5. The Dynamics of Pricing Rivalry

In July 1985 Fairfax increased the price of the Sydney *Sun*, in the expectation that News would follow suit with the *Daily Mirror*'s price, as they had done in the past.

But for 3½ years News kept the *Mirror*'s price below; its share rose from 50% to 53%, and it increased its advertising rates, which increased its annual profit by nearly $1.6m, while the *Sun*'s fell by $1.3 m.

Then Fairfax surrendered and henceforth the *Mirror* has been price leader.

What conditions influence the intensity of price competition in a market?

Why do firms in some markets seem able to coordinate their pricing behaviour and to avoid price wars, while in other markets intense price competition is the norm?

What is the value, if any, of policies under which the firm commits to matching the prices charged by its rivals?

When should a firm match the price of a rival, and when should it do its own thing?

Price competition is a dynamic process: a firm's decisions will affect how rivals and the firm itself behave in the future.

What if Fairfax had understood News' intentions better?

5.1 Dynamic Pricing Rivalry

Firms compete again and again: it's not just once off.

Actions that might have short-run benefits may become harmful in a repeated situation in which rivals can react tomorrow to an action made today.

A price cut today to steal market share from rivals may result in matching price cuts tomorrow by the rivals, leading eventually to no changes in market shares, but lower profits all round: a price war.

5.1.1 Why Cournot & Bertrand are static, not dynamic

Lecture 3-30 mentions that trial-and-error adjustment by the firms will converge to the equilibrium in a Cournot quantity-competition oligopoly;

Lecture 3-32 implies that Bertrand price-competition oligopolies will likewise converge to the equilibrium, whether products are perfectly homogeneous (to the competitive price) or horizontally differentiated (Lecture 3-25, 3-34, and 4-18; to prices above competitive)

But this is searching for a static equilibrium. Static because:

- each firm in the models simultaneously makes a once-and-for-all quantity or price choice,
- the trial-and-error is based on its rival's previous move.
- each firm's reaction is based on maximising its current (single-period) profit
- if dynamic, then each firm would try to maximise the PV of its future profits as well, entailing anticipation of future moves by rivals, not just past moves.

None the less, the simple static Cournot and Bertrand models are useful:

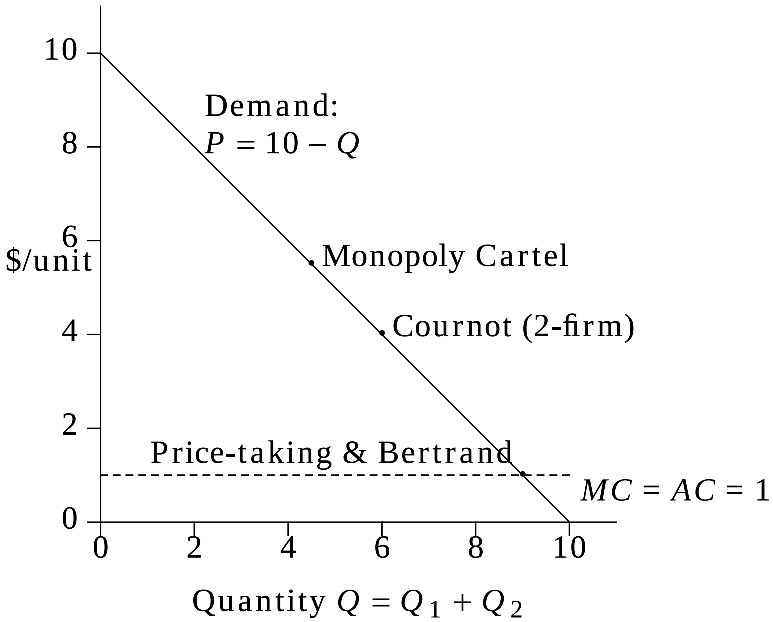
- "What impact does the number of firms have on the prevailing level of prices in the market?"
- "What would be expected to happen to the level of prices in an oligopolistic market as demand expands?"
- Examining the interplay between strategic commitment and tactical manœuvring.

Dynamic models of price competition may help answer:

- Why were prices maintained above competitive levels in such highly concentrated oligopolies as the U.S. steel industry and the U.S. cigarette industry without formal collusion?
- Why is price competition so fierce in other concentrated industries, such as regional cement markets?

5.1.2 Dynamic Pricing Rivalry: Examples and intuition

Consider two identical firms facing an industry demand curve of $P = 10 - Q$ (Lecture 3-35 to 3-37). Collusion results in P = $5.50/unit and an equal share in profits of $20.25, as shown:



Is cooperative pricing (prices above those from a single-shot price- or quantity-setting interaction) achievable when firms make such decisions non-cooperatively (that is, without collusion or binding contracts between firms)?

