Vertical Integration and Foreclosure

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Foreclosure

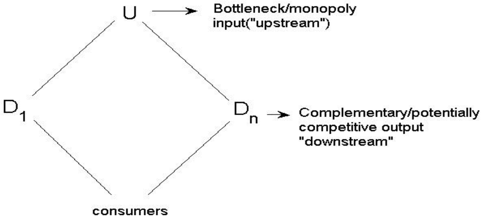
- <u>Definition</u>: A dominant firm denies/ limits access to essential input to some potential users, with the aim to extend its market power from the monopolized segment (tying market) to the complementary segment (tied market)
- <u>Essential facility (bottleneck):</u>
  - essential input ("less costly" does not suffice)
  - controlled by a dominant firm
  - that has no objective reason to deny access (no lack of capacity), no technology incompatibility, no threat to IP protection

Foreclosure

A. Vertical Foreclosure: When a firm controls an input that is essential for a potentially competitive industry.

B. Horizontal Foreclosure: When the bottleneck good is not an input but is sold directly to final users, horizontal foreclosure may arise when the firm somehow bundles the potentially competitive and the bottleneck good.

Vertical Foreclosure



<u>Conducts:</u>

- Vertical Integration ($U - D_1$)
  - refusal to deal
  - incompatibility
  - high wholesale price.
- Discriminatory licensing (exclusive dealing, price discrimination)

Vertical Foreclosure- Examples

- Terminal Railroad Association v. US (1912): TRR formed a joint venture owning a key bridge and excluded non-members.
- Computer Reservation Systems: The Civil Aeronautics Board's decision (1984) imposed equal access in price and quality to what were perceived to be essential facilities.
- Wholesale markets
- Stadiums, ports (Sealink (1992)), airports, tunnels (Eurotunnel)
- Electricity grid, local loop.

Vertical Foreclosure- Remedies

Structural

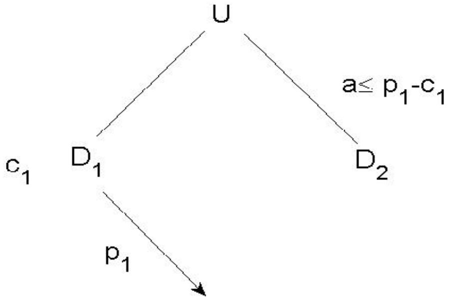
- common ownership of bottleneck (Terminal RR, 1912)
- break-up and line of business restrictions (AT&T, 1984 - divest its regional operations companies).

Regulation of access price (and quality/product characteristics)

- no discrimination of every external clients
- open access
- regulation of wholesale quantities (Eurotunnel)
- (in case of VI) no discrimination between external and internal clients

Vertical Foreclosure- Remedies

Efficient Component Pricing Rule (ECPR): access charge $\leq$ final price - marginal cost on competitive segment (local loop resale)

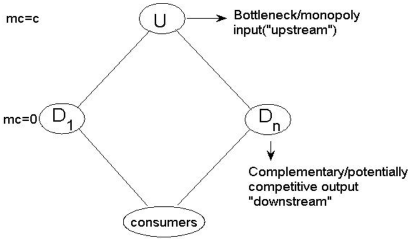


Incentives for Vertical Foreclosure- Preview

Upstream monopolist cannot exercise monopoly power without excluding

- In the absence of VI/exclusivity provision/perfect reputation, U "involuntarily" floods the downstream market.
- Analogies:
  - Patent (often "essential facility"): multiplication of licenses.
  - Franchising: multiplication of franchises.
- Some competition upstream $\Rightarrow$ some access.
- Incentives for foreclosure are stronger
  - the more competitive the downstream industry
  - the less competitive the upstream industry

Vertical Foreclosure Theory



<u>Assume:</u> The profit functions are (strictly) quasi-concave (sufficient condition: $P^{'}(q) + P^{''}(q)q < 0 \; \forall q$)

Define the benchmark:

$$Q^m = argmax(P(q) - c)q$$
$$p^m = P(Q^m)$$
$$\pi^m = (p^m - c)Q^m$$

Vertical Foreclosure Theory

- Stage 1: U offers each D_i a tariff $T_i(q)$, D_i orders q_i and pays $T_i(q_i)$.
- Stage 2: D_1 and D_2 transform the intermediate product to the final good, observe each other's output and set their prices for the final good.
- So the supplier produces to order before the final consumers formulate their demand.
- Kreps-Scheinkman (1983): Bertrand competition with capacities $\approx$ Cournot competition.

