Analysis on Competition Policy

Hongbin Cai

Peking University

Novemeber 2007

Content

- Collusion

——Competitors act as a single firm.

- Horizontal Mergers

—— Competitors join to form a single firm.

- Monopolization

——The preexisting single firm makes its own decision.

Preliminary Knowledge

- **Cournot Equilibrium**

  It is a classic model of Nash Equilibrium, where a small number of firms produce homogeneous products and simultaneously decide their own output levels respectively.

- **Bertrand Equilibrium**

  It is a classic model of Nash Equilibrium, where a small number of firms simultaneously decide the price for the products.

- **Market Power**

  It is a fundamental concept to antitrust economics and to the law. It is a natural measure how much power over price a firm owns in a certain market.

Cournot Equilibrium

- Suppose there are N firms in a certain market.
- They produce homogeneous products and simultaneously decide their own output level. We denote Q_i as the output level of firm i with a cost function $c_i(Q_i)$.
- The market price associated with the aggregate output $\sum_{i=1}^{N} Q_i$,is taken to be $P(\sum_{i=1}^{N} Q_i)$ (Demand Function).

Cournot Equilibrium

- Firm i's maximization problem is

$$\max_{Q_i} \pi(Q_i, Q_{-i}) = P(\sum_{i=1}^{N} Q_i)Q_i - c_i(Q_i)$$

Cournot assumed an interior optimum for each firm.

- The first-order condition is

$$\frac{\partial \pi(Q_i, Q_{-i})}{\partial Q_i} = P'(\sum_{i=1}^{N} Q_i)Q_i + P(\sum_{i=1}^{N} Q_i) - c_i'(Q_i) = 0$$

Cournot Equilibrium

- It is convenient to rearrange the above equation to take the form

$$P(Q)[1+\frac{dP}{dQ}\frac{Q_i}{P}]=c_i'(Q_i) \Rightarrow P(Q)[1+\frac{dP}{dQ}\frac{Q}{P}s_i]=c_i'(Q_i)$$

$$\Rightarrow P(Q)[1+s_i/\varepsilon]=c_i'(Q_i)$$

where $Q=\sum Q_i$ is the total output, $s_i=Q_i/Q$ denotes firm i's share of industry output and ε is the elasticity of market demand.

Cournot Equilibrium (Special Case)

- If each firm has constant marginal cost, then adding up both sides of the first-order condition equation across all n firms, we have

$$P'(\sum_{i=1}^{N} Q_i)Q + nP(\sum_{i=1}^{N} Q_i) = \sum c_i$$

Here, aggregate industry output only depends on the sum of marginal costs.

- If, in addition, all firms have the same constant marginal cost, hence, in a symmetric equilibrium $s_i = 1/n$, and if the elasticity of market demand is also constant, then

$$P(\sum_{i=1}^{N} Q_i)[1+1/N\varepsilon] = c$$

.

For this simple case, it is clear that as $N \to \infty$, price will approach marginal cost.

Bertrand Equilibrium (Symmetric MC)

Suppose there are N firms with constant marginal cost c and face a market demand curve of D(P). Each firm decides the private price P_i for her own products, while all the products are assumed to be homogeneous.

The representative firm i face the following demand curve.

$$d_i(P_i, P_{-i}) = \begin{cases} D(P_i) & \text{if } P_i < \min P_{-i} \\ D(P_i)/n & \text{if } P_i = \min P_{-i} \text{ while there are n firms' price equal to } P_i. \\ 0 & \text{if } P_i > \min P_{-i} \end{cases}$$

Bertrand Equilibrium (Symmetric MC)

Consider the following strategy profile for all the firms.

Set price $P_i = c$ and produces $D(c)/N$ units of output.

In such a case, all the firms' payoffs are zero. It is easy to check that no one would deviate since given the other firms' strategies, any firm will get no more than zero whatever action it may choose.

Bertrand Equilibrium (Asymmetric MC)

Suppose there are two firms with constant marginal costs of c_1 and c_2 . Without loss of generality, we assume $c_1 < c_2$.

They face a market demand curve of D(P). Each firm decides the private price P_i for her own products, while all the products are assumed to be homogeneous.

The representative firm i face the following demand curve.

$$d_i(P_i, P_{-i}) = \begin{cases} D(P_i) & \text{if } P_i < P_{-i} \\ D(P_i)/2 & \text{if } P_i = P_{-i} \\ 0 & \text{if } P_i > P_{-i} \end{cases}$$

Bertrand Equilibrium (Asymmetric MC)

Consider the following strategies for firm 1 and firm 2:

Set $P_1 = c_2$ and produce $D(c_2)$.

Set $P_2 = c_2$ and produce zero.

In such a case, firm 1 earns $D(c_2)[c_2 - c_1] > 0$, while firm 2 gets zero.

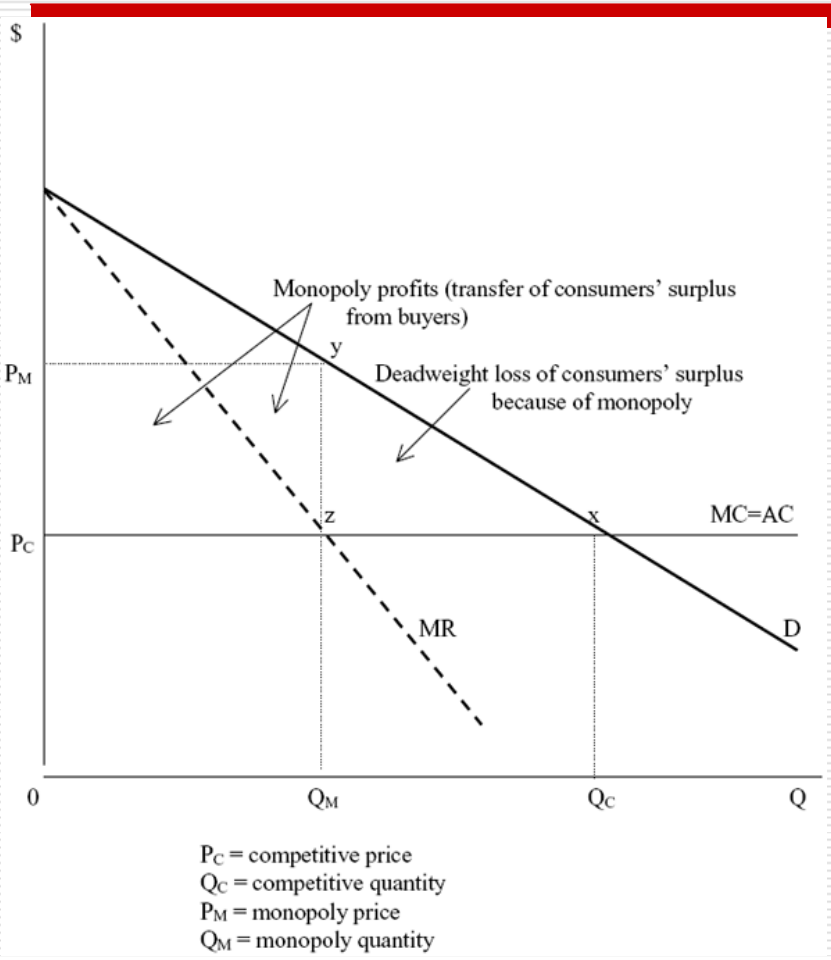
Obviously, if firm 1 lowers its price, its profit will be decreased.

If firm 1 raises its price, its payoff becomes zero given $P_2 = c_2$.

Hence, firm 1 doesn't have the incentive to deviate.

On the other hand, firm 2 cannot get more than zero whatever price it sets.

The Allocative Inefficiency of a Monopoly



- Under monopoly with a linear demand, there exists the so-called deadweight loss of total surplus, i.e., the area of triangle xyz compared to the case of competitive market.
- However, the firm's welfare will be increased by the rectangle Pm Pc y z due to its market power.
- Therefore, we can draw an intuitive conclusion that monopolies are "bad".
- Antitrust law or Anti-Monopoly Law is supposed to restrict producers from abusing market power.

Market Power

Although the notion of a perfectly competitive market is extremely useful as a theoretical construct, most real-world markets depart at least somewhat from this ideal. Hence in practice, almost all firms have some degree of technical market power.

The profit $\pi = PX(P) - C(X(P))$

where X is the firm's product, P is the price the firm receives for its product and $C(X)$ is the cost function.

Market Power

First- order condition with respect to price,

$$0 = \frac{dX}{dP}P + X(P) - \frac{dX}{dP}MC \Rightarrow \frac{P - MC}{P} = -\frac{1}{\frac{dX}{dP}\frac{P}{X}} = \frac{1}{|\varepsilon|}$$

where ε is the elasticity of demand facing that firm and MC is the marginal cost.

Market Power——Definition

$$m \equiv \frac{P - MC}{P} = \frac{1}{|\varepsilon|}$$ the percentage gap between price and marginal cost, which is known as the Lerner Index, is a natural measure of a firm's technical market power.

Specifically, if $m = 0$, it is the case of perfectly competition where firms have no market power.

Market Power——Single –Firm Pricing Model

- Suppose there is one dominant firm facing one or more rivals that sell the same, homogeneous product. When setting prices P, the firm recognizes that rivals will likely respond to higher by producing more output.

- The combined output of the firm's rivals increases with price according to Y(P), with $Y'(P) \geqslant 0$.

- Total demand declines with price according to Z(P), with $Z'(P) \leqslant 0$. The firm's residual demand curve is therefore given by $X(P)=Z(P)-Y(P)$.

Market Power ——Single –Firm Pricing Model

According to the above definitions, the elasticity of the dominant firm can be expressed as

$$|\varepsilon_F| = -\frac{PdX(P)}{XdP} = -\frac{PdZ(P)}{XdP} + \frac{PdY(P)}{XdP} = -\frac{PdZ(P)}{SZdP} + \frac{(1-S)PdY(P)}{SYdP} = \frac{|\varepsilon_D| + (1-S)\varepsilon_Y}{S}$$

where $S = \frac{X}{Z}$ denoting the market share of firm i and

$\varepsilon_F, \varepsilon_D, \varepsilon_Y$ are respectively the elasticity of demand of the dominant firm, the market elasticity of demand and the elasticity of supply of the firm's rivals.

One polar case in this model is that of the traditional monopolist, where S=1. So the elasticity of demand faced by the firm is the market elasticity of demand.

Multiple-Firm Models——Cournot Model

Define $$PCM \equiv \sum_{i=1}^{N} S_i \frac{P - MC_i}{P} = \frac{1}{|\varepsilon_D|} \sum_{i=1}^{N} S_i^2 = \frac{H}{|\varepsilon_D|}$$

where S_i is the market share of firm i

and $H = \sum_{i=1}^{N} S_i^2$ is the Herfindahl-Hirschman Index (HHI) of market concentration.

One of the attractive theoretical features of the Cournot Model s that it generates an elegant formula for the industry-wide average, output-weighted, price-cost margin, that is the expression of PCM.

Multiple-Firm Models——Bertrand Model with Differentiated Products

Suppose there are N firms, a representative firm i's product

$$X_i = D_i(P_1, P_2, \ldots P_N)$$

as usual, the profits of firm i are given by $\pi_i = P_i X_i - C_i(X_i)$

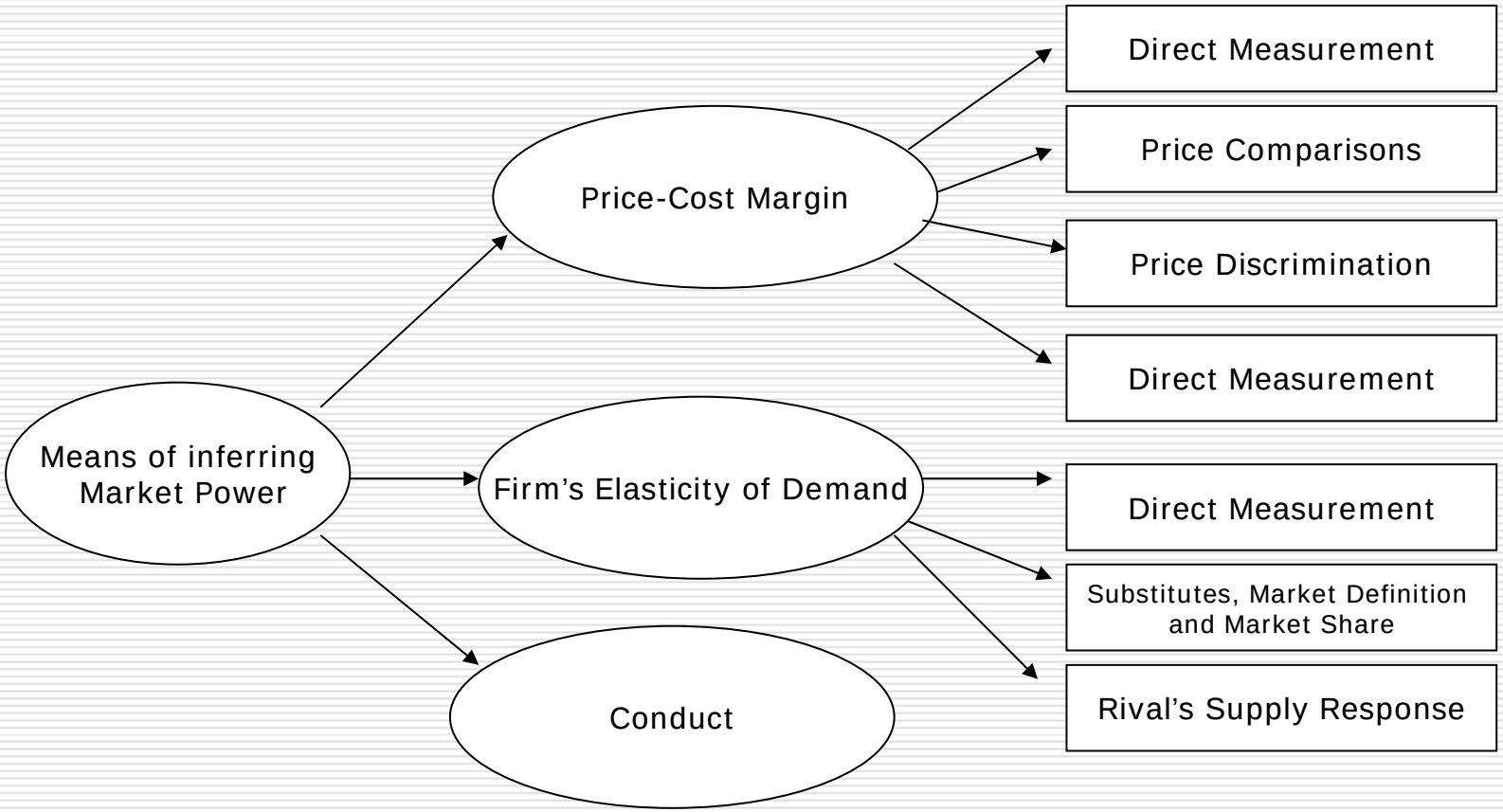
Writing the elasticity of demand facing firm i as $\varepsilon_i = \frac{\partial X_i}{\partial P_i}\frac{P_i}{X_i}$.

firm i's first-order condition is te usual markup equation

$$\frac{P_i - MC_i}{P_i} = \frac{1}{|\varepsilon_i|}$$

Bertrand theory predicts larger markups when the products offered by the various firms are more highly differentiated.

Means of Inferring Market Power



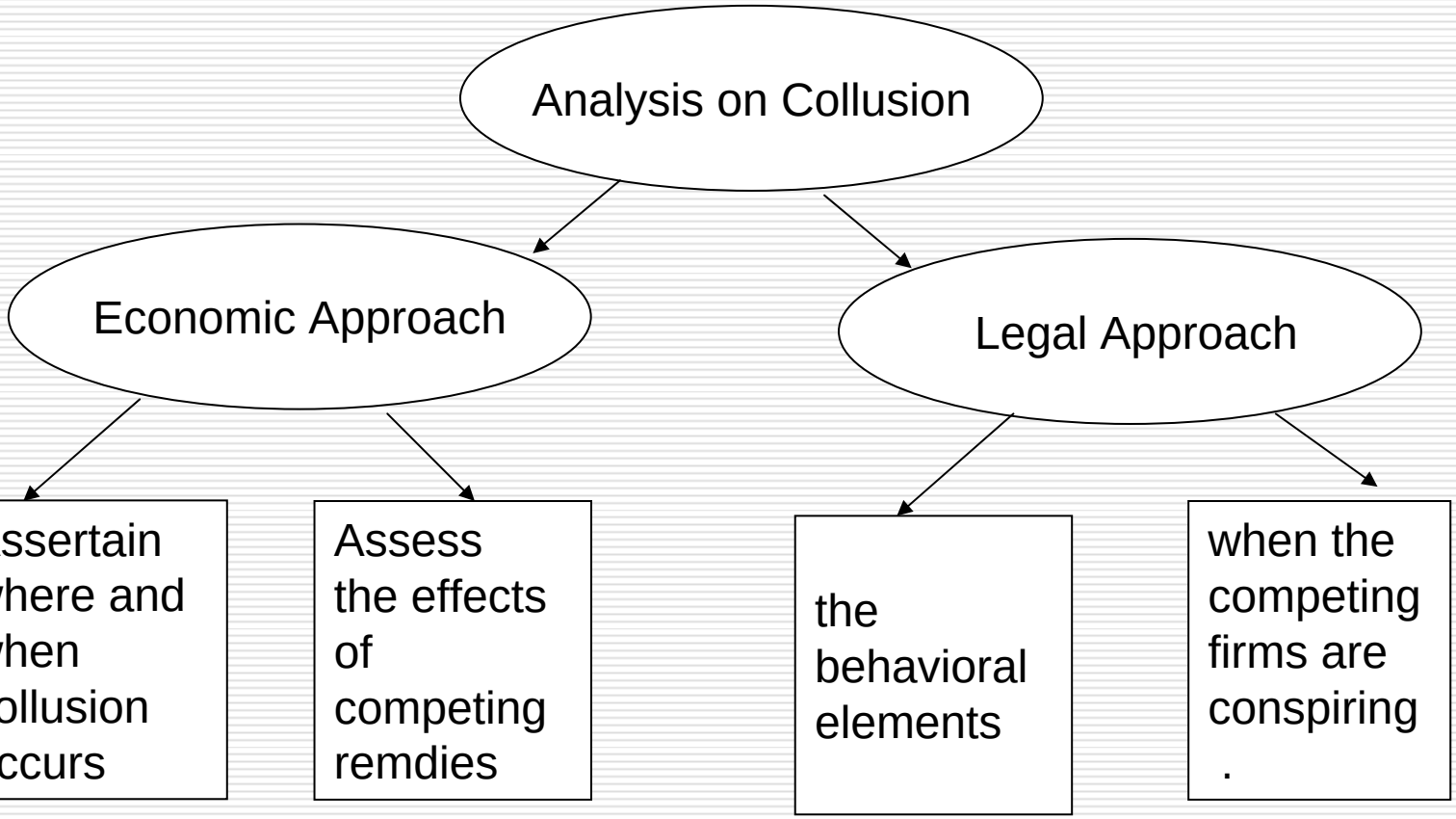
Comments on Market Power

- Assessing the extent of or increase in market power in a given situation is often difficult undertaking.
- In the above static model, we have shown that market power might decrease the social efficiency. But in a dynamic model, some economists, Motta(2004) for example, argue that market power might play an important role as it gives firms incentive for R&D.
- Economic efficiency criterion was taken over from the Coase's supporters among the Chicago School antitrust scholars, who applied it in antitrust area. According to them, it was not sufficient to rely upon some objective criteria (e.g. market share) to decide whether some particular action of the firm was monopolizing, but additionally, it was necessary to estimate economic efficiency of that action.
- According to Chicago antitrust revisionists, it was necessary to find out whether the prospective merger would enhance the consumer welfare, or diminish it; that is, whether cost savings deriving from the economy of scale will exceed deadweight loss from harming the optimal market structure.

