

ECN 594: Mergers and Merger Policy

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Plan

1. Horizontal mergers: effects on prices
2. Merger simulation (connects Part 1 to Part 2!)
3. Worked example: simple merger simulation
4. Antitrust and merger review
5. Market definition and HHI
6. Efficiency defense

HW2 released

- **HW2:** Merger simulation exercise
- You will be given a demand system (estimated in Part 1 style)
- Your task: simulate price effects of a merger
- This lecture explains the methodology

Horizontal mergers

- **Horizontal merger:** Competitors combine
- **Key concern:** Market power
 - Fewer firms → less competition
 - Higher prices for consumers
- **But also:** Potential efficiencies
 - Economies of scale
 - Elimination of duplicated costs
- Trade-off: market power vs efficiency

Why do prices increase after a merger?

- **Before merger:** Firm A and Firm B compete
 - If A raises price, loses customers to B
 - This constrains A's pricing
- **After merger:** Single firm owns both A and B
 - If A raises price, some customers go to B
 - But merged firm also owns B!
 - Lost customers are “recaptured”
- Merger **internalizes substitution** between products

Diversion ratio

- **Definition:** If product A loses a customer, what fraction goes to B?

$$D_{AB} = \frac{\partial q_B / \partial p_A}{-\partial q_A / \partial p_A} = \frac{\text{gain by B}}{\text{loss by A}}$$

- **High diversion:** A and B are close substitutes
- **Low diversion:** A and B are distant substitutes
- **Key insight:** Higher diversion → larger price increase from merger
- Diversion is the key input to merger analysis

Diversion with logit demand

- Under logit, diversion is simple:

$$D_{jk} = \frac{s_k}{1 - s_j}$$

- **Proportional diversion:** Lost sales go to others proportionally
- This is the IIA property at work!
- **Implication:** Mergers between large firms are worse
 - Large s_k means high diversion
 - More recapture → bigger price increase

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Merger simulation: the idea

- **Goal:** Predict post-merger prices
- **Ingredients:**
 1. Demand estimates (from Part 1!)
 2. Pre-merger prices and market structure
 3. The merger (which firms combine)
- **Method:**
 1. Write down firms' pricing FOCs
 2. Change ownership structure
 3. Solve for new equilibrium prices

The ownership matrix

- Define ownership matrix \mathbf{H} where:

$$H_{jk} = \begin{cases} 1 & \text{if products } j \text{ and } k \text{ have same owner} \\ 0 & \text{otherwise} \end{cases}$$

- **Pre-merger** (products 1, 2 owned separately):

$$\mathbf{H}^{pre} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

- **Post-merger** (same owner):

$$\mathbf{H}^{post} = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$$

Pricing FOC with ownership

- Owner of products in set \mathcal{F} maximizes:

$$\sum_{j \in \mathcal{F}} (p_j - mc_j) q_j(p)$$

- FOC for product j :

$$q_j + \sum_{k \in \mathcal{F}} (p_k - mc_k) \frac{\partial q_k}{\partial p_j} = 0$$

- Using ownership matrix, in vector form:

$$\mathbf{q} + (\mathbf{H} \odot \boldsymbol{\Omega}^T)(\mathbf{p} - \mathbf{mc}) = 0$$

- where $\Omega_{jk} = \frac{\partial q_j}{\partial p_k}$ (demand derivatives)

How the merger changes things

- **Pre-merger:** Each firm only cares about own products
 - $H_{jk} = 0$ for $j \neq k$ (different owners)
 - Cross-price effects ignored
- **Post-merger:** Merged firm cares about both products
 - $H_{jk} = 1$ for merged products
 - Cross-price effects internalized
- When H_{jk} changes from 0 to 1:
 - Firm now “counts” sales diverted to product k
 - Less incentive to keep price low

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Worked example: Simple merger simulation

- Two firms, each with one product
- Demand: $q_j = 100 - 3p_j + p_k$ (products are substitutes)
- $MC = 10$ for both products
- **Questions:**
 - (a) Find pre-merger equilibrium prices
 - (b) Find post-merger equilibrium prices
 - (c) Calculate price increase from merger

Take 7 minutes.