Vertical Foreclosure Theory

- Observable contracts: U can fully exert its market power and get the entire monopoly profit (Mathewson and Winter, 1984).
- For example by offering $(q_i, T_i) = (Q^m/2, p^m.Q^m/2)$
- NOTE: Asymmetric allocation of Q^m between the retailers would also work. As long as the downstream firms have symmetric and strictly convex cost functions equal allocation of Q^m is optimal.
- Chicago School Critique: In this world there is no rationale for foreclosure. "There is only one monopoly profit" (Posner, 1976; Bork, 1978).

Vertical Foreclosure Theory

- Hart and Tirole (1990): When supply contracts are private/privately negotiable, $(q_i, T_i) = (Q^m/2, p^m.Q^m/2)$ are not credible.
- Proof: Suppose that U and D_2 have agreed $Q_2 = \frac{Q^m}{2}(T_2 = \frac{p^m.Q^m}{2})$
- U and D_1 would then have an incentive to agree to

$$\begin{aligned} q_1 &= argmax[P(\frac{Q^m}{2} + q) - c]q \\ &= R^C(\frac{Q^m}{2}) > \frac{Q^m}{2} \end{aligned}$$

- where $R^C(.)$ denotes the Cournot reaction function such that $-1 < (R^C)' < 0$.
- Intuition: Once all monopoly sales have taken place (in the 1st period), U has an incentive to sell more to D_1 and exploit the residual demand. Anticipating this D_2 would turn down the monopolist's offer.

Multiplicity of equilibria

- When a common upstream firm deals with more than two downstream firms and contracts are signed bilaterally (not observed by the third parties.)
- If there are externalities between the agents, there is multiplicity of equilibria depending on what agents believe when they receive an out-of-equilibrium offer.

Equilibrium Refinements

- Symmetry conjectures: Each retailer expects that its rival receives the same offer (both on- and off-equilibrium) and so it is willing to pay at most $P(2q)q$ to U.
- Anticipating this U sets $q = \frac{Q^m}{2} = argmax_q[(P(2q) - c)2q]$.
- Passive conjectures: (or market by market bargaining conjectures) When D_i receives an unexpected (out-of-equilibrium) offer from U, D_i believes that U keeps its equilibrium offer to D_{-i} unchanged.
- Passive beliefs are plausible when the supplier produces to order (Cournot competition) since U has no incentive to sell a different quantity to the other downstream firm if it changes its offer to D_i because $\Pi_u = T_1 + T_2 - c.(q_1 + q_2)$ is not affected by retail prices.

Equilibrium with Passive Beliefs

- D_i is willing to pay maximum $P(q_i + q_j)q_i$
- U extracts all of D_i's expected profit by making a t-i-o-l-i offer and sets

$$q_i = argmax_{q_i}[P(q_i + q_j) - c]q_i = R^C(q_j)$$

- The equilibrium is unique and characterized by the Cournot quantities, prices, and profits:

$$q_1 = q_2 = q^C, q^C = R^C(q^C) > \frac{Q^m}{2}$$
$$p_1 = p_2 = p^C = P(2q^C) < p^m$$

Incentives for Foreclosure

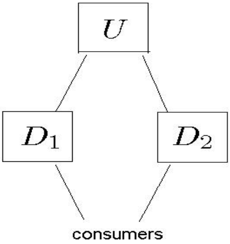
- Commitment problem becomes more severe the larger the number of downstream firms: as n $\rightarrow \infty$, $p^C \rightarrow c$, and $\Pi_U \rightarrow 0$.
- Incentive for foreclosure = restore, rather than extend market power
- Incentive for foreclosure stronger the more competitive the downstream industry

