The Logic of Vertical Restraints, revisited

Stephen Hansen and Massimo Motta

Universitat Pompeu Fabra and Barcelona GSE

Toulouse: 29 June 2012

Our Story

- When downstream firms compete, they impose externalities on each other (when facing a more efficient rival, own profits are lower)
- When downstream firms have private information on their costs:
  1. The size of this externality is unknown ex ante
  2. It depends *endogenously* on the contracts offered by upstream firm
- If downstream firms are risk averse (or subject to limited liability), the uncertainty implies that the upstream firm M must pay out risk premia (or rents) when retailers compete
- Which implications?...

Main Results

1. 'Vertical exclusion with competition externalities' (Paris):
   - Assumptions: (1) the upstream firm M uses simple bilateral contracts; (2) it **can** discriminate; (3) it **cannot** split market between retailers)
   - Results: If retailers are sufficiently risk averse, or cannot lose money, it is optimal to have only one of them
2. This 'note' on "Rey-Tirole, AER 1986":
   - Assumptions: (1) the upstream firm M uses simple bilateral contracts; (2) it **cannot** discriminate; (3) it **can** split market between retailers)
   - Results: If retailers are sufficiently risk averse, or cannot lose money, it is optimal to use ET

"The logic of vertical restraints"

- Rey-Tirole (1986) first introduced asymmetric information between manufacturer and retailers. Three new results:
  1. Depending on the nature of uncertainty and degree of risk aversion, vertical restraints as ET and RPM may or not be optimal
  2. Vertical restraints are not necessarily substitutes
  3. They are not necessarily welfare-improving

Rey-Tirole, II: the role of competition

- When retailers are sufficiently risk-averse, manufacturer wants them to **compete**; when they are risk neutral, it prefers to offer them an exclusive territory clause (ET)
- But Rey-Tirole assume that retailers are fully informed, it is just the manufacturer who is not
- In their context, competition univocally determines downstream market outcome, and therefore eliminates uncertainty for retailers

"The logic of vertical restraints, revisited"

- We assume that retailers' costs are private information (thus departing from Rey-Tirole)
- We consider (like Rey-Tirole) uniform two-part tariff contracts: retailers are offered $A + wq$, w being wholesale price. (Surprisingly, evidence on franchise contracts finds uniformity widespread.)
- Like Rey-Tirole we consider three regimes: COMP, ET, RPM.
- Plus, we consider "vertical integration"
- We reverse their findings:
  - Extreme risk aversion of retailers, manufacturer ranks: ET>RPM>COMP
  - Risk neutrality, it ranks COMP>ET>RPM.

The Model

- A risk-neutral upstream firm M needs two possibly risk-averse retailers, $R1$ and $R2$.(Having n retailers would not change anything)
- Demand functions $p_i = 1 - q_i - gq_j$ (but we mostly focus on $g = 1$: undifferentiated retailers)
- Upstream production is costless; Ri has a constant marginal cost of distribution c_i which is either 0, with probability r (that we assume low enough), or $c < 1/2$, with probability $1 - r$.
- Retail costs c_1 and c_2 are independent.
- (We could rewrite the model with demand uncertainty, $p_i = v_i - q_i - gq_j$, with v_i which is either $1 + k$ or k.)

The Game

1. The manufacturer publicly posts a uniform contract (A, w).
2. Nature chooses the low- or high- cost status of each retailer, which becomes private information to the retailer. (This is THE departure from Rey-Tirole, where retailers know each other's costs.)
3. Each retailer *Ri* simultaneously chooses quantity (knowing own cost and probability distribution of rival *Rj*'s cost)
4. Market price is determined, payments are made.

Extreme retailer risk aversion: COMPETITION

- *Ri*'s certainty equivalent utility equals worst profit realisation; e.g., low cost *Ri* will max $\pi_{Li} = q_{Li}(1 - q_{Li} - q_{Lj} - w)$. (Under risk neutrality: $\pi_{Li} = q_{Li}(1 - q_{Li} - rq_{Lj} - (1 - r)q_{Hj} - w)$
- At the symmetric equilibrium $q_L = (1 - w)/3$ and $q_H = (2 - 2w - 3c)/6$, and profits $\pi_k = q_k^2$ (with $k = L, H$).
- Firm M will max $\pi_M = 2\left[A + w\left(rq_L + (1 - r)\, q_H\right)\right]$, with $A \leq \pi_H = (2 - 2w - 3c)^2/36$; after replacing and solving for w:

$$w_C = \frac{2 - 3c(1 - 3r)}{8}; A_C = \frac{\left(2 - 3c\left(1 + r\right)\right)^2}{64}; \quad (1)$$

$$q_{L,C} = \frac{2 + c(1 - 3r)}{8}; q_{H,C} = \frac{2 - 3c(1 + r)}{8}; \quad (2)$$

$$Q_C = 2\left(rq_{L,C} + (1 - r)\, q_{H,C}\right) = \frac{2 - c(3 - r)}{4}. \quad (3)$$

