Markups, Markdowns, and Bargaining in Vertical Supply Chains

Rémi Avignon⋆, Claire Chambolle⋆,
Etienne Guigue† and Hugo Molina⋆

⋆INRAE
†KU Leuven

EARIE conference - August, 2024

Motivation

What is the consequence of buyer power on welfare?

Controversial views according to the economic literature:

- **countervailing power** theory (Galbraith, 1952):
  - Rebates obtained by downstream firms are transmitted to consumers.
    ⇒ Buyer power toward suppliers is welfare improving.
  - Common feature of the **vertical relationship literature**.
- **monopsony power** theory (Robinson, 1933):
  - Salaries fixed below the competitive level lead to production reduction.
    ⇒ Firms monopsony power is detrimental to welfare;
  - Long tradition in **labor litterature**.

⇒ Two different settings that have not been combined.

Research Question

How do **bargaining power** and **market power** interact in **supply chains**?

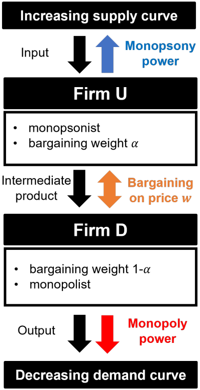
- what implications for **welfare**?
- what implications for **profit-sharing**?

Literature

1. Florishing literature on markups & markdowns:
   - building on the PF approach (De Loecker and Warzynski, 2012),
   - including Morlacco (2019); Rubens (2023); Avignon and Guigue (2022),
   - **not explicitly modeling vertical relations, nor generating counterfactuals.**
2. Structural IO literature analyzing profit-sharing & efficiency in value chains:
   - building on the demand-conduct approach (Berry et al., 1995) and theoretical vertical relationship literature,
   - including Berto Villas-Boas (2007); Crawford and Yurukoglu (2012); Gowrisankaran et al. (2015); Ho and Lee (2017); Dubois and Sæthre (2020); Bonnet et al. (2023).
   - explicitly modeling firm conducts, and generating counterfactuals.
   - **assuming constant marginal cost which rules out monopsony power.**
3. Nascent literature (Alviarez et al., 2023; Hahn, 2023) aiming to bridge both:
   - **developing frameworks where bargaining outcomes have no welfare effects.**

$\Rightarrow$ Need for a bargaining theory with welfare effects allowing for mark-ups/downs.

What we Do



- Considering a simple vertical supply chain.
- Extending the canonical model of vertical relationships to allow for monopsony power.
- Relaxing two standard assumptions to do so:
  - constant marginal cost of U,
  - the exchanged quantity is always set by D.
- Exploring welfare and profit-sharing implications within this framework.
- Clarifying the nature of market power (markups or markdowns) at each stage of the vertical chain.

Definitions

The **markup** of firm i, denoted μ_i is the wedge (ratio) between its output price and the minimal remuneration required for its marginal output to be supplied.

The usual expression for markup is:

$$\mu_i \equiv \frac{output\ \ price\ \ i}{marginal\ \ cost\ \ i} = \frac{output\ \ price\ \ i}{marginal\ \ revenue\ \ i}$$

The **markdown** of firm i, denoted ν_i is the wedge between its input price and the maximal input cost at which the marginal unit would be purchased.

The usual expression for markdown is:

$$\nu_i \equiv \frac{marginal\ \ revenue\ \ i}{input\ \ price\ \ i} = \frac{marginal\ \ cost\ \ i}{input\ \ price\ \ i}$$

Remark: In Nash-Bargaining transactions, the buyer's marginal cost, and the seller's marginal revenue are not defined. We show that well-defined ratios are the appropriate measures of markups and markdowns.

The **margin** of firm i m_i is the wedge (ratio) between the output price and the input price. $m_i = \mu_i \nu_i = \frac{output\ \ price}{input\ \ price}$

Preview of Results

Benchmark

A vertically integrated firm exerting monopsony and monopoly power generates an inefficiency by imposing a markdown and a markup.

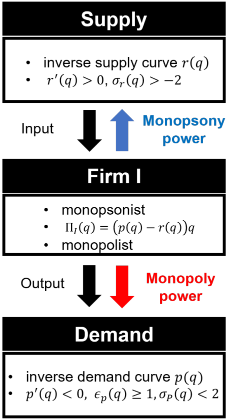
Vertical relationships

Under linear pricing, a vertical chain:

- creates, in general, an additional inefficiency varying with U's bargaining weight α:
  - double *markup-isation* à la Cournot (1838)-Spengler (1950) if $\alpha > \alpha_I$,
    - in that case, total welfare is decreasing in α,
  - double *markdown-isation* if $\alpha < \alpha_I$,
    - in that case, total welfare is increasing in α,

  $\Rightarrow$ U and D cannot simultaneously make a markup and a markdown in a bilateral transaction.
- reaches the vertically integrated firm outcome if $\alpha = \alpha_I$, with:
  - $0 < \alpha_I < 1$ for any increasing MC_U and decreasing MR_D,
  - $\alpha_I = 0$ if MC_U is constant (pure countervailing power case),
  - $\alpha_I = 1$ if MR_D is constant (pure monopsony power case),

Vertically-Integrated Firm: Setting



where for any function f appearing here and throughout the presentation,

- $\epsilon_f(q) \equiv \frac{f(q)}{q|f'(q)|}$ is the elasticity of $f(.)$,
- $\sigma_f(q) \equiv \frac{qf''(q)}{|f'(q)|}$ is a measure of convexity of $f(.)$.

