Predatory accommodation in vertical contracting with externalities

Philippe Bontems
*University of Toulouse (INRA, IDEI)*
Zohra Bouamra-Mechemache
*University of Toulouse (INRA)*
Introduction

- Predatory pricing may cause injury to competition (Robinson-Patman Act)
- However, Marx & Shaffer 1999 offer a contrasted view
- BCP without exclusion and may be welfare improving (predatory accommodation)
- Assumptions: sequential bargaining between 2 manufacturers and a common retailer, public contracts
Predatory accommodation: the first Manufacturer and the retailer jointly benefit from the presence of the second manufacturer

Here, simultaneous bargaining with externalities between manufacturers (oligopsonistic interaction on an upstream input market)

similar consequences: BMCP
Introduction 3

- Framework consistent with some stylized facts from Food Industry
Introduction 4

- This paper: introduces oligopoly interaction with an imperfectly competitive retail sector
- Extreme case: monopolist retailer
- Simultaneous bargaining game between n Manufacturers and a common retailer
- Extension of M&S in presence of externalities
The model

Competitive Agricultural Sector
Homogenous product

n Manufacturers
Oligopoly and oligopsony
Differentiated products

Upstream producer sector

Retailer
Monopoly and monopsony

Inverse supply function
\[ p_x = P_x \left( \sum_i x_i \right) \]

Inverse demand function
\[ q_i = P_i(q_i) \]

Processing Technology
\[ q_i = f_i(x_i) \]
Cost function

Oligopsonistic competition implies **negative cost externalities**: 
\[ \frac{\partial C_i}{\partial q_j} > 0 \]
Procurement cost depends on the other manufacturers’ purchases:

\[
C_i(q) = \left[ P_x(\sum_i f_i^{-1}(q_i)) \right] f_i^{-1}(q_i)
\]
Main assumptions

A1 : \( R(q) \) is continuous, twice differentiable and concave,

A2 : \( C_i(q) \) is continuous, twice differentiable and convex, \( \forall i = 1, \ldots, n, \)

A3 : There are gains from trading all goods, i.e. \( \exists q \in \mathbb{R}^n_+ \) such that \( R(q) - \sum_i C_i(q) > 0 \)

where \( R(q) \) is the revenue function

\[ R(q) = \sum_i P_i(q)q_i \]
Profits

- Manufacturer profits
  \[ \pi^i = T_i - C_i(q) \]

- Retailer profit
  \[ \pi^R = R(q) - \sum_i T_i \]
Bargaining over contracts

- **Timing:**
  1. Retailer negotiates a contract $T_i(q_i)$ with each $M_i$ simultaneously
  2. Manufacturers compete to buy the raw product and process the goods
  3. The retailer resells the differentiated goods to final consumers

- **Focus on equilibria where all products are sold**

- **Assumptions:**
  1. Bargaining between $R$ and $M_i$ maximizes joint profit, taking as given all other contracts
  2. Each player earns its disagreement payoff plus a share of the incremental gain to trade (with proportion $\lambda_i$ to $M_i$)
Simultaneous bargaining

- Multiple equilibria in contracts
- Restriction to two-parts tariffs

\[ T_i(q_i) = \begin{cases} \omega_i q_i - F_i, & q_i > 0 \\ 0, & q_i = 0 \end{cases}, \forall i = 1 \ldots n \]

- Joint profit of M\(_i\) and R:

\[ \Pi^i = \sum_{i} \left[ P_i(q)q_i \right] - C_i(q) - \sum_{j \neq i} T_j \]
Simultaneous bargaining 2

- Retailing stage:

\[ q(w) \in \arg \max_{q_1, \ldots, q_n} \pi^R = \sum_i [(P_i(q) - w_i)q_i + F_i] \]

- Bargaining stage:

\[ \max_{w_i} \Pi^i = P_i(q(w))q_i(w) - C_i(q(w)) + \sum_{j \neq i} [(P_j(q(w)) - w_j)q_j(w) + F_j] \]
Main results

