MANAGERIAL ECONOMICS

LECTURE 4: MARKET TYPES

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This lecture

- We will have a closer look at different types of markets and how this might influence managers.
- We will study how managers can best react by choosing prices and output
- Since most markets are not perfectly competitive, firms have some degree of market power — we need to understand how this influences managers' decisions.
- In perfectly competitive markets, firms have no market power and are "price takers". Decisions are based on the market price, which a single firm cannot influence.

Market types

We characterize markets by the degree of competition:

- No competition (1 firm): Monopoly; Monopsony
- Little competition (few firms): Oligopolies
- Imperfect competition (many firms with market power): Monopolistic competition
- Perfect competition: Many firms, none has market power

Market Power

A firm with market power can influence the price or the quantity of a good in the market by setting the price or changing the quantity it supplies.

Perfect competition

Many firms that are small relative to the entire market and produce very similar products

- Firms are price takers
- Products are standardized (*homogeneous*)
- There is no non-price competition
- There are no barriers to entry

Monopolistic competition

Firms have some degree of market power and can determine prices (output) strategically:

- Products are similar, but differ in aspects that consumer consider important, *"differentiated products"*
- Firms use non-price competition:
  - Product differentiation
  - Advertising
  - Branding
  - Public relations
- These markets have typically no barriers to entry.

Oligopoly

Few firms in markets that have significant barriers to entry:

- Firms are large relative to the overall size of the market
- Decisions on prices (output) have an effect on market prices (“price maker”)
- Collusion between firms is possible
- Strong interdependence of firms’ strategies

Monopoly (Monopsony)

Markets with a single seller (buyer)

- The firm has considerable market power and will influence the price (quantity) directly
- Barriers to entry prevent competitors from entering the market
- There are no close substitutes to the product

Overview

Market type	Examples	Number of firms	Product type	Market power	Barriers	Non-price competition
Perfect competition	Some agriculture	Many	Standardized	None	Low	None
Monopolistic competition	Retail	Many	Differentiated	Some	Low	Branding
Oligopoly	Oil, steel	Few	Standardized or Differentiated	Some	High	Branding
Monopoly	Public utilities	One	Unique	Considerable	Very high	Advertising

Notes: Table 7.1 in Allen et al., Managerial Economics (8th ed.), p227.

A perfectly competitive market

Economists typically start with the analysis of this type of market:

- It provides a convenient *benchmark*
- It allows to abstract from *strategic interdependencies*
- (It is relatively simple)
- (But we can make it always more complicated!)
- (Economists know that this is a rare animal in the wild!)

Prices and output in a perfectly competitive market

Price and quantity are determined by demand and supply:

- A single firm in a perfectly competitive market cannot affect the market price
- If it raised the price, consumers will buy at another firm
- It can sell any amount of output it wants (given its capacities)
- It is important to understand what determines demand and supply — i.e., prices and revenues!
  - Demand shifters: prices, income, advertising, prices of other products, tastes
  - Supply shifters: input cost, technology, research and development

Profit maximization

Firms differ from people:

- People care about more than just money
- For people, money is a means to get what they want
- Different people have different tastes and care about different things
- Economists capture this by using a *utility function*,
  $U = U(\text{many different things})$.

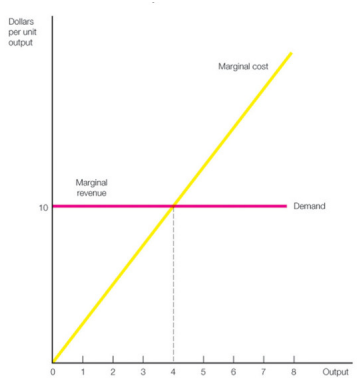
- Firms either stay in business or they exit the market
- Firms need to cover their costs
- Firms must consider their profits

Profit maximization in a perfectly competitive market

In a perfectly competitive market, firms need to maximize their profits — or go bankrupt (remember, economic profits $\neq$ accounting profits!).