Yes:

- If both firms are pricing at $3.50/unit, say (and each making a profit of (3.50 – 1)6.5/2 = $8.125), then is it foolish for Firm 1 to consider a move to $5.50/unit (the monopoly level)?
- If Firm 2 doesn't follows suit, then homogeneous product implies that Firm 2 selling at the lower price will capture all the market and all the profits ($16.25).
- Assume prices can be changed every seven days, and that prices are common knowledge.
- Then a move to $5.50/unit carries a maximum loss of one (or two) week's profit, or $8.125.
- If Firm 1 looks forward and reasons backwards from Firm 2's position of maximising its discounted PV of profits (discounting at 0.2% per week), then it understands:
  — that if Firm 2 stays with the current price of $3.50, and believes that Firm 1 will revert after one (or two) weeks, then Firm 2's PV profits will be

$$16.25 + \frac{8.125}{0.002} = \$4,078.75$$

— that if Firm 2 follows suit immediately (or after one week), then Firm 2's PV profits will be

$$10.125 + \frac{10.125}{0.002} = \$5{,}072.63$$

— and so that it is in Firm 2's interests to match Firm 1's higher price.

- Because Firm 2 has much to gain from matching and Firm 1 has little to lose if Firm 2 doesn't quickly match, we should expect both firms to raise prices: the monopoly outcome without explicit or implicit communication.
- The monopoly price of $5.50/unit is sustainable so long as discount rates are not impossibly high.

If Firm 1 could announce that it was to follow a Tit for Tat policy of matching Firm 2's price in the previous week, then Firm 2 clearly knows that if it doesn't match Firm 1's price rise, then Firm 1 will lower its price back next week.

With this announcement (similar to "We will not be undersold."), Firm 2 can reason that its best action is to match Firm 1's $5.50/unit.

5.1.3 Dynamic Pricing Rivalry: Theory

Formalise the above story:

The market consists of n firms selling a homogeneous product; the prevailing price has been P^0, and there has been a change in the underlying conditions which are expected to persist.

Assume that $P^0 < P^M$, the (new) monopoly price in the industry, and so $\Pi^0 < \Pi^M$, the current and monopoly profits in the industry (shared across firms).

Assume that if all but one firm raise their prices to P^M, then the holdout firm makes a greater profit by defecting than by cooperating with the rest:

$$\frac{\Pi^M}{n} < \Pi^0.$$

That is, each firm faces a Prisoner's Dilemma (Lecture 1-37): all face a strong temptation to cheat, but if all cooperated, then they'd be better off.

At the beginning of each period, firms simultaneously and non-cooperatively set their prices.

Firms will compete indefinitely.

No intertemporal demand or cost linkages; no learning effects.

Question: will the firms in this market be able to raise price to the monopoly price P^M without collusion?

Depends in part on:

- each firm's pricing strategy, and
- each firm's expectations of its rivals' strategies.

Consider a generalisation of Tit for Tat:

> Starting with this period, we shall raise our price to P^M; in each following period we shall set a price equal to the lowest price that prevailed in the period latest but one.

If all firms followed this strategy, then they'd all rise their prices from P^0 to P^M and keep them there.

Is this strategy in their self-interests?

Consider a potential defector, Firm D, considering keeping its price at P^0: all others would price P^M this period and then revert to P^0 for ever.

Firm D's profits/period if it defects:
Now: Π^0, Future: Π^0 / n

Firm D's profits/period if it cooperates:
Now and forever: Π^M / n

If it defects, the PV of Firm D's profits =

$$\Pi^0 + \frac{\Pi^0 / n}{i}.$$

If it cooperates, the PV of Firm D's profits =

$$\Pi^M + \frac{\Pi^M / n}{i},$$

where i is the per-period discount rate.

∴ Firm D is better off cooperating (following the strategy and raising its price to P^M) if:

$$\frac{\frac{1}{n}(\Pi^M - \Pi^0)}{\Pi^0 - \frac{1}{n}\Pi^M} \geq i \qquad (*)$$

Inequation (*) is a condition for the cooperative outcome to be an equilibrium in a non-cooperative interaction of price setting.

The numerator is the per-period benefit to a firm if all firms cooperate and set the high P^M instead of the lower P^0.

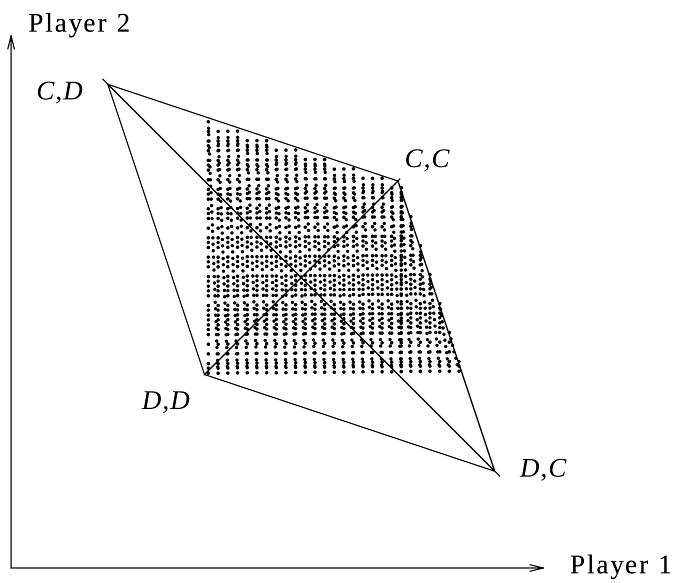
The denominator is the extra per-period profit a firm could earn by defecting.