Tools to restore monopoly power

- Exclusive dealing, e.g., exclusive license or franchise contract with one downstream firm, restores U's ability to sustain the monopoly price.
- Vertical integration with one of the downstream firms enables U credibly commit itself to reduce supplies to downstream firms.
- A market-wide RPM together with a return option (O'Brien and Shaffer, 1992)
- Allowing tariffs to be contingent on both firms' outputs ($q_i = \frac{Q^m}{2}, T_i = \frac{p^m.Q^m}{2}$ and a penalty paid by the supplier to the buyer if the buyer's competitor is delivered a higher quantity of the intermediate good, and thus produces a higher quantity of the final good.)

Tools to restore monopoly power: Conditional contracts

- De Fontenay and Gans (2005, Economics Letters): Contracts conditional on actual trade solve the opportunism problem

- 

1. U offers (w_1, F_1) and (w_2, F_2) to resp. D_1 and D_2.
2. D_1 and D_2 accept or reject.
3. All wholesale prices become public.
4. D_1 and D_2 compete in prices and pay their fixed fees.

Tools to restore monopoly power-Conditional contracts

- Let q_1^m and q_2^m denote the monopoly quantities: $q_i^m = D_i(p_1^m, p_2^m)$
- By setting $F_1 = R_1(q_1^m, q_2^m), F_2 = R_2(q_1^m, q_2^m)$, $w_1 = w_1^m$ and $w_2 = w_2^m$, U could commit not to be opportunistic.
- Intuition: Given $q_1 = q_1^m$, suppose that U was opportunistic to D_1 and sold more than the monopoly quantity to the other retailer, $q_2 > q_2^m(w_2 < w_2^m)$.
  - D_1 would then opt out not to pay a fixed fee higher than its variable profit since $F_1 = R_1(q_1^m, q_2^m) > R_1(q_1^m, q_2)$ for any $q_2 > q_2^m$.

Tools to restore monopoly power-Ctd

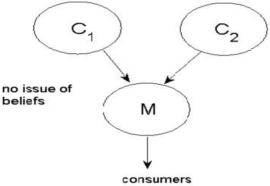
- Most-Favored-Customer (MFC) clauses would help U restore its commitment power (De Graba, 1996).
- Non-discrimination laws enable U to commit and so reduce the consumer surplus and total welfare.
- U alternatively can offer $T(q) = \Pi^m + cq$ to both downstream firm. It is then an equilibrium for D_1 to sign an agreement and for D_2 to turn it down $\Rightarrow$ fixed fee transforms a competitive downstream industry to a natural monopoly.
- Remark: If U is restricted to use linear prices, the outcome would even be worse for consumers and economic welfare! [$q < q^m$ due to double marginalization]

Restoring market power

Exclusionary Behavior	Analogue for the Durable-Good Monopolist
Exclusive dealing	Destruction of production unit
Profit sharing or VI	Leasing
Retail price floor	Most favored nation clause
Reputation for implicit exclusive dealing	Reputation for not flooding the market
Limitation of productive capacity	Limitation of productive capacity

Common Agency

- If the bottleneck is downstream, M internalizes any negative externality between C_1 and C_2 (There is no issue of beliefs, robust regardless of bargaining power is upstream or downstream.)



1. C_1 and C_2 make offers to M, respectively $T_1(.)$ and $T_2(.)$.
2. M decides whether to accept or reject each offer.
3. M orders q_1 and q_2 and pays $T_1(q_1)$ and $T_2(q_2)$ accordingly.

Common Agency-Ctd

- There exists an equilibrium $q_i = \frac{q^M}{2}$, $T_i(q) = 0$ if C_1 and C_2 perfect substitutes, otherwise $T_i(q) = \Pi^M - \Pi_j^m > 0$, where Π^M is monopoly profit with two suppliers and Π_j^m is monopoly profit when supplier j is the exclusive supplier (Bernheim and Whinston, 1986, 1998; Beck and Zender, 1993, Green and Newbery, 1992; Klemperer and Meyer, 1989)
- There always exists an exclusive dealing equilibrium if C_1 offers exclusivity, the other offers exclusivity as well. ($q_i = q^m$; $T_i(q) = 0$ if C_1 and C_2 symmetric.)
- Robust to price competition.
    - IDEA: By selling the product at its marginal cost, upstream firms make the common agent residual claimant of all industry profits.

