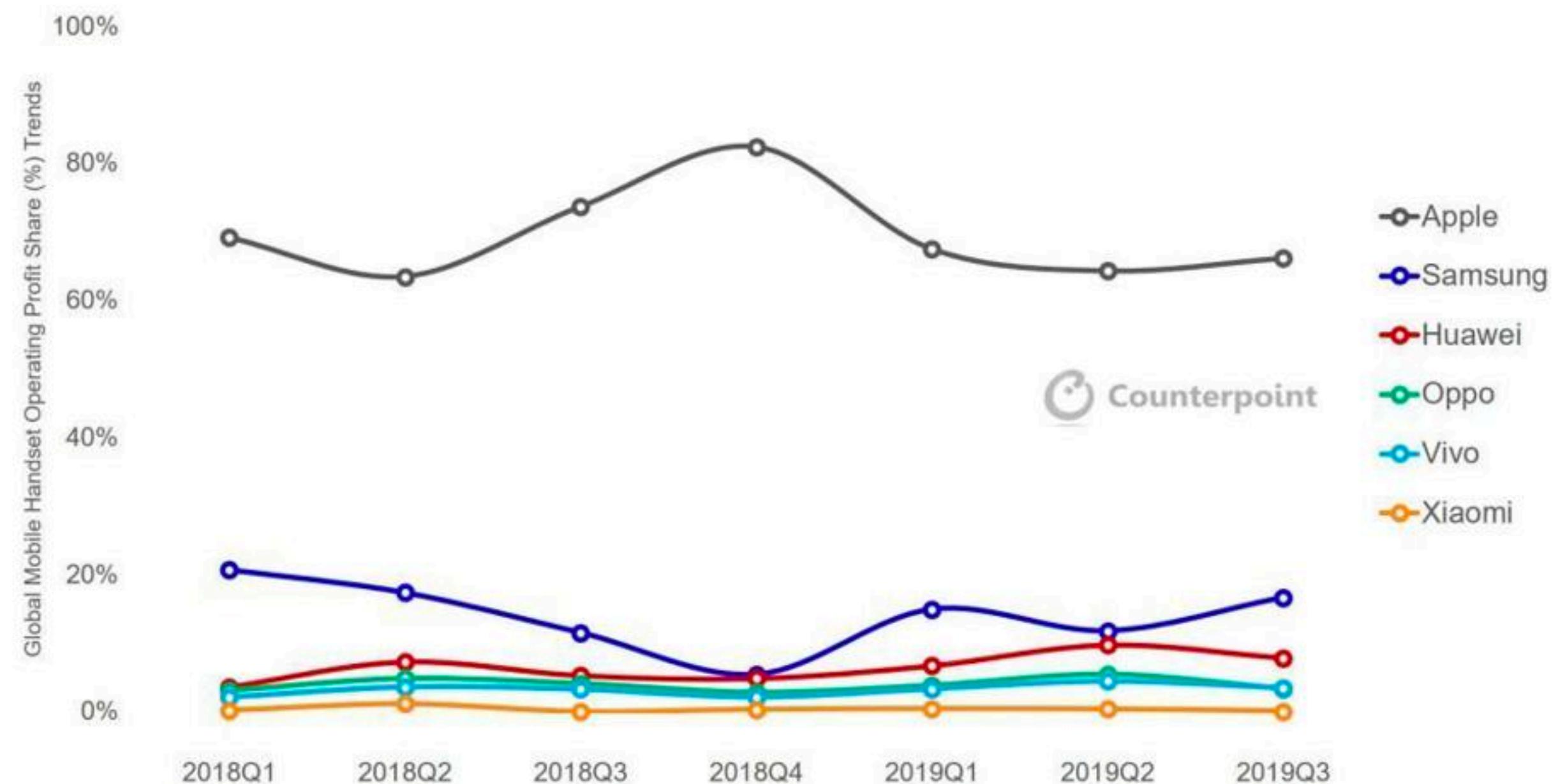
# Market Definition

- Substitutability principle: strong long-term substitutability: if buyers can shift in a large scale from product A to B in the long term
  - Transportation: YYZ-YUL: Is Air Canada a monopoly?
- Market power: ability to charge price higher than MC
  - App Store 30%?
  - Is Apple a monopoly in the smartphone industry?