If the numerator is large, or the denominator small, or the discount rate small, then a firm is better off cooperating (implicit collusion) at P^M.

5.1.3.1 The Folk Theorem

The Folk Theorem of game theory says that for sufficiently low discount rates, *any* price between the monopoly price P^M and the MC can be sustained as an equilibrium in the infinitely repeated Prisoner's Dilemma. (A low discount rate is equivalent to low impatience.)

For the two-person PD, any individually rational outcome can be supported for sufficiently low discount rates (shaded below):



5.1.3.2 Coordinating on an equilibrium

The Folk Theorem doesn't guarantee an equilibrium, and achieving a desired equilibrium, one amongst many, is a coordination problem, such as faced Jim and Della on Lecture 1-38.

To price cooperatively, firms must coordinate on a strategy, such as Tit for Tat.

A collusive agreement would achieve this — but illegal.

Without an agreement or overt communication, the firms must find a *focal point* — a strategy so compelling that it would be natural for all firms to expect others to adopt it.

Focal points are highly context- or situation-specific.

Especially difficult to coordinate in competitive markets that are turbulent and changing rapidly.

Sometimes facilitated by traditions and conventions that make rivals' moves easier to follow or their intentions easier to interpret.

5.1.3.3 Why Is Tit-for-Tat So Compelling?

Consider the Grim Trigger Strategy:

> Starting with this period, we shall raise our price to P^M; if, in any following period, any firm deviates from P^M, then we shall drop our price to MC in the next period and keep it there forever.

Relies on the threat of an infinitely long price war to support collusive pricing.

Why Tit for Tat? Why not the Grim Trigger? Well, Tit for Tat is:

- clear — easy to describe and understand
- nice — starts off cooperating
- provocable — one defection and you're on
- forgiving — one cooperation and it relents.

Moreover, it's pretty robust, as Axelrod's computer experiments showed, but it's not always the best (at best it can tie with another strategy).

But flawed? Misperception of the other's last move can be very costly: misreading a Cooperate as a Defection → DC, CD, DC, · · · Breakdown, mistake echoes.

TfT doesn't include "Enough is enough". It's too easily provoked. If the probability of mistakes → 50%, then Always Defect.

How about:

1. begin cooperating
2. continue cooperating
3. keep count of how many times the other side appears to have defected while you have cooperated
4. when this count becomes "too high", then TfT (as punishment, that is)

The question remains of defining "too high".

Case: How misunderstanding can lead to price wars

It may be that many real-life price wars are not started by deliberate attempts by one firm to steal business from its competitors, but instead flow from misreads and misunderstanding of rivals' behaviour.

Such as the tyre manufacturers.

5.1.4 How Market Structure Affects the Sustainability of Cooperative Pricing

Under certain market structures firms will find it difficult to coordinate on a focal strategy, and the cost–benefit inequation (*) may be influenced by market structure. Four conditions of market structure that may affect the attainment of cooperative pricing and competitive stability:

- Market concentration,
- Structural conditions that affect reaction speeds and detection lags,
- Asymmetries among firms,
- Multi-market contact between firms.

5.1.4.1 Market concentration and the sustainability of cooperative pricing

Inequation (*) is an increasing function of the number of firms n, so the more concentrated the market, the greater the likelihood of cooperative pricing.

This is the rationale behind the ACCC merger guidelines in terms of the four-firm concentration ratio (CR4).

In a concentrated market, a typical firm's share is larger than in a fragmented market, so it captures a larger share of the overall benefit when the industry moves from P^0 to P^M.

Moreover, the more concentrated the market, the smaller the numerator (the single-period profit gain the firm sacrifices from not undercutting the rest of the market), because the greater the deviator's share, the less there is to steal from rivals.

In short: the greater the degree of market concentration, the larger the benefits from cooperation, and the smaller the costs.

Intuitively, the greater the number of competitors, the greater the difficulty of coordinating on a specific focal pricing strategy.

5.1.4.2 Reaction speed, detection lags, and the sustainability of cooperative pricing

For a given discount rate, the greater the speed of reaction to rivals' moves (i.e., the shorter the period that prices are constant), the greater the likelihood that cooperation will be sustained.

Consider inequation (*): if the period implicit were a month, and we wished to rewrite the inequation for weekly periods, it would become:

$$\frac{\frac{1}{n}(\Pi^M - \Pi^0)}{\Pi^0 - \frac{1}{n}\Pi^M} \geq \frac{i}{4} \qquad (**)$$

The threshold for using Tit for Tat has fallen.

In the limit, with instant matching of price cuts, cooperative pricing will always be sustainable.

In the U.K., the wholesale price of electricity is determined by an auction to sell between the two generators, every half hour, continually. Does it surprise you to learn that, with no communication outside this frequent interaction, prices have been consistently above costs, even with the fluctuations in demand?

Four reasons why a firm's response to its rivals' actions might be delayed:

- infrequent interactions,
- lags in confirming rivals' prices
- ambiguities in identifying exactly who (among a group) is cutting price
- difficulties in separating falls in sales due to rivals' stealing from those due to unanticipated contractions in market demand.