Collusion

- Economic and Legal Approaches
- Oligopoly Theory
- Industry Conditions Bearing on the Likelihood of Collusive Outcomes
- Agreements under Antitrust Law
- Other Horizontal Arrangements
- Antitrust Enforcement

Collusion


Analysis on Collusion
Economic Approach
Legal Approach
Assertain where and when collusion occurs
Assess the effects of competing remdies
the behavioral elements
when the competing firms are conspiring .

Oligopoly Theory

- Elements of Successful Collusion
  - Reaching consensus
  - Detection
  - Punishment
  - Inclusion
  - Entry barriers
- Repeated Oligopoly Games and the Folk Theorem
  - Perfect Monitoring
  - Imperfect Monitoring
- Role of Communications

Repeated Oligopoly Games and the Folk Theorem

- Perfect Monitoring

  Fudenberg and Maskin (1986)
  Abreu(1988), etc.

- Imperfect Monitoring

  Green and Porter (1984)
  Abreu, Pearce and Stachetti(1986,1990)
  Fudenberg, Levine and Maskin (1994), etc.

Folk Theorem

Classic Folk Theorem: For any $(v_1, v_2 \ldots v_n) \in V^*$, if players discount the future sufficiently little, there exists a Nash equilibrium of the infinitely repeated game where for all i player i's average payoff is v_i and

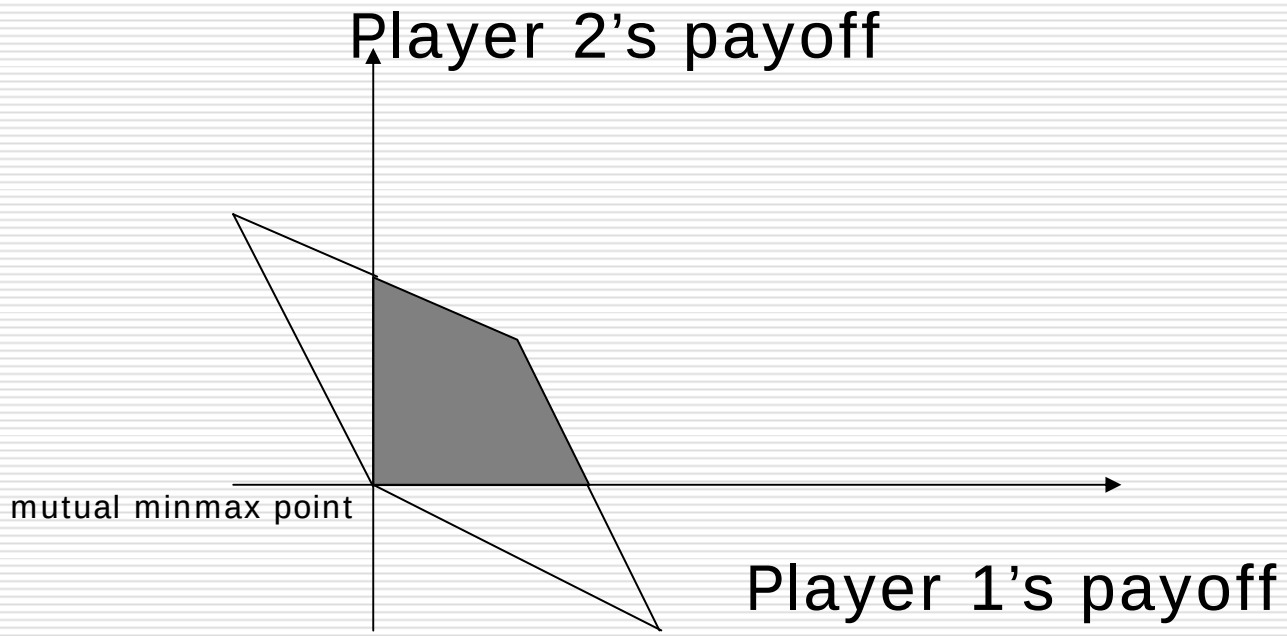
$$V^* = \{(v_1, v_2 \ldots v_n) \in V \mid v_i > \min\max v_i \quad \text{for all } i\}$$

is the set of individually rational payoffs, which is contained in the feasible payoff set V .

The intuitive explanation of this theorem is that when players are patient enough, they will give up the current temptation to maximize the total payoff in the long run.

The Illustration of the Set of Individually Rational Payoffs

- The Example of Two Players



The Development of Folk Theorem From Nash Equilibrium to Perfect Equilibrium

- Friedman (1971) shows that any payoff vector Pareto dominating a one-shot Nash equilibrium will be sustained by a perfect equilibrium if the discount factor is close to unity.

- Aumann and Shapley(1976), Rubinstein(1979) demonstrate that if the discount factor is close to unity, any payoff vector in the set of individually rational payoffs can be sustained by a perfect equilibrium.

- Fudenberg and Maskin (1986) provides the sufficient condition that any vector in V* can be sustained a perfect equilibrium when the discount factor is strictly less than 1. Abreu, Dutta and Smith (1994) gives the sufficient and necessary condition for that case.

Perfect Monitoring
——Fudenberg and Maskin (1986)

- If the dimensionality of V* equals to n, the number of players, namely, the interior of V* is nonempty, then any element in V* can be sustained by a subgame-perfect equilibrium when the discount factor is close to unity.

- The intuitive idea is that if one player deviates, he will be minmaxed by the other players long enough to wipe out any gain from his deviation. To induce the other players to go through with minmaxing him, they are ultimately given a reward in the form of an additional e in their average payoff. The possibility of providing such a reward relies on the full dimensionality of the payoff set.

- Consider the following strategy for player I

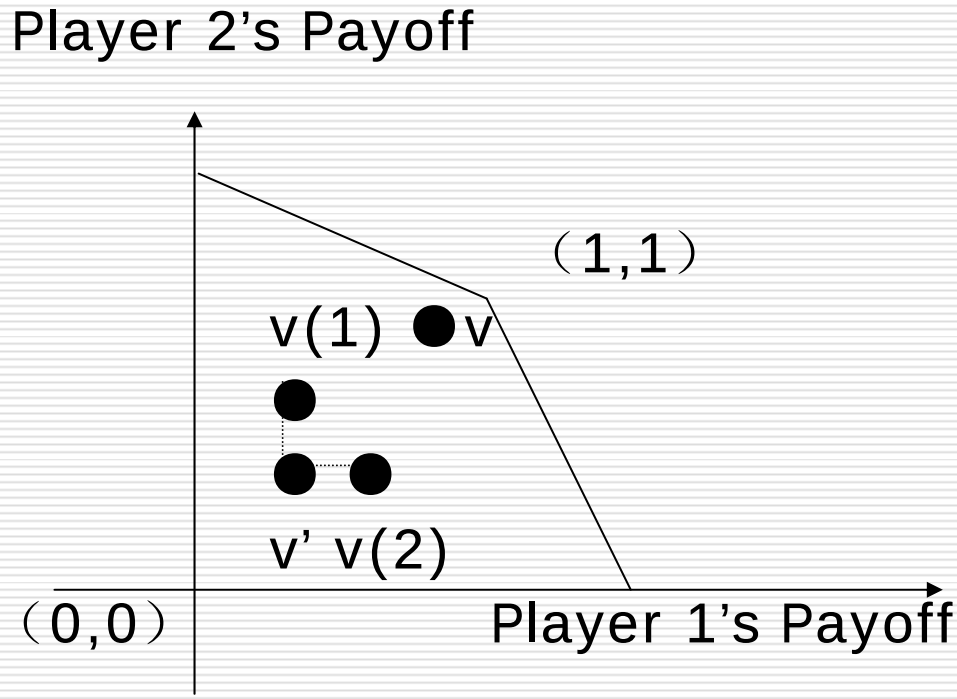
  1)Play s(i) each period as long as s was played last period. If player j deviates from 1), then :

  2) play M(i,j) to minmax j for x(j) period;

  3)play T(i, j) thereafter to stay at the point of

$$(v_1'+e,...,v_{j-1}'+e,v_j',v_{j+1}'+e,...v_n'+e)$$

Perfect Monitoring
——Fudenberg and Maskin (1986)



Repeated Oligopoly Games and the Folk Theorem

- In a Bertrand game with perfect monitoring, let $\pi(P)$ denote the profits earned by one firm setting price P and serving the entire market.
- The total benefit to conspire is $\frac{\pi(P)}{N(1-\delta)}$
- The condition that no firm would defect is $\frac{\pi(P)}{N(1-\delta)} > \pi(P)$.
- Hence, there is a threshold δ^* , no firm would defect when $\delta > \delta^*$.

Repeated Oligopoly Games and the Folk Theorem

In a cournot model with imperfect monitoring (Green and Porter,1984),

the price of each period $p_t(\theta_t, \sum Q_{it})$ can be observed by the public, where θ_t is an iid demand shock and Q_{it} is the output quantity of firm i at period t. In the stage Nash equilibrium, each firm's expected payoff is zero.

Repeated Oligopoly Games and the Folk Theorem

Consider the following trigger strategy for firm i,

if $a)\ t=0$, or $b)\ Q_{it-1}=x_{t-1}$ and $p_{t-1}>\overline{p}$, or

$c)\ Q_{it-T}=x_{t-T}$ and $p_{t-T}>\overline{p}$, then produce the respective shares x_t at period to conspire;

produce the Cournot output y_t otherwise.

Repeated Oligopoly Games and the Folk Theorem

Then the value function for firm i when it produce Q_i

$$V_i(Q_i) = \pi_i(Q_i + \sum_{j \neq i} x_j) + \delta \Pr(\bar{p} \leq p_{t-T}(\theta_t, Q_i + \sum_{j \neq i} x_j)_{x_t} V_i(Q_i)$$

$$+ \delta \Pr(\bar{p} \leq p_{t-T}(\theta_t, Q_i + \sum_{j \neq i} x_j)_{y_t} [\sum_{t=1}^{T-1} \delta^t E_\theta \pi_i(\sum y_j) + \delta^T V_i(Q_i)]$$

$$\leq V_i(x_i)$$

Repeated Oligopoly Games and the Folk Theorem

- In the model with imperfect monitoring, public signal , the price in each period cannot completely reveal the past actions .
- Hence, the price might be lower than the threshold even if all the firms control their output quantity.
- Even though the firms know that no one defects, they will play Cournot profiles for T periods.
- Even though there once existed episodes in which price and profit levels sharply decreased, cartel might still be sustained.

Role of Communication

Athey and Bagwell (2001,2006)	permit the firms to communicate about private cost information in a repeated pricing game.
Compete(1998) Kandori and Matsushima(1998)	study communications when firms observe private but imperfect signals about past play.
Athey, Bagwell and Sanchirico(2004)	study a model with private cost shocks and publicly observed prices.
Kuhn(2001)	discusses the antitrust implications of the battle of the sex game.

Collusion with Persistent Cost Stocks ——Athey and Bagwell(2006)

- Suppose there are N ex ante identical firms that meet in periods t=1, 2,... to engage in Bertrand competition for sales in a homogeneous-good market.

- Firm i's cost type in time t, $\theta_{i,t}$, follows a first-order Markov processes with support $\Theta_i \subseteq [\underline{\theta}, \overline{\theta}]$. The commonly known distribution function is $F(.|\theta_{i,t-1})$.

- Let δ <1 denote the discount factor.

- In each period, demand is inelastic and there is a unit mass of identical consumers who are not strategic players with a fixed reservation price r, where $r > \overline{\theta}$.

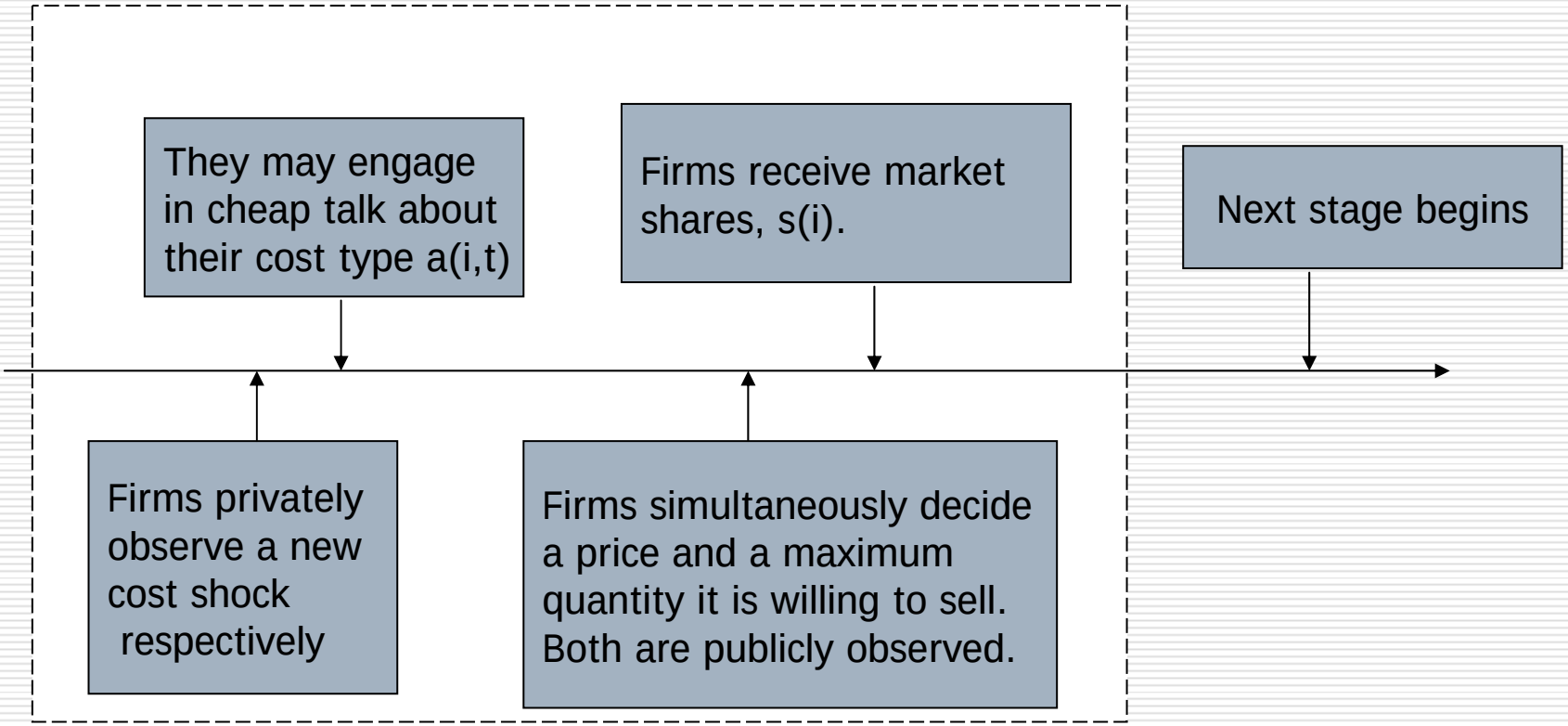
Collusion with Persistent Cost Stocks ——Athey and Bagwell(2006)

- Two special cases of this model are investigated

- 1. $\Theta_i = \{\underline{\theta}, \overline{\theta}\} \in \square^2$. We focus on the case of positive serial correlation, whereby $0 < F(\underline{\theta} \mid \overline{\theta}) < F(\underline{\theta} \mid \underline{\theta}) < 1$.