Global Smartphone Market Share (2018 Q1 - 2020 Q2)



Global Mobile Handset Operating Profit Share Trends

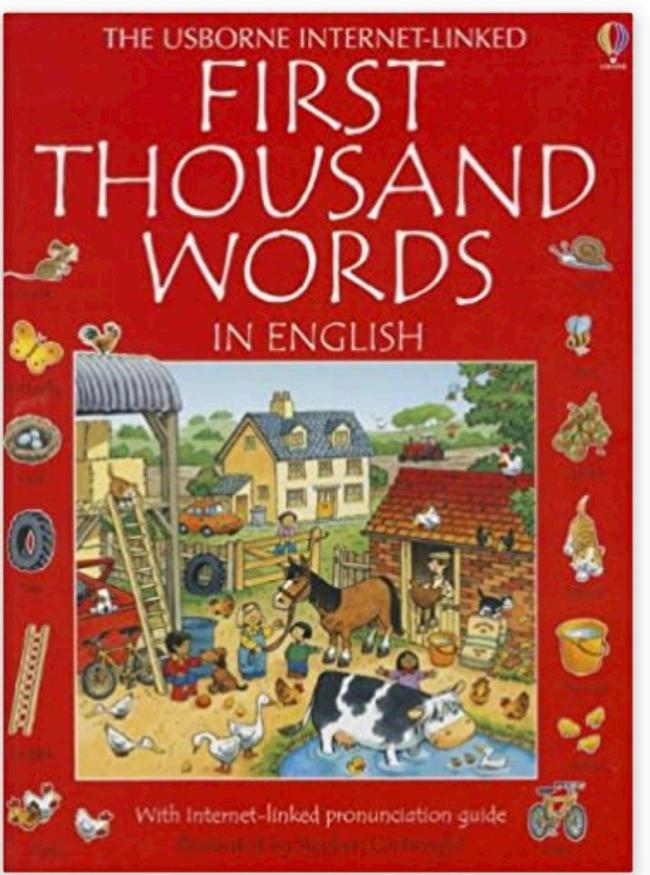


# Market Structure

- Concentration: need to account for number of firms & market share
  - Herfindahl–Hirschman Index (HHI):  $H = \sum_{i=1}^N s_i^2$
  - It's one indicator but it doesn't always mean market is less or more competitive
- Entry Conditions: how easy for new firms to enter?
  - High entry barrier: incumbent firms can earn large profit without attracting new entrants. e.g., airplane vs. popsicle stand
  - Network effects/externalities
  - Data

# Market Structure

- Product differentiation
  - Unique products can charge higher prices than competitors



## First Thousand Words in English (Usborne Internet-Linked First Thousand Words)

Hardcover – June 1, 2013

by Heather Amery ▾ (Author), Mike Olley (Editor), & 1 more

★★★★★ ▾ 1,025 ratings

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**Hardcover**  
\$12.50

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This classic Usborne book has now been revised to include many brand new illustrations and it continues to stimulate and delight today's generation of children as it did when it was first published over 20 years ago. It provides a treasury of learning