All of these slow the firm's reaction time, and so the effectiveness of retaliatory price cuts against defecting firms.

Several structural conditions affect the importance of these factors:

- Market concentration
- Lumpiness of Orders
- Information about sales transactions
- The number and size of buyers
- Volatility of demand and cost conditions

5.1.4.2.1 Market concentration:

The fewer the number of rivals in a market, the lower the cost of monitoring the prices and shares of rivals.

The impact on the sales and profits of cooperating firms of a single defector will be more pronounced in a concentrated industry than in a fragmented industry:

- Customers, for idiosyncratic reasons, will switch even if all firms are charging the same (cooperative) price → fluctuations in shares.
- For a given rate of customer switching, market shares in a fragmented market will be more volatile than in a concentrated market: a rise from 2% to 4% might not be unusual, but a rise from 20% to 40% would be almost impossible as a consequence of a given rate.
- Thus large firms in a concentrated market will be able to correctly attribute a significant fall in share to a rival's price cutting,
- whereas small firms in a fragmented market are less likely to suspect price cutting, since they normally see a high degree of volatility in shares.

5.1.4.2.2 Lumpiness of orders:

Lumpy orders occur when sales are relatively infrequent, in large batches: see airframe manufacture, shipbuilding, and diesel locos.

Implies long response lags, which may reduce the attractiveness of cooperative pricing.

5.1.4.2.3 Information about sales transactions:

With privately negotiated prices, more difficult for rivals to detect defections than when prices are posted outside every establishment.

Indeed, it may be difficult for the selling firm to accurately monitor its own prices — beware if one's sellers are paid for sales and not revenues generated.

Secrecy of transaction terms worsens the incentive for cooperation:

- when transactions involve more than a listed or invoice price, such as a "net price" or favourable credit terms.
- when products are customised or tailor-made for specific customers.
- by increasing the chance of misreads of one's rivals' actions.

5.1.4.2.4 The number and size of buyers:

With prices set in secret, detection of deviations from cooperative pricing is easier when each firm sells to many small buyers than when to a few large buyers.

Buyers have an incentive to play sellers of against each other, which means reporting any price cuts to other sellers, in an attempt to obtain even lower prices.

For a given probability of a rival learning of a price cut to a customer, the greater the number of customers receiving the cut, the greater the likelihood that rivals will learn of the price cut.

5.1.4.2.5 The volatility of demand and cost conditions:

The greater the volatility of demand conditions, the greater the difficulty of detecting price cutting, especially when the firm can only observe its own price and market share.

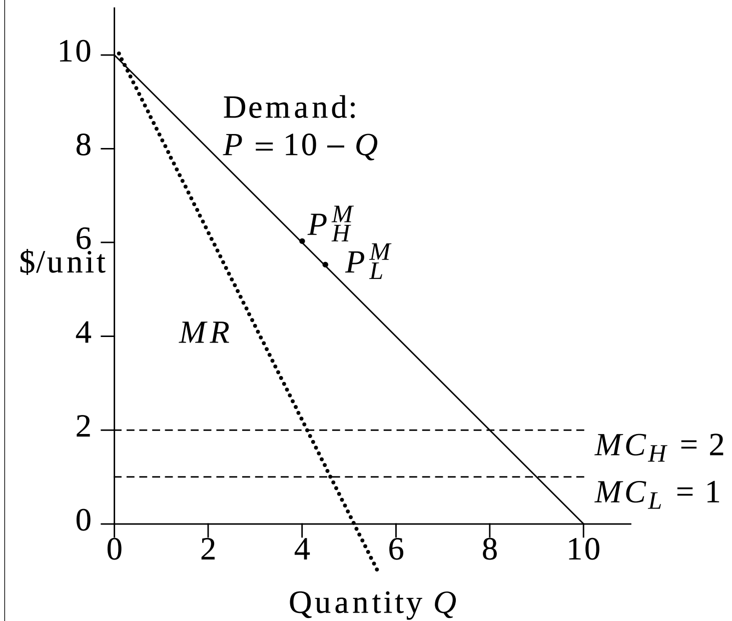
With *FC*s a substantial proportion of a firm's costs, especially serious: *MC*s decline rapidly at output levels below capacity → substantial swings in P^M → problems of coordinating on a moving target, and with excess capacity a high temptation to cut prices to steal business.

With mainly *VC*s, P^M will not change much with demand.

5.1.4.3 Firm asymmetries and the price umbrella

Inequations (*) and (**) assumed identical firms; but when firms have different costs or sell vertically differentiated product, achieving cooperative pricing becomes more difficult.

In a simple case: two firms have different marginal costs, so the monopoly prices each would charge differ.



With identical costs, there is a monopoly focal price, but not here.

Moreover, even if agreement on a focal price, differences in costs, capacities, and product qualities may create asymmetrical incentives:

Small firms may have a greater incentive to defect than do large firms:

- larger firms typically capture more of the industry profits (at the high collusive price) than do small firms
- small firms may understand that large firms have weak incentives to punish an under-cutting small firm:

  A small firm price-cuts by β% and so steals fraction α of the large firm's demand.

