Non-Equivalence of Upstream Cartel and Upstream Merger in Vertical Markets with Passive Backward Ownership

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Motivation: Institutional Reality & Antitrust Scrutiny

- Modern antitrust enforcement has become increasingly attentive to the competitive effects of non-controlling minority stakes in vertically related firms.
- Passive Backward Ownership (PBO) is structurally embedded in key industries.
  - *Automotive:* The Japanese *Keiretsu* system features downstream automakers (e.g., Toyota, Honda) holding structural stakes in dedicated upstream suppliers (e.g., Denso, Showa). Upstream consolidations, such as the 2021 creation of Hitachi Astemo, routinely force authorities to evaluate how ownership dilution impacts downstream product competition.

Motivation: Institutional Reality & Antitrust Scrutiny

- The Benchmark Antitrust Case (Time Warner-Turner, 1996):
  - Tele-Communications Inc. (TCI), a major downstream cable operator, held a concentrated 24% passive equity stake in its upstream programming supplier, Turner.
  - Upon Time Warner's acquisition of Turner, TCI's claim was mechanically diluted into a roughly 9% non-voting stake in the newly enlarged entity.
- How does the simultaneous shock of upstream structural consolidation and downstream financial dilution alter pricing behavior and bilateral bargaining incentives?

The Theoretical Gap & Contribution

- **Standard Economic Theory:** Historically treats upstream mergers and upstream cartels as generating roughly equivalent competitive harms under two-part tariffs (e.g., Horn and Wolinsky, 1988; Milliou and Petrakis, 2007). Both perfectly internalize cross-chain pricing externalities.
- **Our Contribution:** We show that PBO shatters this baseline equivalence.
  - A *cartel* preserves originally concentrated ownership stakes and outside options.
  - A *merger* mechanically dilutes the downstream firms' equity claims and structurally alters disagreement payoffs in bilateral negotiations.
- **Conclusion:** Upstream consolidation under PBO mandates distinct theories of harm.

Baseline Model Setup

- **Industry Structure:** Two downstream firms (D_i, D_j) buy an essential input from dedicated upstream suppliers (U_i, U_j). Constant upstream marginal cost $c > 0$.
- **Downstream Market:** Symmetric Cournot competition with imperfect substitutes, facing inverse demand $p_i = p(q_i, q_j)$.
- **Passive Backward Ownership (PBO):** Each D_i holds a non-controlling equity stake $k \in (0, 1/2)$ in its dedicated supplier U_i.
- **Timing:**
  - *Stage 1:* Bilateral Nash-in-Nash bargaining over two-part tariffs (w_i, F_i) with bargaining powers β (upstream) and $1 - \beta$ (downstream).
  - *Stage 2:* Cournot quantity competition.

The Effective Marginal Cost

- Under PBO, the downstream firm internalizes a fraction k of upstream operating profits:

$$\Pi_{D_i} = \pi_{D_i} + k\pi_{U_i}$$

- The **effective marginal cost** (m_i) perceived by D_i drives product market conduct, not the nominal wholesale price (w_i):

$$m_i = (1-k)w_i + kc \quad \Leftrightarrow \quad w_i = \frac{m_i - kc}{1-k}$$

- **Economic Intuition:** PBO drives a wedge between negotiated wholesale terms and downstream marginal exposure. D_i perceives only the fraction $1-k$ of an increase in wholesale price as a true increase in its marginal cost.

Benchmark (Upstream Separation) & Invariance

- Under separation, the (U_i, D_i) pair maximizes the generalized Nash product.
- The two-part tariff allows neat separation:
  - F_i allocates the joint surplus.
  - w_i (and thus m_i) maximizes the joint vertical surplus $S_i^{\mathcal{B}}$.
- **First-Order Condition:**

$$(m_i - c)\partial_1 q_i(.) + q_i(.)\partial_2 p(.)\partial_1 q_j(.) = 0$$

- **The Invariance Effect:** Following Greenlee and Raskovich (2006), PBO modifies the transfer F_i needed to implement a given downstream conduct, but not the conduct itself.
- The benchmark values $m^{\mathcal{B}}, q^{\mathcal{B}}, p^{\mathcal{B}}$, and $CS^{\mathcal{B}}$ are independent of the ownership stake k and bargaining power β.