- 2. $\Theta_i = [\underline{\theta}, \overline{\theta}]$. Cost type are perfectly persistent, so that $F(. \mid \theta_{i,t-1})$ places all of the probability weight on $\theta_{i,t-1}$. F_0 has a strictly positive density over its support.

Collusion with Persistent Cost Stocks ——Athey and Bagwell(2006)



Interim Profit

At the interim stage, for any given period strategy, $\sigma_{i,t}$, a firm can deviate from it in several ways.

1) The firm might choose a deviant announcement.
2) The firm might choose prices and quantity restrictions that are inconsistent with the set of realized announcements or its own type.
3) The firm might do some combination of these things.

All of these possible deviations can be represented by an alternative strategy $\hat{\sigma}_{i,t} \neq \sigma_{i,t}$.

On-schedule deviation and off-schedule deviation

- In an on-schedule deviation, a firm will mimic another cost type's strategy.
- In an off-schedule deviation, a firm will chooses an action or a series of action that no cost type should have chosen in equilibrium.
- Hence, off-schedule deviation is observable, while on-schedule deviation is not.

Rigid-Pricing Scheme

A set of strategies where, on the equilibrium path, firms share the market equally at a fixed price. Along the equilibrium path $q(i,t)=1$ (non-binding quantity restrictions), and announcements are uninformative. In a best rigid-pricing scheme, the price is set to be r.

Carrot-Stick Scheme

A set of strategies where, on and off the equilibrium path, announcement are uninformative and the quantity is constant, $q_{i,t} = 1$.

.

There are two states, i.e. the war state and the reward state. The firms begin in the war state, where if all firms choose price $p_w < r$ in a given period, the firms switch to the reward state with probability x. In the reward state, if all firms choose price r in a given period, the firms remain in the reward state with probability 1. In each period, if any firm charges a price other than the assigned price, the firms switch to the war state with probability 1.

In a worst carrot-stick scheme, in the initial period, a firm with the highest type, $\overline{\theta}$ is indifferent between choosing the price p_w and charging a higher price , where by charging a higher price the firm would sell nothing and restart the scheme with probability 1.

Collusion with Persistent Cost Stocks ——Athey and Bagwell(2006)

- Proposition 1. Consider either Model 1 or Model 2. If the discount factor is close to unity, there exists a worst carrot-stick equilibrium.

- Proposition 2. Consider Model 2. If the discount factor is close to unity and F_0 is log-concave or if r is large enough, an ex ante optimal perfect public Bayesian equilibrium is the best rigid-pricing (pooling) equilibrium.

Odd-Even Scheme

- Consider two functions, the odd-period market share allocation function $k_i^o(a_t)$ and the even-period market share allocation function $k_i^e(a_t)$, where $a_t = (a_{1,t}, \ldots a_{i,t}, \ldots a_{N,t})$ is the announcements at period t and $\sum_i k_i^o(a_t) = \sum_i k_i^e(a_t) = 1$.

- In the odd-period, all firms announce their cost types while in the even-period, announcements are uninformative. All the time the price is set to be r.

- In all periods, any off-schedule deviation is punished by switching to a worst carrot-stick scheme.

Collusion with Persistent Cost Stocks ——Athey and Bagwell(2006)

- Proposition 3 Consider model 1. If the discount factor is sufficiently small, there exists an odd –even equilibrium, where this equilibrium achieves strictly higher ex ante payoffs than the best rigid-pricing equilibrium.

Industry Conditions Bearing on the Likelihood of Collusive Outcomes

- Limited Growth for Defecting Firm
- Imperfect Detection
- Credibility of Punishment
- Market Structure
- Product Differentiation
- Capacity Constraints, Excess Capacity and Investment in Capacity
- Market Dynamics

Limited Growth for Defecting Firm

Why a defecting firm might not be able to capture the entire market?

- Upward sloping marginal cost
- Customer loyalty
- Customer switching costs
- Product differentiation

Imperfect Defection

Stigler(1964)	The role of price transparency and secret price cutting
Spence(1978)	Uncertainty about demand conditions makes it more difficult for suppliers to distinguish shifts in demand from defections by their rivals
Green and Porter(1984)	Trigger strategies are formed when the prices are only observed with noise
Harrington and Skrzypacz(2007)	Asymmetric punishments are required if the firms observe each other outputs but not prices.

Collusion under Monitoring of Sales ——Harrington and Skrzypacz(2007)

- Consider an infinitely repeated game, in which N firms make simultaneous price decisions.
- Cost is zero.
- Demand is fixed at m discrete units, which can also be explained that there are m customers with unit demands. Though total demand is fixed, firm demand is stochastic. Let q_i denote the quantity of firm i, Hence, $\sum_i q_i = m$. Define $\psi(q, p)$ as the probability of realizing quantity vector $q = (q_1, q_2 \ldots q_N)$ given the price vector p.

Collusion under Monitoring of Sales ——Harrington and Skrzypacz(2007)

- Assumptions

1) $\psi(q,p)$ is continuously differentiable with respect to p_i .

2) $\psi(q,p)=\psi(w(q,i,j),w(p,i,j))$, where $w(x,i,j)$ is the vector x when elements i and j are exchanged.

3) $$\sum_{i=1}^{N}\frac{\partial\psi}{\partial p_i}|_{p_i\equiv p}=0$$

which implies that if we start at equal prices then the distribution of demand remains unchanged if firms make small identical price changes.

Collusion under Monitoring of Sales ——Harrington and Skrzypacz(2007)

- A set of symmetric histories consists of the initial null history, denoted h_0 and if m is a multiple of N, also of histories in which each firms had sales of m/N in every period.

- A symmetric Nash equilibrium is a Nash equilibrium in which the strategy profile calls for identical prices when the history is symmetric.

- A strongly symmetric Nash equilibrium is one in which strategies are symmetric for all histories. That implies the continuation payoffs are also symmetric after all histories.

- A equilibrium is said to be history-relevant when: if firms charge static Nash prices in period then the period t+1 continuation payoff functions are independent of the period t quantities.

Collusion under Monitoring of Sales ——Harrington and Skrzypacz(2007)

- Theorem 1 (Impossibility result) Assuming the above assumptions, the set of strongly symmetric exchangeable history-relevant Nash equilibrium prices for the infinite horizon game coincides with the set of symmetric Nash equilibrium prices for the stage game.

- Theorem 1 shows that no collusion can be sustained since it only uses the symmetry of the continuation payoff.

Collusion under Monitoring of Sales ——Harrington and Skrzypacz(2007)

- Another assumption

  The one shot game with demand $\psi(q, p)$ and cost $c \geq 0$ has a symmetric Nash equilibrium and there is a lower bound to the equilibrium price vector that is increasing and unbounded in c.

Collusion under Monitoring of Sales ——Harrington and Skrzypacz(2007)

- Theorem 2. If the above assumption holds, for any price p higher than a static Nash equilibrium price vector, there exists a perfect equilibrium in which the cartel sets a price vector exceeding p in every period when the discount factor is close to 1.

- Collusion can be sustained by a punishment strategy in which firms with above-average sales compensate those firms with below-average sales. This is sustainable as long as firms are sufficiently patient and transfers can be made.

Credibility of Punishment

- Subgame Perfect Equilibrium

  When the punishment path is not a stage-game Nash equilibrium, some firms might not have the incentive to punish the deviator. This problem has been mentioned in the discussion of the Folk Theorem.

- Renegotiation-Proof

  The punishment is not collectively credible.

  Farrell and Maskin(1989), Bernheim and Ray(1989)

Market Structure

- Market Concentration
- Cost Asymmetries
- Buyer Concentration and Auction Markets
- Collective Market Power Including Entry Barriers
- Multi-Market Contact

Market Concentration

- Suppose that firms asymmetrically have various market share in a Bertrand game with perfect monitoring. Let s_i denote the share owned by firm i.

  If firm i conspires, it will get $s_i \pi(P)/(1-\delta)$.

  If firm i defects, it will get $\pi(P)$.

  To guarantee all the firm to coordinate,

$$\pi(P) < s_{\min}\pi(P)/(1-\delta) \Rightarrow \delta^* = 1 - s_{\min} > 1 - 1/N$$

- Hence, it is more difficult to sustain collusion.

Cost Asymmetries——An Explanation to Asymmetric Market Shares

Mason, Phillips and Nowell （1992）	Show that cooperation is more likely in a duopoly if the firms have symmetric costs
Ivaldi, Jullien, Rey, Seabright and Tirole (2003)	Argue that cost asymmetries hinder collusion even if firms agree on a given collusive price since low-cost ones will be hard to discipline.
Vasconcelos(2005)	Shows that in the optimal collusive equilibrium, output is shifted away from the less efficient firms and towards more efficient firms.

Tacit Collusion, Cost Asymmetries and Mergers ——Vasconcelos(2005)

- Consider N firms that produce in the same market for infinitely many periods.
- They make output decisions simultaneously at the beginning of each period. Let $q_{i,t}$ denote the quantity chosen by firm i in period t.
- Let k_i be the fraction of the industry capital stock owned by firm i.
- The cost function of firm i is given by $c_i(q_i, k_i)$, where $\frac{\partial c_i}{\partial q_i} > 0, \quad \frac{\partial c_i}{\partial q_i} < 0$.

Tacit Collusion, Cost Asymmetries and Mergers ——Vasconcelos(2005)

- A proportional-SPE is an SPE of the infinitely repeated game such that in any equilibrium path, each firm I obtains a share k_i of the market.

- Let V denote the set of all aggregate per-period continuation payoffs that can be sustained in a proportional-SPE. Furthermore, let $\underline{v}(\delta) \equiv \inf v$, $\bar{v}(\delta) \equiv \sup v$ be the lowest and the highest possible continuation value in a proportional-SPE when the discount factor is δ .

Tacit Collusion, Cost Asymmetries and Mergers ——Vasconcelos(2005)

- Proposition 1. Suppose that $\underline{v}(\delta) = 0$, then $\bar{v}(\delta) = \Pi(Q^m)$ when the discount factor is close to 1, where $\Pi(Q^m)$ is the monopoly aggregate profit .

- This proposition captures the fact that under the assumed output-allocation rule, output is shifted away from small (inefficient) firms toward large (efficient) firms.

Tacit Collusion, Cost Asymmetries and Mergers ——Vasconcelos(2005)

- Proposition 2. Suppose that $\bar{v}(\delta) = \Pi(Q^m)$, then $\underline{v}(\delta) = 0$ when the discount factor is close to 1.

- The intuition here rests on the fact that in the first period of the punishment path, the aggregate output produced has to be large enough that a very sharp price cut occurs, leading all firms to earn negative profits in this period. The largest firm is the one that proportionally most affected by this price cut, since it is the one with the highest market share in the agreement. As a result, a lower bound on the discount factor is clearly necessary. The discount factor has to be sufficiently high so that the largest firm can recoup the one-period losses from the more attractive phase of the punishment.

Buyer Concentration——Another Barrier to Collusion and Another Side Collusion

Snyder(1996)	Shows how a large buyer can strategically undermine collusion.
Klemprer(2002)	Argues that some auction designs facilitated collusion of buyers and thus led to lower price.
Marshall and Meurer (2004)	Argues that collusion is more difficult in sealed-bid, first-price auctions than in oral ascending-bid auctions.

A Dynamic Theory of Countervailing Power —— Snyder(1996)

- Consider N+1 players, N of whom are sellers and one buyer.
- In each period, the buyer has the opportunity to consume one unit of the good from which it obtains surplus v.
- There are infinite number of periods in the game indexed by t=1,2... .
- If the buyer does not consume in period t, in period t+1, it obtains a new consumption opportunity valued at v, while the old consumption opportunity in period t+1 gives the buyer surplus θ v, where $\theta \in (0,1)$. Let $S = p/v$ denote the quotient of the equilibrium price over the surplus, which can be used to measure the level of collusion.

A Dynamic Theory of Countervailing Power —— Snyder(1996)

- Perfect Collusion is the case where sellers are able to extract all the buyer's surplus.

- Intermediate Collusion is between perfect competition and perfect collusion.

- Define $K = \{i \in \square \mid i > \frac{\ln(N-1) - \ln N}{\ln \delta}\}$ as the set that if the buyer conducts an auction for a backlog of $k \in K$ units, the worse-off seller doesn't deviate from bidding a collusion price.

A Dynamic Theory of Countervailing Power —— Snyder(1996)

- Proposition 1. Perfect collusion is sustainable if and only if the discount factor $\delta \geq \frac{N-1}{N-\theta}$.

- Proposition 1 implies that perfect collusion is sustainable for large enough values of the discount factor. Thus the folk theorem for repeated games holds in the present case as well. Note that the lower θ is, the weaker the condition is and hence the easier it is to achieve perfect collusion. Intuitively, if the consumption opportunities degrade fairly rapidly over time, then accumulating a backlog of orders does not help the buyer break the sellers collusion.

A Dynamic Theory of Countervailing Power —— Snyder(1996)

- Proposition 2. If the discount factor $\delta \in (\frac{N-1}{N}, \frac{N-1}{N-\theta})$, then the level of collusion in the extremal equilibrium is given by

$$S = \min_{k \in K} [\frac{1-\delta^k - \delta^{k-1}(1-\delta)s_k(\theta)}{1-N\delta^k/(N-1)}]$$, where $s_k(\theta) = \sum_{i=1}^{k} \theta^{i-1}$ stands for all the old consumption opportunities' value discount .

From this proposition, although S does not have a closed-form solution, it is possible to compute S by minimizing the right hand side of the above equation numerically. Intuitively, the higher is θ, the greater is the buyer's payoff from accumulating a backlog relative to its payoff from consuming each period.

Multi-Market Contact——A Way Which Might Sustain Collusive Outcomes

Evans and Kessides (1994)	find that fares are higher on routes for which the carriers interact on multiple routes
Parker and Roeller (1997)	Find higher prices in markets where carriers have multi-market contact in the mobile telephone industry.
Cramton and Schwartz （2000）	Shows that multiple auctions for licenses would support collusion.
Genesove and Mullin (2001)	Shows that multi-market contact may have no effect on collusion.

Rules, Communications and Collusion: Narrative Evidence from the Sugar Institute Cases
——Genesove and Mullin(2001)

- This paper reexamines the cartel problem by studying the private discussions within one cartel.
- The Sugar Institute was very careful to calibrate punishment to the violation and certainly did not employ the maximum possible punishment. Had they done so, the cartel would have collapsed early on.
- The Sugar Institute steered away from multi-market linkages, carefully limiting punishment to the same geographic region where the violation occurred.

Product Differentiation

- Traditional view in antitrust circles has been that collusion is easier to sustain among firms selling homogeneous products rather than differentiated products

- Ross(1992) captures the ambiguity of the effect from product differentiation on the forming of collusion.

Capacity Constraints, Excess Capacity and Investment in Capacity

Collusion on Prices with Capacity Constraints

- Scheinkman(1985) shows that collusion is more difficult to sustain in the presence of capacity constraints.
- Lambson (1987) generalizes these results to optimal cartel punishment strategies.
- Abreu(1986) obtains similar results for repeated quantity-setting games with capacity constraints.

Capacity Investment Decision

- Benoit and Krishna (1987) show that firms will choose to build and maintain excess capacity to support a collusive pricing outcome.

- Davidson and Deneckere(1990) study a semi-collusive equilibrium in which the firms first pick capacities and then play a repeated pricing game.

Market Dynamics

- **Demand Growth, Demand shock and Business Cycles.**

  Rotemberg and Saloner(1986) show that in the boom period, it is harder to maintain collusion since the temptation to deviate is too great. That is why the prices in some industries decrease during the boom period.

- **Disruptive Innovation**

  Suppose that each period there is some probability x that a major new technological innovation will be introduced into the market. In such a case, the original market will disappear. Hence this is equivalent to changing the discount factor b to b(1-x), making collusion more difficult to sustain.

- **Switching Costs, Network Effects and Learning by Doing**

  If the defecting firm can gain a lasting advantage over its rivals, defection is more tempting. That means the consumers might have switching costs. The defecting firm capturing consumers will have lasting value.

  Network will make collusion difficult to be sustained since the firm losing the standards battle may be very tempted to engage in price-cutting to avoid entering a downward spiral.

  If learning is based on cumulative output, a firm that expands its production today will experience lower costs tomorrow, thereby gaining a lasting advantage, which makes the temptation to deviate from collusion greater.

Antitrust Enforcement

- Impact of Antitrust Enforcement on Oligopolistic Behavior

  Harrington(2004a,b, 2005) posits that a newly formed cartel will be likely to attract the attention of antitrust enforcers if it rapidly raises price from the competitive level to the cartel level. He shows how the price path adopted by the cartel and the steady-state cartel price are affected by antitrust enforcement.

- Determinants of the Effectiveness of Antitrust Enforcement

  One approach to enforcement is the government's attempt to strategically induce some colluding firms to turn on their peers

  Another approach which is particularly important in the United States involves private lawsuits for treble damages.

A Case From Fixed Phone Industry in China
——Collusion Between China Telecom and China Netcom

Background

- Since May 17, 2002, when the former fixed-line monopoly China Telecom was formally split geographically into two firms, China Telecom and China Netcom. After the split, China Telecom operates mainly in the southern part of China, while Netcom operates in the northern region. Regulators had hoped that China Telecom would head north and Netcom would expand to the south, which could spur competition.

- With a registered capital of 158 billion yuan (RMB), China Telecom's fixed-line business currently covers 21 provinces. The net profit of China Telecom is 27.1 billion yuan in 2006.

- China Netcom's registered capital is 60 billion yuan whose fixed-line business covers 10 provinces with 10.5 billion-yuan profit in 2006.