Proposition 1 In a simultaneous bilateral bargaining equilibrium with two-parts tariffs, wholesale prices are given implicitly by

\[ w_i - \frac{\partial C_i}{\partial q_i} = \sum_{j \neq i} \gamma_{ji} \frac{\partial C_i}{\partial q_j}, \quad \forall i = 1, ..., n. \quad (5) \]

where \( \gamma_{ji} = \frac{\partial q_i}{\partial w_i} \frac{\partial q_i}{\partial w_j} \) with \( |\gamma_{ji}| \in [0, 1] \). Moreover, if products are imperfect substitutes (complements), then wholesale price is below (above) marginal cost \((w_i - \frac{\partial C_i}{\partial q_i} < (>)0, \forall i)\).
Main results 2

- Intuition: decreasing \( w_i \) amounts to decrease rivals’ quantities and hence its own procurement cost « reducing its own cost » strategy
- Cost externalities irrelevant if independent demands
- More compelling when products are less differentiated
- Assuming symmetry, below average cost pricing (with substitutes) iff there is few differentiation

\[ 1 + \sum_{j \neq i} \gamma_{ji} < 0 \]
Main results 3

Proposition 2 In a simultaneous bilateral bargaining equilibrium with two-parts tariffs, joint profit of all manufacturers and the retailer is not maximized.

Optimal internal price for the integrated structure:

\[ w_i = \sum_j \frac{\partial C_i}{\partial q_i} \]
Main results 4

Proposition 3 In a simultaneous bilateral bargaining equilibrium with two-parts tariffs, the equilibrium payoff to manufacturer $M_i$, for any $i$, is:

$$\pi^i = \lambda_i \left[ \Pi - \Pi_{-i} - \Delta_{-i} \right]$$

while the equilibrium payoff to the retailer is:

$$\pi^R = \left(1 - \sum_i \lambda_i \right) \Pi + \sum_i \lambda_i \Pi_{-i} + \sum_i \lambda_i \Delta_{-i}$$

where $\Delta_{-i} = \sum_{j \neq i} \left[ w_{ij} q_j - C_j(q) \right] - \sum_{j \neq i} \left[ w_{ij} \hat{q}_j - C_j(\hat{q}_{-i}) \right]$. 
Optimal fee

\[ F_i = \left[ w_i - \frac{C_i(q)}{q_i} \right] q_i - \lambda_i [\Pi - \Pi_{-i} - \Delta_{-i}] \]

\( \checkmark \) If the retailer has all the bargaining power (\( \lambda_i = 0 \)) and if \( w_i \) is between MC and AC, then \( F_i > 0 \)
Sequential Bargaining

- Extension of Marx and Shaffer (1999) to the presence of externalities
- 2 manufacturers negotiate sequentially with the retailer
- $M_1$ is the first to negotiate
- Proposition 1 obviously applies to $M_2$

$$w_2^* = \frac{\partial C_2}{\partial q_2} + \gamma_{12} \frac{\partial C_2}{\partial q_1}$$
Sequential bargaining 2

Optimal contract for \( M_1 \):

**Proposition 4** At the equilibrium with sequential bilateral negotiations, the wholesale price for \( M_1 \) is given by:

\[
\begin{align*}
    w_1^* - \frac{\partial C_1}{\partial q_1} &= (1 - \lambda_2)(1 - \eta) \frac{\partial C_2}{\partial q_1} + \gamma_{21} \frac{\partial C_1}{\partial q_2} - \frac{\lambda_2}{\frac{\partial q_1}{\partial w_1}}(q_1^* - \hat{q}_1) \\
\end{align*}
\]

where \( \gamma_{ji} = \frac{\partial q_i}{\partial w_i} / \frac{\partial q_j}{\partial w_i} \) and \( \eta = \gamma_{21} \gamma_{12} \).