Upstream Cartel & Internalization

- Under an upstream cartel ($\mathcal{C}$), the coordinated suppliers maximize joint net accounting profits: $\Pi^{\mathcal{C}}_{U_i+U_j} = \Pi_{U_i} + \Pi_{U_j}$.
- The fixed fee F_i continues to efficiently allocate rents, while $m_i^{\mathcal{C}}$ maximizes the joint surplus $S_i^{\mathcal{C}}$.
- **First-Order Condition:**

$$\underbrace{(m_i - c)\partial_1 q_i}_{\text{Margin-Volume}} + \underbrace{q_i \partial_2 p_i \partial_1 q_j}_{\text{Strategic Commitment}} + \underbrace{(m_j - c)\partial_1 q_j}_{\text{Cross-Chain Internalization}} = 0$$

- **Economic Intuition:** The cartel structurally internalizes the externality that D_i's aggressiveness imposes on chain j's volume.
- Crucially, the pre-existing ownership link k is preserved, so the **invariance logic holds**: $m^{\mathcal{C}}$ remains strictly independent of k and β.

The Financial Dilution Mechanism

- **The Economic Mismatch:** IO literature typically ignores the "financing side" of mergers, focusing solely on production. However, in practice, PBO stakes are "sticky" financial assets that must be re-valued.
- **The Finance Standard (Relative-Value Rule):** When two independent firms U_1 and U_2 merge, shareholders are compensated based on the relative pre-merger value of their holdings.

$$\text{Share-Exchange Ratio: } \mathcal{V}_i = \frac{\pi^{\mathcal{B}}_{U_i}}{\pi^{\mathcal{B}}_{U_i} + \pi^{\mathcal{B}}_{U_j}}$$

- **The Resulting Dilution:** A downstream firm's original claim k on its stand-alone supplier is converted into a claim s on the enlarged entity U.

$$s = k \times \mathcal{V}_i < k$$

Upstream Merger

- Because benchmark Nash bargaining yields symmetric pre-merger operating profits ($\pi^{\mathcal{B}}_{U_1} = \pi^{\mathcal{B}}_{U_2}$), the financial rule mathematically mandates $s = k/2$.
- This is not a relabeling of shares; it is a structural reduction in the downstream firm's marginal exposure to its specific supply chain.
- **The Modified Effective Marginal Cost:**

$$m_i^{\mathcal{M}} = (1 - s)w_i^{\mathcal{M}} + sc$$

- **Economic Intuition:** Financial dilution permanently weakens the downstream firm's exposure to upstream profits generated exclusively on its own trading relationship.

What happens if bilateral negotiations on chain i break down?

Upstream Cartel ($\mathcal{C}$)

- D_i's equity k is strictly concentrated in U_i.
- **Downstream Threat Point:**

$$d_{D_i}^{\mathcal{C}} = 0$$

D_i receives 0 continuation value if U_i idles.

- **Upstream Threat Point:**

$$d_U^{\mathcal{C}} = (1-k)[(w_j - c)q_j^{-i} + F_j] > 0$$

Cartel captures the non-contingent monopoly profit on the surviving link j.

- Asymmetry alters only F_i; m_i remains invariant.

Upstream Merger ($\mathcal{M}$)

- D_i holds diluted equity s in the newly enlarged entity U.
- **Downstream Threat Point:**

$$d_{D_i}^{\mathcal{M}} = s\pi_U^{(-i)} > 0$$

D_i free-rides on chain j's monopoly profit.

- **Upstream Threat Point:**

$$d_U^{\mathcal{M}} = (1-2s)\pi_U^{(-i)} > 0$$

U retains its net share of link j's profit

- D_i's secure, equity-linked continuation value empowers it to resist margin inflation, permanently shifting the Nash product.

Upstream Merger – The Modified Bargaining Problem

- Incorporating the cross-chain threat points, the generalized Nash product for the (U, D_i) negotiation becomes:

$$\Omega_i^{\mathcal{M}} = [\Pi_{D_i}^{\mathcal{M}} - s\pi_U^{(-i)}]^{1-\beta}[\Pi_U^{\mathcal{M}} - (1-2s)\pi_U^{(-i)}]^{\beta}$$

- While F_i handles the revised surplus split, the effective marginal cost $m_i^{\mathcal{M}}$ is chosen to maximize the **joint surplus net of disagreement**:

$$S_i^{\mathcal{M}} = \underbrace{\Pi_{D_i}^{\mathcal{M}} - s\pi_U^{(-i)}}_{D_i\text{'s net surplus}} + \underbrace{\Pi_U^{\mathcal{M}} - (1-2s)\pi_U^{(-i)}}_{U\text{'s net surplus}}$$

- Substituting profits and simplifying yields the exact surplus being maximized:

$$S_i^{\mathcal{M}} = (p_i(q_i, q_j) - c)q_i + (m_j - c)(q_j - q_j^{-i})$$

- **Key Insight:** The merger ceases to be just another form of upstream internalization. It alters the bargaining problem through the surplus that remains relevant *after* disagreement, driving a distinct FOC.