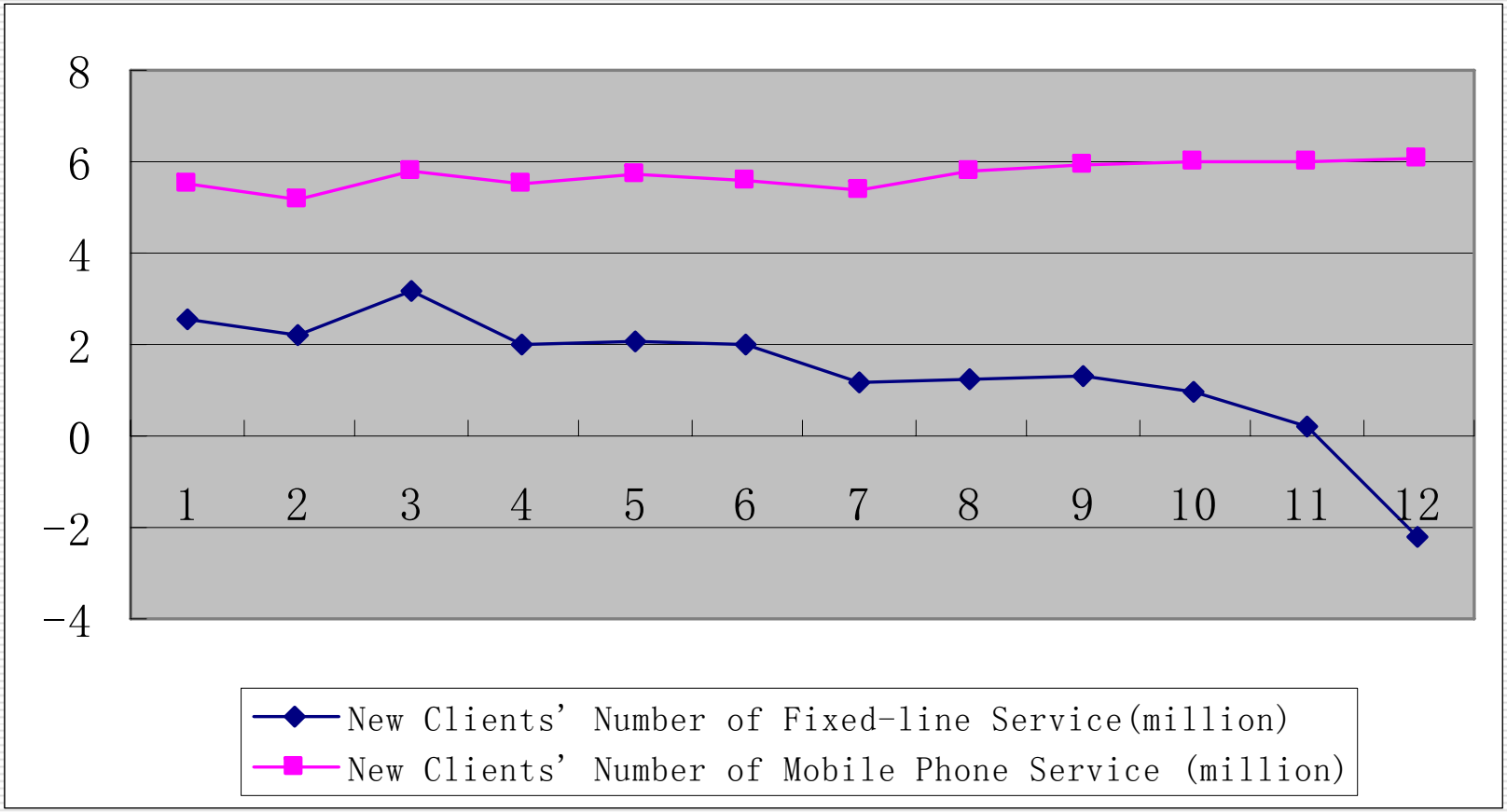
A Case From Fixed Phone Industry in China
——Collusion Between China Telecom and China Netcom

Background

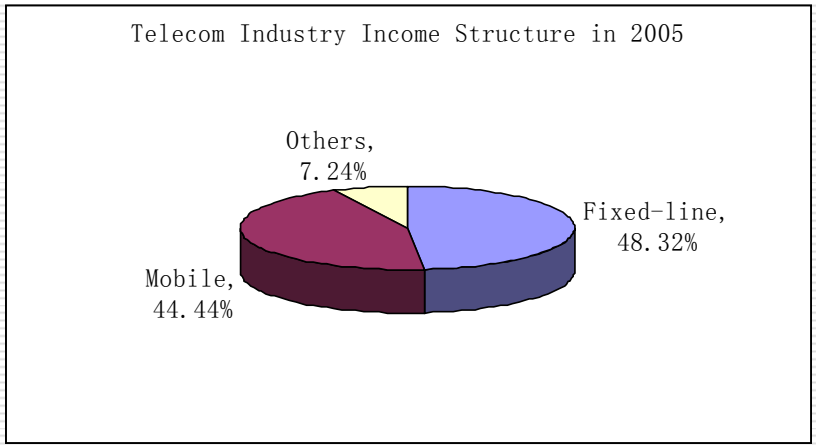
- Fixed phone service faces the competition from the Mobile phone service. In 2001, China replaced the United States and became the largest mobile telecommunication market in the world. In 2006, the biggest mobile phone tycoon in China, China Mobile earned 66 billion yuan which is more than the sum of those of China Telecom and China Netcom.

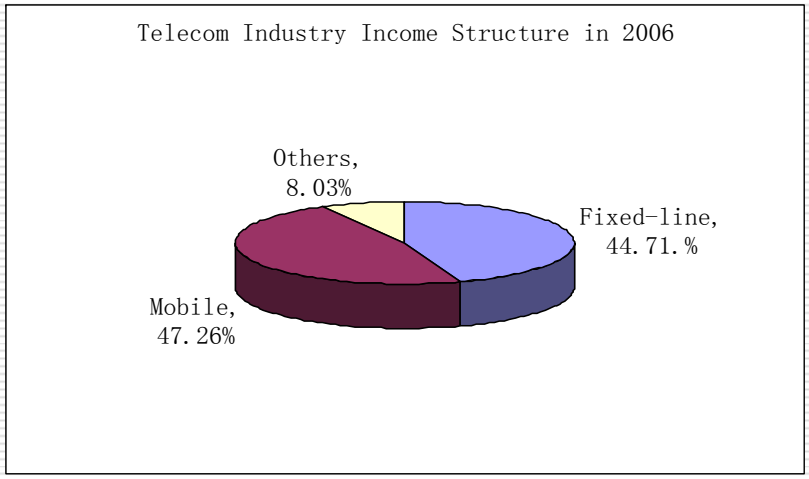
- On the other hand, the fixed-line service seems in a satiation condition. In 2006, there are only 17.37 million new users of fixed phone which is much lower than the number of 49.70 million in 2004 and 38.68 million in 2005.

The Comparison of New Clients' Number between Fixed Phone and Mobile Phone in 2006



The Change of Telecom Industry Structure





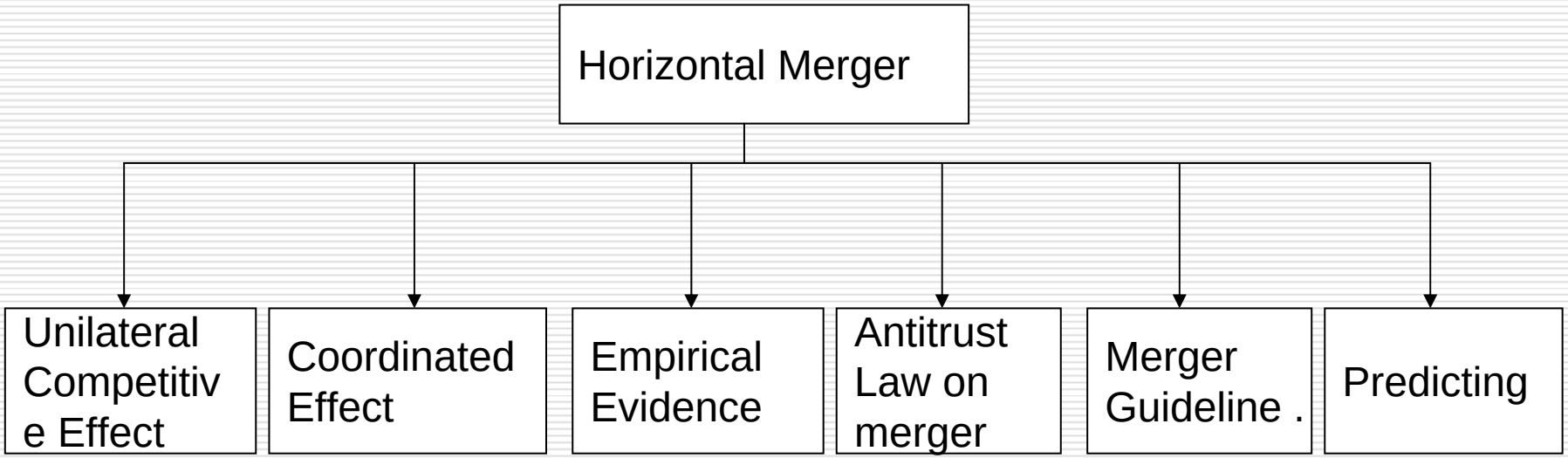
The Gentlemen's Agreement between China Telecom and China Netcom

- In February 2007, the two fixed-line telephone operators in the country, have reportedly signed a deal under which they will stop treading on each other's turf .

- Behind the truce between China Telecom and China Netcom is a rationale that expansion hardly enables an operator to challenge its rival and investment on the rival's turf could see "losses of State-owned assets".

- The awful truth is that the reshuffle in 2002 truly broke a national monopoly but created regional monopolies. And when a cease-fire deal is inked, it seems the national monopoly is coming back to life. The only difference is that the new national monopoly is a collaborative act.

The Content of Horizontal Merger



Cournot Model with Homogeneous Products (Farrell and Shapiro, 1990)

- Define the pre-merger outputs of two merging firms as $\overline{X}_1$ and $\overline{X}_2$ and the pre-merger price as $\overline{P}$. The marginal costs of the two firms are respectively $\overline{MC_1}$ and $\overline{MC_2}$, where we assume $\overline{MC_1} \geq \overline{MC_2}$. Denote the merged firm's marginal cost at the combined output by $\overline{MC_{12}} = MC_{12}(\overline{X}_1 + \overline{X}_2)$.

Cournot Model with Homogeneous Products (Farrell and Shapiro, 1990)

- Farrell and Shapiro provide a necessary and sufficient condition:

A merger reduces price if and only if

$$\overline{MC}_2 - MC_{12} > \overline{P} - \overline{MC}_1$$

Bertrand Model with Differentiated Products

- Shapiro(1996) shows that the percentage gap between the monopoly price and the Bertrand price is given by

$$\frac{P_M - P_B}{P_B} > \frac{\alpha}{2(1-\alpha)} \frac{P_B - MC}{P_B}$$

where $\alpha = \frac{dX_2}{dP_1} / \left| \frac{dX_1}{dP_1} \right|$ is the diversion ratio that is , the fraction of the lost unit sales of product 1, when the price of product 1 is raised, that are captured as unit sales of product 2.

Bidding Model

Waehrer and Perry (2003)	Show how the price effect of a merger can be estimated for certain cumulative distributions of valuations.
Klemperer(2004)	Provides an overview of the enormous literature on auction.
Werden and Froeb (2007)	Discuss merger analysis in a situation where a seller is auctioning off an item using an ascending oral auction and the bidders have private values for the item.

The Effects of Mergers in Open-Auction Market ——Waehrer and Perry(2003)

- We assume that a buyer requests bids from N suppliers who can provide an input necessary for production of a final good.
- The buyer employs an open auction to select the winning supplier.
- The buyer has value c_0 for the input, where c_0 is known to the buyer and to all of the suppliers.
- The ith supplier has a capacity parameter t_i and draws his cost c_i of producing the input from the distribution $G(.|t_i)$ with a support of $[\underline{c},\bar{c}]$.

The Effects of Mergers in Open-Auction Market ——Waehrer and Perry(2003)

- Property 1 (no externalities). The cost distribution of each supplier depends only on its own capacity and is independent of the capacities of other suppliers.
- Property 2 (homogeneity). If two suppliers have the same capacity, then they also have the same cost distribution.
- Property3 (constant returns). The probability distribution of the lowest-cost draw of the suppliers depends only on total industry capacity is distributed among the suppliers.

The Effects of Mergers in Open-Auction Market ——Waehrer and Perry(2003)

- Theorem 1 Properties 1-3 are satisfied if and only if there exists a distribution function F with a support of $[\underline{c}, \bar{c}]$ such that for $c \in [\underline{c}, \bar{c}]$, $G(c \mid t_i) = 1 - [1 - F(c)]^{t_i}$

This theorem characterizes Properties 1-3 in terms of the functional form of the cost distribution.

Oligopoly Theory and Coordinated Effects

Demsetz(1973)	Mounted an attack on those who claimed that a positive cross-sectional relationship between concentration and profits was indicative of market failure or the need for an interventionist antitrust policy.
Compte , Jenny and Rey (2002) and Vasconcelos(2005)	Discussed how the distribution of capacities affects the ability of the firms to sustain collusion in price-setting and quantity-setting supergames respectively.
Kovacic Marshall, Marx and Schulenberg(2006)	Propose a new way to quantify the dangers associated with coordinated effects in a situation where a number of suppliers are bidding for the customer's patronage.

Quantitative Analysis of Coordinated Effects—— Kovacic, Marshall, Marx and Schulenberg(2006)

- Coordinated interaction is comprised of actions by a group of firms that are profitable for each of them only as a result of the accommodating reactions of the others.
- Successful coordination requires reaching terms of coordination that are profitable to the firms involved.
- The approach of this paper focuses on how a proposed merger affects the perceptions of the industry participants of their post-merger profitability and how perceptions of greater of lesser profitability affect their incentive to strive to solve the tasks, including consensus building , detection and punishment, that must be accomplished for coordination to succeed.

Quantitative Analysis of Coordinated Effects—— Kovacic, Marshall, Marx and Schulenberg(2006)

Background on Hospital Corporation.

- Hospital Corporation of America (HCA) acquired Hospital Affiliates International, Inc. and Health Care Corporation.
- After the acquisition, Hospital Corporation owned or managed 5 of the 11hospitals in Chattanooga, Tennessee.
- The acquisition raised Hospital Corporation's market share in the Chattanooga area from 14% to 26%. This made it the second-largest provider of hospital services in a market where the four largest firm together had a post-acquisition market share of 91%.
- The Federal Trade Committee (FTC) concluded that the acquisitions created a danger that the largest Chattanooga hospitals would collude.

Quantitative Analysis of Coordinated Effects—— Kovacic, Marshall, Marx and Schulenberg(2006)

The scenarios this paper considers are:

- Pre-acquisition noncooperative : all eleven firms behave noncooperatively.
- Post-acquisition noncooperative: firms 1-5 act as a single firm, but that firm and the other six firms behave noncooperatively with respect to one another.
- Pre-acquisition cooperative: The four largest firms in the pre-acquisition market (1,6,7,8) act as a single firm, but that firm and the other seven firms behave noncooperatively with respect to one another.
- Post-acquisition cooperative: firms 1-8 act as a single firm, but that firm and the remaining three firms behave noncooperatively with respect to one another.

Change in Quantities Relative to Pre-Acquisition Noncooperative

Firm	Post-acquisition noncooperative (1-5 as single firm)	Pre-acquisition cooperative (1,6,7,8 as single firm)	Post-acquisition cooperative (1-8 as single firm)
1	-7%	-16%	-20%
2, 3, 4, and 5	-21%	17%	-49%
6	5%	-9%	-12%
7 and 8	7%	-13%	-17%
9, 10, and 11	16%	17%	111%
1+2+3+4+5	-16%	6%	-39%
1+6+7+8	3%	-12%	-16%
1+2+3+4+5+6+7+8	-4%	-4%	-25%
1+…+11	-0.2%	-0.2%	-1.5%

HHI and the Comparison

Pre-acquisition noncooperative	Post-acquisition noncooperative	Pre-acquisition cooperative	Post-acquisition cooperative
1773	2145	5687	6414

Comparing the above two tables, we can find consistent results. But the latter one lacks the ability to quantify the effects of coordination on profits, prices , quantities and consumer surplus, while the former given by the paper, does not.

Measuring the Effect of Mergers by Studying the Stock Market Performance of the Merging Firm

Advantage

Relies on detailed and accurate stock market data

Disadvantage

- Cannot distinguish between favorable stock market returns based on efficiencies versus market power.
- Measures the expectations of investors about merger effect, not actual effects of mergers
- Is not focused on horizontal mergers
- Do not disentangle predicted effects of the merger and other information that may be signaled by the announcement

Accounting Measures of Firm Performance

Ravenscraft and Scherer(1987,1989)	Using widely cited FTC line of Business Data find that horizontal mergers tends to be more profitable than conglomerate mergers
Healy et al.(1992)	Examine post-merger operating performance for the fifty largest mergers that took place from 1979-1984.
Siegel(1987) and McGuckin and Nguyen (1995)	Find plant level productivity gains associated with mergers in manufacturing industries, using the Census Bureau's Longitudinal Establishment Data for 1972-1981.

Case Studies

Kaplan(2000)	Provides a collection of case studies of mergers in a diverse set of industries.
Borestein(1990) Werden, Joskow and Johnson(1991), and Peters(2002)	Studies two airline mergers from the mid-1980that were approved by the Department of Transportation over the objections of the Department of Justice.
Borenstein(1990)	Finds significant fare increases following the Northwest Airlines/Republic Airlines merger but not following the TWA/Ozark merger.
Kim and Signal(1993)	Examine 14 airline mergers from the mid-1980s
Prager and Hannan(1998)	Study the effects of major horizontal mergers in the US banking industry during the early 1990s.
Vita and Sacher(2001)	Find large price increases, not reflecting increases in service quality, following a hospital merger in Santa Cruz, CA
Pesendorfer(2003)	Studies the effect of horizontal mergers in the paper industry on capacity choices.
Hastings(2004)	Looks at pricing in the retail gasoline market in Southern California.