Vertically-Integrated Firm: Equilibrium

The maximization program of firm I is given by:

$$\max_{q} \Pi_I = (p(q) - r(q))q,$$

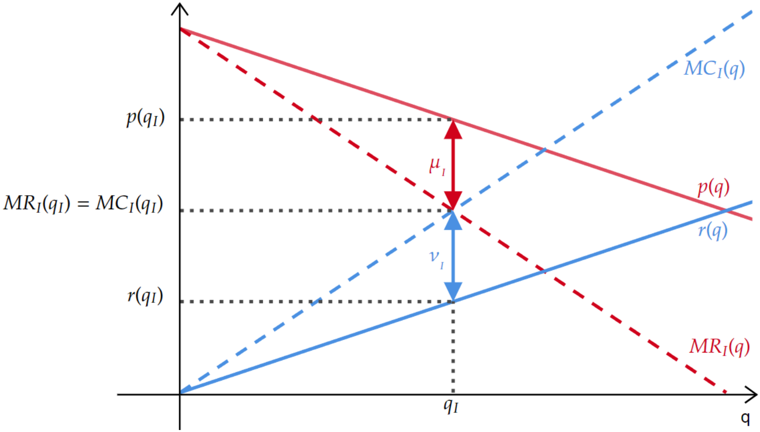
yielding the FOC:

$$\underbrace{p(q_I)\left(1 - \varepsilon_p^{-1}(q_I)\right)}_{MR_I(q_I)} = \underbrace{r(q_I)\left(1 + \varepsilon_r^{-1}(q_I)\right)}_{MC_I(q_I)}.$$

We can define firm's I:

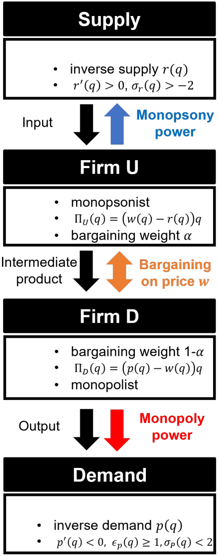
1. markup $\mu_I \equiv \frac{p(q_I)}{MC(q_I)} = \frac{1}{1-\varepsilon_p^{-1}(q_I)}$,
2. markdown $\nu_I \equiv \frac{MR(q_I)}{r(q_I)} = 1 + \varepsilon_r^{-1}(q_I)$,
3. (total) margin $M_I \equiv \frac{p(q_I)}{r(q_I)} = \nu_I \times \mu_I = \frac{1+\varepsilon_r^{-1}(q_I)}{1-\varepsilon_p^{-1}(q_I)}$.

Vertically-Integrated Firm: Representation



$\implies$ Both markups and markdowns reduce welfare by reducing quantity.
$\implies$ Consumers pay a higher price and input suppliers get a lower price.

The Supply Chain



Timing Assumption

- **Stage 1:** firms U and D bargain over a unit (wholesale) price w.
- **Stage 2:** based on w,
  - U sets its optimal quantity q_U,
  - D sets its optimal quantity q_D.

  The equilibrium quantity is

  $$q(w) = \min\{q_U(w), q_D(w)\},$$

  and the equilibrium input and output prices are $r(q)$ and $p(q)$.

Note that:

- increasing MC_U requires to make the equilibrium condition explicit,
- it embeds the literature standard assumption ($i.e$ quantity is set by D),
- we restrict attention to linear prices.

Quantity choice of D

D knows w, its maximization program is given by:

$$\max_{q_D} \Pi_D = (p(q_D) - w)q_D \quad \text{subject to} \quad q_D \leq q_U(w)$$

The FOC holds for the interior solution $\tilde{q}_D(w)$:

$$\underbrace{p(\tilde{q}_D(w))\left(1 - \varepsilon_p^{-1}(\tilde{q}_D(w))\right)}_{MR_D(\tilde{q}_D(w))} = w$$

If $\tilde{q}_D(w) > q_U(w)$, $MR_D(q_U(w)) > w$ as MR_D is decreasing. This yields:

$$q_D(w) = \begin{cases} \tilde{q}_D(w) & \text{if } \tilde{q}_D(w) \leq q_U(w), \\ q_U(w) & \text{otherwise.} \end{cases}$$

Quantity choice of U

U knows w, its maximization program is given by:

$$\max_{q_U} \Pi_U = (w - r(q_U))q_U \quad \text{subject to} \quad q_U \leq q_D(w)$$

The FOC holds for the interior solution $\tilde{q}_D(w)$:

$$w = \underbrace{r(\tilde{q}_U(w))\left(1 + \varepsilon_r^{-1}(\tilde{q}_U(w))\right)}_{MC_U(\tilde{q}_U(w))}$$