Worked example: Pre-merger (solution)

Solution

- **Pre-merger:** Each firm maximizes own profit

- Firm 1: $\max_{p_1} (p_1 - 10)(100 - 3p_1 + p_2)$

- FOC: $100 - 6p_1 + p_2 + 30 = 0$

- Symmetric: $p_1 = p_2 = p$, so:

$$100 - 6p + p + 30 = 0 \Rightarrow p = 26$$

- Pre-merger: $p_1^{pre} = p_2^{pre} = 26$

- Quantity: $q = 100 - 3(26) + 26 = 48$

Worked example: Post-merger (solution)

Solution

- **Post-merger:** Merged firm maximizes joint profit

- $\max_{p_1, p_2} (p_1 - 10)q_1 + (p_2 - 10)q_2$

- FOC for p_1 :

$$q_1 + (p_1 - 10)(-3) + (p_2 - 10)(1) = 0$$

- Note: now includes $\frac{\partial q_2}{\partial p_1} = 1$ term!

- Symmetric: $p_1 = p_2 = p$:

$$100 - 3p + p - 3(p - 10) + (p - 10) = 0$$

$$100 - 3p + p - 3p + 30 + p - 10 = 0$$

$$120 - 4p = 0 \Rightarrow p = 30$$

Worked example: Results

- **Pre-merger price:** $p = 26$
- **Post-merger price:** $p = 30$
- **Price increase:** $\frac{30-26}{26} = 15.4\%$
- **Why?**
 - Before: raising p_1 loses customers to product 2
 - After: those “lost” customers still buy from merged firm
 - Less competitive pressure → higher prices
- This is on HW2 (with more products)!

Upward Pricing Pressure (UPP)

- **UPP:** Quick measure of merger's pricing incentive

$$UPP_1 = D_{12} \times (p_2 - mc_2)$$

- **Interpretation:** Value of sales recaptured from product 2
- If $UPP_1 > 0$: merger creates upward pricing pressure
- **Advantage:** Quick to compute, no full simulation needed
- **Limitation:** First-order approximation only
- Used by DOJ/FTC as a screening tool

Practice: UPP calculation

- **Question:** Products A and B with:
 - $p_A = 100$, $mc_A = 60$, $s_A = 0.2$
 - $p_B = 80$, $mc_B = 50$, $s_B = 0.3$
 - Using logit diversion, calculate UPP_A and UPP_B .

Take 3 minutes.

Practice: UPP calculation (solution)

Solution

- **Diversion ratios (logit):**

$$D_{AB} = \frac{s_B}{1 - s_A} = \frac{0.3}{0.8} = 0.375$$

$$D_{BA} = \frac{s_A}{1 - s_B} = \frac{0.2}{0.7} = 0.286$$

- **UPP calculations:**

$$UPP_A = D_{AB} \times (p_B - mc_B) = 0.375 \times 30 = 11.25$$

$$UPP_B = D_{BA} \times (p_A - mc_A) = 0.286 \times 40 = 11.44$$

- Both positive: merger creates incentive to raise both prices
- Express as % of price: $UPP_A / p_A = 11.25\%$

Welfare effects of mergers

- **Consumer surplus:** Falls due to higher prices
- **Producer surplus:** Rises (merged firm profits increase)
- **Deadweight loss:** From reduced quantity
- Using logit demand:

$$\Delta CS = \frac{1}{|\alpha|} \left[\ln \left(\sum_j e^{\delta_j^{post}} \right) - \ln \left(\sum_j e^{\delta_j^{pre}} \right) \right]$$

- Key: $\delta_j = x_j \beta + \alpha p_j + \xi_j$
- Higher prices \rightarrow lower δ_j \rightarrow lower CS

Practice: T/F on mergers

- **True, False, or NEI:**
- (a) A merger between firms with high diversion ratio will have a larger price effect.
- (b) Under logit demand, diversion is proportional to market shares.
- (c) The Williamson trade-off always favors blocking mergers.

Take 2 minutes.

Practice: T/F on mergers (solution)

Answers

- **(a) TRUE.** High diversion means customers switch between merging firms. More recapture = more incentive to raise prices.
- **(b) TRUE.** Under logit, $D_{jk} = s_k / (1 - s_j)$. This is the IIA property: lost sales go proportionally to others.
- **(c) FALSE.** Williamson trade-off says efficiencies can outweigh market power. Some mergers are welfare-improving.