Relevant U.S. Law

Sherman Act Section 1	Prohibition on any contract, combination or conspiracy in restraint of trade.
Clayton Act Section 7	Prohibition on acquisitions of Stock or assets whose effect may be substantially to lessen competition or to tend to create a monopoly
Federal Trade Commission Act Section 5	Prohibition on any unfair method of competition.

Three Merger Guidelines(1968, 1982,1992)

- If the post-merger HHI is below 1000, no further analysis will be undertaken.
- If the post-merger is between 1000 and 1800, concerns are deemed to exist when the merger raisers the HHI by more than 100.
- If the post-merger HHI exceeds 1800, significant concerns are deemed to exist when the merger raises the HHI by more than 50.

Discussion on the Efficiency of Merger

Coase(1937), Williamson (1975,1985), Grossman and Hart (1986), Holmstrom and Tirole (1989), Hart and Moore(1990), etc.	The benefit from combining activities that cannot be achieved by single firms through contracting.
Farrell and Shapiro (2000)	In the presence 0f economies of scale firms can grow internally to reduce their average costs.
Kolasky and Dick (2003)	Examine the treatment of efficiencies in mergers.
Salop(2005), Farrell and Katz (2006), Heyer (2006)	Recent contributions to the debate about the proper objective of antitrust policy.

The Costs and Benefits of Ownership ——Grossman and Hart（1986）

- There are two firms with two managers respectively.
- The relationship which may be either vertical or lateral is assumed to last two periods.
- In the first period, the manager of each firm makes relationship-specific investments while in the second period, some further production decisions are taken and the benefits from the relationship are realized.
- The production decisions, represented by vector q are sufficiently complex that they cannot be specified completely in an initial contract between the firms.
- The noncontractibility of q creates the need to allocate residual rights of control.
- Although q is ex ante noncontractible, it is clear to the public and the parties can recontract over these. That is , q is ex post contractible.

The Costs and Benefits of Ownership ——Grossman and Hart（1986）

The model.

- The firms sign a contract at date 0 and soon after manager 1 and 2 make investments, denoted by a1 and a2, respectively.
- At date 1, some further actions q1 and q2 are taken and the gains from trade are realized.
- The benefit of firm i's manager from the relationship at date 1, net of investment costs, as $B_i[ai, f_i(q1, q2)]$ where f_i is a function of q1 and q2 and B_i is increasing in f_i .

The Costs and Benefits of Ownership ——Grossman and Hart（1986）

An optimal contract must maximize the total ex ante net benefits of the two managers,

$$B_1[a1, f_1(q1,q2)] + B_2[a2, f_2(q1,q2)]$$

Let $a1^*, a2^*, q1^*, q2^*$ be the maximizers of the above problem.

The Costs and Benefits of Ownership
——Grossman and Hart（1986）

Case 1 Nonintegration

In this case, manager i has the right to choose qi respectively.
We assume that there exists a unique pair $(\hat{q}1, \hat{q}2)$ satisfying :

$$\hat{q}i = \arg\max f_i(q1, q2)$$

By Nash bargaining solution, actually the manager i will get

$$x_i(a) \equiv B_i[ai, f_i(q1(a), q2(a))] - p_i$$

where p_i is the transfer price and $\sum_{i=1}^{2} p_i = 0$.

Let $\hat{a}i = \arg\max x_i(a)$, the total surplus in this case would be

$$B_1[\hat{a}1, f_1(q(\hat{a})] + B_2[\hat{a}2, f_2(q(\hat{a})]$$

The Costs and Benefits of Ownership
——Grossman and Hart（1986）

Case 2 Firm 1 Control

In this case, manager 1 has the right to choose q1 and q2. We assume that there exists a unique pair $(\bar{q}1, \bar{q}2)$ satisfying :

$$(\bar{q}1, \bar{q}2) = \arg\max \cdot f_1(q1, q2)$$

By Nash bargaining solution, actually the manager i will get

$$y_i(a) \equiv B_i[ai, f_i(q1(a), q2(a))] - p_i$$

Let $\bar{a}i = \arg\max y_i(a)$, the total surplus in this case would be

$$B_1[\bar{a}1, f_1(q(\bar{a})] + B_2[\bar{a}2, f_2(q(\bar{a})]$$

The Costs and Benefits of Ownership
——Grossman and Hart（1986）

Case 3 Firm 2 Control

In this case, manager 2 has the right to choose q1 and q2. We assume that there exists a unique pair $(\underline{q}1, \underline{q}2)$ satisfying：

$$\underline{q}i = \arg\max f_i(q1., q2)$$

By Nash bargaining solution, actually the manager i will get

$$z_i(a) \equiv B_i[ai, f_i(q1(a), q2(a))] - p_i$$

Let $\underline{a}i = \arg\max z_i(a)$, the total surplus in this case would be

$$B_1[\underline{a}1, f_1(q(\underline{a})] + B_2[\underline{a}2, f_2(q(\underline{a})]$$

The Costs and Benefits of Ownership ——Grossman and Hart（1986）

Conclusion: The optimal market structure should optimize the total social surplus according to the above results.

Market Definition

- The pre-merger gross margin $m \equiv \frac{P - MC}{P}$.
- Define L as the critical loss which is the largest percentage reduction in sales such that the price increase is barely profitable.
- By the above definition, we have

  $$(P - MC)X = [P(1+G) - MC]X(1-L)$$

  where G is the factor that monopolist raises the price to P(1+G).
- Hence, $L = \frac{G}{G + m}$

Market Definition

- Define the aggregate diversion ratio D for a given product as the fraction of the overall sales lost by that product that are captured by any of the other products in the candidate product market.
- The actual loss of sales for the hypothetical monopolist is
- $A=(1-D)G/m$.
- It can be shown that $A<L$ if and only if $D>L$.

Merger Simulation

Werden and Froeb (2007), Epstein and Rubinfeld (2001,2004)	Provide discussion of the merger simulation methodology.
Berry (1994), Berry, Levinsohn and Pakes (1995)	Build a model in which demand for the various differentiated products depends on their underlying characteristics
Nevo(2000a, 2001)	Applies similar methods in the ready-to eat cereal industry
Nevo(2001b)	Provides a practitioners' guide
Hausman, Leonard and Zona (1994)	Employ a multi-stage budgeting procedure, under which products in a market are sorted into subgroups based on their characteristics and demand
Werden and Froeb (1994)	Use a logit model, which imposes a great deal of structure but requires the estimation of relatively few parameters.

A Case of Horizontal Merging
——SEB Acquires Supor

Two Parties' Background

- Headquartered in a small town called YUHUAN 550 kilometers south of Shanghai, ZHEJIANG SUPOR COOKWARE CO., LTD. has been making cookware since 1988 with the total capital over 1.3 billion yuan and 4000 plus staffs. Supor is one of China's largest manufacturers of electrical kitchen appliances. In 2004, Supor issued A share in Shenzhen Stock Exchange.

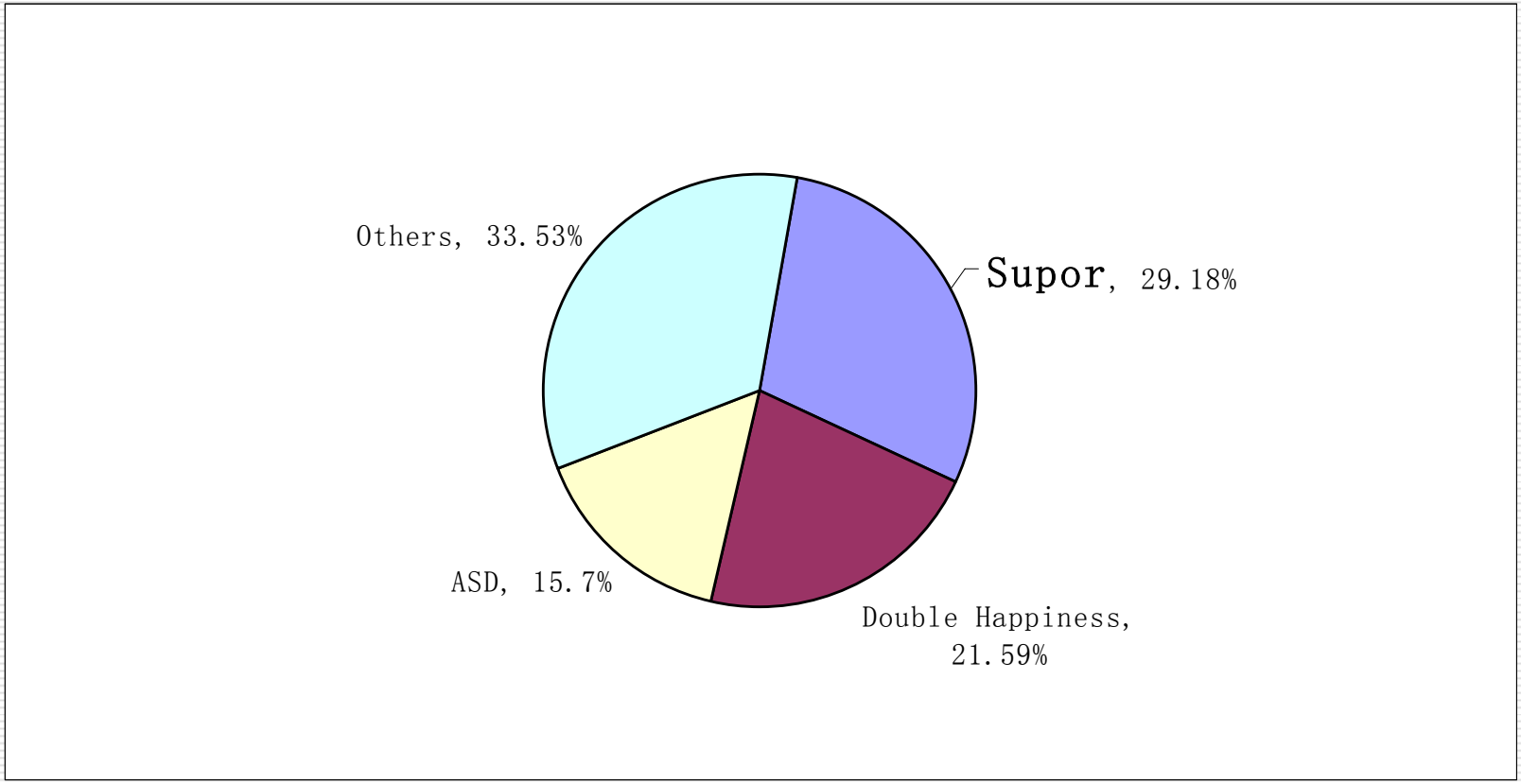
- SEB is one of world wide largest manufacturers of kitchen appliances with more than 150 years history. It has a sales network covering over 120 countries. The net revenue of SEB amounted to 2.46 billion euro, while the net profit was only 0.1billion euro. The group has a desire to enter Chinese market.

A Case of Horizontal Merging ——SEB Acquires Supor

- In August of 2006, Supor Cookware Co Ltd confirmed its takeover by French firm SEB Internationale SAS for 2.37 billion yuan (US$296 million) which was based on the A share's price of Supor. According to the company's statement, Supor has agreed to sell a 61 per cent stake to the France-based producer of small domestic appliances.

- Such merging plan met the opposition from Supor's competitors in China. They worried that such a merging would break the balance in Chinese kitchen appliance market and at last, drive them out of the market. The rest companies sued to the Ministry of Commerce. But eventually, the ministry permitted this merging case.

The Pressure Cooker Market Structure in China



A Case of Horizontal Merging ——SEB Acquires Supor

According to the Contract, SEB promises that

- The Brand “ Supor” will still be used by the new firm to develop the Chinese market.
- The managing staffs of original firm will be kept as much as possible.
- The A shares they bought will not be sold within three years.

Mergers When Firms Compete by Choosing both Price and Promotion
——Tenn，Froeb and Tschantz(2007)

This paper builds a structural merger model where firms compete using both price and promotion, the latter of which includes expenditures of advertising, sales promotion, publicity, and personal selling, and refers to the various methods of promoting the product, brand, or company (McCarthy, 1981). There are two sources of potential bias from ignoring promotional competition.

- Estimation bias: It is a type of omitted variables bias. If promotion is correlated with price, then observed price changes will proxy for unobserved (or ignored) changes in promotional activity. As a consequence, price elasticity estimates will be biased. Bias in estimated own-price elasticities affects the post-merger price prediction because a merged firm facing a more elastic demand would not raise price as high as a merged firm facing a less elastic demand.

- Extrapolation bias: Following a merger, we would expect the merged firm to internalize both price and promotional competition among its commonly owned products. In price-only merger models, promotional activity is implicitly held constant at pre-merger levels when the post-merger equilibrium is calculated. This leads to extrapolation bias when optimal price depends on the level of promotional activity.

Mergers When Firms Compete by Choosing both Price and Promotion
——Tenn，Froeb and Tschantz(2007)

- Let's begin by reviewing the determination of Nash equilibrium in static Bertrand price-only models.

- The industry is composed of n products, with product j having price p_j and quantity demanded $q_j(p)$, which is a function of the vector p containing each product's price. The cost of producing product j is denoted by $c(q_j)$. Hence , the profit associated with product j $\pi_j = p_j q_j - c(q_j)$.

- If each product is owned by a different firm which sets price so as to maximize its profit, then the first-order condition for optimal pricing is given by $q_j + (p_j - c'_j)\frac{\partial q_j}{\partial p_j} = 0$ Hence we get $\frac{p_j - c'_j}{p_j} = -\frac{1}{\varepsilon_{jj}}$

Mergers When Firms Compete by Choosing both Price and Promotion
——Tenn，Froeb and Tschantz(2007)

- We can extend the above analysis to multi-product firms. If a single firm owns J products, say after merger, then the first order condition for j=1,2...J are:

$$q_j + \sum_{k=1}^{J} (p_k - c'_k) \frac{\partial q_k}{\partial p_j} = 0$$

- The above equations are post –merger Nash equilibrium. The difference between the pre- and post-merger Nash equilibrium is known as the unilateral price effect of the merger because the merged firm can raise prices without the cooperation of the non-merging firms.

Mergers When Firms Compete by Choosing both Price and Promotion
——Tenn，Froeb and Tschantz(2007)

- Similarly, we can analyze the price-plus- promotion model. In addition to setting a price p_j, the firm that owns product j also chooses promotional expenditure m_j.
- Quantity demanded $q_j(p, m)$ is a function of the vector p containing each product's price and the vector m containing each product's promotional expenditure.
- The profit equation for product j becomes: $\pi_j = p_j q_j - c(q_j) - m_j$.
- Assuming each product is independently owned and that price and promotion are optimally chosen, the first-order conditions for product j are given by $q_j + (p_j - c'_j)\frac{\partial q_j}{\partial p_j} = 0$

  and $-1 + (p_j - c'_j)\frac{\partial q_j}{\partial m_j} = 0$.

Mergers When Firms Compete by Choosing both Price and Promotion
——Tenn，Froeb and Tschantz(2007)

- If a firm owns J products and chooses price and promotion to maximize total profit, the first-order conditions on these products change to

$$q_j + \sum_{k=1}^{J} (p_k - c'_k) \frac{\partial q_k}{\partial p_j} = 0$$

and $$-1 + \sum_{k=1}^{J} (p_k - c'_k) \frac{\partial q_k}{\partial m_j} = 0$$

- The difference between these equilibria is the unilateral effect (price and promotion) of the merger.

Correspondence between Price-only and Price-plus-promotion models
——Tenn， Froeb and Tschantz(2007)

- Define $q^* = \arg\max\ p_j q_j - c(q_j) - m_j$ and $m^* = \arg\max\ p_j q_j - c(q_j) - m_j$. In the price-plus-promotion model, by the first-order condition , we get

$$\frac{p_j - c'_j{}^*}{p_j} = -\frac{1}{\varepsilon_{jj}{}^*}$$

- where $$c'_j{}^* = c'_j(q_j{}^*) + \frac{\partial m_j{}^* / \partial p_j}{\partial q_j{}^* / \partial p_j}$$

- and $$\varepsilon_{kj}{}^* = \frac{\partial q_k{}^*}{\partial p_j}\frac{p_j}{q_k{}^*}$$.

- The difference between $\frac{p_j - c'_j{}^*}{p_j}$ and $\frac{p_j - c'_j}{p_j}$ can be interpreted as a characterization of the omitted variables bias in demand estimation.

Mergers When Firms Compete by Choosing both Price and Promotion
——Tenn，Froeb and Tschantz(2007)

- In the price-only model, for a merger between products 1 and 2, the marginal costs that keep prices constant are

$$c'_{1,post-merger} = \frac{\varepsilon_{12}\varepsilon_{21}p_1q_1 - (1+\varepsilon_{11})\varepsilon_{22}p_1q_1 + \varepsilon_{21}p_2q_2}{(\varepsilon_{12}\varepsilon_{21} - \varepsilon_{11}\varepsilon_{22})q_1}$$

$$c'_{2,post-merger} = \frac{\varepsilon_{12}\varepsilon_{21}p_2q_2 - (1+\varepsilon_{22})\varepsilon_{11}p_2q_2 + \varepsilon_{12}p_1q_1}{(\varepsilon_{12}\varepsilon_{21} - \varepsilon_{11}\varepsilon_{22})q_2}$$

- While the pre-merger marginal costs

$$c'_{j,pre-merger} = p_j(1+\varepsilon_{jj}^{-1})$$

Mergers When Firms Compete by Choosing both Price and Promotion
——Tenn， Froeb and Tschantz(2007)

- Define the compensating marginal cost reductions

$$\Delta mc_j = c'_{j,pre-merger} - c'_{j,post-merger}$$

- Hence we can get $\Delta p \approx [\partial p / \partial mc]_{J \times J} \Delta mc$

where $\Delta mc = (\Delta mc_1, \Delta mc_2 ... \Delta mc_J)$.

