## Merger Typology

<table>
<thead>
<tr>
<th>Horizontal</th>
<th>Vertical</th>
<th>Conglomerate</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Substantial overlap of business (same mkts or closely related mkts).</td>
<td>-Businesses are related up or down production (supply) chain</td>
<td>-Nominally unrelated businesses BUT, vary lots in degree of unrelatedness</td>
</tr>
</tbody>
</table>

**Examples:**
- Boeing/McDonnell Douglas
- Staples/Office Depot
- BP Amaco/ARCO
- Exxon/Mobil

**Examples:**
- Time-Warner/Turner: Cable programming and cable systems
- GM & Fisher Auto Body
- Coca-Cola/ independent bottlers

**Examples:**
- RJR Tobacco/Nabisco
- LBO (food products)
- TWT/AOL

## Alternatives to Mergers/Acquisitions

1. **Direct Investment:**
   Expand or enter market directly by investment, not acquisition

2. **Leveraged Buyouts, Management Buyouts** (LBOs & MBOs):
   Change management or control structure without necessarily reorganizing production/firm

3. **Strategic Alliances, Joint Ventures:**
   Coordinate activities without changing ownership of firm’s assets
Motivations for Mergers

1. Market Power
   - Horizontal mergers: take out competitor
   - Vertical mergers: concerns about foreclosure of competitors, mkt power extension
   - This is the focus of U.S. merger policy: prevent monopoly, make oligopoly coordination more difficult.

2. Efficiencies
   - “synergies” in costs (econ of scale, scope?)
   - align management incentives with shareholder interests (LBOs?)
   - internal capital market access
   - management change: replace inferior/inefficient management
     --used to be called x-inefficiency; now “suboptimal” effort,
     deviations from cost-minimization
     --why not just fire management? managerial entrenchment?

3. Financial/Pecuniary Gains
   - Tax advantages to combination
   - diversify to reduce bankruptcy costs
   - contract abrogation (especially labor, pension)

4. Information Asymmetry: undervalued target

5. Management objectives/self-interest
   - managerial aggrandisement
   - increase compensation (function of size), power, control
   - “winner’s curse” : believe they can pick undetected “winners,”
     though this may be illusionary (Richard Roll “hubris”)
Efficiency vs. Market Power
Trade-off

Merger: \( MC_0 \rightarrow MC_1 \)
\( P_0 \rightarrow P_1 \)
\( Q_0 \rightarrow Q_1 \)
\( \Rightarrow \uparrow P, \downarrow Q \)
\( \uparrow W \)

Williamson Diagram
Farrell & Shapiro, 1990 AER

Question: What are the welfare effects of a horizontal merger in the context of a Cournot model?

Question: Can we develop simple guidelines and how do these compare to existing merger policy?

Basic Approach:

\[ \Delta \text{Welfare} = \Delta \pi^m + \Delta \pi^o + \Delta \text{CS} \]
\[ = \text{private gains} + \text{"external effects" of merger from merger} \]

Consider effect of "infinitesimal merger"
(merger is integral of infinitesimal merger sequence)

Model
Cournot competition

N firms; \( C_i = \text{marginal costs of firm } i \)
\( x_i = \text{output of firm } I \)
\( dx_i = \Delta x_i \)

Result 1: \[ \text{sign } dW = \text{sign } (\frac{1}{2} \frac{dH}{H} + \frac{dX}{X}) \]

Implications:
i) Mergers that increase output are more likely to enhance welfare, all else equal

ii) Mergers that increase Herfindahl are more likely to increase welfare, all else equal.
Result: \[ dW = \left[ \frac{1}{2} \frac{dH}{H} + \frac{dx}{x} \right] \]

Derivation: (1) \[ dW = \sum_{i=1}^{n} \left( p - mc_i \right) \cdot dx_i \]

\[ \text{See Ex 5.8 Tirole} \]

Cournot FOC \[ \Rightarrow \quad P - X_j P' - MC_j = 0 \]

\[ \Rightarrow (2) \quad dW = \sum_{i=1}^{n} \frac{2}{x} P' \cdot X_j \cdot dx_j \]

