ECN 594: Mergers and Merger Policy

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Plan

1. **Merger effects and simulation**
2. Merger policy

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 $\rightarrow$ 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 $\rightarrow$ 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 $\rightarrow$ bigger price increase

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 **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:

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

- 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

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: $p_1=p_2=p$:

$$\begin{aligned} 100-3p+p-3(p-10)+(p-10)&=0\\ 100-3p+p-3p+30+p-10&=0\\ 120-4p=0 \Rightarrow p&=30 \end{aligned}$$

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 $\rightarrow$ 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

Plan

1. Merger effects and simulation
2. **Merger policy**

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

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 $\rightarrow$ lower market shares $\rightarrow$ 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:**

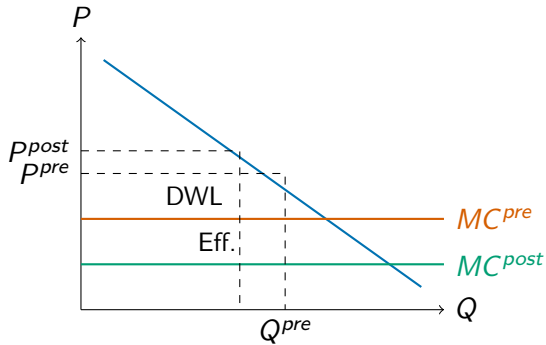
$$HHI = (0.50)^2 + (0.30)^2 + (0.20)^2 = 0.38$$

- $HHI = 3800$, $\Delta HHI = 800$
- **Shortcut:** $\Delta HHI = 2 \times s_1 \times s_4 \times 10000 = 2 \times 0.4 \times 0.1 \times 10000 = 800$

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: $D \times \textit{margin}$
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** $= \Sigma s_i^2 \times 10000$; 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)