Common Agency: Price Competition

Competition game

1. C_1 and C_2 set (w_1, F_1) and (w_2, F_2), respectively.
2. M accepts one offer or both offers or none, and sets its price(s) for the accepted product(s).

- Solution:
- 2(i) If M accepted both offers, it sets p_1 and p_2 by

$$(\hat{p}_1, \hat{p}_2) = argmax_{p_1,p_2} \sum_{i=1,2} (p_i - w_i) D_i(p_1, p_2)$$

- Let $\pi_M(1,2) \equiv \sum_{i=1,2}(\hat{p}_i - w_i) D_i(\hat{p}_1, \hat{p}_2)$. In this case, M earns $\pi_M(1,2) - F_1 - F_2$.

Common Agency: Price Competition-Ctd

- 2(ii) If M accepted only C_i's offer, it sets p_i by

$$\tilde{p}_i = argmax_{p_i}[(p_i - w_i)D_i(\phi, p_i)]$$

- Let $\pi_M(i) \equiv (\tilde{p}_i - w_i)D_i(\phi, \tilde{p}_i)$. In this case, M earns $\pi_M(i) - F_i$.
- The highest fixed fee that C_1 can set to have its offer accepted is therefore

$$\overline{F}_1 = \pi_M(1,2) - \pi_M(2)$$

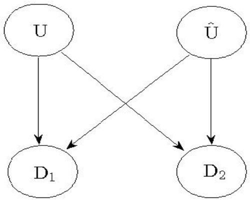
- In equilibrium C_1 sets $F_1 = \overline{F}_1$ and w_1 by

$$max_{w_1}[(\hat{p}_1 - c)D_1(\hat{p}_1, \hat{p}_2) + (\hat{p}_2 - w_2)D_2(\hat{p}_1, \hat{p}_2) - \pi_M(2)]$$

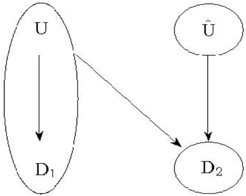
- Given $w_2 = c$ it is optimal for C_1 to set $w_1 = c$, since then C_1's profit coincides with the industry profit up to a constant

Upstream Competition

Alternative supplier $\hat{U}$: $\hat{c} > c$ (less efficient) and substitute to U.



(a)



(b)

Timing

1. U and $\hat{U}$ both secretly offer each D_i a tariff, $T_i(.)$ and $\hat{T}_i(.)$. Each D_i then orders a quantity, q_i and $\hat{q}_i$, and pays $T_i(q_i)$ and $\hat{T}_i(q_i)$.
2. D_1 and D_2 transform the intermediate product into final good, observe each other's output and set their prices for the final good.

(a) Without Vertical Integration

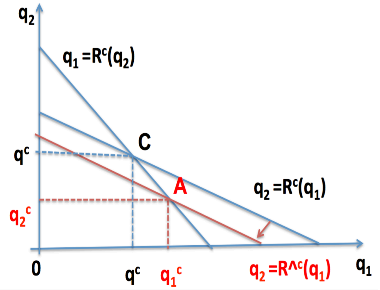
- Solution: (under passive beliefs) U supplies q^c to both downstream firms (as before), but for a payment $= \Pi^c$ - max $[P(q+q^c) - \hat{c}]q$, since each downstream firm can alternatively buy from $\hat{U}$, which is willing to supply them at any price $\hat{p} \geq \hat{c}$.
- $\hat{U}$ does not affect final prices and quantities, but it alters the split of the profit between U and the downstream firms.

(b) When U and D_1 are vertically integrated

- The equilibrium U supllies D_2, but the eqb is the asymmetric Cournot duopoly with costs $c_1 = c < c_2 = \hat{c}$:

$$q_1^C = R^C(q_2^C), q_2^C = \hat{R}^C(q_1^C),$$

- where $\hat{R}^C(q_1)$ denote the Cournot reaction function when the firm faces cost $\hat{c} > c$.