Herfindahl: \[ H = \sum_{i=1}^{n} S_i^2 = \sum_{i=1}^{n} \left( \frac{X_i}{x} \right)^2 \]

\[ dh = \sum_{i=1}^{n} \frac{2}{x} \frac{dH}{dx_i} \cdot dx_i \]

\[ \frac{dH}{dx_j} = 2 \frac{X_j}{x} \cdot \frac{1}{x} + \sum_{i=1}^{n} 2 \left( \frac{X_i}{x} \right)^2 \left( \frac{-X_i}{x^2} \right) \]

\[ \Rightarrow \quad dh = \frac{2}{x} \left[ \sum_{j=1}^{n} \frac{X_j}{x} \cdot dx_j - H \sum_{j=1}^{n} dx_j \right] \]

\[ \Rightarrow \quad \sum_{j=1}^{n} x_j \cdot dx_j = \frac{dH}{2} \cdot x^2 + H \cdot dx \cdot x \]

Substitute into (2):

\[ dW = - P' \cdot x^2 \cdot H \left[ \frac{1}{2} \frac{dH}{H} + \frac{dx}{x} \right] \]

\[ \Rightarrow \quad \text{sign} (dW) = \text{sign} \left( \frac{1}{2} \frac{dH}{H} + \frac{dx}{x} \right) \]
What's going on here?

In an asymmetric Cournot model, low share firms have low shares because their marginal costs are high.

=> Want highest share firm to increase its share (because it has lowest cost)

=> Want to shut down low share firms (little surplus from their activity)

Result 2: If there are no synergies, a merger will raise price. Why?

No synergies <= no change in production possibilities, costs unchanged

Merged firm joint output falls (produce less than pre-merger because now account for ΔP effect on merger partner's output now)

Total output moves in same direction as merged firm's output (see Lemma)

Example Policy Results

Prop. 5: Under some reasonably general conditions, moderate size mergers that raise price and are privately profitable increase welfare.

Prop. 7: Under some reasonably general conditions, imposing or tightening an import quota when the import share is low will raise welfare.
### Cournot Merger Game

#### Pre-Merger

<table>
<thead>
<tr>
<th>Marginal Cost</th>
<th>Quantities</th>
<th>Share</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm 1</td>
<td>0.15</td>
<td>0.37</td>
<td>0.25</td>
</tr>
<tr>
<td>Firm 2</td>
<td>0.15</td>
<td>0.37</td>
<td>0.25</td>
</tr>
<tr>
<td>Firm 3</td>
<td>0.15</td>
<td>0.37</td>
<td>0.25</td>
</tr>
<tr>
<td>Firm 4</td>
<td>0.15</td>
<td>0.37</td>
<td>0.25</td>
</tr>
</tbody>
</table>

\[ P = 2 - Q \]

Total Quantity = 1.48

HHI = 2500

Market Price = 0.52

Total Profit = 0.5476

#### Post-Merger

<table>
<thead>
<tr>
<th>Marginal Cost</th>
<th>Quantities</th>
<th>Shares</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm 1</td>
<td>0.15</td>
<td>0.4625</td>
<td>0.33333333</td>
</tr>
<tr>
<td>Firm 2</td>
<td>0.15</td>
<td>0.4625</td>
<td>0.33333333</td>
</tr>
<tr>
<td>Firm 3</td>
<td>0.15</td>
<td>0.4625</td>
<td>0.33333333</td>
</tr>
</tbody>
</table>

Total Quantity = 1.3875

HHI = 3333.3333

Market Price = 0.6125

Total Profit = 0.64171875

### Welfare

- \( \Delta CS = -0.1326218 \)
- \( \Delta Profit I = -0.0598937 \)
- \( \Delta Profit O = 0.1540125 \)
- \( \text{Net External} = 0.02139062 \)
- \( \Delta Welfare = -0.0385031 \)
## Cournot Merger Game