  Will the large firm follow suit? Only if the loss of profit due to a lower price is less than the loss of profit due to stolen demand:

  By allowing the smaller firm to undercut it, the larger firm is extending a *price umbrella* to the smaller firm, which it should do if

  $$\alpha < \frac{\beta}{PCM},$$

  where PCM is the % mark-up, $(P - MC)/P$.

  So the price umbrella strategy is desirable when: β is large relative to α, and margins in the industry are small to begin with.

Case: The 1992 U.S. Airlines Fare War

Why did Northwest Airlines (NWA) start a fare war in northern spring 1992 that was matched and later escalated by its rivals? The fare war deepened the losses in the industry.

Given the immediate computerised information about fares, the others would know and respond: how to increase profits this way?

But asymmetries: NWA had a poor route system, an inferior FF programme, and a bad reputation. With P^M, NWA would get less buiness than would American and United, with better route structures and better FF programmes, and NWA would fly almost empty planes.

Cutting prices has an effect not emphasised above: if the industry prices fall, the Law of Demand (Lecture 1-16) suggests that total demand will rise.

So two benefits to NWA:

1. with price-sensitive vacationers, NWA's competitive disadvantages minimised,
2. a disproportionate share of additional traffic with NWA.

So if NWA could fill its planes only by stimulating market demand, should do so when demand most elastic, during the summer.

Low-quality or low-share firms may gain more from defection, even if the higher-quality rivals immediately match.

Case: Price discipline in the U.S. tobacco industry

Reflecting its high concentration (CR4 = 92% and H.I. = 0.25), until the 1990s the cigarette industry had a high degree of pricing cooperation.

Dominant firms (PM and RJR) would announce the list price rises twice a year, and the others would follow: much above the inflation rate, and highly profitable (40% operating profit margins).

But L&M's share had fallen from 21% in 1947 to 2% in the late 1970s — shut-down? Least to lose from undercutting, by selling discount cigs at 30% below branded. By 1984 its share had tripled, selling 65% of its output as discounts.

An insignificant niche? But B&W lost $50 m in revenues in 1983, and in 1984 undercut L&M's discounts, as did other rivals: L&M's share of discounts fell from 90% to 15% by 1989.

L&M then introduced "deep discounts" 30% below discounts, and their rivals followed: in 1992 three segments — a premium ($69/1000), a discount ($49/1000), and a d-d ($31/1000).

Coordination of pricing in three tiers more difficult than a single tier, and growth in the cheaper tiers have come from the premium tier (when the total market was shrinking), with considerable substitution.

On "Marlboro Friday," 3/4/93, PM cut its flagship's price by 20%: Marlboro's share had fallen from 30% to 21% over five years. Reluctance of rivals to raise their d-d prices: highly elastic demand and retailer reluctance.

Since then return of market discipline? Price increases in all segments in 1993, 1994, 1995: premium prices down 26%, discount up 8%, d-d up 48%, and Marlboro's share up to 30% by mid-1995.

5.1.4.4 Multi-market contact

When firms are rivals in more than one market, cooperative pricing may be easier to maintain: retaliation for Firm 1 to cut in one market could be a cut by Firm 2 in another.

The conditions summarised by inequation (*) that discourage discounting may not hold in both markets, or hold in both markets simultaneously for a smaller range of discount rates than for each separately.

5.1.4.5 Market Structure & Cooperative Pricing: Summary

See Besanko Table 10.3.

5.1.5 Firms’ practices to facilitate pricing cooperation

Firms themselves can facilitate cooperative pricing by:

- Advance announcement of price changes
- Price leadership
- Most-Favoured-Customer (MFC) Clauses
- Uniform delivered prices
- Strategic use of inventories and order backlogs

5.1.5.1 Advance announcement of price changes

In some industries, firms will publicly announce the prices they intend to charge at some date in the future.

Such advance announcements reduce the uncertainty that their rivals will not follow them, and it allows firms to renege on price changes that rivals refuse to follow.

5.1.5.2 Price leadership

One firm announces its price changes before other firms: once the *Sun*, and then the *Mirror*. Happens with television advertising rates.

Overcomes the problem of coordinating on a focal equilibrium: other firms cede control over pricing to a single firm.

Price leadership can break down if the price leader fails to discipline defectors, as happened in the Sydney afternoon newspaper market.

Distinguish oligopolistic price leadership from “barometric” price leadership, in which the price leader’s behaviour reflects changes in market conditions: since there is no great gain to the barometric leader, the leadership role may change frequently, unlike oligopolistic price leadership.

Another model of oligopolistic price leadership is the Stackelberg model. in which the Leader looks forward and reasons backwards to consider what price to charge, in the realisation that the Follower will maximise its short-run profit already knowing the Leader’s price. The price outcome with two firms is shown on Lecture 3-36 and 37: above competitive, but below Cournot.

5.1.5.3 Most-Favoured-Customer (MFC) Clauses

A provision in a sales contract that promises a buyer that it will pay the lowest price the seller charges.