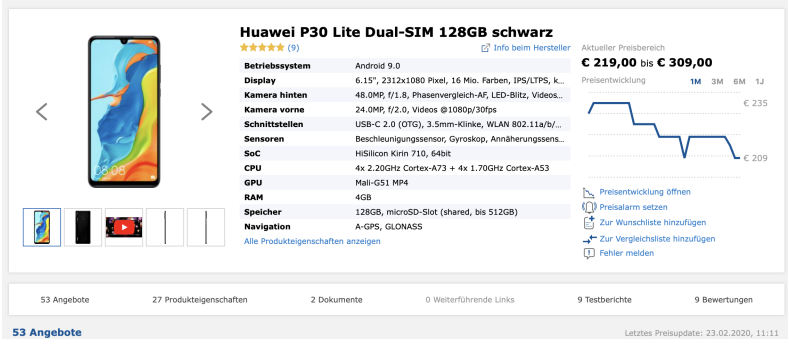
- Firms are price takers at market price P. For the individual firm, demand is a horizontal curve.
- (NB: The market demand curve is downward sloping!)
- Competition forces firm to supply at P (or less); if firm is too expensive, it will not make any sales.
- Profit maximization:
  $\max \pi = TR - TC$
  $\partial\pi/\partial Q = 0 \Rightarrow MR = MC$.
- Firm produces at minimum of average costs!

Marginal costs and marginal revenues



Notes: Figure 7.4 in Allen et al., Managerial Economics (8th ed.), p236.

Is this a perfect market?



Notes: Screenshot from `www.geizhals.at` (23-2-2020).

How could we find out?

Testing for market power

In a perfect market, firms have no price setting power. If we find evidence that firms *can* influence prices, we have imperfect competition.

Data sample	All product offers	All product offers		Censored dataset	
		Type of LCT		Type of LCT	
Dependent variable	Clicks	Prod	Subsubc	Prod	Subsubc
Relative price	−1.396***	−1.546***	−1.647***	−1.231***	−1.607***
	(0.010)	(0.038)	(0.059)	(0.069)	(0.094)
Firm evaluation	−0.024***	−0.048***	−0.041***	−0.127***	−0.081***
	(0.001)	(0.004)	(0.005)	(0.016)	(0.017)
Relative shipping cost	0.016***	0.011***	0.014***	0.000	0.016
	(0.001)	(0.004)	(0.004)	(0.014)	(0.015)
Germany	−0.196***	−0.249***	−0.260***	−0.191***	−0.229***
	(0.002)	(0.007)	(0.011)	(0.016)	(0.019)
Availability	0.105***	0.152***	0.147***	0.230***	0.225***
	(0.002)	(0.005)	(0.007)	(0.015)	(0.017)
Pickup	0.040***	0.075***	0.076***	0.154***	0.148***
	(0.002)	(0.005)	(0.006)	(0.016)	(0.018)
Missing shipping cost	0.126***	0.117***	0.134***	0.171***	0.211***
	(0.002)	(0.007)	(0.009)	(0.020)	(0.023)
No. of evaluations	0.0003***	0.0003***	0.0003***	0.0004***	0.0004***
	(0.000003)	(0.00001)	(0.00001)	(0.00003)	(0.00003)
Observations	847,246	400,694	306,641	90,626	73,678
Products	34,128	11,238	8,622	10,909	8,084
χ^2	89,361	15,031	10,679	1,307	1,307
LL	−422,957	−74,706	−45,816	−51,600	−32,655
Relative importance of price over service	58.2	32.2	40.2	9.7	19.8

Method of estimation: Negative Binomial with product fixed effects – marginal effects with respective standard errors are shown.
*, **, ***statistical significance at the 10%, 5% and 1% level, respectively. Constant is not shown in the table. Marginal effects for dummy variables represent discrete change from 0 to 1. 'Censored Dataset' omits all product offers with no clicks at all.