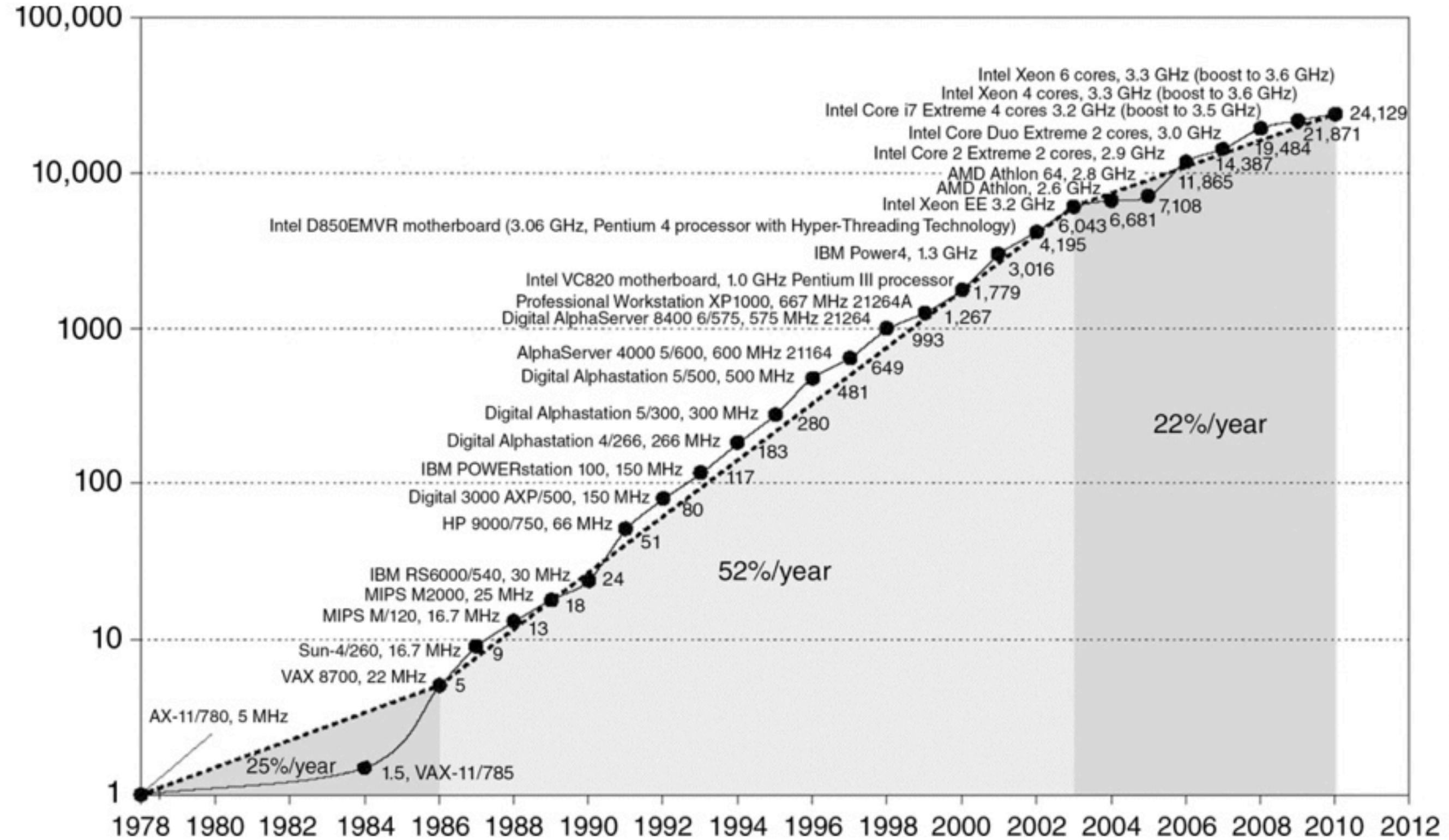