The Core Result: Breaking the Equivalence

- By imposing symmetry on the FOCs, we compare the effective marginal costs:

$$\text{Cartel:} \quad m^{\mathcal{C}} = c - \frac{q^{\mathcal{C}} \partial_2 p_i \partial_1 q_j}{\partial_1 q_i + \partial_1 q_j}$$

$$\text{Merger:} \quad m^{\mathcal{M}} = c - \frac{q^{\mathcal{M}} \partial_2 p_i \partial_1 q_j}{\partial_1 q_i + \frac{1}{1-s} \partial_1 q_j}$$

- **The Mechanism:** Under the merger, financial dilution ($s = k/2$) places a strictly higher, inflated weight $1/(1-s) > 1$ on the positive cross-cost effect ($\partial_1 q_j$).
- **The Result:** *Under linear demand:* $m^{\mathcal{M}} < m^{\mathcal{C}}$. Because the diluted downstream firm is highly resistant to margin inflation, the merged entity is forced to aggressively protect downstream volume.

Upstream Profitability (Proposition 1)

- **Proposition 1:** Under Cournot competition, *linear demand*, PBO ($k > 0$), and two-part tariffs, upstream merger is strictly less profitable for the suppliers than upstream cartel: $\Pi_U^{\mathcal{M}} < \Pi_{U_i+U_j}^{\mathcal{C}}$.
- **The Mechanism:**
  - The cartel preserves the original ownership link k, internalizing the cross-chain externality as in the classic $k = 0$ case.
  - The merger physically consolidates the asset base, diluting equity to $s < k$, and generates regime-specific disagreement payoffs.
  - This forces the merged entity to negotiate a significantly more aggressive $m^{\mathcal{M}}$.
- **Result:** This heightened aggressiveness cannibalizes joint industry profits under strategic substitutes, making the merger the strictly least profitable regime for the upstream firms.

Welfare Rankings (Proposition 2)

- **Proposition 2:** Under Cournot competition, *linear demand*, PBO ($k > 0$), and two-part tariffs:
  - **Consumer Surplus:** $m_i^{\mathcal{C}} > m_i^{\mathcal{M}}$ and $q_i^{\mathcal{C}} < q_i^{\mathcal{M}}$, thus $CS^{\mathcal{M}} > CS^{\mathcal{C}}$.
  - **Producer Surplus:** If $k < k_2^{\text{crit}}$, then $PS^{\mathcal{C}} > PS^{\mathcal{M}}$.
  - **Total Welfare:** The ranking depends on the magnitude of PBO (k) relative to the product differentiation (γ).
- **Phase Diagram Summary:**
  - For low PBO, the merger's internalization increases PS.
  - For high PBO, the output contraction from merger-induced aggressiveness destroys producer surplus.

Robustness Across Competitive Environments

- The core ranking ($CS^{\mathcal{M}} > CS^{\mathcal{C}}$) survives alternative strategic and contractual environments.
- **Price Competition (Bertrand):**
  - Pricing decisions are strategic complements. Linear demand, differentiated products.
  - The cartel induces mutual escalation in retail prices (highest $m_i^{\mathcal{C}}$).
  - Financial dilution restrains the merger's ability to inflate costs, keeping the merger strictly less anti-competitive ($CS^{\mathcal{M}} > CS^{\mathcal{C}}$).
- **Linear Tariffs (Inefficient Contracts):**
  - Wholesale price only, linear demand, differentiated products.
  - Inefficient contract; introduces severe double marginalization into all regimes.
  - Cartel inflicts the most severe output contraction; merger is forced to moderate wholesale pricing. $CS^{\mathcal{M}} > CS^{\mathcal{C}}$ structurally holds.

Conclusion & Policy Implications

- Standard literature equating upstream mergers and cartels implicitly relies on a strong assumption: the absence of PBO.
- Once downstream firms hold equity in their suppliers, the two institutions are fundamentally non-equivalent.
- **Cartel:** Preserves original concentrated ownership and outside options.
- **Merger:** Dilutes downstream equity ($k \to s$) and builds structurally secure, equity-linked continuation values into the bargaining fallbacks.
- **Antitrust Takeaway:** Treating an upstream cartel as a proxy counterfactual for a blocked merger is a severe policy error. Neither the legal form nor the nominal wholesale price is a sufficient statistic for competitive harm.