Extreme retailer risk aversion: ET

- Ri's is assigned half of the market: $q = (1-p)/2$. Risk aversion plays no role since Ri is alone in its ET.
- Standard problem, resulting in: $q_L = (1-w)/4$ and $q_H = (1-c-w)/4$.
- Manufacturer will max $\pi_M = 2A + 2w\left(rq_L + (1-r)\,q_H\right)$ subject to $A \leq \pi_H = (1-c-w)^2/8$:

$$w_{ET} = cr; \quad A_{ET} = \frac{(1-c-cr)^2}{8}; \tag{4}$$

$$q_{L,ET} = \frac{1-cr}{4}; q_{H,ET} = \frac{1-c-cr}{4}; Q_{ET} = \frac{1-c}{2}. \tag{5}$$

Extreme retailer risk aversion: RPM

- Suppose M can impose retail price p. Retailers are undifferentiated and sell at same final price, so each will supply half of the demand.
- For low cost Ri: $\pi_L = (p - w)(1 - p)/2$; for high cost: $\pi_H = (p - c - w)(1 - p)/2$. The manufacturer will set $A = \pi_H$, resulting in profits $\pi_M = 2A + w(1 - p) = (p - c)(1 - p)$. Maximisation will lead to:

$$p_{RPM} = \frac{1 + c}{2}; \; A_{RPM} = \frac{(1 - c)^2}{8}; \tag{6}$$

$$q_{L,RPM} = q_{H,RPM} = \frac{1 - c}{4}; Q_{RPM} = \frac{1 - c}{2}. \tag{7}$$

Extreme retailer risk aversion: COMPARISONS

- For M: $\pi_{M,ET} > \pi_{M,RPM} > \pi_{M,C}$: to eliminate the externality created by the competition uncertainty it resorts to either ET or RPM.
- But RPM removes all uncertainty at the cost of having all types produce the same amount, thus sacrificing all production efficiency.
- As for expected consumer surplus, it increases with both expected output Q and its variance $Var(X)$:

$$CS = E\left[\left(X^2/2\right)\right] = \left(\left[E\left(X\right)\right]^2 + Var\left(X\right)\right) = Q^2 + Var(X).$$

1. Total expected output: $Q_{ET} = Q_{RPM} > Q_C$
2. But under RPM there is no variability of output.
3. It follows that $CS_{ET} > CS_{RPM}$. Also: $CS_{RPM} > CS_C$.

Extreme retailer risk aversion: CONCLUSION

Proposition 1. If retailers are undifferentiated and extremely risk averse, then the manufacturer prefers ET to *RPM*, and *RPM* to *Competition. The social planner would not object to this ranking.*

Risk neutral retailers

Under risk neutrality, the only case to be solved is Competition; under ET and RPM the solutions are identical to previous case

Proposition 2. If retailers are undifferentiated and risk neutral, then the manufacturer prefers Competition to *ET*, and *ET* to *RPM*. *The social planner would not object to this ranking.*

Welfare results: a comment

- With undifferentiated retailers, we found that the social planner's rankings coincide with the manufacturer's
- With sufficiently differentiated retailers, ET may not be optimal for the manufacturer. Also, its choices of vertical restraints may be welfare detrimental
- More particularly, in our product differentiation model with "love for variety" (market expands with differentiation, i.e. when g decreases):
  1. There exists a threshold value $\gamma(c, r)$, such that for $g < \gamma$, COMP is equilibrium
  2. For $g > \gamma$, ET is equilibrium
  3. There exists a threshold value $\hat{g} > \gamma$, such that for $\gamma < g < \hat{g}$ $W_{COMP} > W_{ET}$, i.e., firm M chooses ET but social planner would not.

"Vertical integration"

- Since agents are risk averse, natural to ask whether manufacturer would find it optimal to offer them full insurance
- "Vertical integration": M pays a fixed wage F to Ri's, and owns output. M chooses number of units to sell, gives them to Ri's, who adds retail services and put them on the market on behalf of M, and sends back revenue to M.
- Note that "vertical integration" does not eliminate asymmetric information: M chooses F, q without knowing the retailers' costs (so, if high cost Ri is to sell, $F > cq$, which leaves a rent to low-cost Ri).
- Fixed wage contract turns out to be inferior to ET for the manufacturer.
- **Note**: This is different than usual models, where vertical integration is **assumed** to eliminate informational asymmetries and agents' rents, and thus gives the first best (for industry)

Empirical evidence

Our model suggests that retailers' risk aversion is associated with exclusive territories. No direct evidence on franchisees. However, to the extent that retailers' risk is higher when the franchise is new and less established, we do find some evidence:

- ET adopted when franchisor is small and newly established (McDonald's case)
- In movie industry when exhibitors adopted multiplexes and could diversify across movies, exclusivities disappeared
- Azoulay-Shane (2001): new franchisors are more likely to use ET than large established franchisors (for whom you would expect less product uncertainty and more reneging temptation, which is the Hart-Tirole's motive for ET)