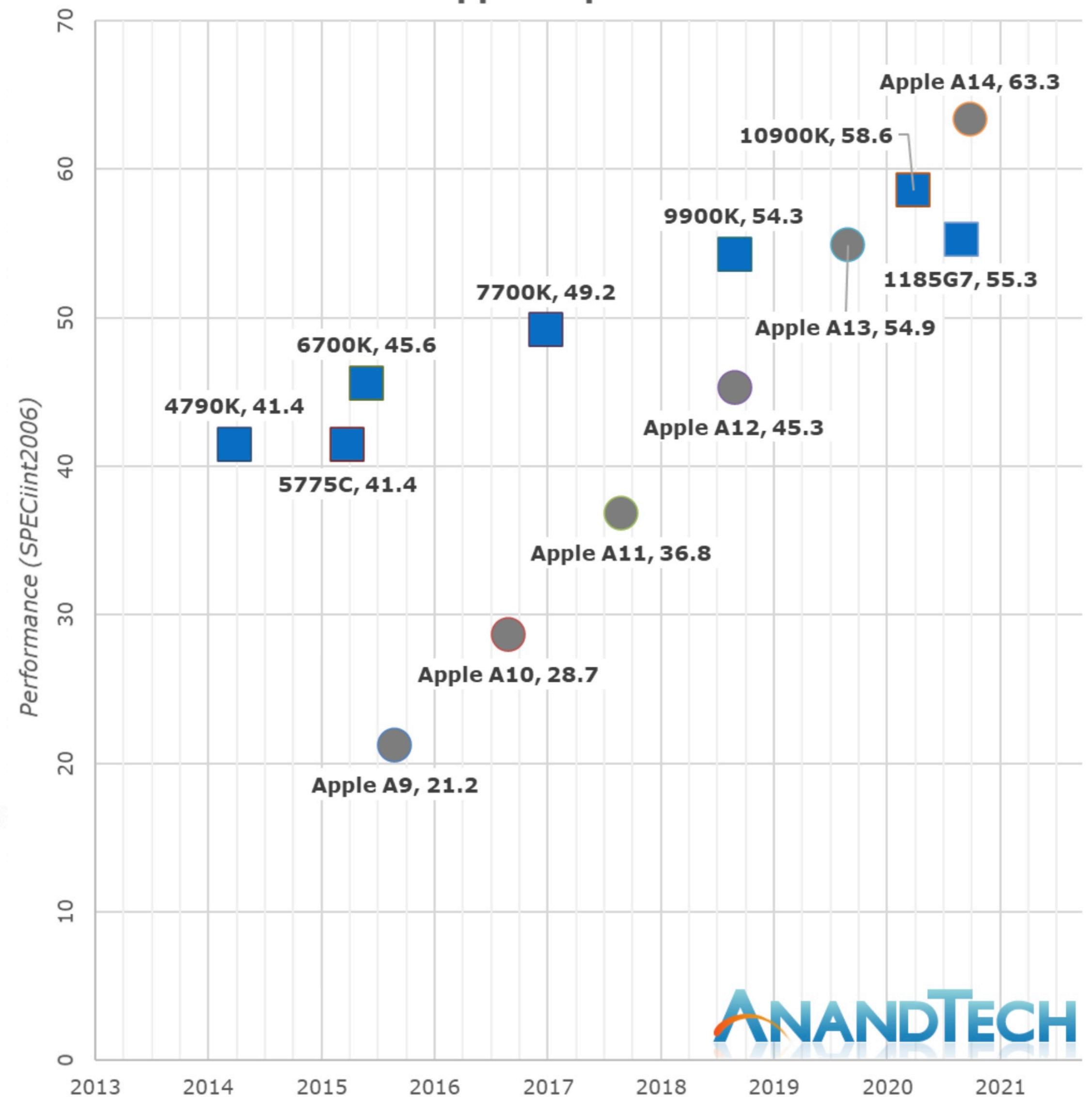
# Conduct