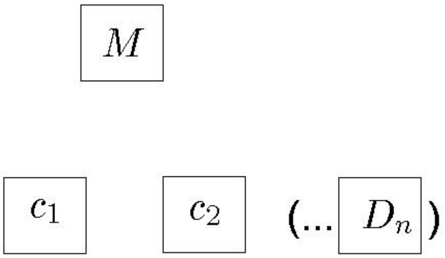
- 

C: Cournot eqb$(c_1 = c_2 = c)$

A: Asymmetric Cournot eqb $(c_1 = c < c_2 = \hat{c})$

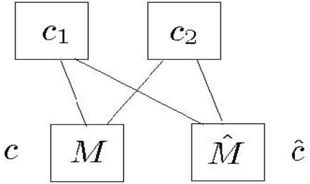
- $2q^c > q_1^c + q_2^c$: Aggregate quantity is lower.
- D_2 is hurt by VI, $U - D_1$ gains more.
- NOTE: ED is strictly dominated unless $\hat{c}$ is very high.

Upstream vs downstream bottleneck



No bypass: Integration between M and C_i results in downstream monopoly (exclusion of C_2), so whether the bottleneck is upstream or downstream, does not matter.

- Possible bypass of the bottleneck segment
  When the bottleneck is downstream, the less efficient alternative downstream firm cannot be shut down $\Rightarrow$ productive inefficiency
- BUT the outcome is again the asymmetric Cournot:
  $q_1 = R^C(q_2), q_2 = \hat{R}^C(q_1)$
  Efficiency loss: $(\hat{c} - c)\ q_2^c$.



- Whether $M - C_1$ is integrated or not, M and $\hat{M}$ have access to good B at marginal cost (zero).

Summary

	VI	NI		VI	NI
BU	M	C	BU	AC	C
BD	M	M	BD	AC	AC
				IP	IP
No Bypass			Bypass		

Vertical Int (VI) or No Int (NI)
Bottleneck Upstream (BU) or Downstream (BD)
M: pure monopoly outcome
C: Cournot eqb. $(c_1 = c_2 = c)$
AC: Asym. Cournot
IP: Inefficient Production

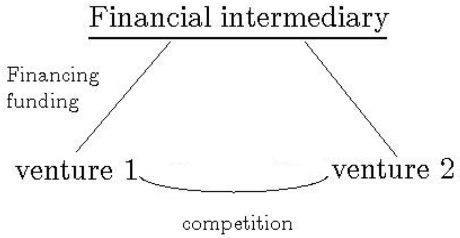
Exclusive Dealing vs Vertical Integration

- No bypass: ED is perfect substitute for VI.
- Bypass: ED is dominated by VI (when $\hat{U}$ is not very inefficient) both for the bottleneck owner and for the social welfare!

Further Issues

- Private incentives not to exclude: Anticipating partial foreclosure by the vertically integrated bottleneck, the independent downstream firm might want to invest in technology of the inefficient bypass.
- Therefore the bottleneck owner might want to commit not to foreclose, which might require divesting downstream units.

“Coasian logic” applies beyond industrial markets.



General results on contracting with externalities.

Passive conjectures?

- Passive conjecture is reasonable in the Cournot case, but less appealing in the case of Bertrand competition.
- A pure strategy equilibrium with passive beliefs might not exist (when gains from multi-lateral deviations $>$ the total gains of the unilateral deviations).
- Rey and Verge (2006) show that the unique contract equilibrium characterized by O'Brien and Shaffer (1992) does not survive multilateral deviations when $\varepsilon_{cross} \geq \frac{1}{2}\varepsilon_{own}$.
- Segal and Whinston (2003) note a similar existence problem when the manufacturer faces non-constant returns to scale.

Alternative conjectures?