If $\tilde{q}_U(w) > q_D(w)$, $w > MC_U(q_D(w))$ as MC_U is increasing. This yields:

$$q_U(w) = \begin{cases} \tilde{q}_D(w) & \text{if } \tilde{q}_D(w) \leq q_U(w), \\ q_U(w) & \text{otherwise.} \end{cases}$$

Quantity Exchanged

The quantity exchanged is the minimum of the two quantities each player is willing to exchange:

$$q(w) = \min\{q_U(w), q_D(w)\},$$

and we have:

$$q(w) = \min\{\tilde{q}_U(w), \tilde{q}_D(w)\},$$

implying that:

$$w(q) = \begin{cases} MC_U(q) \text{ if } \tilde{q}_u(w) < \tilde{q}_D(w) \\ MR_D(q) \text{ if } \tilde{q}_u(w) > \tilde{q}_D(w) \end{cases}$$

$\Rightarrow$ firms anticipate the price schedule $w(q)$ when negotiating in stage 1.

▸ Graph

Bargaining

U and D bargain à la Nash with resp. bargaining weights α and $1-\alpha$.

We write and solve the program in q (equivalent to solving in w):

$$\max_q \Pi_U(q)^{\alpha}\Pi_D(q)^{(1-\alpha)} \quad \text{s.t} \quad w(q) = \begin{cases} MC_U(q) \text{ if } \tilde{q}_u(w) < \tilde{q}_D(w) \\ MR_D(q) \text{ if } \tilde{q}_u(w) > \tilde{q}_D(w) \end{cases} \}$$

where $\Pi_U(q) = (w(q) - r(q))q$ and $\Pi_D(q) = (p(q) - w(q))q$.

The FOC yields:

$$\alpha \underbrace{\left[\frac{\partial w(q)q}{\partial q} - MC_U(q)\right]}_{\frac{\partial \Pi_U(q)}{\partial q}} \Pi_D(q) + (1-\alpha) \underbrace{\left[MR_D(q) - \frac{\partial w(q)q}{\partial q}\right]}_{\frac{\partial \Pi_D(q)}{\partial q}} \Pi_U(q) = 0$$

$\Rightarrow$ depends on firm anticipations of the schedule $w(q)$, and thus on α.

Bargaining with efficient weights ($\alpha = \alpha_I$)

We start with a specific case that proves to be a useful baseline.

α_I is the threshold value of α such that the Nash-bargaining outcome corresponds to the integrated-firm outcome.

For this α_I, the Nash-program FOC thus has to yield:

$$MR_D(q_{\alpha_I}) = MC_U(q_{\alpha_I}),$$

which implies that:

$$\alpha_I \equiv \frac{\Pi^U(q_I)}{\Pi^U(q_I) + \Pi^D(q_I)},$$

with $0 < \alpha_I < 1$. Authorizing constant MC_U or MR_D, we have:

$$\alpha_I = \begin{cases} 0 & \text{if } MC_U(q) \text{ is constant in } q \textbf{ ("pure countervailing power case")} \\ 1 & \text{if } MR_D(q) \text{ is constant in } q \textbf{ ("pure monopsony power case").} \end{cases}$$

Road Map

We now treat the two remaining cases, each divided into two sub-cases:

1. D is weak in the bargaining ($\alpha_I < \alpha$):
   (a) extreme case: $\alpha = 1$ (TIOLI offer from U), ▸ More
   (b) intermediate case: $\alpha_I < \alpha < 1$; ▸ More
2. U is weak in the bargaining ($\alpha < \alpha_I$):
   (a) extreme case: (TIOLI offer from D) ▸ More,
   (b) intermediate case: $0 < \alpha < \alpha_I$; ▸ More

Recap

The equilibrium $\{q_\alpha, r_\alpha, w_\alpha, p_\alpha\}$ is defined in three parts depending on the value of α relatively to a threshold $\alpha_I = \frac{\Pi_U(q_I)}{\Pi_U(q_I)+\Pi_D(q_I)}$.

- Case 1: when $0 \leq \alpha < \alpha_I$,
  - (i) $q_\alpha < q_I$, $r_\alpha < r_I$, $w_\alpha < w_I$, and $p_\alpha > p_I$,
  - (ii) $\nu_U > 1$, $\mu_U = 1$, $\nu_D > 1$, $\mu_D > 1$,
  - (iii) $\frac{\partial q_\alpha}{\partial \alpha} > 0$, $\frac{\partial r_\alpha}{\partial \alpha} > 0$, $\frac{\partial w_\alpha}{\partial \alpha} > 0$, and $\frac{\partial p_\alpha}{\partial \alpha} < 0$,
  - (iv) total welfare is increasing in α;
- Case 2: when $\alpha = \alpha_I$,
  - (i) $q_{\alpha_I} = q_I$, $r_{\alpha_I} = r_I$, $w_{\alpha_I} = w_I$, and $p_{\alpha_I} = p_I$;
  - (ii) $\nu_U > 1$, $\mu_U = \nu_D = 1$, $\mu_D > 1$,
- Case 3: when $\alpha_I < \alpha \leq 1$,
  - (i) $q_\alpha < q_I$, $r_\alpha < r_I$, $w_\alpha > w_I$, and $p_\alpha > p_I$,
  - (ii) $\nu_U > 1$, $\mu_U > 1$, $\nu_D = 1$, $\mu_D > 1$,
  - (iii) $\frac{\partial q_\alpha}{\partial \alpha} < 0$, $\frac{\partial r_\alpha}{\partial \alpha} < 0$, $\frac{\partial w_\alpha}{\partial \alpha} > 0$, and $\frac{\partial p_\alpha}{\partial \alpha} > 0$,
  - (iv) total welfare is decreasing in α.

