micro 3 2019: Strategic Commitments

- Decisions with respect to variables of an irreversible and long-run character whereby the outcome of the competition at a later stage, the market stage, can be influenced.

- Strategic commitments in order to gain advantages in the competition based on variables of a short run character like quantity or price (tactical decisions in the terminology of Besanko, Dranove and Shanley (1996)).

- The importance of strategic commitments is illustrated by the following example.

		FIRM 2	
		Aggressive	Soft
FIRM 1	Aggressive	(12.5 , 4.5)	(16.5 , 5)
	Soft	(15 , 6.5)	(18 , 6)

Firm 1, the dominant firm, is contemplating its capacity strategy.

"Aggressive" $\Leftrightarrow$ large and rapid increase in capacity

I. Simultaneous capacity decisions

Nash equilibrium (soft, aggressive) $\Rightarrow$ (15, 6.5)

II. If firm 1 can make a commitment to the aggressive strategy (a pre-emptive move) $\Rightarrow$ firm 1 can guarantee itself a payoff 16.5 as long as firm 1's commitment is credible.

Equilibrium outcome: (aggressive, soft)

(16.5, 5)

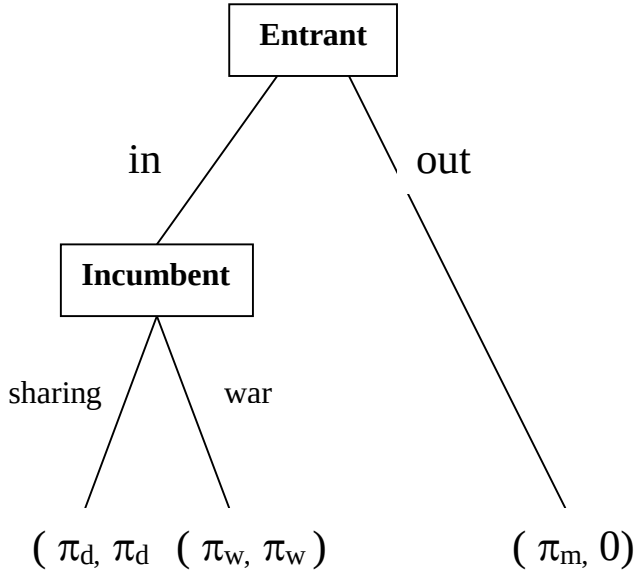
A Taxonomy of Commitment Strategies

Whether a firm should make a strategic investment depends on whether the commitment makes the firm tough or soft and on whether the tactical variables (for example price or production) with respect to the subsequent short-run competition are strategic substitutes or complements.

	Tough	Soft
Strategic Complements (e.g., prices)	"Puppy-Dog Ploy" Strategic effect is negative: commitment causes rival to behave more aggressively	"Fat-Cat Effect" Strategic effect is positive: commitment causes rival to behave less aggressively
Strategic Substitutes (e.g., quantities)	"Top-Dog Strategy" Strategic effect is positive: commitment causes rival to behave less aggressively	"Lean and Hungry Look" Commitment causes rival to behave more aggressively

APPLICATION I: STRATEGIC ENTRY DETERRENCE

Example: Consider the extensive form entry game in which one Nash equilibrium is not self-enforcing.