- Decision: price, quantity, R&D, capacity
- Two extremes:
  - Perfect competition: Uber/Lyft in the early days
  - Collusion: coordination among firms
    - Explicit collusion: communication => illegal
    - Tacit collusion: no explicit communication => not illegal

# Performance

- Efficiency: total surplus. e.g., monopoly, variety, wage, service.
- Technological progress
  - Fundamental driver of economic growth

## Intel vs Apple Top Performance



# Government Role

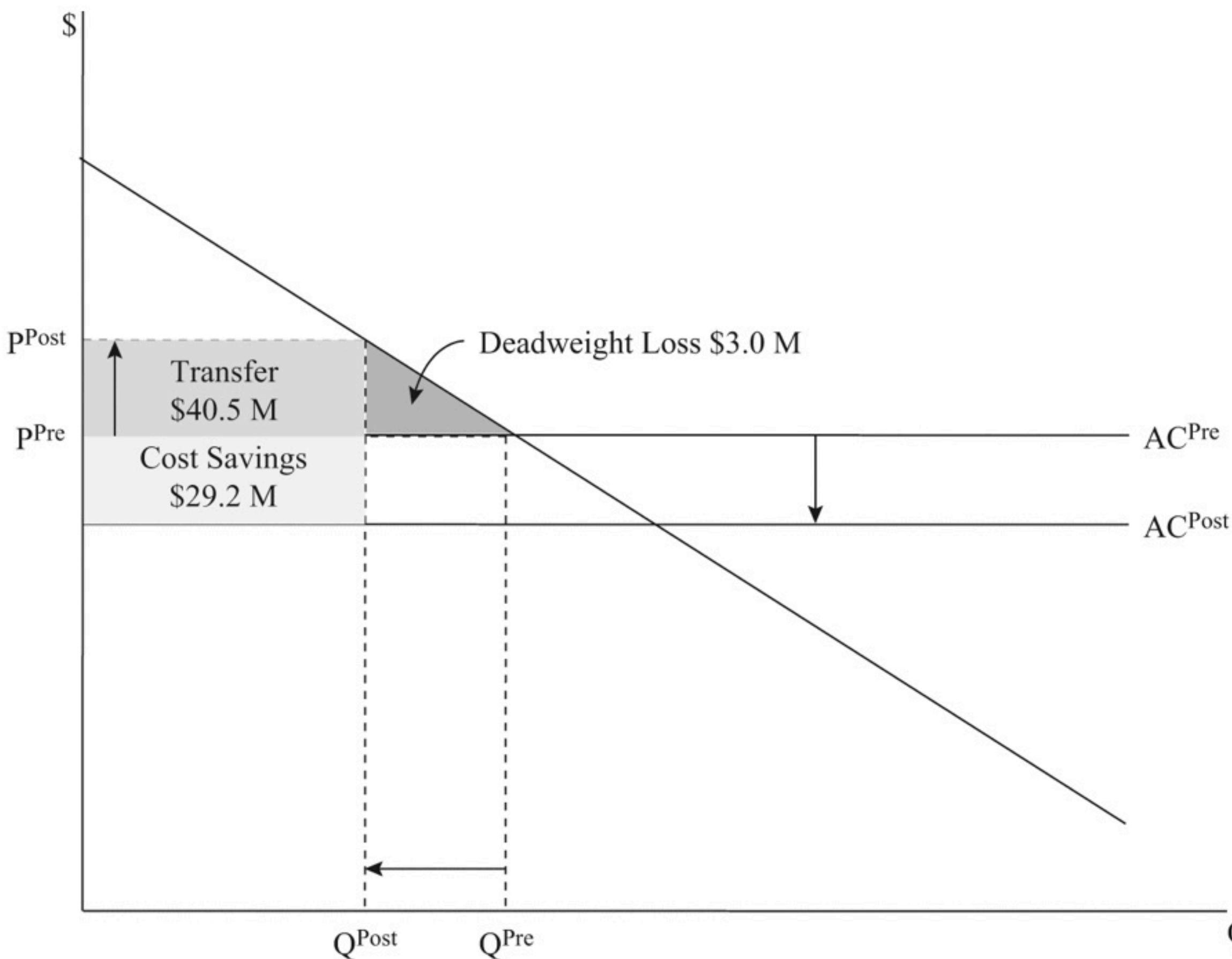
- Antitrust: structure: e.g., prevent consolidation
- Regulation: conduct

# Antitrust Laws

- Ronald Coase's satire
  - Higher price => monopoly/collusion
  - Lower price => predatory pricing
  - Stable price => tacit collusion, price parallelism
- Purpose of antitrust/competition law: maintain a competitive marketplace by prohibiting certain practices that allow firms to create, enhance, or extend market power

# Antitrust Laws

- Protect competition vs. competitors
  - 1950s: laws to protect small businesses: Wal-Mart is bad with low price
  - 1970s: focus on consumer: low price, high quality and innovations are good
  - US: focus more on consumer surplus
  - Canada: more on total welfare



**Figure 3.11**  
Welfare Effects of the Merger of Standard Propane and ICG Propane

# Summary

- Antitrust/competition law: protect competition and forbid certain activities
- IO Theory: framework/structure to help understand how market and competition works, and how one factor can affect the outcome (who benefits and who suffers by how much).
  - Chapter 4/5: IO models: how conduct affects performance, and how collusions are formed and maintained
- Empirical IO: Estimate IO models and assign a value to it, because many are ambiguous at a theoretical level
- Chapter 6/7: horizontal and vertical mergers
- Chapter 8: monopolization and price discrimination
- Chapter 9: new economy: data, platform, network effects

# Chapter 4: Oligopoly, Collusion & Antitrust

- Cournot competition
  - Demand:  $P = 100 - Q$
  - Cost: constant marginal cost = 40
  - 2 firm choose quantity
  - What is the Nash equilibrium?
  - What are the profits under competition vs. collusion?
  - What about repeated games?