Mergers When Firms Compete by Choosing both Price and Promotion
——Tenn，Froeb and Tschantz(2007)

- In a price-plus-promotion model where $\pi_j = p_j q_j - c(q_j) - \gamma_j m_j$, we can similarly approximate the post-merger equilibrium as the dot product of the pass through matrix and the compensating marginal reductions,

$$\begin{bmatrix} \Delta p \\ \Delta m \end{bmatrix} \approx \begin{bmatrix} \partial p / \partial mc & \partial p / \partial \gamma \\ \partial m / \partial mc & \partial m / \partial \gamma \end{bmatrix}_{2J \times 2J} \begin{bmatrix} \Delta mc \\ \Delta \gamma \end{bmatrix}$$

Mergers When Firms Compete by Choosing both Price and Promotion
——Tenn，Froeb and Tschantz(2007)

Compare $\Delta p \approx [\partial p / \partial mc]_{J \times J} \Delta mc$ and $\begin{bmatrix} \Delta p \\ \Delta m \end{bmatrix} \approx \begin{bmatrix} \partial p / \partial mc & \partial p / \partial \gamma \\ \partial m / \partial mc & \partial m / \partial \gamma \end{bmatrix}_{2J \times 2J} \begin{bmatrix} \Delta mc \\ \Delta \gamma \end{bmatrix}$

there are two distinct reasons why extrapolation bias arises when one mistakenly applies a price-only model to an industry where firms compete via both price and promotion.

1) $\partial p / \partial mc$ in the latter equation does not, in general, equal $\partial p / \partial mc$ in the former equation.

2) Post-merger the combined firm will adjust each product's promotional activity to maximize its profits. This leads to an additional price effect $(\partial p / \partial \gamma)\Delta \gamma$, which is absent in the price-only model.

A Particular Case Study
——Tenn，Froeb and Tschantz(2007)

- Nestle proposed acquisition of Dreyer's Ice Cream.
- Federal Trade Commission alleged that super-premium ice cream was the relevant product market in which to analyze the proposed transaction.
- The super-premium ice cream data from ACNiuelsen reports 80 weeks of sales data for 11 city-chain combinations.
- To comply with confidentiality requirement, they are referred to as Brand A,B,C and D.

A Particular Case Study
——Tenn，Froeb and Tschantz(2007)

The data separately reports sales for four mutually exclusive levels of promotional activity,

$$m \in M = \{\text{No Promotion, Display Only, Feature Only, Feature \&Display}\}$$

- A display is a secondary sales location.
- A feature is an advertisement appearing in a newspaper, circular or flyer.

A Particular Case Study
——Tenn，Froeb and Tschantz(2007)

Table presents summary statistics for each brand. A significant fraction of super-premium ice cream is sold on promotion with Feature Only, the most common form of promotional activity. Unit sales are high relative to the fraction of stores on promotion for each type of elevated promotional activity.

In part, this is due to the price reduction that typically occurs when a brand is on promotion; each brand's price is approximately 10% lower when on Display Only and 30% lower when on either Feature Only or Feature & Display.

Table 1
Summary Statistics

Brand A	No Promotion	Display Only	Feature Only	Feature & Display
% of Unit Sales	81.5%	0.7%	15.6%	2.2%
% of Stores	92.6%	0.4%	6.5%	0.5%
Avg. Normalized Price	$1.00	$0.89	$0.74	$0.73

Brand B	No Promotion	Display Only	Feature Only	Feature & Display
% of Unit Sales	68.8%	1.1%	25.7%	4.4%
% of Stores	87.6%	0.6%	10.6%	1.2%
Avg. Normalized Price	$1.00	$0.90	$0.71	$0.70

Brand C	No Promotion	Display Only	Feature Only	Feature & Display
% of Unit Sales	76.0%	0.5%	20.1%	3.4%
% of Stores	89.2%	0.3%	9.6%	0.9%
Avg. Normalized Price	$1.00	$0.91	$0.75	$0.76

Brand D	No Promotion	Display Only	Feature Only	Feature & Display
% of Unit Sales	77.0%	0.6%	20.0%	2.4%
% of Stores	93.1%	0.2%	6.2%	0.5%
Avg. Normalized Price	$1.00	$0.91	$0.68	$0.66

A Particular Case Study
——Tenn， Froeb and Tschantz(2007)

- Table 2 presents the demand estimates. Promotions increase the average quality or attractiveness of each brand according to the intercept values.

- Promotions make consumers more price-sensitive according to coefficients in Panel A.

Table 2
Parameter Estimates

A. Mean Coefficients

	Intercept	Price
No Promotion		**-0.61**
		(0.05)
Display Only	**0.60**	**-0.79**
	(0.42)	(0.12)
Feature Only	**0.83**	**-1.13**
	(0.28)	(0.09)
Feature & Display	**2.40**	**-1.34**
	(0.37)	(0.13)

B. Standard Deviation of Random Coefficients

Price	**0.13**
	(0.08)
Display Only	**1.01**
	(0.53)
Feature Only	**1.71**
	(0.18)
Feature & Display	**1.22**
	(0.42)

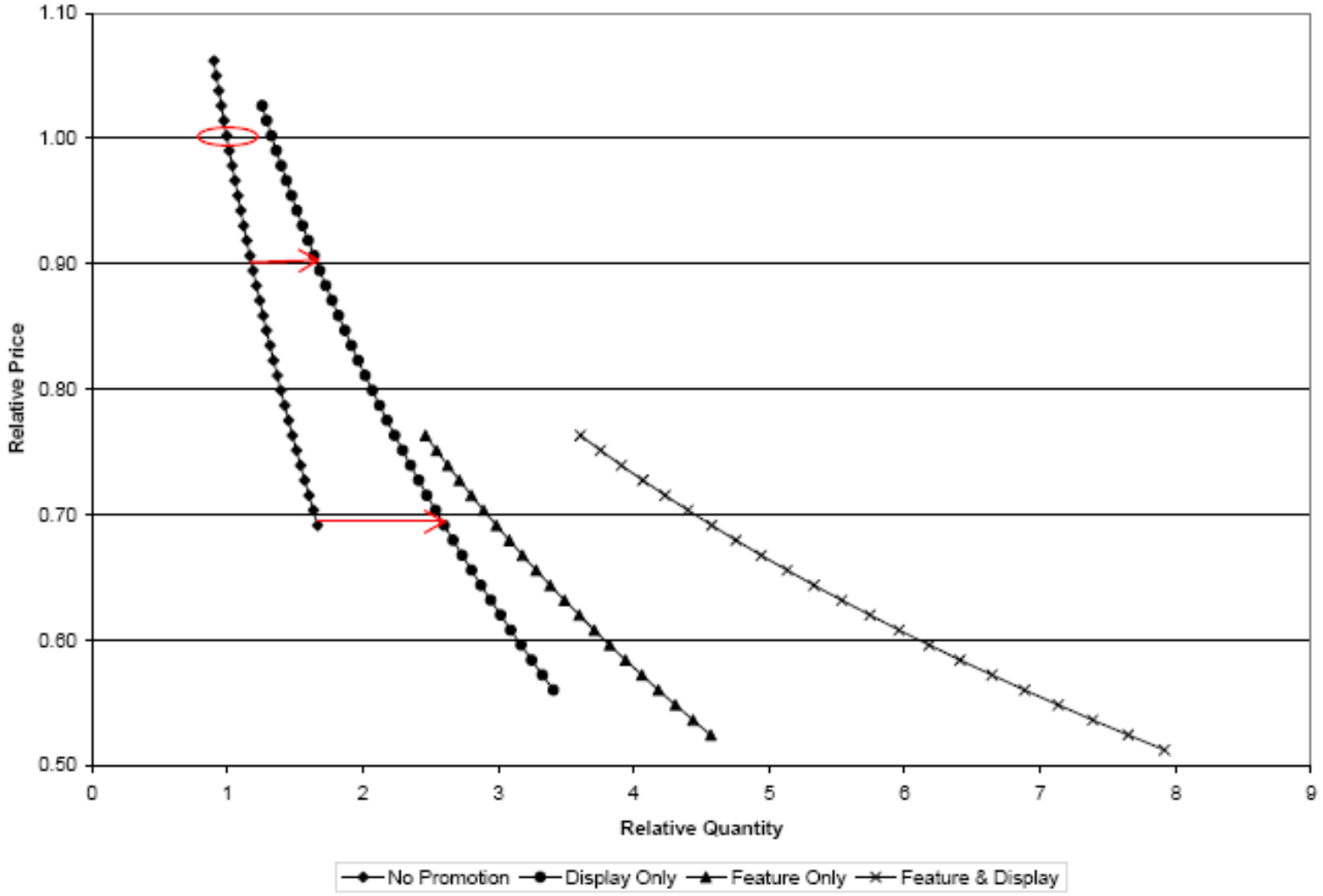
Notes: Standard errors are reported in parentheses. The "No Promotion" intercept is normalized to zero.

A Particular Case Study
——Tenn，Froeb and Tschantz(2007)

- Figure 1 presents Brand B's demand curve for each type of promotional activity. To comply with a confidentiality agreement, the demand curves are rescaled so that the average No Promotion price equals one and unit sales at that price also equals one.

- In Figure 1, we can find that promotions have a larger impact at lower price levels. For example, while a change from No Promotion to Display Only leads to a 33% sales increase when demand is evaluated at the average No Promotion price, a 52% increase is obtained when price is 25% lower.

Figure 1
Demand Curve for Brand B



Notes: The demand curves are rescaled such that Brand B's average "No Promotion" price equals one, and unit sales at that price also equals one. For Brand B, the demand curves are evaluated between the 10th and 90th percentile of prices for each type of promotional activity. The other brands are evaluated at their average price when not on promotion.

A Particular Case Study
——Tenn，Froeb and Tschantz(2007)

- Table 3 presents price elasticities. The first set of results reports own-price elasticity estimates. We can find that demand becomes more elastic at higher levels of promotion.
- The second panel reports the cross-price elasticity matrix.
- To give a more complete picture of inter-brand substitution, the third panel of Table 3 presents the matrix of diversion ratios. For example, the diversion ratio from Brand A to Brand B reports the following: If the price of Brand A were to rise, what fraction of the customers leaving Brand A would switch to Brand B?

Table 3
Elasticity Estimates

A. Own-Price Elasticities by Promotion

	No Promotion	Display Only	Feature Only	Feature & Display
Brand A	**-1.62**	**-1.87**	**-1.88**	**-2.29**
	(0.07)	(0.24)	(0.15)	(0.23)
Brand B	**-1.66**	**-1.96**	**-1.94**	**-2.30**
	(0.06)	(0.24)	(0.15)	(0.22)
Brand C	**-1.56**	**-1.80**	**-1.75**	**-2.24**
	(0.07)	(0.22)	(0.14)	(0.22)
Brand D	**-1.80**	**-2.31**	**-2.19**	**-2.70**
	(0.08)	(0.28)	(0.18)	(0.25)

B. Elasticity Matrix

	With respect to a price increase by: Brand A	Brand B	Brand C	Brand D
Brand A	**-1.67**	**0.08**	**0.13**	**0.03**
	(0.06)	(0.01)	(0.02)	(0.00)
Brand B	**0.20**	**-1.76**	**0.16**	**0.03**
	(0.02)	(0.06)	(0.03)	(0.01)
Brand C	**0.13**	**0.06**	**-1.61**	**0.02**
	(0.02)	(0.01)	(0.06)	(0.00)
Brand D	**0.16**	**0.07**	**0.14**	**-1.90**
	(0.03)	(0.01)	(0.02)	(0.07)

C. Diversion Ratios

	With respect to a price increase by: Brand A	Brand B	Brand C	Brand D
Brand A		**0.11**	**0.08**	**0.09**
		(0.01)	(0.01)	(0.02)
Brand B	**0.05**		**0.04**	**0.04**
	(0.01)		(0.01)	(0.01)
Brand C	**0.08**	**0.09**		**0.08**
	(0.01)	(0.02)		(0.01)
Brand D	**0.02**	**0.02**	**0.01**	
	(0.00)	(0.00)	(0.00)	

Notes: Standard errors are reported in parentheses. The cross-price elasticities and diversion ratios are calculated assuming a uniform percentage price increase across all types of promotion.

A Particular Case Study
——Tenn， Froeb and Tschantz(2007)

- Table 4 present own- and cross-brand promotional effects. The percent change in sales associated with each type of promotion is computed relative to No Promotion and is evaluated at each brand's average price for the given level of promotion.

- Across all four brands, promotional activity leads to a significant sales increase for brand undertaking the promotion, with Display Only having the smallest effect and Feature and Display the largest impact.

Table 4
Promotional Effects

	Promotion by Brand A			Promotion by Brand B			Promotion by Brand C			Promotion by Brand D		
	Display Only	Feature Only	Feature & Display	Display Only	Feature Only	Feature & Display	Display Only	Feature Only	Feature & Display	Display Only	Feature Only	Feature & Display
Brand A	54.2%	104.7%	213.7%	-1.6%	-4.8%	-8.7%	-1.9%	-5.4%	-9.2%	-0.5%	-2.6%	-4.4%
	(7.4%)	(8.5%)	(15.6%)	(0.7%)	(0.6%)	(2.0%)	(1.3%)	(0.8%)	(2.8%)	(0.3%)	(0.5%)	(0.9%)
Brand B	-2.9%	-10.2%	-15.7%	68.7%	173.2%	340.8%	-2.0%	-9.2%	-12.5%	-0.6%	-3.7%	-5.3%
	(2.3%)	(1.2%)	(3.6%)	(11.2%)	(10.1%)	(27.4%)	(1.6%)	(1.1%)	(3.1%)	(0.3%)	(0.7%)	(1.1%)
Brand C	-2.5%	-7.3%	-11.2%	-1.4%	-5.1%	-7.8%	45.9%	88.0%	180.3%	-0.5%	-2.8%	-4.1%
	(1.3%)	(0.9%)	(2.5%)	(0.6%)	(0.7%)	(1.7%)	(7.1%)	(5.5%)	(12.3%)	(0.2%)	(0.5%)	(0.7%)
Brand D	-2.2%	-9.7%	-12.4%	-1.4%	-6.4%	-8.2%	-1.5%	-8.8%	-10.3%	71.0%	276.2%	518.5%
	(1.9%)	(1.5%)	(2.9%)	(0.7%)	(1.1%)	(1.5%)	(1.4%)	(1.3%)	(2.3%)	(20.5%)	(18.6%)	(71.0%)

Notes: Standard errors are reported in parentheses. The table reports the percent change in unit sales relative to "No Promotion."

A Particular Case Study
——Tenn， Froeb and Tschantz(2007)

- Panel A of Table 5 presents the predicted impact of a merger between Brand B and Brand C.

- To assess the empirical support for the FTC's proposed market delineation, panel B of Table 5reports results form a second mergers simulation that predicts the impact of a merger to monopoly.

Table 5
Merger Simulation Results

A. Merger between Brand B and Brand C

% Change Price	Brand A	Brand B	Brand C	Brand D	Category Index
No Promotion	0.1%	6.1%	2.0%	0.0%	
Display Only	0.1%	5.4%	1.7%	0.0%	
Feature Only	0.2%	6.7%	2.0%	0.1%	
Feature & Display	0.1%	5.4%	1.5%	0.1%	
Total	0.1%	8.1%	2.4%	-0.1%	2.2%

% Change Quantity Per Store	Brand A	Brand B	Brand C	Brand D	Category Index
No Promotion	0.7%	-9.2%	-2.6%	0.9%	
Display Only	0.5%	-9.8%	-2.6%	0.7%	
Feature Only	0.4%	-11.8%	-3.0%	1.1%	
Feature & Display	0.3%	-11.5%	-3.0%	0.7%	
Total	0.7%	-13.5%	-3.4%	1.2%	-3.0%

% Change Number of Stores	Brand A	Brand B	Brand C	Brand D	Category Index
No Promotion	-0.1%	3.1%	1.0%	-0.1%	
Display Only	-0.7%	-16.1%	-5.3%	-0.1%	
Feature Only	0.8%	-22.8%	-8.4%	1.9%	
Feature & Display	0.1%	-20.0%	-8.0%	0.9%	
Total on Promotion	0.7%	-22.2%	-8.3%	1.8%	-6.1%

B. Merger to Monopoly

% Change Price	Brand A	Brand B	Brand C	Brand D	Category Index
No Promotion	9.0%	16.0%	8.1%	13.7%	
Display Only	7.5%	13.6%	6.6%	12.0%	
Feature Only	8.3%	15.8%	7.8%	15.4%	
Feature & Display	6.5%	12.9%	6.0%	13.3%	
Total	10.3%	19.9%	9.4%	17.0%	11.7%

% Change Quantity Per Store	Brand A	Brand B	Brand C	Brand D	Category Index
No Promotion	-11.1%	-20.2%	-9.5%	-18.6%	
Display Only	-11.2%	-21.3%	-9.6%	-21.8%	
Feature Only	-12.3%	-23.6%	-10.8%	-24.8%	
Feature & Display	-12.4%	-24.1%	-11.1%	-27.9%	
Total	-13.3%	-26.9%	-11.9%	-24.4%	-15.3%

% Change Number of Stores	Brand A	Brand B	Brand C	Brand D	Category Index
No Promotion	2.6%	5.8%	3.3%	2.7%	
Display Only	-22.6%	-34.7%	-20.2%	-41.8%	
Feature Only	-32.9%	-41.5%	-27.1%	-35.6%	
Feature & Display	-28.0%	-40.7%	-27.8%	-40.1%	
Total on Promotion	-32.0%	-41.1%	-26.9%	-36.1%	-31.5%

Notes: The category index weights each brand using the average of its pre- and post-merger unit sales.