Merger simulation in practice

- **Step 1:** Estimate demand (logit, nested logit, etc.)
 - Get elasticities and demand derivatives
- **Step 2:** Recover marginal costs
 - Use pre-merger FOC: $mc_j = p_j - \frac{q_j}{\partial q_j / \partial p_j}$
- **Step 3:** Change ownership matrix
- **Step 4:** Solve for new equilibrium prices
 - Often requires numerical solution
- **Step 5:** Calculate welfare effects

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Antitrust and merger review

- In the US:

- Department of Justice (DOJ) Antitrust Division
- Federal Trade Commission (FTC)
- Large mergers must be reported (Hart-Scott-Rodino Act)
- Agencies review and can challenge mergers
- **Horizontal Merger Guidelines:** Framework for analysis
- Similar agencies in EU, UK, and other jurisdictions

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Market definition

- First step: define the relevant market
- **SSNIP test:** Small but Significant Non-transitory Increase in Price
 - Would a hypothetical monopolist raise price 5%?
 - If yes: products are in same market
 - If no (too much substitution): market is too narrow
- Market definition is often contentious
- Broader market → lower market shares → merger more likely approved

HHI: Herfindahl-Hirschman Index

- **Definition:**

$$HHI = \sum_{i=1}^N s_i^2 \times 10000$$

- where s_i is firm i 's market share (as decimal)
- Ranges from 0 to 10,000

- **Interpretation:**

- $HHI < 1500$: Unconcentrated
- $1500 \leq HHI < 2500$: Moderately concentrated
- $HHI \geq 2500$: Highly concentrated

HHI and merger guidelines

- Agencies look at ΔHHI from merger
- **Merger thresholds (approx):**
 - $\Delta HHI < 100$: Unlikely to raise concerns
 - Post-merger $HHI < 1500$: Unlikely to raise concerns
 - Post-merger $HHI > 2500$ AND $\Delta HHI > 200$: Likely scrutiny
- HHI is a screen, not definitive
- Real analysis uses merger simulation, efficiencies, etc.

Worked example: HHI calculation

- **Question:** Market has 4 firms with shares: 40%, 30%, 20%, 10%.
- Firm 1 (40%) merges with Firm 4 (10%).
- (a) Calculate pre-merger HHI
- (b) Calculate post-merger HHI and ΔHHI

Take 3 minutes.

Worked example: HHI (solution)

Solution

- (a) Pre-merger:

$$HHI = (0.40)^2 + (0.30)^2 + (0.20)^2 + (0.10)^2 = 0.30$$

- $HHI = 3000$ (highly concentrated)

- (b) Post-merger:

$$HHI = (0.50)^2 + (0.30)^2 + (0.20)^2 = 0.38$$

- $HHI = 3800$, $\Delta HHI = 800$

- **Shortcut:** $\Delta HHI = 2 \times s_1 \times s_4 \times 10000 = 2 \times 0.4 \times 0.1 \times 10000 = 800$

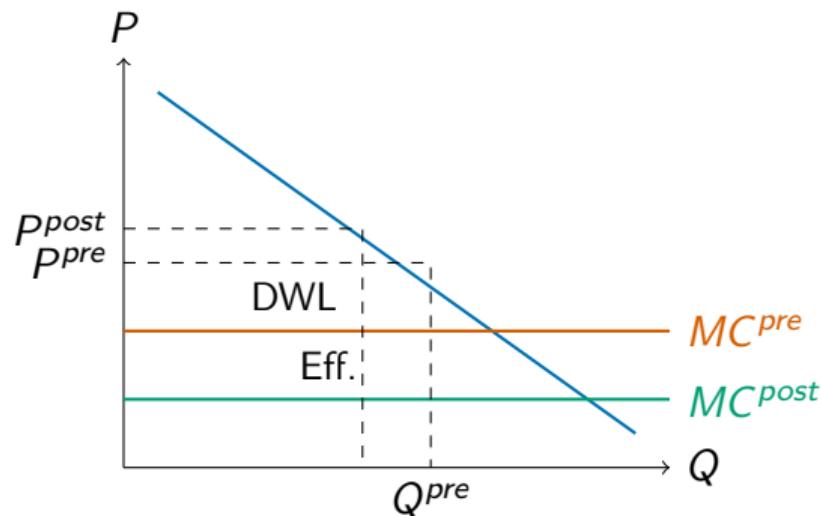
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Efficiency defense