Internalization effect

Marx and Shaffer’s rent shifting effect

« Reducing its own cost » effect
Sequential bargaining 3

- M&S rent-shifting effect: non positive if substitutes $q_1^* < \hat{q}_1$

Increase in retailer disagreement payoff with $M_2$
But also increase joint profit with $M_2$ that weakens bargaining position of $R$
First effect dominates as long as $\lambda_2 > 0$
-> below marginal cost pricing

- Internalization effect is non negative -> above marginal cost pricing
Incentives to partially internalize the negative externality of $q_1$ on $C_2$

- Two effects towards BMCP
- One effect towards AMCP
Wholesale pricing

For M₁, for low λ internalization effect overcomes the two other effects (rent-shifting and cost reduction)
For high values, the rent shifting effect becomes dominant and BMCP appears
Surplus analysis

- Simultaneous bargaining

BMCP may be welfare improving compared to MCP

For instance,

Proposition 5 Assume that \( n = 2 \). Consider (symmetric) linear demand functions, \( P_i(q_i, q_j) = \alpha - q_i - \nu q_j \) where \( 0 \leq \nu \leq 1 \) as well as a linear supply function \( P_x = \delta + \phi(x_i + x_j) \). In addition, consider a Leontieff (constant return to scale) technology where \( q_i = k x_i \). Then, below marginal cost pricing is always welfare improving compared to marginal cost pricing.
**Surplus analysis with simultaneous bargaining**

**TABLE 1:** Comparisons between below-cost pricing, marginal cost pricing and integrated vertical structure

<table>
<thead>
<tr>
<th></th>
<th>MCP</th>
<th>BMCP*</th>
<th>IVSP*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PS</strong></td>
<td>0.0123</td>
<td>+4.06%</td>
<td>-7.32%</td>
</tr>
<tr>
<td><strong>IS</strong></td>
<td>0.1605</td>
<td>-0.19%</td>
<td>+0.12%</td>
</tr>
<tr>
<td><strong>CS</strong></td>
<td>0.0494</td>
<td>+3.85%</td>
<td>-7.08%</td>
</tr>
<tr>
<td><strong>W</strong></td>
<td>0.2222</td>
<td>+0.95%</td>
<td>-1.85%</td>
</tr>
<tr>
<td>(w_i - \frac{\partial C_i}{\partial q_i})/(w_i)</td>
<td>0.00%*</td>
<td>-4.41%**</td>
<td>+7.50%**</td>
</tr>
<tr>
<td><strong>Average cost</strong></td>
<td>0.3055</td>
<td>+0.36%</td>
<td>-4.12%</td>
</tr>
<tr>
<td><strong>(w_i)</strong></td>
<td>0.3333</td>
<td>-3.75%</td>
<td>+7.14%</td>
</tr>
<tr>
<td><strong>(P_i)</strong></td>
<td>0.6666</td>
<td>-0.93%</td>
<td>+1.80%</td>
</tr>
</tbody>
</table>

*: These values are in percentage of MCP. **: These percentages indicate the value of ratios.
The monopolist retailer always gains a strictly positive profit.
In the sequential game, the industry surplus decreases.
Being the first to negotiate is preferred by both manufacturers.
The retailer would most often play a simultaneous game.
Consumers and upstream producers benefit from a strong bargaining power for manufacturers (increasing competition effect leads to increase in input price but low final price for product 1 which overcomes increase in product 2 price)

A strong bargaining power for the retailer implies a higher size of industry surplus

Overall, welfare increases with manufacturers’ bargaining power
An unbalanced case

The retailer would prefer to negotiate with M₂ first (internalization effect disappears while rent-shifting effect is maximal)
M₁ would prefer simultaneous bargaining while retailer would prefer sequential bargaining
Conclusion

- Oligopsonistic behaviour and bargaining over contracts with a monopolist retailer BMCP as a rule in the substitute case and may be welfare improving
- Inefficiency result for the industry
  Degree of inefficiency depends on the form of contracts
- Extension of M&S in the sequential case
Extensions

- Comparative statics: in progress
  Transmission of shocks at the upstream level, processing level and demand level on prices and surplus sharing
- More general contracts:
  Non linear pricing, market share contracts
- More than one retailer: in progress
  Links with multiprincipals-multiagents literature