Conclusion

A vertically integrated firm exerting monopsony and monopoly power generates an inefficiency by imposing a markdown and a markup.

Under linear pricing, a vertical chain:

- can reach the vertically integrated firm outcome if and only if U's bargaining weight α is at its efficient level (α_I), with:
  - $0 < \alpha_I < 1$ for any increasing MC_U and decreasing MR_D,
  - $\alpha_I = 0$ if MC_U is constant (pure countervailing power case),
  - $\alpha_I = 1$ if MR_D is constant (pure monopsony power case),
- generates, in general, an additional inefficiency:
  - double *markup-isation* à la Cournot (1838)-Spengler (1950) if $\alpha > \alpha_I$,
    - in that case, total welfare is decreasing in α,
  - double *markdown-isation* if $\alpha < \alpha_I$,
    - in that case, total welfare is increasing in α,

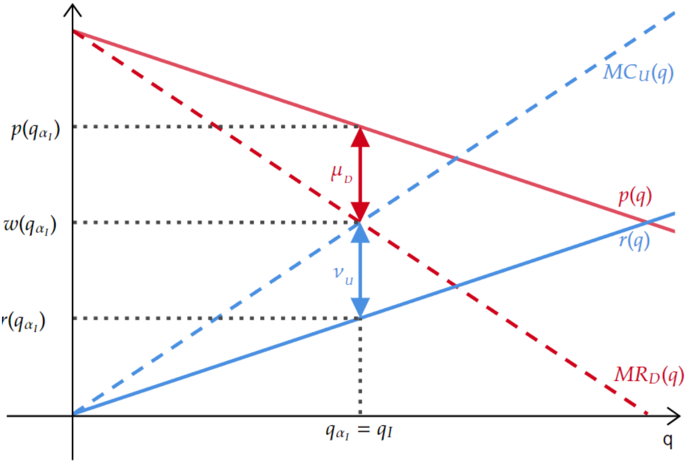
$\Rightarrow$ U and D cannot simultaneously make a markup and a markdown in a bilateral transaction.

Next Steps

- pass-through analysis à la Mrázová and Neary (2017),
- more welfare and policy implications,
- maybe another paper: upstream and downstream competition,

Thank you!

Bargaining with efficient weights ($\alpha = \alpha_I$): Representation



Back

TIOLI offer from U $(\alpha = 1)$

U anticipates that its offer w leads to $q(w) = \tilde{q}_D(w) < \tilde{q}_U(w)$, and thus:

$$w(q) = MR_D(q).$$

Its program, here equivalent to the Nash program (as $\alpha = 1$), is thus:

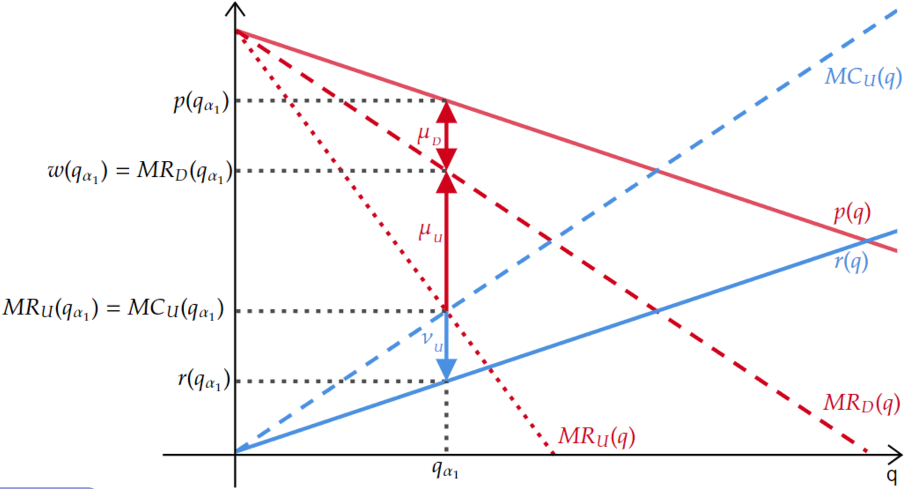
$$\max_q \Pi_U(q) = w(q)q - r(q)q \quad \text{subject to} \quad w(q) = MR_D(q)$$