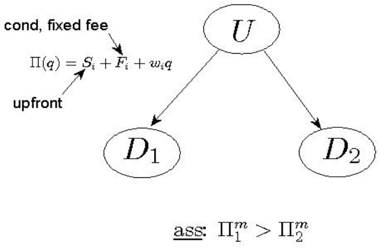
- Wary beliefs: When it receives an unexpected offer, a downstream firm expects that given the received offer the supplier changes its contract optimally with other downstream firms (McAfee and Schwartz, 1994)
- Rey and Verge (2004): When demand is linear, wary beliefs equilibrium exists even when passive beliefs equilibrium fails to exist.
    - These equilibria exhibit some degree of opportunism, although it performs better than when downstream firms hold passive beliefs.

Downstream Bargaining Power

Segal and Whinston (2003), Martimort and Stole (2003)

- Downstream rivals make the offers and the upstream monopolist chooses how much to supply $\Rightarrow$ Equilibrium is again competitive.
- Idea: each bidder exerts an externality on the other, which the contracts cannot internalize despite using a common supplier.

Marx and Shaffer (2007, RAND): Even when conditional tariffs could solve the opportunism of the upstream monopoly, offers by the competing retailers would result in exclusion of the less efficient retailer.



1. D_1 and D_2 offer simultaneously $T_1(q)$ and $T_2(q)$.
2. U accepts or rejects each contract. Contracts become public.
3. D_1 and D_2 competes.

Notation: Let Π^M denote the industry-wide monopoly profit when both retailers are active and Π_i^m denote the monopoly profit when only retailer i is active.

Assumption: Imperfect substitutes: $\Pi_1^m + \Pi_2^m > \Pi^M > max\{\Pi_1^m, \Pi_2^m\}$.

Marx and Shaffer (2007, RAND)-Ctd

- In equilibrium U must be indifferent between accepting one or both offers.
- However, D_i prefers to be the exclusive retailer.
- In equilibrium the more efficient retailer becomes the exclusive dealer (m denotes the monopoly outcome when one retailer is the exclusive dealer).

$$\begin{array}{lll} F_1 = R_1(q_1^m, 0), & S_1 = -(\Pi_1^m - \Pi_2^m), & w_1 = w_1^m = c \\ F_2 \leq R_2(0, q_2^m), & & w_2 = w_2^m = c, \\ S_2 + F_2 = R_2 & & \end{array} \Rightarrow \begin{cases} \pi_1 = \Pi_1^m - \Pi_2^m \\ \pi_u = \Pi_2^m \\ \pi_2 = 0 \end{cases}$$

Rey, Thal-Miklos and Verge (2011, JEEA)

The same framework as Marx and Shaffer (2007), but allow $T_i(q)$ to be contingent on the downstream market structure.

$$T_i(q) = \begin{cases} T_i^c(q) & \text{if both retailers are active} \\ T_i^e(q) & \text{if } D_i \text{ is the exclusive dealer} \end{cases}$$

Rey et al.'s result: There exists an equilibrium where the firms can sustain the monopoly outcome where both retailers are active (denoted by M).

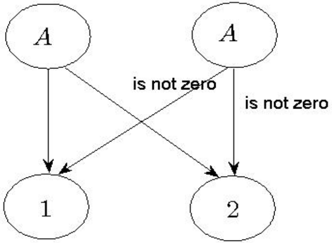
$$
\begin{aligned}
w_i^c &= w_i^M > c \quad \Rightarrow \quad p_i = p_i^M \\
F_i^c &= (p_i^M - w_i^M) q_i^M \\
S_i^c &= -(\Pi^M - \Pi_{-i}^m) \\
w_i^E &= c \rightarrow p_i = p_i^m \\
\\
F_i^E &= \Pi_i^m \\
S_i &= -(\Pi^M - \Pi_{-i}^m)
\end{aligned}
$$

Rey et al.-Ctd

- If U accepts both contracts, it gets $\Pi^M - (\Pi^M - \Pi_1^m) - (\Pi^M - \Pi_2^m) = \Pi_1^m + \Pi_2^m - \Pi^M > 0$ (given that 1 and 2 are substitutes).
- If U accepts only D_i's offer, it gets $\Pi_i^m - (\Pi^M - \Pi_{-i}^m) = \Pi_i^m + \Pi_{-i}^m - \Pi^M$ ($= \Pi_i^m$ if retailers are perfect substitutes.)
- Hence, accepting both offers or only one gives the same profit.
- There exists an equilibrium where both contracts are accepted, both retailers sell the product and pay $F_i = (p_i^M - w_i^M)q_i^M$ $\longrightarrow$ lead to monopolisation.