### Pre-Merger

<table>
<thead>
<tr>
<th>Marginal Cost</th>
<th>Quantities</th>
<th>Share</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm 1</td>
<td>0.15</td>
<td>0.52</td>
<td>0.39097744</td>
</tr>
<tr>
<td>Firm 2</td>
<td>0.25</td>
<td>0.42</td>
<td>0.31578947</td>
</tr>
<tr>
<td>Firm 3</td>
<td>0.35</td>
<td>0.32</td>
<td>0.24060150</td>
</tr>
<tr>
<td>Firm 4</td>
<td>0.6</td>
<td>0.07</td>
<td>0.05263157</td>
</tr>
<tr>
<td>P = 2 - Q</td>
<td>Total Quantity</td>
<td>1.33</td>
<td>HHI = 3132.45519</td>
</tr>
<tr>
<td>Market Price</td>
<td>=</td>
<td>0.67</td>
<td>Total Profit = 0.5541</td>
</tr>
</tbody>
</table>

### Post-Merger

<table>
<thead>
<tr>
<th>Marginal Cost</th>
<th>Quantities</th>
<th>Shares</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm 1</td>
<td>0.05</td>
<td>0.6125</td>
<td>0.45794392</td>
</tr>
<tr>
<td>Firm 2</td>
<td>0.25</td>
<td>0.4125</td>
<td>0.30841121</td>
</tr>
<tr>
<td>Firm 3</td>
<td>0.35</td>
<td>0.3125</td>
<td>0.23364485</td>
</tr>
<tr>
<td>Total Quantity</td>
<td></td>
<td>1.3375</td>
<td>HHI = 3594.20036</td>
</tr>
<tr>
<td>Market Price</td>
<td>=</td>
<td>0.6625</td>
<td>Total Profit = 0.64296875</td>
</tr>
</tbody>
</table>

### Welfare

- Delta CS: 0.01000312
- Delta Profit I: 0.09985625
- Delta Profit O: -0.0109875
- Net External: -0.0009843
- Delta Welfare: 0.09887187
## Cournot Merger Game

### Pre-Merger

<table>
<thead>
<tr>
<th>Marginal Cost</th>
<th>Quantities</th>
<th>Share</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm 1</td>
<td>0.1</td>
<td>0.52</td>
<td>0.37681159</td>
</tr>
<tr>
<td>Firm 2</td>
<td>0.2</td>
<td>0.42</td>
<td>0.30434782</td>
</tr>
<tr>
<td>Firm 3</td>
<td>0.3</td>
<td>0.32</td>
<td>0.23188405</td>
</tr>
<tr>
<td>Firm 4</td>
<td>0.5</td>
<td>0.12</td>
<td>0.08695652</td>
</tr>
<tr>
<td>( P = 2 - Q ) Total Quantity</td>
<td>1.38</td>
<td>HHI = 2959.46229</td>
<td></td>
</tr>
<tr>
<td>Market Price</td>
<td>= 0.62</td>
<td>Total Profit = 0.5636</td>
<td></td>
</tr>
</tbody>
</table>

### Post-Merger

<table>
<thead>
<tr>
<th>Marginal Cost</th>
<th>Quantities</th>
<th>Shares</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm 1</td>
<td>0.1</td>
<td>0.55</td>
<td>0.40740740</td>
</tr>
<tr>
<td>Firm 2</td>
<td>0.2</td>
<td>0.45</td>
<td>0.33333333</td>
</tr>
<tr>
<td>Firm 3</td>
<td>0.3</td>
<td>0.35</td>
<td>0.25925925</td>
</tr>
<tr>
<td>( \text{Total Quantity} )</td>
<td>1.35</td>
<td>HHI = 3443.07270</td>
<td></td>
</tr>
<tr>
<td>( \text{Market Price} = 0.65 ) Total Profit = 0.6275</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Welfare

- \( \Delta CS \) \(-0.04095\)
- \( \Delta \text{Profit I} \) \(0.0177\)
- \( \Delta \text{Profit O} \) \(0.0462\)
- \( \text{Net External} \) \(0.00525\)
- \( \Delta \text{Welfare} \) \(0.02295\)
Some Remaining Questions

1. Is Cournot the right model?

   - Welfare implications of Δshare, ΔHHI don’t necessarily generalize to other models of competition (strategic substitutes v. strategic complements)

   - But could re-do the analysis with appropriate alternative model (e.g. Willig, BPEA, 1991)

2. Is focus on “unilateral effects” appropriate?

   - Implicit assumption that model of competition is unaffected by merger:
     
     Once Cournot, always Cournot?