The FOC yields:

$$\underbrace{w(q_{\alpha_1})\left(1 - \varepsilon_{MR_D}^{-1}(q_{\alpha_1})\right)}_{MR_U(q_{\alpha_1};\alpha_1)} = \underbrace{r(q_{\alpha_1})\left(1 + \varepsilon_r^{-1}(q_{\alpha_1})\right)}_{MC_U(q_{\alpha_1})}$$

where $\varepsilon_{MR_D}^{-1}(q) = \dfrac{2 - \sigma_p(q)}{\varepsilon_p(q) - 1}$ and $MR_U(q, \alpha_1) \equiv \frac{\partial MR_D(q)q}{\partial q}$. road map

TIOLI offer from U $(\alpha = 1)$: Representation



road map

Bargaining when D is weak ($\alpha_l < \alpha < 1$)

U and D anticipate $q(w) = \tilde{q}_D(w) < \tilde{q}_U(w)$ and $w(q) = MR_D(q)$, hence:

$$\Pi_U(q) = (MR_D(q) - r(q))q,$$
$$\Pi_D(q) = (p(q) - MR_D(q))q.$$

The (rearranged) Nash-program FOC yields the equilibrium quantity q_α:

$$MC_U(q_\alpha) = \underbrace{\beta_D(q_\alpha)MR_D(q_\alpha) + (1 - \beta_D(q_\alpha))\, MR_U(q_\alpha)}_{\widetilde{MR}_U(q_\alpha)}$$

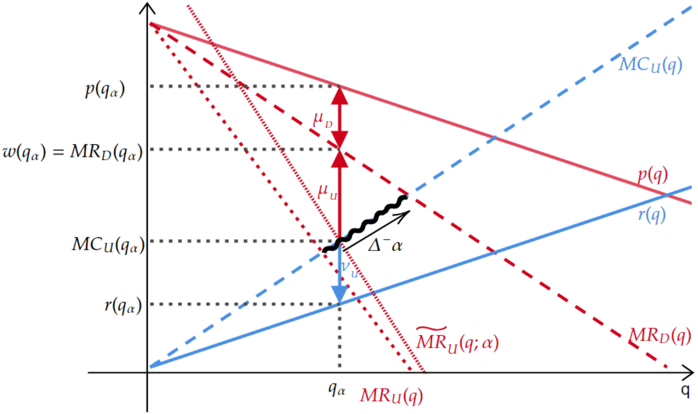
where $\beta_D(q) \equiv \frac{1-\alpha}{\alpha}\frac{\Pi_U(q)}{\Pi_D(q)}$, and $\beta_D(q_{\alpha_1}) = 0 < \beta_D(q_\alpha) < \beta_D(q_{\alpha_l}) = 1$.

Rewriting again the Nash-program FOC yields:

$$r(q_{\alpha_1})\underbrace{\left(1 + \varepsilon_r^{-1}(q_\alpha)\right)}_{\text{markdown } \nu_U(q_\alpha)} = \underbrace{\left(1 - \varepsilon_{MR_D}^{-1}(q_\alpha)(1 - \beta_D(q_\alpha))\right)}_{\text{inv. markup } \mu_U^{-1}(q_\alpha)} w(q_\alpha)$$

road map

Bargaining when D is weak ($\alpha_l < \alpha < 1$): Representation



⇒ double *markup-isation* à la Cournot (1838)-Spengler (1950)

⇒ total welfare decreasing in α

road map

TIOLI offer from D ($\alpha = 0$)

D anticipates that its offer w leads to $q(w) = \tilde{q}_U(w) < \tilde{q}_D(w)$ and thus:

$$w(q) = MC_U(q).$$

Its program, here equivalent to the Nash program (as $\alpha = 0$), is thus:

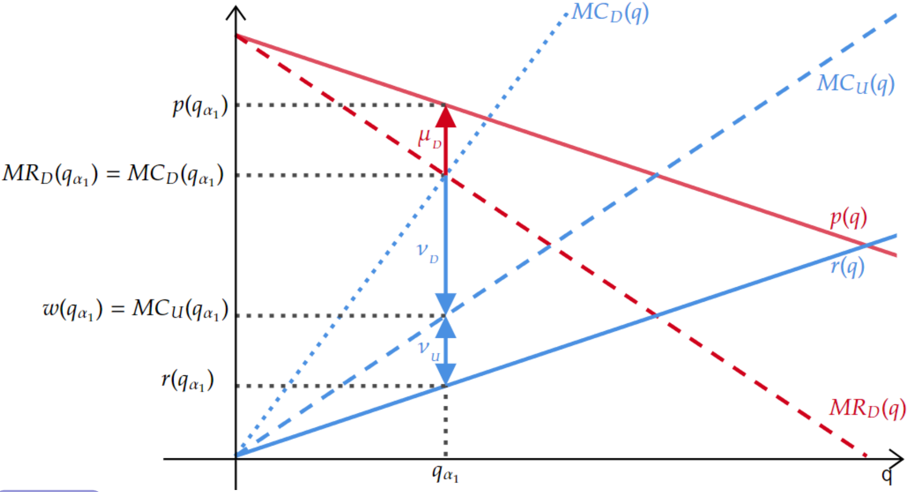
$$\max_q \Pi_D(q) = p(q)q - w(q)q \quad \text{subject to} \quad w(q) = MC_U(q)$$