Two types:

- contemporaneous: a contract to sell at a particular price also specifies that if any customer buys at a lower price during the period of the contract, then the seller will also charge this price for this contract.
- retroactive: the seller agrees to pay the buyer a rebate if any customer buys at a lower price than the contract price within a specified period after the contract has expired; the rebate equal to the difference between the contract price and the lower price.

Although MFCCs appear to benefit buyers, they can inhibit price competition:

- contemporaneous MFCCs discourage firms from using selective price cutting to compete for highly price-elastic customers;
- retroactive MFCCs discourage future price cutting, either selectively or across the board.

Because adoption of a retroactive MFCC soften price competition in the future, oligopolists may have an incentive to adopt a MFCC policy unilaterally, even if rivals do not.

5.1.5.4 Uniform delivered prices

When buyers and sellers are geographically apart and transport costs are a significant fraction of the product’s total value, the choice of pricing method can affect the nature of competitive interactions.

Three kinds of pricing policies:

- with *uniform FOB (Free On Board) pricing*, the seller quotes a price for pickup at the seller’s loading dock, and the buyer absorbs the freight charges for shipping;
- with *uniform delivered pricing*, the seller quotes a single delivered price for all buyers and absorbs any freight charges itself;
- with *base point pricing*, the seller designates one or more base locations, and quotes FOB prices from them. A kind of intermediate case between the first two.

Uniform delivered pricing facilitates cooperative pricing by allowing firms to make a more focussed response to rivals’ price cutting (at the expense of using non-uniform pricing).

Under FOB pricing, retaliation requires a reduced price to all customers.

By cutting the “cost” that the victim firm incurs by retaliating, retaliation is more likely, and the credibility of policies, such as Tit for Tat, that can sustain cooperative pricing, is enhanced.

5.1.5.5 Strategic use of inventories and order backlogs

Careful adjustment of inventory or order backlogs (a firm’s queue of unfilled orders) can facilitate cooperative pricing.

Faced with a downturn in demand, a dominant firm can absorb the reduced demand by allowing its inventories to build up (or its order backlogs to be drawn down), rather than attempting to lead the industry down to the new P^M. This strategy is known as *buffering*.

Buffering is used to avoid the risk that, faced with lower prices and a possible fall in market share, smaller firms might misinterpret the dominant firm’s actions as an attempt to steal market share permanently.

The dominant firm sacrifices share (and short-term profitability) by extending a price umbrella to smaller firms, enhancing the chances that long-run pricing discipline in the industry will be preserved: when demand picks up, small firms will be more likely to raise prices back to the new P^M.

Holding larger than normal inventories enables a dominant firm to make a credible commitment (Lecture 4-8) to retaliate against rivals who deviate from the cooperative pricing outcome by cutting price, thus following a “top-dog” strategy (Lecture 4-24) of behaving “tough” in order to induce rivals to behave less aggressively.

5.2 Quality Competition

Since consumers may choose on the basis of such product attributes as performance and durability, not solely on price, firms may compete just as fiercely on these dimensions.

Besanko speak of “quality” as any any product attribute whose increase increases demand for the product at a fixed price.

How can markets structure and competition influence the firm’s choice of quality?

5.2.1 Quality choice in competitive markets

In a competitive market, either all goods are identical, or they exhibit vertical differentiation (Lecture 3-25), in which case firms will offer different levels of quality at different prices.

Competition will force all firms to charge the same price per unit of quality.

So long as buyers can perfectly evaluate the quality of each seller. If not, then sellers that charge more than the going price per unit of quality may still have customers.

Consider a market in which it is costly to be an informed buyer, and in which some buyers have information, while others do not. Uninformed buyers can learn and benefit from their observations of the choices of informed buyers.

5.2.1.1 The market for lemons

With sufficient informed buyers in a market, quality will likely be adequate for almost everyone. But:

- if uninformed buyers cannot gauge quality by observing informed buyers, and
- if low-quality products are cheaper to make than are high-quality products,

then a *lemons market* can emerge.

Outcomes:

- The risk of buying a lemon may deter buyers.
- And the proportion of lemons offered for sale may exceed the overall proportion if the owners of good products are deterred from offering them for sale since they command no premium over lemons because buyers cannot distinguish the two qualities.
- Since a good products is worth more to its owner than a lemon, the sale price may be less than the value of not selling the products.
- This is an example of *adverse selection*.

Consider a second-hand car market, with good cars and lemons, but the quality is unobservable before sale. For the market to exist, the price of cars must be:

- low enough for buyers to accept the risk of a lemon.
- and high enough to induce owners of good cars to sell.
- Inconsistent? If the proportion of lemons is high enough, the market will die, with efficiency losses (potentially gainful trades exist, but cannot occur).
- A Gresham's law of cars: the bad drive out the good.