A Particular Case Study
——Tenn，Froeb and Tschantz(2007)

- A comparison of the three sets of results shown in Table 6 reveals that larger post-merger price effects are obtained when promotions are controlled for both in demand model and when simulating the merger.
- Panel A corresponds to a merger between Brand B and C.
- Panel B reports results from a second set of merger simulations.

Table 6
Merger Simulation Comparisons

A. Merger between Brand B and Brand C

Control for Promotions in:		% Change Price					% Change Quantity				
Demand Estimation?	Merger Simulation?	Brand A	Brand B	Brand C	Brand D	Category Index	Brand A	Brand B	Brand C	Brand D	Category Index
Yes	Yes	0.1%	8.1%	2.4%	-0.1%	2.2%	0.7%	-13.5%	-3.4%	1.2%	-3.0%
Yes	No	0.1%	6.3%	2.0%	0.0%	1.8%	0.5%	-10.0%	-2.8%	0.7%	-2.3%
No	No	0.0%	3.3%	1.1%	0.0%	0.9%	0.4%	-7.4%	-2.4%	0.5%	-1.9%

B. Merger to Monopoly

Control for Promotions in:		% Change Price					% Change Quantity				
Demand Estimation?	Merger Simulation?	Brand A	Brand B	Brand C	Brand D	Category Index	Brand A	Brand B	Brand C	Brand D	Category Index
Yes	Yes	10.3%	19.9%	9.4%	17.0%	11.7%	-13.3%	-26.9%	-11.9%	-24.4%	-15.3%
Yes	No	8.9%	16.2%	8.1%	14.5%	10.0%	-11.5%	-21.6%	-10.1%	-20.6%	-12.9%
No	No	4.4%	7.8%	4.1%	7.2%	4.9%	-9.3%	-15.6%	-8.2%	-16.0%	-10.1%

Notes: The category index weights each brand using the average of its pre- and post-merger unit sales.

A Particular Case Study
——Tenn，Froeb and Tschantz(2007)

- Panel A of Table 7 reports the changes in marginal production cost and marginal promotion cost necessary to preserve the pre-merger equilibrium.

- Panel B reports the compensating marginal cost reductions in the price-only model.

- Conclusion: In this case, reliance on a price-only model could lead antitrust authorities to conclude that claimed merger efficiencies are sufficient to offset the anticompetitive impact of a merger. But in fact much larger efficiencies might be required.

Table 7
Compensating Marginal Cost Reductions

A. Price-Plus-Promotion Model

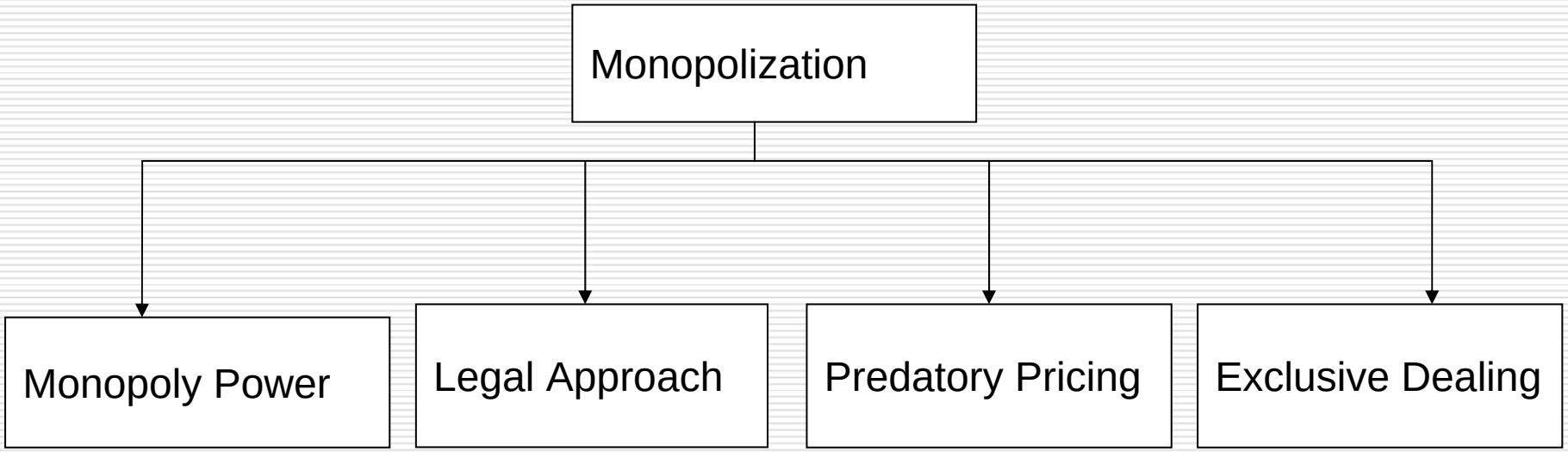
	Merger between Brand B and Brand C		Merger to Monopoly			
% Change Marginal Production Cost	Brand B	Brand C	Brand A	Brand B	Brand C	Brand D
No Promotion	-15.5%	-6.4%	-26.2%	-42.7%	-26.0%	-32.0%
Display Only	-12.2%	-4.6%	-19.8%	-32.1%	-19.0%	-23.4%
Feature Only	-15.9%	-5.9%	-23.0%	-39.0%	-23.6%	-33.7%
Feature & Display	-11.3%	-3.7%	-16.1%	-28.3%	-15.2%	-25.4%
% Change Marginal Promotion Cost	Brand B	Brand C	Brand A	Brand B	Brand C	Brand D
Display Only	-0.8%	-0.8%	-4.4%	-4.3%	-3.5%	-1.9%
Feature Only	-3.9%	-3.6%	-13.0%	-9.8%	-10.2%	-2.6%
Feature & Display	-3.8%	-2.7%	-8.8%	-10.5%	-8.9%	-4.7%

B. Price-Only Model

	Merger between Brand B and Brand C		Merger to Monopoly			
	Brand B	Brand C	Brand A	Brand B	Brand C	Brand D
% Change Marginal Production Cost	-6.0%	-2.2%	-8.6%	-15.1%	-8.3%	-12.6%

Notes: The table reports the percent change in marginal costs required to preserve the pre-merger equilibrium.

The Content of Monopolization



Rationale for Monopoly Power Requirement

- One firm may gain dominant position for best serving the interests of consumers.
- Government intervention is unnecessary because the most successful companies will continually face the challenge from the new and innovative rivals.
- There is a risk that it is hard to distinguish exclusionary from pro-competitive conduct.
- The magnitude of incremental harm induced by price increases is another factor bearing on the value of a monopoly power requirement.

Application of a Monopoly Power Test

- How high should the market power requirement be?
- What is the cost and potential for error in the market power inquiry itself?
- How is conduct itself highly probative of market power in case in which the conduct would not be rational?

Monopoly Power

- The central legal question is how much market power is denoted by monopoly power.

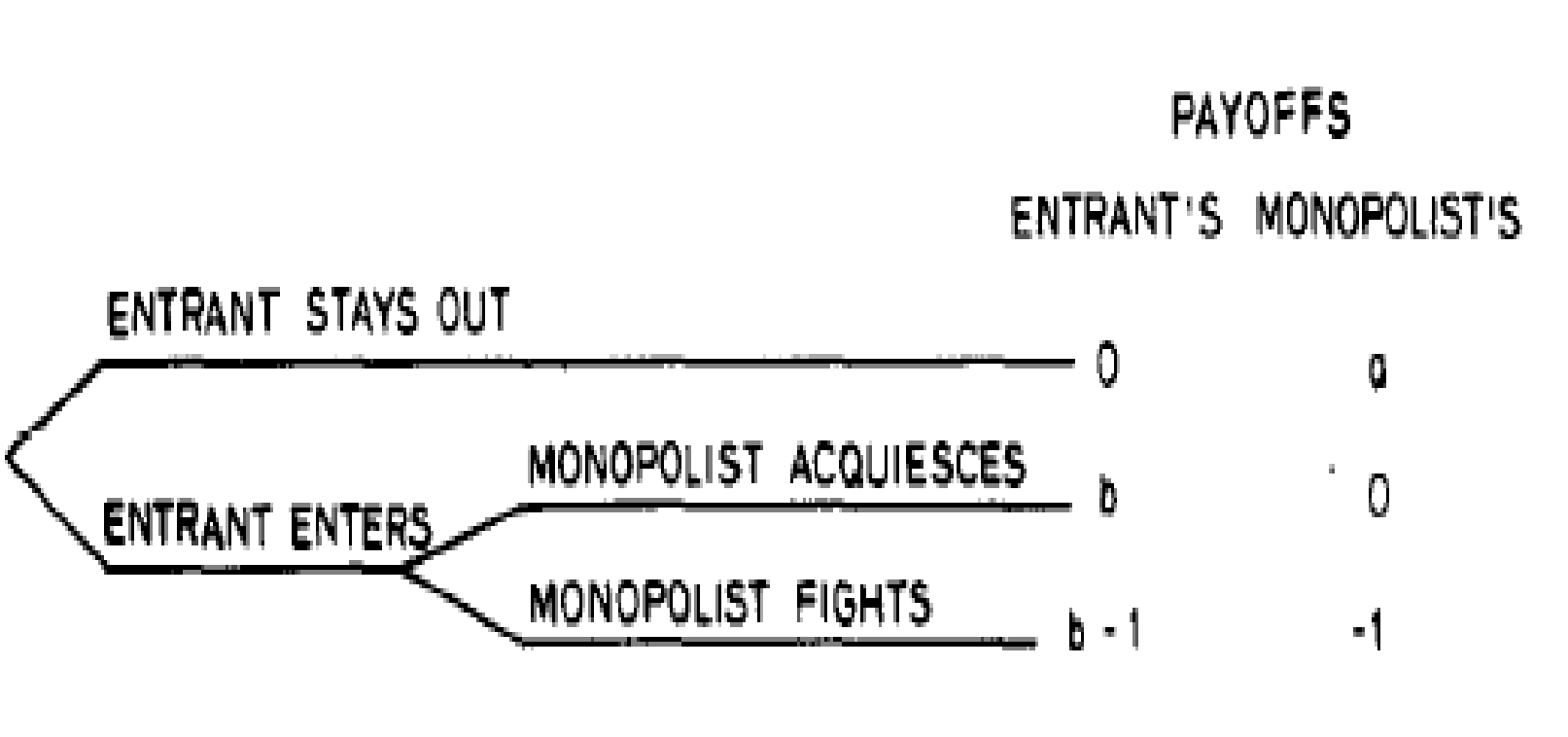
$$\varepsilon_F = \frac{|\varepsilon_D| + (1 - S)\varepsilon_R}{S}$$

- In addition to the market share S, both the market elasticity of demand, ε_D and the elasticity of supply response, ε_R are important. The high share might be associated with low market power and a modest share might be associated with substantial market power.

Economic Theory

McGee(1958)	Attacks on traditional concerns about predatory pricing.
Telser(1966), Benoit (1984)	Show that the smaller firm will earn positive profit if not for predation, but have limited ability to sustain losses before it must exit the market.
Bolton and Scharfstein (1990)	show how deep-pocket predation can occur even if the prey and its lenders are sophisticated
Kreps and Wilson (1982), Milgrom and Roberts(1982)	Demonstrate the power of reputation and signaling to support essence of predation based on reputation on the presence of asymmetric information.
Fudenberg and Tirole(1986)	Show how predation can also work by disrupting the ability of the entrant to determine whether remaining in the market will be profitable.

Chain –store Paradox



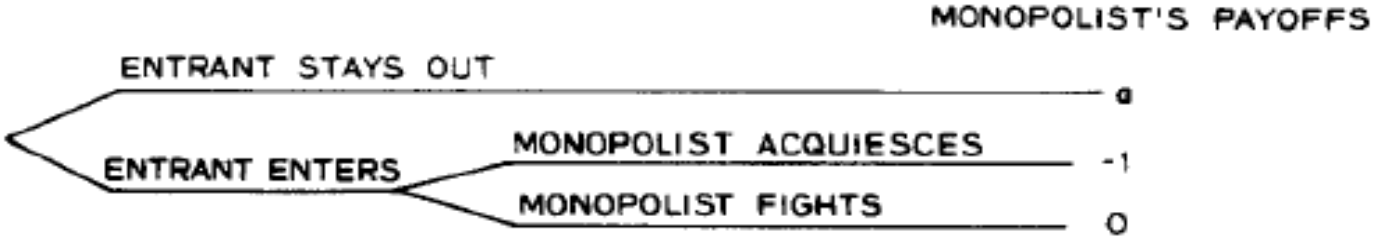
- Here $a>1$ and $0<b<1$

Chain –store Paradox

- If the horizon is infinite, there is an equilibrium in which the monopolist will fight whenever the entrant enters and the entrant will choose to stay out in each period.
- If the horizon is finite, such scheme cannot be an equilibrium which is easy to check by backward induction.
- In finite repeated game, the unique perfect equilibrium is that the entrant will enter each period and the monopolist will acquiesces.

Reputation and Imperfect Information ——Kreps and Wilson(1982)

- The monopolist might belong to two types, i.e. the tough and the weak.
- The weak monopolist face the game the same as the one in chain-store paradox while the tough one face the game as follows. Obviously, this type will always fight.



Reputation and Imperfect Information ——Kreps and Wilson(1982)

- Suppose there are N periods.
- In each period, there is an entrant who might choose to stay out or enter. If the entrant choose to stay out, he will leave the industry forever.
- In the industry, there is a long-lived monopolist who might choose to fight or acquiesce when an entrant enters.
- The short-lived entrants assess an initial probability p_0 that the monopolist is tough.

The recursive belief

- If there is no entry at stage n-1, then $p_n = p_{n-1}$.
- If there is entry at stage n-1, this entry is fought and $p_{n-1} > 0$ then $p_n = \max(b^{N-n}, p_{n-1})$.
- If there entry at stage n-1 and either this entry is met by acquiescence or $p_{n-1} = 0$ then $p_n = 0$.

Strategy of the Monopolist

- If the monopolist is tough, it always fights entry.

- If the monopolist is weak and entry occurs at stage n, the monopolist's response depends on n and p_n : If n=N, the monopolist acquiesces; If n<N and $p_n \geq b^{N-n}$, the monopolist fights; If n<N and $p_n < b^{N-n}$, the monopolist fights with probability $[(1-b^{N-n})p_{n-1}]/[(1-p_n)b^{N-n}]$.

Strategies of the Entrants

- If $p_n > b^{N-n+1}$, entrant n stays out;
- If $p_n < b^{N-n+1}$, entrant n enters;
- If $p_n = b^{N-n+1}$, entrant n randomizes, staying out with probability 1/a .

Reputation and Imperfect Information ——Kreps and Wilson(1982)

- Proposition The strategies and beliefs given above constitute a sequential equilibrium.

- In this equilibrium, we can verify inductively that the expected payoff to the weak monopolist from stages n to N is given by the following function, where $k(p) = \sup\{n : b^{N-n+1} < p\}$.

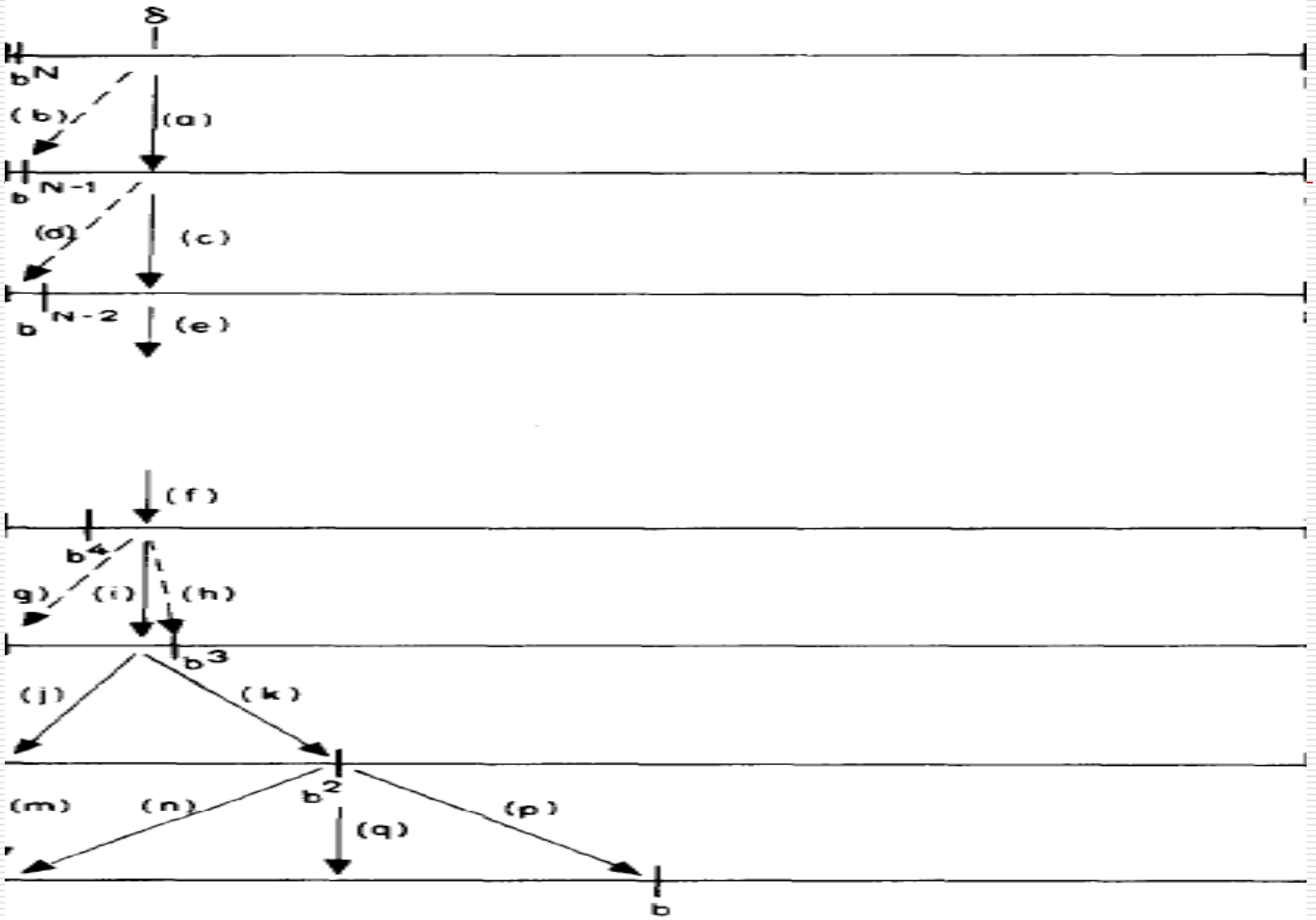
$$
\begin{aligned}
v_n(p_n) &= a(n - k(p_n) + 1) + 1 && \text{if } b^{N-n+1} < p_n = b^{k(p_n)-1};\\
&= a(n - k(p_n) + 1) && \text{if } b^{N-n+1} < p_n < b^{k(p_n)-1};\\
&= 1 && \text{if } p_n = b^{N-n+1};\\
&= 0 && \text{if } p_n < b^{N-n+1}.
\end{aligned}
$$

Reputation and Imperfect Information ——Kreps and Wilson(1982)

- Hence, we have

$$\lim_{N \to \infty} v_0(p_0)/N = a \quad \text{if} \quad p_0 > 0;$$
$$= 0 \quad \text{if} \quad p_0 = 0.$$

- That means even for very small but strictly positive initial probability that the monopolist might be tough, the average payoff in the finite horizon model tends to that in the infinite horizon model. In such a sense, chain-store paradox is solved.