- Mergers can create efficiencies:
 - Economies of scale
 - Elimination of duplicated fixed costs
 - Better management
- **Williamson trade-off:**
 - Market power effect: prices rise, deadweight loss
 - Efficiency effect: costs fall, resource savings
- Merger approved if efficiency gains outweigh market power harms
- In practice: high bar for efficiency claims

Williamson trade-off: graphical



- DWL (lost surplus) vs Efficiency gain (cost savings)
- Merger is welfare-improving if Efficiency > DWL

Practice: Merger policy

- **Question:** Market has shares: 35%, 25%, 20%, 15%, 5%.
- The 35% and 25% firms propose to merge.
- (a) Calculate pre-merger and post-merger HHI.
- (b) Would this merger likely face scrutiny under the Guidelines?

Take 3 minutes.

Practice: Merger policy (solution)

Solution

- (a) Pre-merger:

$$HHI = 35^2 + 25^2 + 20^2 + 15^2 + 5^2 = 2500$$

- Post-merger:

$$HHI = 60^2 + 20^2 + 15^2 + 5^2 = 4250$$

- $\Delta HHI = 1750$ (or: $2 \times 35 \times 25 = 1750$)
- (b) Yes. Post-merger $HHI > 2500$ (highly concentrated) and $\Delta HHI > 200$. Merger would likely face significant scrutiny.

Remedies in merger review

- If merger raises concerns, agencies can:
 1. Block the merger entirely
 2. Require divestitures (sell some products/plants)
 3. Impose behavioral conditions (licensing, access)
- **Divestitures:** Sell assets to maintain competition
 - Must sell to capable buyer
 - Assets must be “viable” standalone
- Example: T-Mobile/Sprint required divestiture to Dish

Recent merger cases

- **Tech mergers:**
 - Google/Fitbit: wearables and data
 - Microsoft/Activision: gaming
- **Healthcare:**
 - Hospital mergers: quality vs price concerns
- **Key issues in modern cases:**
 - Data as competitive asset
 - Potential competition (would target have grown into competitor?)
 - Vertical concerns (platforms buying content)

Merger simulation vs HHI

	HHI	Merger Simulation
Data needed	Market shares	Demand estimates
Output	Concentration screen	Predicted price increase
Pros	Simple, transparent	Accounts for substitution
Cons	Ignores substitution	Requires demand model

- Modern merger review uses both approaches

Connection to HW2

- HW2 asks you to:
 1. Take demand estimates (given)
 2. Compute pre-merger margins and implied MC
 3. Change ownership matrix
 4. Solve for post-merger equilibrium
 5. Calculate price effects and welfare change
- This connects Part 1 (demand) to Part 2 (competition)
- Same methodology used in real merger cases!

Merger analysis summary

1. **Diversion ratio:** Key determinant of price effects
 - High diversion = close substitutes = larger price increase
2. **Simulation:** Change ownership, solve new equilibrium
3. **UPP:** Quick screen: $D \times \text{margin}$
4. **HHI:** Concentration screen, not definitive
5. **Efficiencies:** Can offset price effects, but hard to prove
6. **Practice:** Apply these tools in HW2!

Key Points

1. Mergers reduce competition by **internalizing substitution**
2. **Merger simulation:** Use demand + ownership change to predict prices
3. Key: ownership matrix **H** changes from 0 to 1 for merged products
4. FOC changes: merged firm counts cross-price effects
5. **SSNIP test:** Would hypothetical monopolist raise price 5%?
6. **HHI** = $\sum s_i^2 \times 10000$; ΔHHI screens mergers
7. **Efficiency defense:** Cost savings may offset price effects

Next time

- **Lecture 11:** Vertical Relationships
 - Double marginalization
 - Vertical integration
 - Vertical restraints (RPM, exclusive dealing)