An example:

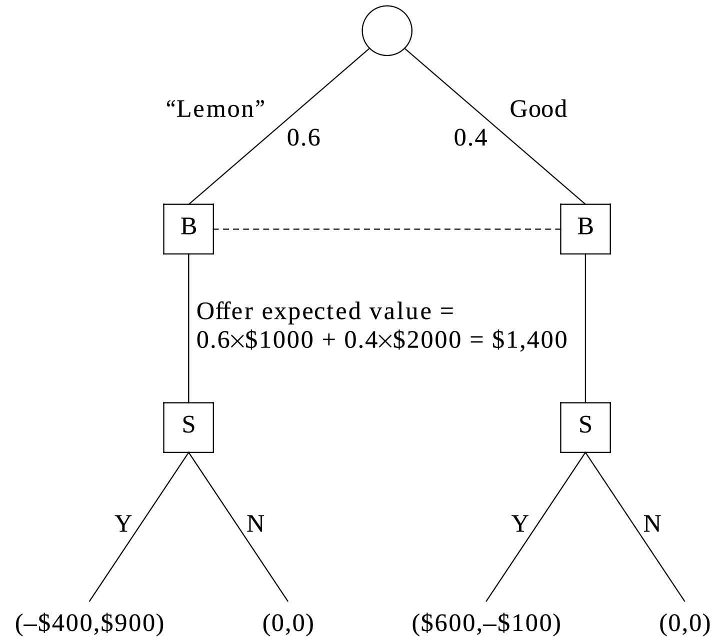
- 60% of a model are lemons, as the Buyer knows but can't distinguish.
- To Buyer, a good car is worth (a max. of) $2000, a lemon (a max. of) $1000;
- to the Seller, (a min. of) $1500 and $500, respectively.
- Seller knows the quality.

Price?

- First, only one price since Buyer can't distinguish the quality.
- Buyer ignores Seller's claims of quality, "Well, she would say that, wouldn't she", as Mandy Rice Davies might have said.
- For risk-neutral Buyer, pay up to $0.6 \times \$1000 + 0.4 \times \$2000 = \$1400$.
- If the market operates and potential Buyers exceed the numbers of cars for sale, then this is the market price.

Will the market operate?

- Will Sellers be willing to sell at $1400?
  - — Certainly the owners of lemons will,
  - — but what about the owners of good cars? They won't, since they value good cars at $1500, and will withhold them.
  - — But then the proportion of good cars for sale is too low, in consequence.
  - — The market will not operate, a further inefficiency as a consequence of the privacy of information.
  - — Potential gains to trade exist ($2000 to Buyer, $1500 to Seller), but since Buyer can't tell good from lemon, then no trade.
  - — A *separating* equilibrium.



The Market for Lemons with Separating. (B,S)

	"Lemon"	Good
Buyer	$1,000	$2,000
Seller	$500	$1,500

Other examples are: insurance markets and private information about health and longevity. Will insurance companies expect a disproportionate number of unhealthy people to be attracted? Consequences?

Sometimes sell policies to groups, with lower risk to the insurance company of adverse selection.

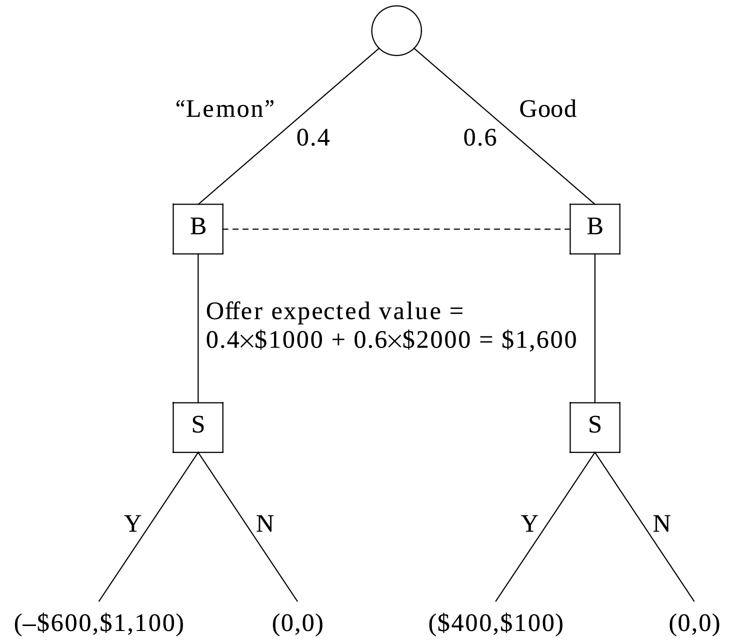
Sometimes the fact that uninformed can deduce information from observing the behaviour of informed buyers means that the information's value is reduced. In turn, there may be less investment in information than otherwise.

Secrecy may be valuable in those cases: take-over battles.

But: Private information is not always a problem:

- if 40% lemons,
- then Buyer will pay up to $0.4 \times \$1000 + 0.6 \times \$2000 = \$1600$,
- a price at which Seller gets a gain of \$1600 – \$1500 = \$100.
- The market will exist, with a price between \$1500 and \$1600, despite the informational asymmetry.
- Although some gain (buyers of good cars) and others lose (sellers of good cars) compared to fully informed trading.

A *pooling* equilibrium.



The Market for Lemons with Pooling. (B,S)

	"Lemon"	Good
Buyer	\$1,000	\$2,000
Seller	\$500	\$1,500

5.2.1.2 Signalling in markets

Can sellers credibly signal quality? Reputation, third-party credentials. For insurance, medical checks compulsory. But limited elimination of informational asymmetries. *How can Seller signal her good car's quality?*

A guarantee is more costly for Seller selling a lemon than for selling a good car, and so can signal quality. Signals can overcome informational frictions, to reduce inefficiencies, but not always, or not always efficiently.