The FOC yields:

$$\underbrace{p(q_{\alpha_0})\left(1 - \varepsilon_p^{-1}(q_{\alpha_0})\right)}_{MR_D(q_{\alpha_0})} = \underbrace{w(q_{\alpha_0})\left(1 + \varepsilon_{MC_U}^{-1}(q_{\alpha_0})\right)}_{MC_D(q_{\alpha_0};\alpha_0)}$$

where $\varepsilon_{MC_U}^{-1}(q) = \frac{2+\sigma_r(q)}{\varepsilon_r(q)+1}$ and $MC_D(q;\alpha_0) \equiv \frac{\partial MC_U(q)q}{\partial q}$. road map

TIOLI offer from D ($\alpha = 0$): Representation



road map

Bargaining when U is weak $(0 < \alpha < \alpha_I)$

U and D anticipate $q(w) = \tilde{q}_U(w) < \tilde{q}_D(w)$ and $w(q) = MC_U(q)$, hence:

$$\Pi_U(q) = (MC_U(q) - r(q))q,$$
$$\Pi_D(q) = (p(q) - MC_U(q))q.$$

The (rearranged) Nash-program FOC yields the equilibrium quantity q_α:

$$MR_D(q_\alpha) = \underbrace{\beta_U(q_\alpha)MC_U(q_\alpha) + (1 - \beta_U(q_\alpha))\, MC_D(q_\alpha)}_{\equiv \widetilde{MC}_D(q_\alpha)}$$

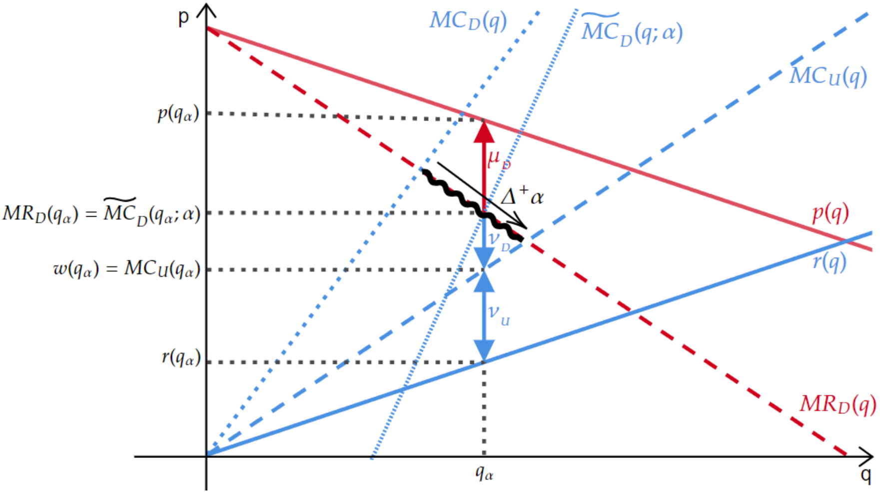
where $\beta_U(q) \equiv \frac{\alpha}{1-\alpha}\frac{\Pi_D(q)}{\Pi_U(q)}$, and $\beta_U(q_{\alpha_0}) = 0 < \beta_U(q_\alpha) < \beta_U(q_{\alpha_I}) = 1$.

Rewriting again the Nash-program FOC yields:

$$p(q_\alpha)\underbrace{\left(1 - \varepsilon_p^{-1}(q_\alpha)\right)}_{\text{inv. markup } \mu_D^{-1}(q_\alpha)} = \underbrace{\left(1 + \varepsilon_{MC_U}^{-1}(q_\alpha)(1 - \beta_U(q_\alpha))\right)}_{\text{markdown } \nu_D(q_\alpha)} w(q_\alpha)$$

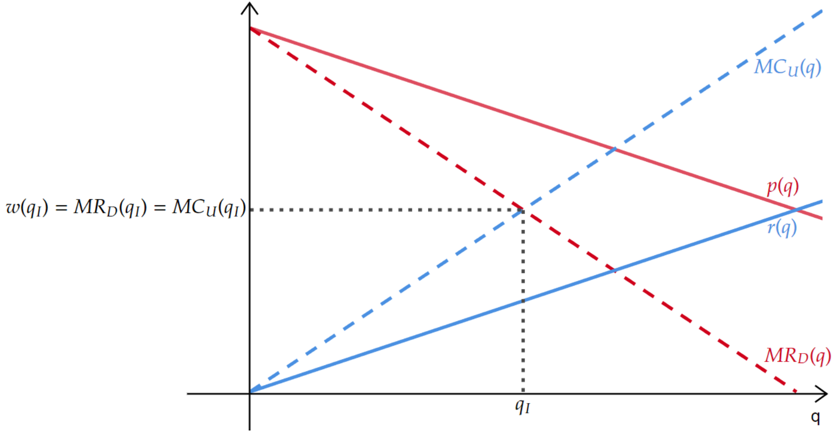
road map

Bargaining when U is weak ($0 < \alpha < \alpha_l$): Representation



⇒ double *markdown-isation* and total welfare increasing in α. ▸ road map

Appendix - Price schedule



▸ Back

Appendix - TIOLI offer from U ($\alpha = \alpha_1 = 1$)