# Challenges to Collusion

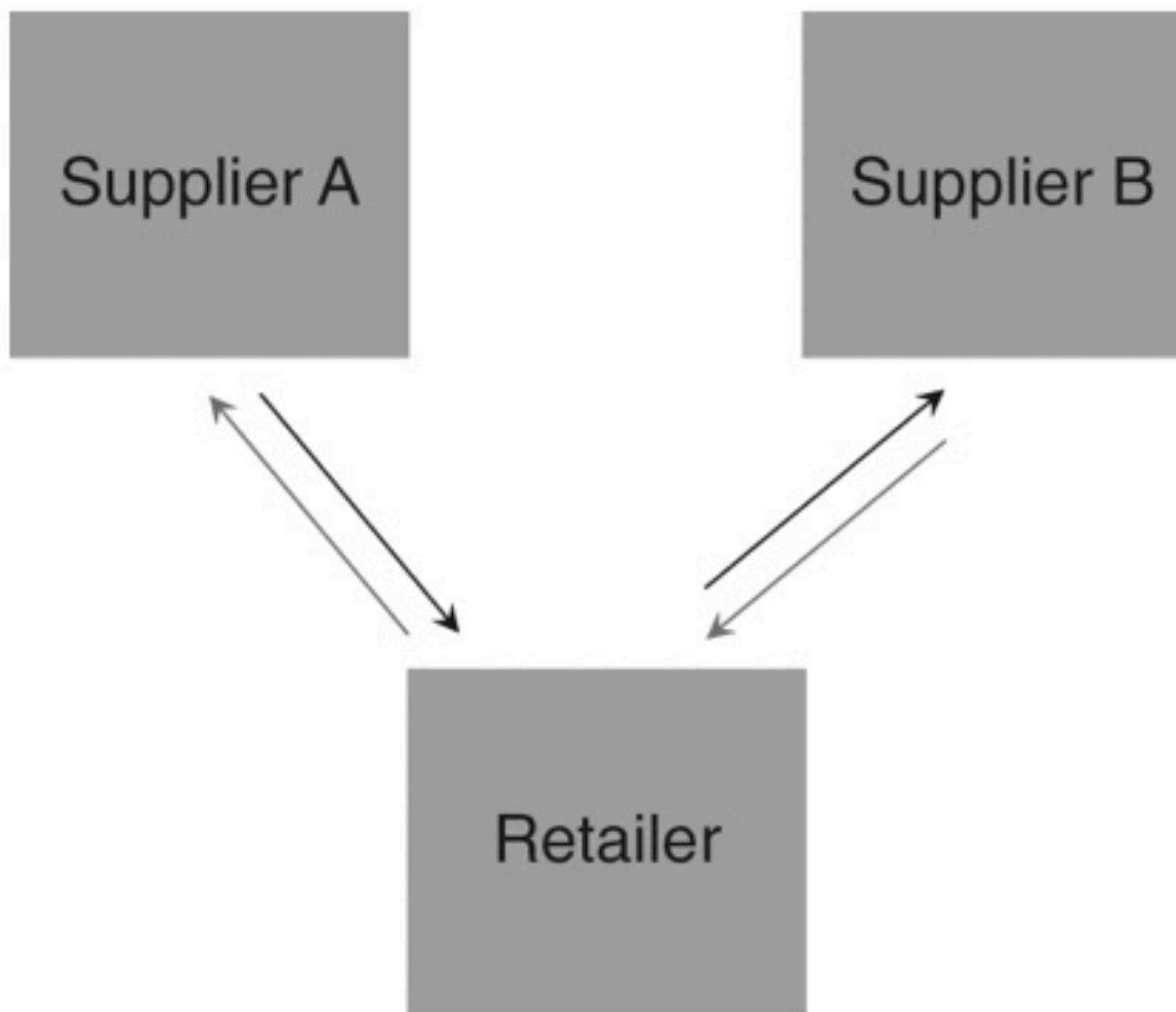
- Coordination
  - Communication method: e.g. Apple regularly met with publishers in private dining rooms
  - How to agree on price and quantity level?
- Compliance
  - How to sustain collusion?
  - How to monitor deviations?
  - Competition in other dimensions?