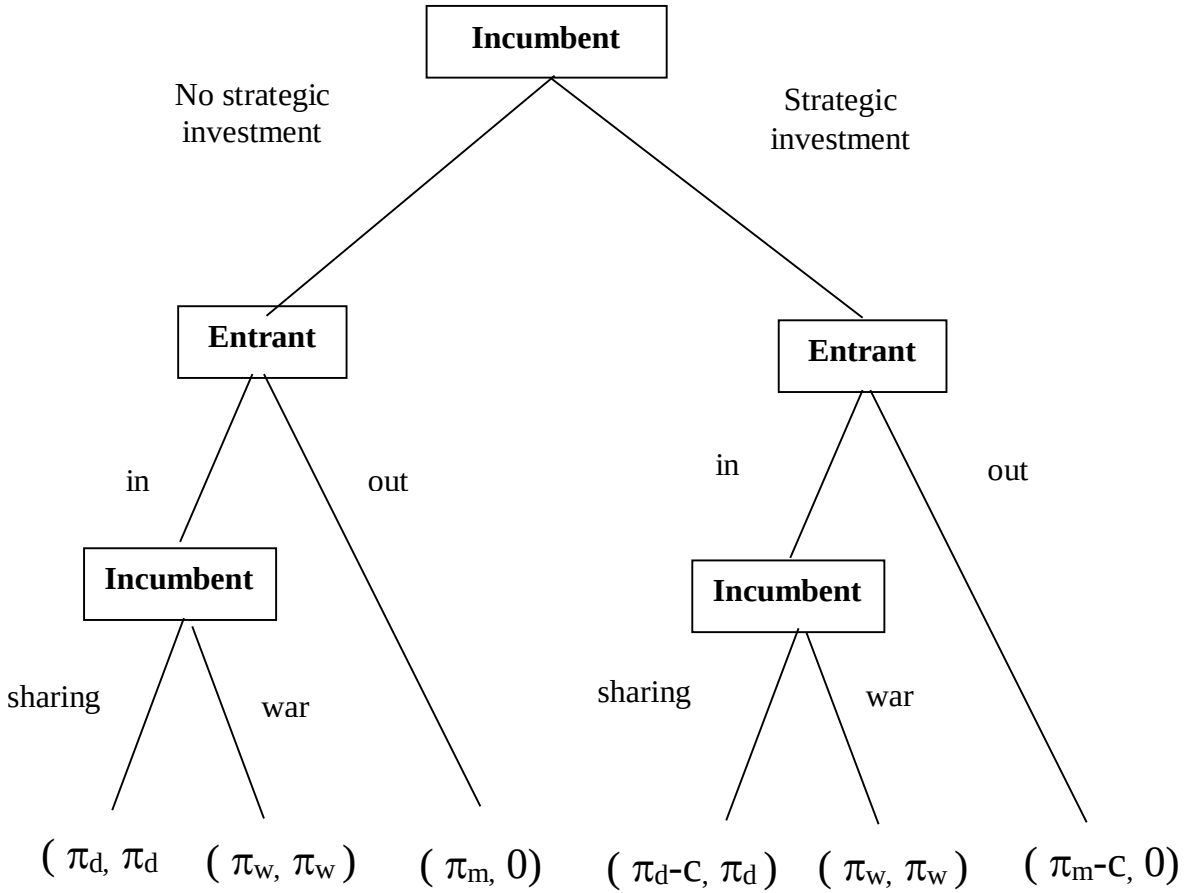
Assume: $\pi_m > \pi_d > 0 > \pi_w$

Two Nash equilibria: (in,share)
(out,war)

However, (out,war) is not credible! If entry does take place it is not rational for the incumbent to choose war.

In the example above (in,share) is a subgame perfect equilibrium.

Example: Illustration of how a strategic commitment can change the set of subgame perfect equilibria.



Assume that the incumbent has access to a specific and irreversible investment corresponding to a fixed cost c, providing the means to engage in war. This expenditure does not affect its profits if war actually takes place because π_w includes such expenditure, but in other circumstances it burdens profits.

It is *credible* for the incumbent to engage in war if $\pi_w > \pi_d - c$

If so, the entrant's optimal strategy is to stay out of the market. The incumbent, aware of this, must therefore assess recursively if its optimal behavior is to choose the strategic investment or not. The incumbent will opt for strategic behavior if $\pi_m - c > \pi_d$. In sum, the incumbent will engage in strategic investment and deter entry if and only if

$$\pi_m - \pi_d > c > \pi_d - \pi_w$$

APPLICATION 2: STRATEGIC DELEGATION

The owners of the competing firms (the principals) delegate the production decisions to professional managers (the agents).

Consider a duopoly where competition takes place in two stages.

I. Owners simultaneously write and publicly announce compensation contracts with the managers. These contracts specify how the managers are rewarded (conditional on the firm's verifiable profit and output).