- **Quantity and prices:** $q_{\alpha_1} \leq q_I$, $p(q_{\alpha_1}) \geq p(q_I)$, $r(q_{\alpha_1}) \leq r(q_I)$.
- **Firm U margins:**
  - markup: $\mu_U(q_{\alpha_1}) = \frac{w(q_{\alpha_1})}{MC_U(q_{\alpha_1})} = \frac{\varepsilon_p(q_{\alpha_1}) - 1}{(\varepsilon_p(q_{\alpha_1}) - 1) + (\sigma_p(q_{\alpha_1}) - 2)} > 1$,
  - markdown: $\nu_U(q_{\alpha_1}) = \frac{MR_U(q_{\alpha_1})}{r(q_{\alpha_1})} = 1 + \varepsilon_r^{-1}(q_{\alpha_1}) > 1$,
  - total margin:
    $M_U(q_{\alpha_1}) = \frac{w(q_{\alpha_1})}{r(q_{\alpha_1})} = \nu_D(q_{\alpha_1}) \times \mu_D(q_{\alpha_1}) = \frac{1+\varepsilon_r^{-1}(q_{\alpha_1})}{1-\varepsilon_w^{-1}(q_{\alpha_1})} > 1$.
- **Firm D margins:**
  - markup: $\mu_D(q_{\alpha_1}) = \frac{p(q_{\alpha_1})}{MC_D(q_{\alpha_1})} = \frac{1}{1-\varepsilon_p^{-1}(q_{\alpha_1})} > 1$,
  - markdown: $\nu_D(q_{\alpha_1}) = \frac{MR(q_{\alpha_1})}{w(q_{\alpha_1})} = 1$,
  - total margin: $M_D(q_{\alpha_1}) = \frac{p(q_{\alpha_1})}{r(q_{\alpha_1})} = \mu_D(q_{\alpha_1}) > 1$.

$\Rightarrow$ additional inefficiency w.r.t the integrated firm case due to classical double marginalization (Cournot, 1838; Spengler, 1950).

Back

Appendix - Bargaining when D is weak ($\alpha_I < \alpha < 1$)

- **Quantity and prices:** $q_\alpha \leq q_I$, $p(q_\alpha) \geq p(q_I)$, $r(q_\alpha) \leq r(q_I)$.
- **Firm U margins:**
  - markup: $\mu_U(q_\alpha) = \frac{w(q_\alpha)}{MC_U} = f(\alpha, \varepsilon_r(q_\alpha), \varepsilon_p(q_\alpha), \sigma_p(q_\alpha)) > 1$,
  - markdown: $\nu_U(q_\alpha) = \frac{\widetilde{MR}_U(q_\alpha;\alpha)}{r(q_\alpha)} = 1 + \varepsilon_r^{-1}(q_\alpha) > 1$,
  - total margin: $M_U(q_\alpha) = \frac{w(q_\alpha)}{r(q_\alpha)} = \nu_D(q_\alpha) \times \mu_D(q_\alpha) > 1$.
- **Firm D margins:**
  - markup: $\mu_D(q_\alpha) = \frac{p(q_\alpha)}{MC_D(q_\alpha)} = \frac{1}{1-\varepsilon_p^{-1}(q_\alpha)} > 1$,
  - markdown: $\nu_D(q_\alpha) = \frac{MR(q_\alpha)}{w(q_\alpha)} = 1$,
  - total margin: $M_D(q_\alpha) = \frac{p(q_\alpha)}{r(q_\alpha)} = \mu_D(q_\alpha) > 1$.

Back

Appendix - TIOLI offer from D $(\alpha = \alpha_0 = 0)$

- **Quantity and prices:** $q_{\alpha_0} \leq q_I$, $p(q_{\alpha_0}) \geq p_I$, $r(q_{\alpha_0}) \leq r_I$.
- **Firm U margins:**
  - Markup: $\mu_U(q_{\alpha_0}) = \frac{w(q_{\alpha_0})}{MC_U(q_{\alpha_0})} = 1,$
  - Markdown: $\nu_U(q_{\alpha_0}) = \frac{MR_U(q_{\alpha_0})}{r(q_{\alpha_0})} = 1 + \varepsilon_r^{-1}(q_{\alpha_0}) > 1,$
  - Total margin $M_U(q_{\alpha_0}) \equiv \frac{w(q_{\alpha_0})}{r(q_{\alpha_0})} = \nu_U(q_{\alpha_0}) > 1.$
- **Firm D margins:**
  - Markup: $\mu_D(q_{\alpha_0}) = \frac{p(q_{\alpha_0})}{MC_D(q_{\alpha_0})} = \frac{1}{1-\varepsilon_p^{-1}(q_{\alpha_0})} > 1,$
  - Markdown: $\nu_D(q_{\alpha_0}) = \frac{MR(q_{\alpha_0})}{w(q_{\alpha_0})} = \frac{\sigma_r(q_{\alpha_0}) + \varepsilon_r(q_{\alpha_0}) + 3}{\varepsilon_r(q_{\alpha_0}) + 1} > 1,$
  - Total margin
    $M_D(q_{\alpha_0}) \equiv \frac{p(q_{\alpha_0})}{r(q_{\alpha_0})} = \mu_D(q_{\alpha_0}) \times \nu_D(q_{\alpha_0}) = \frac{1+\varepsilon_w^{-1}(q_{\alpha_0})}{1-\varepsilon_p^{-1}(q_{\alpha_0})} > 1.$