# Coordination

- Public announcement: capacity discipline
- Advance price announcement: airline publish future fares
- Hub & Spoke: ToysRUs
- AI

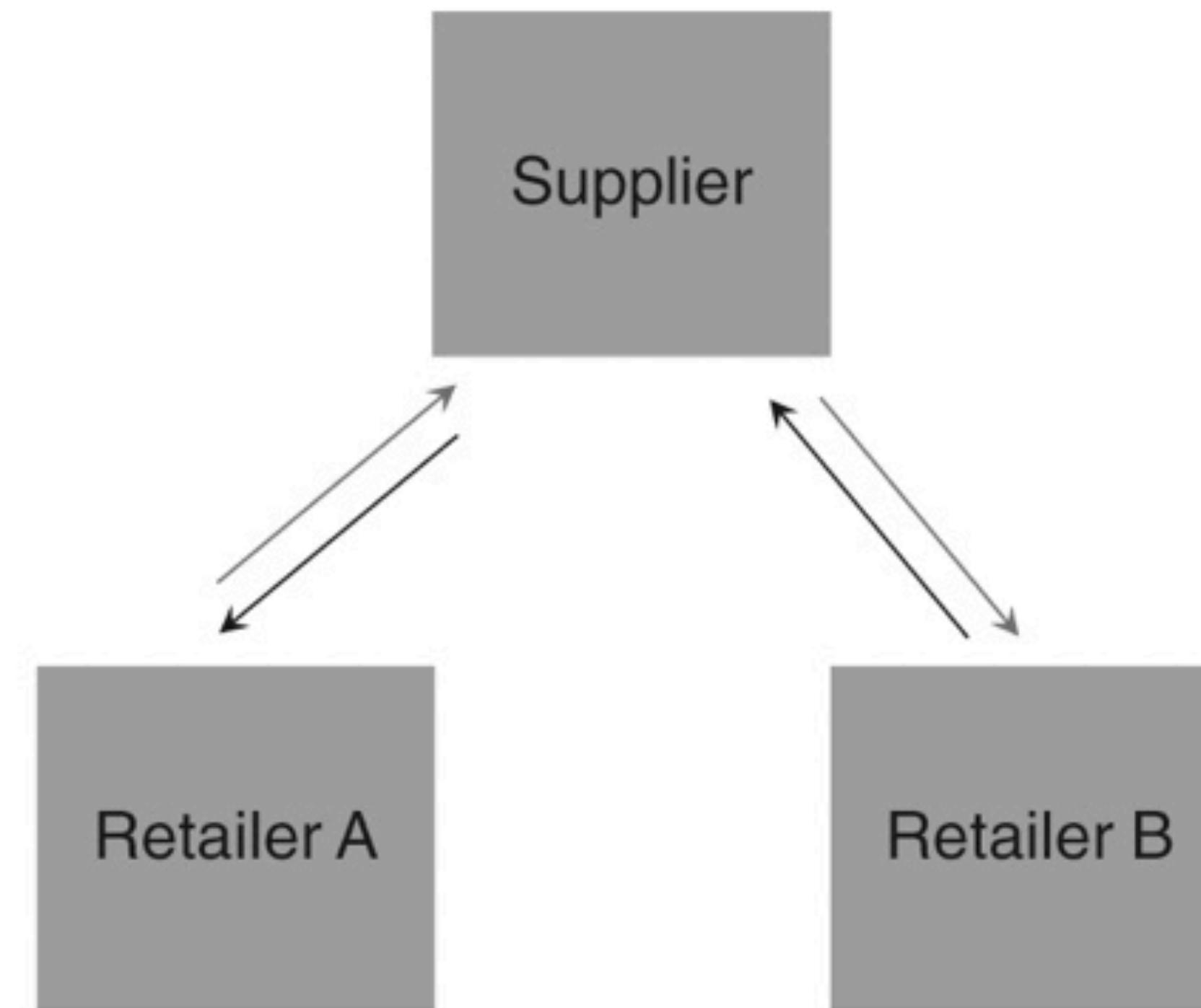
# Coordination

Supplier to Retailer to Supplier



Toys “R” Us (FTC, 1998)

Retailer to Supplier to Retailer



Hasbro (OFT, 2004)

# Parallelism Plus

- Not enough to show firms having similar behavior
- A “plus” factor is needed to convict collusion: something that shows inconsistency with firms acting independently
- Traditionally, the plus factor involves communication (emails, calls), but that might change with AI.