II. Managers simultaneously choose their firms' output.

Introduce the following notation:

$\pi_i(q_i, q_j)$: profit of firm i (i=1,2) as a function of the production levels chosen by the two firms

$R_i(q_i, q_j)$: revenue of firm i (i=1,2) as a function of the production levels chosen by the two firms

Let us consider the following class of compensation contracts

$$g_i = \lambda_i \pi_i(q_i, q_j) + (1-\lambda_i) R_i(q_i, q_j)$$

$$= R_i(q_i, q_j) - \lambda_i C_i(q_i) \qquad \text{(i=1,2).}$$

Definition 1: A combination of production decisions (q_1^*, q_2^*) is a Nash equilibrium in the managers' subgame if

$$q_i^* = \arg\max_{q_i} g_i(q_i, q_j^*) \qquad i, j = 1,2; i \neq j.$$

Since g_i depends on λ_i, λ_j we can see that $q_i^* = q_i^*(\lambda_i, \lambda_j)$.

Definition 2 The choice of delegation parameters $(\lambda_1^*, \lambda_2^*)$ is a subgame perfect delegation equilibrium if

$$\lambda_i^* = \arg\max_{\lambda_i} \pi_i(q_i^*(\lambda_i, \lambda_j^*), q_j^*(\lambda_j^*, \lambda_i)) \qquad i, j = 1,2; i \neq j.$$

Let us examine the model above with linear demand, homogeneous products, Cournot competition and constant marginal costs.

Assume:

Linear inverse demand $p = a - b(q_1 + q_2)$, a > 2

Constant marginal costs c = 1

In this case we find that the Nash equilibrium with respect to the production decisions is given by

$$q_i^* = \frac{a - 2\lambda_i + \lambda_j}{3b} .$$

Note: Owner i makes his manager more aggressive by decreasing λ_i, i.e. by placing a higher relative weight on sales.

At the delegation stage the profit of owner i is

$$\pi_i(\lambda_i, \lambda_j) = \frac{1}{9b}\left(M + \lambda_i(6 - a - \lambda_j) - 2\lambda_i^2\right) ,$$

where $M = a^2 - 3a - 3\lambda_j + 2a\lambda_j + \lambda_j^2$.

The reaction function of owner i is

$$\lambda_i = \frac{1}{4}\left(6 - a - \lambda_j\right)$$

$\Rightarrow$ the delegation equilibrium

$$\lambda_i^* = \frac{6-a}{5}$$

Conclusion The delegation equilibrium is characterized by a positive weight on revenues, i.e. $\lambda_i^* < 1$.

The owners of firms engaged in strategic product market competition will have strategic incentives to delegate the production decisions to managers who are offered contracts which deviate from profit maximization. The owners have strategic incentives to design compensation contracts with a positive weight on sales so as to make the managers more aggressive.

The same reasoning can be used provide a strategic justification for the use of option contacts.

With Cournot competition in the product market the delegation equilibrium will generate output decisions which are higher than the ordinary Cournot level, yet still below the socially optimal level.

Prisoners' dilemma situation from the point of view of the owners.

INDIVIDUAL STUDY APPLICATION 3: FINANCIAL STRUCTURE AND STRATEGIC PRODUCT MARKET COMPETITION

I. Financial Structure

II. Product Market Competition

Brander & Lewis (AER, 1986)

Second stage: Cournot competition in a market where demand is uncertain

- Debt serves as a commitment to a risky product market behaviour (with Cournot competition)

- Limited liability: Risky debt ↔ purchasing a "call option" on the earnings of the firm. The value of such an option increases the greater the volatility of the underlying asset.

- Of course, shareholders prefer higher profits to lower profits, but once the firm has been pushed into bankruptcy, they are indifferent to whether its losses are large or small (limited liability).

- Because debt makes the production decisions more aggressive, the logic of the TOP-DOG strategy applies.

- Thus, with Cournot competition in the short run debt has a strategic value for firms operating under limited liability.