δ
b N
(b)
(a)
b N-1
(d)
(c)
b N-2
(e)
(f)
b 4
(g)
(i)
(h)
b 3
(j)
(k)
b 2
(m)
(n)
(q)
(p)
b

Empirical Evidence

McGee (1958)	Studies the Standard Oil case.
Koller (1971)	Studies 26 cases ranging from 1907 through 1965 of which only four cases showed the predation had been successful.
Yamey(1972)	Argues that predatory practices may not be as rare as McGee suggested and provided an example of predation in the China-to-England ocean shipping business in 1890.
Zerbe and Cooper(1982)	Update and expand Koller's study based on 49 predatory-pricing cases from 1940 through1981.
Burns(1986)	Presents evidence that predation by the tobacco trust enabled it acquire its rivals on more favorable terms.
Weiman and Levin(1994)	Argue that the Southern Bell company engaged in predation to protect and build its telephone monopoly.
Morton(1997)	Finds related evidence of deep-pocket predation in merchant shipping.
Genesove and Mullin(2006)	Find evidence of predatory pricing in the U.S. sugar refining industry before World War I.
Bolton et al. (2000)	Assemble and discuss the body of empirical evidence of predatory pricing.

Predation and Its Rate of Return: the Sugar Industry 1887-1914 ——Genesove and Mullin(2006)

- The Sugar Trust, later reorganized as the American Sugar Refining Company（ASRC）was formed in 1887 as a consolidation of 18 firms controlling 80% of industry capacity.
- There were two sets of entrants, Spreckels and later Arbuckle Brothers and Doscher, who were met with sharp cuts in price. During the price wars, the price cost margin fell to zero or below.
- The evidence this paper is based on is twofold: by direct comparison of price to marginal cost and by construction of a lower bound to predicted competitive price-cost margins that is shown to exceed observed margins.

Predation and Its Rate of Return: the Sugar Industry 1887-1914 ——Genesove and Mullin(2006)

The constant marginal cost can be summarized by

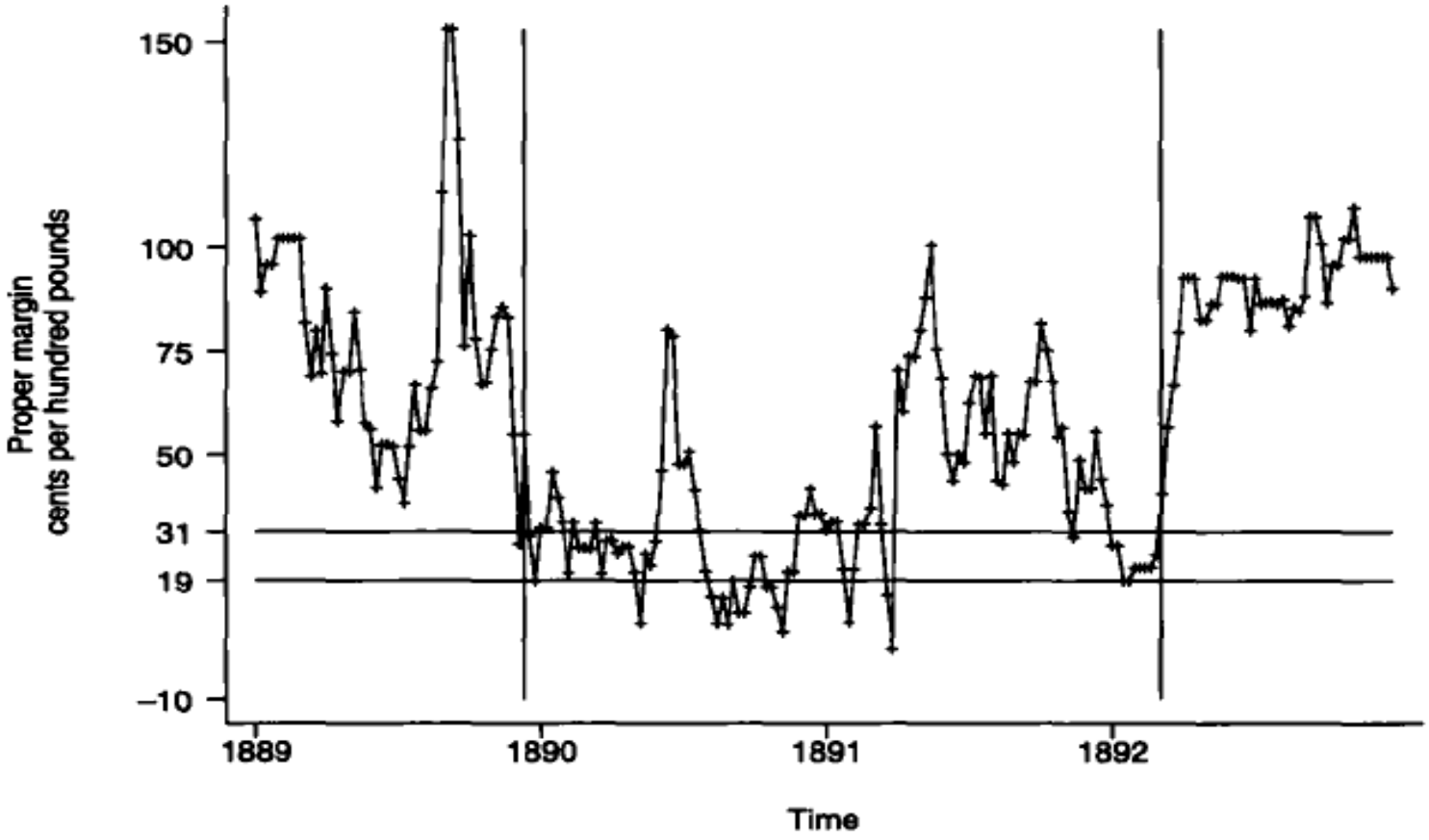
$$c = c_0 + 1.075 P_{RAW}$$

since 100 pounds of raw sugar would yield 93 pounds of refined sugar due to impurities and losses in the refining process.

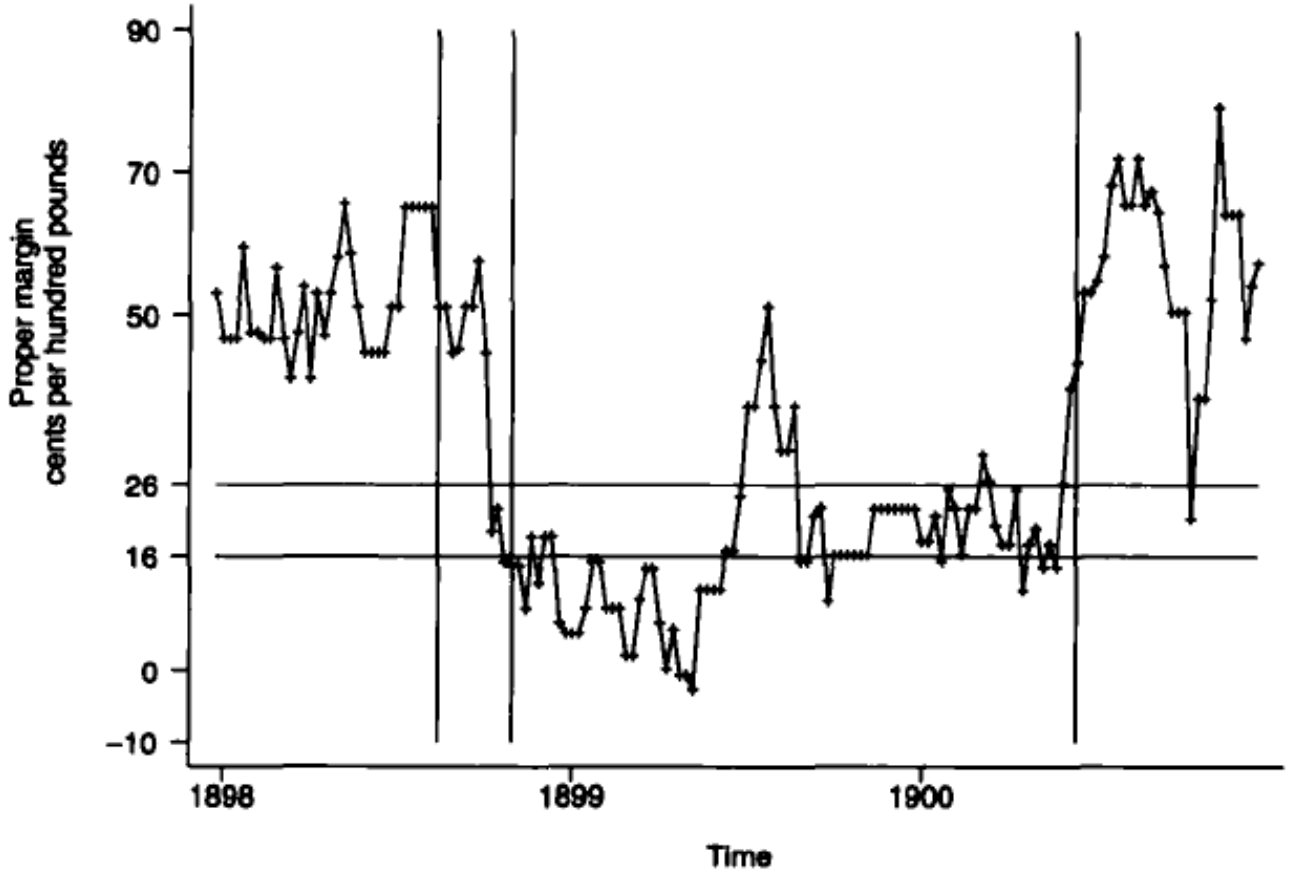
Define Proper margin .

$$PM \equiv P - 1.075 P_{RAW} \leq P - c$$

Spreckels SR. War



Arbuckle Brothers- Doscher War



The Controversy of Legal Test

- No reference to any cost-based test
- Some predation would not be engaged but for its threat effects of excluding rivals.
- Price cuts might be a move in the right direction for the sake of total welfare.
- Sophistication of decision making.
- There may be learning by doing in practice.
- And so forth.

Anticompetitive Effects

- Anticompetitive exclusion will solve free riding problem. Kaplow(1985), Rasmusen(1991), Innes and Sexton(1994) and Segal and Whinston(2000b).
- The exclusion ia s robust outcome if Monopolist can make discriminatory offers to various buyers. Segal and Whinston (2000b, 2003)
- If monopolist is constrained to make nondiscriminatory offers and if the buyers can coordinate to the extent of selecting their Pareto-preferred equilibrium, the outcome might be fragile. Whinston(2006)
- Buyers might have little incentive to resist anticompetitive exclusion of an upstream entrant. Aghion and Bolton(1987), Mankiw and Whinston (1986), Simpson and Wickelgren (2004), Farrell(2005).

Efficiencies

Marvel (1982)	Shows that the exclusive arrangement can promote efficiency .
Masten and Snyder (1993)	Argues that the contractual provisions inducing shoe manufacturers to exclusively use United Shoe's machines protected the investments made by United Shoe in training shoe manufacturers to organize their production more efficiently.
Segal and Whinston （2000a）	Use a model to show that exclusivity has no effect when all investments are fully specific to the relationship contrary to some informal claims in the literature.

Exclusive Contracts and Protection of Investments ——Segal and Whinston(2001a)

- Consider a situation in which a buyer B and a seller S initially contract , while facing the possibility that the buyer may later wish to buy from an external source E.
- At the initial stage, B and S can sign an exclusive contract that prohibits B from trading with E .
- Suppose that B demands either zero or one unit of the good, which she values at v, that S's cost of producing the good is c_s and that E's cost of producing the good is c_E .
- Denote by $\phi_s(c_s)$ the ex ante investment cost for S of achieving cost level c_s .
- Let e=1 denote an exclusive contract and e=0 denote a nonexclusive one. Let $U_s^0(c_s,e)$ and $U_B^0(c_s,e)$ denote the two parties' disagreement utilities, which may in general depend on S's ex post c_s .

Exclusive Contracts and Protection of Investments ——Segal and Whinston(2001a)

- Suppose that E receives no surplus in the bargaining.
- B and S split their renegotiation surplus 50/50 over the disagreement point, which is determined by the original contract.
- The renegotiation surplus can be written as $T(c_s) - U_s^0(c_s, e) - U_B^0(c_s, e)$

  where $T(c_s) = \max\{v - c_s, v - c_E, 0\}$.
- S's ex post utility can be written as

$$U_s(c_s, e) = U_s(c_s, e) + 0.5[T(c_s) - U_s^0(c_s, e) - U_B^0(c_s, e)]$$

Exclusive Contracts and Protection of Investments ——Segal and Whinston(2001a)

- Consider a nonexclusive contract. In this case, the parties' utilities at the disagreement point are

$$U_s^0(c_s, 0) = 0;\ U_B^0(c_s, e)c_s = \max\{v - c_s, 0\}$$

- The seller's ex ante investment decision is to choose

$$\bar{c}_s = \arg\max[U_s(c_s, 0) - \phi_s(c_s)] = \arg\max 0.5T(c_s) - \phi_s(c_s)$$

- The first- best solution

$$c_s^* = \arg\max T(c_s) - U_s^0(c_s, 0) - U_B^0(c_s, 0) - \phi_s(c_s) = \arg\max T(c_s) - \phi_s(c_s)$$

- Hence, $c_s^* > \bar{c}_s$, which implies that S's incentive to invest is socially suboptimal. .

Exclusive Contracts and Protection of Investments ——Segal and Whinston(2001a)

- Consider an exclusive contract. Then $U_s^0(c_s,1)=U_B^0(c_s,1)=0$
- Hence $U_s(c_s,1)=U_s(c_s,0)+0.5\max\{v-c_E,0\}$
- The seller's investment decision is to choose

$$\underline{c}_s=\arg\max[U_s(c_s,1)-\phi_s(c_s)]=\arg\max 0.5T(c_s)-\phi_s(c_s)c_E=\bar{c}_s$$

- The exclusivity does not affect the investment level.

Standard Oil

- Standard Oil had exclusive supply contracts with 16% of the retail outlets in the geographic market, most of which were terminable at 6 month intervals.

- Although this arrangement does not seem to constitute an insuperable barrier to an entrant or a rival seeking to expand, the Court affirmed a determination that it was anticompetitive.

Microsoft

- In the mid-1990s, the US government challenged and Microsoft ultimately agreed to cease the use of per-processor licensing fees for its operating system.
- Computer manufacturers who had wished to load Microsoft's operating system on some of their computers were charged for loading it on all of the computers they shipped, as a condition for dealing with Microsoft.
- Although not literally barred from dealing with competitors, computer manufacturers had to pay for Microsoft's operating system even on computers shipped with an alternative operating system or with none.
- Subsequent litigation challenged other features of Microsoft's contracting and operating system design that exhibited some exclusivity.

Microsoft Monopoly Maintenance Example

- There is a Windows monopoly.
- There could be dynamic competition for the operating system market if internet entrepreneurs built standards in new markets.
- But contracts with distributors and with other complementors kept the Internet entrepreneurs form getting a market test.

Dentsply International Inc.

- The leading supplier of artificial teeth with a 75-80% market share was found to have violated Sherman Act section 2 for imposing exclusivity on its dealers.
- There is a monopoly in prefab artificial teeth.
- There could be competition in the market from a number of far smaller and lower priced competitors.
- But exclusive contracts with dealer block smaller competitors from offering consumers effective tooth choice.