No change fees



**7:30 a.m. – 9:05 a.m.**  
LGA LaGuardia - ORD O'Hare Intl

direct

**2h 35m**

1 0

**C\$ 87**

Main Cabin  
American Airlines

[View Deal](#)

American Airlines

No change fees



**7:30 a.m. – 9:05 a.m.**  
LGA LaGuardia - ORD O'Hare Intl

direct

**2h 35m**

1 0

**C\$ 87**

Blue Basic  
JetBlue

[View Deal](#)

Operated by American Airlines  
JetBlue

No change fees



**2:50 p.m. – 4:27 p.m.**  
LGA LaGuardia - ORD O'Hare Intl

direct

**2h 37m**

1 0

**C\$ 87**

Basic Economy  
Delta

[View Deal](#)

Delta

No change fees



**6:25 a.m. – 8:02 a.m.**  
LGA LaGuardia - ORD O'Hare Intl

direct

**2h 37m**

1 0

**C\$ 87**

Economy  
United Airlines

[View Deal](#)



United Airlines

Economy Plus C\$ 149

# Coordination - AI

- Recent increase in the adoption of “artificial intelligence” algorithmic pricing (AP)
  - Autonomously learn how to reach objectives in unknown environments without human intervention
- Concern in policy circles: adoption can lead to **higher prices/collusion**
  - **EU Inception Impact Assessment** (Q4 2020): *“increased risk for tacit collusion [in] markets featuring [...] algorithm-based technological solutions”*
  - **Furman Report** (2019): *“Should further evidence emerge of pricing algorithms tacitly co-ordinating of their own accord, a change in the legal approach may become necessary.”*
  - **China’s State Administration for Market Regulation - Platform Antimonopoly Guidelines** (2021): *“Competing platforms may reach fixed prices in the following ways: [...] 3. Use data, algorithms, platform rules, etc. to achieve coordinated behavior.”*

# Coordination - AI

## AP and Competition

- Extensive **theoretical** debate on the effects of AP on competition
  - Possible mechanisms for algorithmic collusion:
    - Algorithms can autonomously learn trigger strategies (Calvano et al 2020, Klein 2019)
    - Sped up interactions can facilitate collusion via faster detection and punishment of deviations (Abreu et al 1991)
    - Multiple firms adopting same algorithm can result in hub and spoke arrangements (Harrington 2020)
  - As a “prediction tool” or commitment device AI does not necessarily facilitate collusion (Miklos-Thal and Tucker 2019, Brown and MacKay 2021)
- Algorithmic pricing can reduce competition in theory, but how real is this risk?
- This is the first paper to **empirically** tackle this question

# Coordination - AI

## Pricing Algorithms

- Retail gasoline is a leader in algorithmic pricing software adoption
- **Marketing pitch:** neural networks / deep learning, dynamics, customization, help avoid price wars (!)
- More concretely:
  - Algorithm has some “model” of consumer behaviour and an “objective function” for the station
  - Use observational data to fit model (i.e., historical weather, prices, volume, etc)
    - Inputs include competitors’ prices
    - Set prices to maximize “objective function”
    - Then take new inputs and re-fit model
- Still many unknowns: memory, learning method, etc.
- Regardless, common features - faster changes, responsiveness to competitors and some dynamics

# Coordination - AI

1. We find a large number of structural breaks around the date AP supposedly became widely available (summer 2017)
2. IV estimates show adoption increases margins by 9% and prices by 0.6 cents/litre (cpl)
3. We find evidence suggesting that AP adoption softens competition:
  - Adoption has limited effects on margins of monopoly stations
  - In duopoly markets, adoption has no effect if only one duopolist adopts
  - 40% higher margins after **both** duopolists adopt
4. Mechanism/Timing:
  - Algorithms are better at conditioning on competitors' prices: price decreases more likely to be matched quickly
  - Effects kick in a year after adoption – Algorithms take time to learn new strategies