   - Policy seems concerned with both “coordinated” and unilateral effects:
     implicit “Stigler” concern that coordination becomes easier with fewer, larger firms

3. What about market dynamics?

   - Difficult to model, but ultimately important
     (especially wrt entry)
What is the empirical evidence on merger effects?

Two caveats:

1. Selection:
   - we observe only a subset of potential mergers
   - can’t infer effect of current policy from study of current mergers (Lucas critique)

2. Counterfactual:
   - merger effects relative to what?
   - benchmarking what would have happened without the merger can be difficult

What question is being asked?

I.O.: Do mergers increase P (market power) and/or decrease costs (efficiency)?

Corporate Finance: Are mergers good for shareholders? For corporate governance?

Types of empirical evidence

Bulk of studies rely on stock market data, measure (at best) ex ante anticipated effects of merger

A few look (credibly) at ex post outcomes
Empirical Studies of Merger Effects

1. Target firm shareholders gain (unanimous result)

2. Acquiring firms shareholders average no gain or loss at time of acquisition (some studies positive, some 0, some negative effect; almost all small in magnitude). Why?

3. Rivals’ performance at time of acquisition is mixed. How much reflects estimates of the true economic effect, how much is a statistical artifact of the study (e.g., McAfee & Williams, 1988)?

4. Merged firm’s actual performance post-merger?

- Relatively little good empirical evidence here
- On profits: average post-merger performance not spectacular
  But: we would like more careful analyses to rely upon
- Some studies use direct measures of price, investment, other ex post indicators (e.g. Pesendorfer, 1998, on investment)
Table 3
Announcement Period Abnormal Returns by Decade, 1973–1998

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[−1, +1]</td>
<td>1.5%</td>
<td>2.6%</td>
<td>1.4%</td>
<td>1.8%</td>
</tr>
<tr>
<td>[−20, Close]</td>
<td>0.1%</td>
<td>3.2%</td>
<td>1.6%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Target</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[−1, +1]</td>
<td>16.0%</td>
<td>16.0%</td>
<td>15.9%</td>
<td>16.0%</td>
</tr>
<tr>
<td>[−20, Close]</td>
<td>24.8%</td>
<td>23.9%</td>
<td>23.3%</td>
<td>23.8%</td>
</tr>
<tr>
<td>Acquirers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[−1, +1]</td>
<td>−0.3%</td>
<td>−0.4%</td>
<td>−1.0%</td>
<td>−0.7%</td>
</tr>
<tr>
<td>[−20, Close]</td>
<td>−4.5%</td>
<td>−3.1%</td>
<td>−3.9%</td>
<td>−3.8%</td>
</tr>
<tr>
<td>No. Obs.</td>
<td>598</td>
<td>1,226</td>
<td>1,864</td>
<td>3,688</td>
</tr>
</tbody>
</table>

*Note:* Statistical significance at the 5 percent level is denoted by *a.*
Table 6  
Pre- and Post-Merger Abnormal Operating Performance (AOP)

<table>
<thead>
<tr>
<th></th>
<th>$t - 1$</th>
<th>$t + 1$</th>
<th>$t + 2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A$</td>
<td>2.92%$^a$</td>
<td>3.27%$^a$</td>
<td>3.15%$^a$</td>
</tr>
<tr>
<td>$b$</td>
<td>[2,012]</td>
<td>[2,101]</td>
<td>[1,796]</td>
</tr>
</tbody>
</table>

$$AOP(t + 1) = a + b \ AOP(t - 1)$$

<table>
<thead>
<tr>
<th></th>
<th>$A$</th>
<th>$b$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A$</td>
<td>1.07%$^a$</td>
<td>0.804$^a$</td>
<td>0.551$^a$</td>
</tr>
</tbody>
</table>

**Note:** Statistical significance at the 5 percent level is denoted by $^a$. 
Table 2

Summary statistics on industry-adjusted cash flow returns for acquirers and combined target and acquirer firms in the five years following takeover, and the stock premium paid by acquirers to target stockholders.