"Wasteful" expenditures as signals:

Generally: expenditures that yield no direct benefit in themselves can serve as communication devices, signals. Any observable expenditures that are cheaper for "good" signallers than for "bad" signallers might work.

"Try it, you'll like it." How can you credibly communicate the value of your product (brake linings) to potential customers (car manufactures), when you're sure that they'll be satisfied? Obviously extravagant expenditures may signal (wining & dining, lavish brochures, high-rent address, etc), if the potential buyer knows that you are relying on continued sales to cover these apparently unproductive costs: if your product were of low quality, you couldn't cover your promotional expenditures.

Signals must be more costly (net of future earnings) for low-quality producers than for high-quality producers. Wasteful expenditures don't necessarily work as signals: opportunities for signalling don't ensure that signalling actually occurs in the market.

Signalling is pervasive.

By giving a personal guarantee against his private assets, Alan tried to credibly communicate (to signal) that he believed the project wouldn't fail, in order to induce the Bank to lend him more. The bank (or the venture capitalist) might still want to check Alan's judgement, but not — Alan hopes — his sincerity.

Signalling is *credible communication* of private information. Signalling must not only cost you to undertake it, but your opponent must understand that your cost is higher if you're misrepresenting yourself than if you're being truthful.

Nothing succeeds like the appearance of success.
— Christopher Lasch

5.2.2 Quality choices of sellers with market power

If buyers who are willing to pay most for a product are also willing to pay the most to improve quality, then as quality increases, demand gets less elastic (the demand curve steeper).

A seller will determine its level of quality so that the marginal cost of quality increase equals the marginal revenue tat follows, as purchases increase. (We ignore strategic effects: the side effects of the choice of quality on the intensity of price competition, Lecture 4-23).

5.2.2.1 The MC of increasing quality

If a firm is producing efficiently already, then more quality is costly. That there is an industry to improve quality (Total Quality Management, Continuous Quality Improvement, Quality Assurance) is evidence that efficiency is not ubiquitous.

In general, further equal increases in quality will be ever more expensive.

5.2.2.2 The MB of improving quality.

When a firm improves the quality of its product, it will sell more. How much revenue this fetches depends on:

1. The increase in demand consequent on the increase in quality.
2. The incremental profit earned on each additional unit sold.

The firm should focus on the "marginal" customers when considering changing quality; it may provide more or less than its existing customers ("inframarginal") would choose.

If its marginal customers are willing to pay more for higher quality than are its inframarginal customers, the firm will over-provide quality. (And vice versa, if the marginals are less willing.)

But in general the firm will have more customers and higher PCMs than before.

The purpose of raising quality is to attract more customers and make more sales. An increase in quality will attract more customers if:

a. there are more marginal customers, who

b. can readily determine that quality has improved.

These two factors are in turn determined by:

i. the degree of horizontal differentiation (Lecture 3-25),

ii. the precision of quality determination.

In a horizontally differentiated market (Macintosh v. Windows?), customers may be reluctant, because of an idiosyncratic match between preferences and attributes, to switch to another seller, even one who offers a higher level of quality.

That *Choice* is popular is testimony top the difficulties of determining quality: even without idiosyncratic loyalties, customers must be able to observe quality changes. But there are no reviews for many goods and services, and reputations may constitute local knowledge.

Absent clearly observed quality, buyers may focus on superficial attributes of *experience goods* — the suck-it-and-see products. (Those products whose quality is relatively easy to observe are *search goods*.)

To cover their dealers' investments to help buyers determine true quality, some brands refuse to distribute through discount stores.

To further protect their dealers, many brands grant them *exclusive territories*.

Another erstwhile protection for dealers was *resale price maintenance*.

If two sellers can gain the same increase in sales by increasing quality, who has the stronger incentive? The seller with the higher PCM, who will make more money.

But market structure can create conflicting incentives: a monopolist will have a higher PCM than a competitive firm, but may face far fewer marginal buyers.

Horizontal differentiation may

- create loyal customers, allowing sellers to increase PCMs and attract new buyers via higher quality.
- but loyal customers may not easily switch from other sellers: few marginals.

After airline deregulation, quality fell as PCMs fell with greater competition: the lower prices may not benefit all buyers, in particular those who value quality.

Higher prices or better information may militate against high PCMs, as buyers search more on the basis of price rather than quality.

Case: The Medical Arms Race

Since doctors prefer hospitals with the latest technology, however expensive, the U.S. has experienced a medical arms race over quality, despite laws to restrict expenditure on vastly expensive diagnostic machinery.

Some research shows that hospitals in competitive markets had more high-tech machinery, and higher costs, than did monopoly hospitals. A case of competition not working?

But:

- Better and faster diagnosis — worse off?
- Centrally located hospitals (with more competition) may be the right place for expensive diagnostic tools, not in the lone hospital out bush.
- As Lecture 3-40 suggested, insurance companies, not doctors, now choose hospitals, and keep costs down: the race is over?

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