$\Rightarrow$ additional inefficiency w.r.t the integrated firm case due to double marginalization, hereby coming from monopsony power.

Back

Appendix - Bargaining when U is weak $(\alpha_I < \alpha < 1)$

- **Quantity and prices:** $q_\alpha \leq q_I$, $p(q_\alpha) \geq p_I$, $r(q_\alpha) \leq r_I$.
- **Firm U margins:**
  - Markup: $\mu_U(q_\alpha) = \frac{w(q_\alpha)}{MC_U(q_\alpha)} = 1$,
  - Markdown: $\nu_U(q_\alpha) = \frac{MR_U(q_\alpha)}{r(q_\alpha)} = 1 + \varepsilon_r^{-1}(q_\alpha) > 1$,
  - Total margin $M_U(q_\alpha) \equiv \frac{w(q_\alpha)}{r(q_\alpha)} = \nu_U(q_\alpha) > 1$.
- **Firm D margins:**
  - Markup: $\mu_D(q_\alpha) = \frac{p(q_\alpha)}{MC_D(q_\alpha)} = \frac{1}{1-\varepsilon_p^{-1}(q_\alpha)} > 1$,
  - Markdown: $\nu_D(q_\alpha) = \frac{MR(q_\alpha)}{w(q_\alpha)} = g(\alpha, \varepsilon_r(q_\alpha), \varepsilon_p(q_\alpha), \sigma_r(q_\alpha)) > 1$,
  - Total margin $M_D(q_\alpha) \equiv \frac{p(q_\alpha)}{r(q_\alpha)} = \mu_D(q_\alpha) \times \nu_D(q_\alpha) = \frac{1+\varepsilon_w^{-1}(q_\alpha)}{1-\varepsilon_p^{-1}(q_\alpha)} > 1$.

Back

References I

Alviarez, V. I., M. Fioretti, K. Kikkawa, and M. Morlacco (2023). Two-sided market power in firm-to-firm trade. Technical report, National Bureau of Economic Research.

Avignon, R. and E. Guigue (2022). Markups and markdowns in the french dairy market. Technical report, Technical report, mimeo.

Berry, S., J. Levinsohn, and A. Pakes (1995). Automobile prices in market equilibrium. *Econometrica 63*(4), 841–890.

Berto Villas-Boas, S. (2007). Vertical relationships between manufacturers and retailers: Inference with limited data. *The Review of Economic Studies 74*(2), 625–652.

Bonnet, C., Z. Bouamra-Mechemache, and H. Molina (2023). The buyer power effect of retail mergers: An empirical model of bargaining with equilibrium of fear. *RAND Journal of Economics*.

References II

Cournot, A. (1838). Recherches sur les principes mathématiques de la théorie des richesses.

Crawford, G. S. and A. Yurukoglu (2012). The welfare effects of bundling in multichannel television markets. *American Economic Review 102*(2), 643–685.

De Loecker, J. and F. Warzynski (2012). Markups and firm-level export status. *American economic review 102*(6), 2437–2471.

Dubois, P. and M. Sæthre (2020). On the effect of parallel trade on manufacturers' and retailers' profits in the pharmaceutical sector. *Econometrica 88*(6), 2503–2545.

Galbraith, J. (1952). *American capitalism: The concept of countervailing power*.

References III

Gowrisankaran, G., A. Nevo, and R. Town (2015). Mergers when prices are negotiated: Evidence from the hospital industry. *American Economic Review 105*(1), 172–203.

Hahn, N. (2023). Who is in the driver's seat? markups, markdowns, and profit sharing in the car industry. Technical report, Working Paper.

Ho, K. and R. S. Lee (2017). Insurer competition in health care markets. *Econometrica 85*(2), 379–417.

Morlacco, M. (2019). Market power in input markets: Theory and evidence from french manufacturing. *From Micro to Macro: Market Power, Firms' Heterogeneity and Investment, Luxembourg. EIB*.

Mrázová, M. and J. P. Neary (2017, December). Not so demanding: Demand structure and firm behavior. *American Economic Review 107*(12), 3835–74.

Robinson, J. (1933). *The economics of imperfect competition*. Springer.

References IV

Rubens, M. (2023). Market structure, oligopsony power, and productivity. *American Economic Review 113*(9), 2382–2410.

Spengler, J. J. (1950). Vertical integration and antitrust policy. *Journal of political economy 58*(4), 347–352.

Back