<table>
<thead>
<tr>
<th>Transaction characteristics (Number of deals)</th>
<th>Acquirers' cash flow returns</th>
<th>Premium paid to target stockholders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Given actual target premium</td>
<td>Assuming zero target premium</td>
</tr>
<tr>
<td></td>
<td>Median (%)</td>
<td>Percent positive (%)</td>
</tr>
<tr>
<td><strong>Attitude:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friendly (35)</td>
<td>2.6&lt;sup&gt;e&lt;/sup&gt;</td>
<td>64&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Hostile (15)</td>
<td>0.0</td>
<td>53</td>
</tr>
<tr>
<td><strong>Target and acquirer business relation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Related businesses (14)</td>
<td>2.7&lt;sup&gt;e&lt;/sup&gt;</td>
<td>85&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Semi-related businesses (18)</td>
<td>1.5</td>
<td>56</td>
</tr>
<tr>
<td>Unrelated businesses (18)</td>
<td>-0.6</td>
<td>47</td>
</tr>
<tr>
<td><strong>Form of payment:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock and debt securities (23)</td>
<td>3.2&lt;sup&gt;d&lt;/sup&gt;</td>
<td>82&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cash and debt securities (17)</td>
<td>1.0</td>
<td>59</td>
</tr>
<tr>
<td>Cash and stock (10)</td>
<td>-2.1</td>
<td>30</td>
</tr>
</tbody>
</table>

<sup>a</sup> The takeovers are completed in the period 1979 to mid-1984. Operating cash flow return on assets are sales less cost of sales less selling and administrative expenses plus depreciation, divided by the market value of assets at the beginning of the year. Industry-adjusted returns are computed for each acquirer and year as the difference between the sample firm value in that year and median values for other firms in the same industry (defined by Value Line in year -1). Industry returns are weighted averages of target and acquirer industry returns, with the weights being the relative asset values of the acquirer and target firms in year -1. The target stock premium is the return to target stockholders from 5 days before the first acquisition announcement to the date the target stock is delisted, less the market return in this period.

<sup>b</sup> Post- takeover returns before target premiums are acquirer post- takeover operating cash flows as a percentage of beginning assets excluding the value of the premium paid to target stockholders. Post- takeover returns after target premiums are acquirer post- takeover operating cash flows as a percentage of beginning assets including the value of the premium paid to target stockholders.

<sup>c</sup> Strategic takeovers are defined as friendly deals between firms in related or semi-related businesses, that are financed with stock and debt securities. Financial takeovers are hostile deals between firms in unrelated or semi-related businesses, that are financed with cash and securities.

<sup>d</sup> Significantly different from zero at the 1% level using a two-tailed test

<sup>e</sup> Significantly different from zero at the 5% level using a two-tailed test

27
Asset Market Valuation

**Basic model: Finance**

\[ V_t = \sum_{s=1}^{\infty} \frac{Div_s}{(1 + r)^s} \]

where  
- \( V = \) value of the firm = PDV of dividend stream  
- Div = dividends  
- r = risk-adjusted discount rate

If Div grows at a constant rate, \( g \), and \( r \) is constant over time,

\[ V_t = \frac{Div_t}{r - g} \]

**Basic model: IO**

\[ V_t = \left[ \int (P_t - AC_t) \cdot F(K_L, L_L) + rK_t - K_t \right] e^{-r(s-t)} ds \]

where  
- \( V = \) PDV(Revenues - Costs - Investments)  
- = PDV ("free cash flows")  
- \( F(K_L, L_L) = \) production function (output)  
- K = value of capital stock ("replacement cost")

If \( r \) and \( g \) are constant, and there is no technological change,

\[ V_t = K_t + \Pi_0 \]

where  
- \( \Pi_0 = \frac{(P_t - AC_t) \cdot F(K_t, L_t)}{r - g} \)

**Tobin's q:**  
\[ q = \frac{V}{K} = 1 + \frac{\Pi_0}{K} \]