Interlocking relationships (Rey and Verge, 2010, JIE)

(Observable contracts)



A fails to account for B's margin on its sales.
$\Rightarrow w^{eq} \neq w_{ij}^M$ where w_{ij}^M is the wholesale price which induces the fully integrated monopoly price.

Competition game

1. A offers (w_{A_I}, F_{A_I}), (w_{A_2}, F_{A_2})
   B offers (w_{B_1}, F_{B_1}), (w_{B_2}, F_{B_2})
2. 1 and 2 accept or reject both or none, and set prices (p_{A_1}, p_{B_2}), (p_{A_2}, p_{B_2}).

Rey and Verge (2010)-Ctd

- Assumption: Retailers are competing to get the distribution at each retail site.
- Each upstream firm, say A, sets its contract terms by maximising its profit subject to the participation of each retailer, given the other contracts:

$$
\begin{aligned}
max_{w_{A_1},w_{A_2},F_{A_1},F_{A_2}} \pi_A &= (w_{A_1}-c)q_{A_1}+(w_{A_2}-c)q_{A_2}+F_{A_1}+F_{A_2} \\
st.(i)\pi_1 &= (p_{A_1}-w_{A_1})q_{A_1}-F_{A_1}+(p_{B_1}-w_{B_1})q_{B_1}-F_{B_1}\geq 0 \\
(ii)\pi_2 &= (p_{A_2}-w_{A_2})q_{A_2}-F_{A_2}+(p_{B_2}-w_{B_2})q_{B_2}-F_{B_2}\geq 0
\end{aligned}
$$

- In equilibrium the constraints should be binding and so A's problem becomes

$$
\begin{aligned}
max_{w_{A_1},w_{A_2}}[&(p_{A_1}-c)q_{A_1}+(p_{B_1}-w_{B_1})q_{B_1}-F_{B_1} \\
&+(p_{A_2}-c)q_{A_2}+(p_{B_2}-w_{B_2})q_{B_2}-F_{B_2}]
\end{aligned}
$$

Rey and Verge (2010)- Equilibrium

- In a common agency of one retailer setting $w_i = c$ would induce the retailer to set the monopoly prices p_i^M.
- When there are two common agents competing, the manufacturers set $w_{ij} > c$ to compensate for downstream competition.
- But then manufacturers do not internalise their rivals' (upstream) margin while setting their wholesale prices
- The equilibrium prices will be somehow competitive: $p_{ij} < p_{ij}^M$.
- If the manufacturers can use RPM, there exists an equilibrium with the monopoly outcome: $p_{ij} = p_{ij}^M$, $w_{ij} = c$ (reduce the upstream margins to zero).

Rey and Verge (2010)- Downstream Bottleneck

When the retailers are bottlenecks, so if they reject a supplier's offer, the good of the supplier could be sold at the rival retailer location.

- In equilibrium each retailer is indifferent between accepting one or both offers.
- By offering a retailer $\epsilon > 0$ more amount can break this indifference.
- Under linear demand there exists no equilibrium in which all four channels are active.

Concluding remarks

- When competing suppliers sell through a common agent retailer, a simple two-part tariff is sufficient to coordinate pricing and implement the fully integrated monopoly outcome (robust result).
- When one supplier sells through two (or more) competing retailers,
  - Public contracts: A simple two-part tariff is sufficient to coordinate pricing
  - Secret contracts: The equilibrium prices are competitive with a two-part tariff.
    - Vertical Integration or ED or RPM with a return option or contracts conditional on the rival's output enable coordination.
- When competing suppliers sell through competing retailers, the equilibrium prices are competitive with a two-part tariff.
  - RPM + two-part tariff might enable to implement the fully integrated monopoly prices (multiplicity of equilibria).
  - Technical issues: Inexistent of equilibrium where all channels are active