Notes: Table 2 of Dulleck, Hackl, Weiss, and Winter-Ebmer (2011), p400.

More on the results

- The authors find considerable price variation, Coefficient of Variation ≈ 0.1.[1]
- Firms differ (e.g., `evaluation`) which suggests that there is a trade-off between a cheaper price and firm characteristics.
- For some products, there are few suppliers: Ten more firms reduce markup by 2.6 percentage points Hackl, Kummer, Winter-Ebmer, and Zulehner (2014).

[1] CoV $= \sigma/|\mu|$, i.e., Standard deviation / | Mean |.

Monopoly

- Monopoly: the firm's demand curve is the market demand curve.
- Monopolistically competitive firms: have (local) market power based on product differentiation, but barriers to entry are modest or absent.

Numerical example: Monopolist

Output	Price[a]	Total cost[b]	Variable cost[c]	TR	Profit	TR-VC
0	10	1	0	0	-1	0
1	9	2.5	1.5	9	6.5	7.5
2	8	5	4	16	11	12
3	7	8.5	7.5	21	12.5	13.5
4	6	13	12	24	11	12
4.5	5.5	15.625	14.625	24.75	9.125	10.125
5	5	18.5	17.5	25	6.5	7.5
6	4	25	24	24	-1	0
7	3	32.5	31.5	21	-11.5	-10.5
8	2	41	40	16	-25	-24
9	1	50.5	49.5	9	-41.5	-40.5
10	0	61	60	0	-61	-60

Notes: [a] $P = 10 - Q$. [b] $TC = 1 + Q + Q^2/2$. [c] $VC = Q + Q^2/2$. Table 8.1 in Allen et al., Managerial Economics (8th ed.), p259.

How much should the monopolist produce?

Demand: $P = 10 - Q$

TR: $TR = PQ = 10Q - Q^2$

TC: $TC = 1 + Q + Q^2/2$

This implies: $FC = 1$

This implies: $VC = Q + Q^2/2$

This implies: $MC = \partial TC/\partial Q = 1 + Q$

$$\max \pi = TR - TC = 10Q - Q^2 - [1 + Q + Q^2/2]$$

$$\partial \pi/\partial Q = 10 - 2Q - [1 + Q] \qquad \Rightarrow Q = 3, P = 7.$$

Output and prices of a monopolist

A monopolist's output decision determines the market price. (In contrast to a market with perfect competition, where the output of one firm does not influence the market price.)

- The $MR(Q)$ is the difference between TR at one level of output and the TR of producing one more unit:

$$\begin{aligned} MR(Q) &= \frac{\partial TR}{\partial Q} = \frac{\partial P(Q)Q}{\partial Q} = \frac{\partial P}{\partial Q}Q + P(Q) \\ &= P\left[1 + \frac{\partial P}{\partial Q}\frac{Q}{P}\right] \\ &= P[1 + (1/\eta)] = P[1 - (1/|\eta|)] = P - P/|\eta|. \end{aligned}$$

(If demand is downward-sloping, $\eta < 0$.)

$MR < P$ in a monopoly

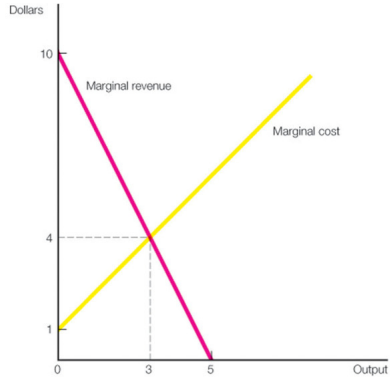
$MR = P[1 + (1/\eta)] < P$:

- A profit-maximizing monopolist will not produce where demand is inelastic; that is, where $|\eta| < 1$, because $MR < 0$.
- $MC = MR = P[1 - (1/|\eta|)]$; so the profit-maximizing price is

$$MC = P\left[1 - \left(\frac{1}{|\eta|}\right)\right]$$

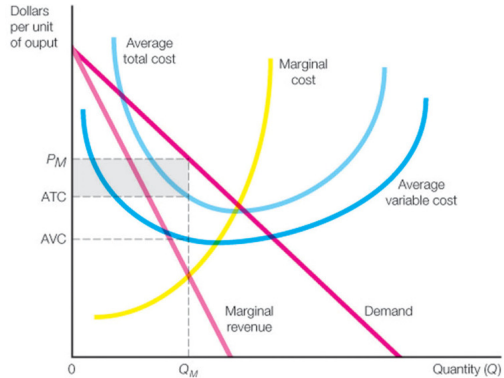
$$P = \frac{MC}{\left[1 - \left(\frac{1}{|\eta|}\right)\right]} \quad .$$

Optimal quantity in a monopoly: $MR = MC$.



Notes: The profit maximizing output of a monopolist is where MR equals MC. Figure 8.3 in Allen et al., Managerial Economics (8th ed.), p264.

A monopolist's output and prices



Notes: 1. MR equals MC leads to Q_M; 2. $P_M = P(Q_M)$. Figure 8.4 in Allen et al., Managerial Economics (8th ed.), p265.

Monopoly lowers welfare

- Producer surplus: difference b/n marginal cost and price
- Consumer surplus: difference b/n willingness to pay and price
- Total welfare: producer surplus + consumer surplus

- A monopolist explicitly considers demand
- Why does no other firm enter the market?

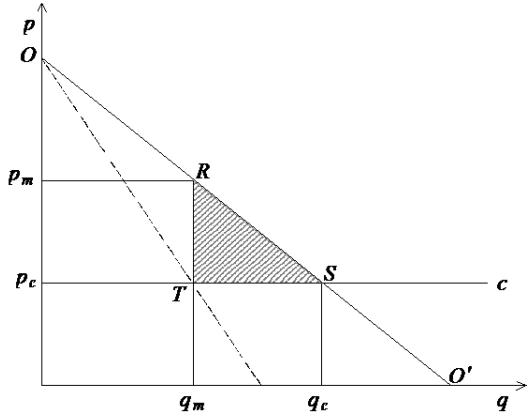
Monopoly and market power

A monopolist has market power and raises prices above marginal cost. The impact of market power on social welfare:

- Allocative inefficiency: effect on welfare if market power is exerted (less output, higher price)
- Productive inefficiency: effect on welfare if market power is exerted by a technologically inefficient firm (less attention to marginal costs from lack of competition)
- Dynamic inefficiency: lack of investment due to lower incentive to generate new technologies (innovation)

Allocative inefficiency

Any price above marginal cost induces a net loss in social welfare.



Notes: In a competitive market, the total surplus from free trade is the area P_cSO. In a monopoly market, the total surplus is the area P_cTRP_m. The welfare loss is the shaded area RST.

The determinants of welfare loss

- The **more market power**, the higher the price, hence the greater the welfare loss
  $\Rightarrow$ inverse relationship between market power and social welfare.
- The **more elastic the demand curve** with respect to price, the lower is the welfare loss.
- The **larger the market** under consideration, the greater the welfare loss.

Rent-seeking activities

- The potential profits of a monopoly can lead firms to waste resources in **unproductive lobbying activities** to increase market power. The more firms try this, the more is wasted.
- In the extreme, all the profits created under monopoly may be sacrificed on such activities, "full rent dissipation" (Posner, 1975).
- Conditions for full rent dissipation:
  - competition among the firms involved in rent-seeking
  - the rent-seeking activities do not have any social value

Productive inefficiency

A monopolist may produce at a higher marginal cost than a firm under perfect competition:

- Managers may not have the right incentives to adopt the most efficient technology, “managerial slack”
- Lack of competition does not force the firm to lower marginal costs

Dynamic inefficiency

A monopolist has lower incentives to innovate. Example:

- A new technology at fixed cost F allows the firm to produce at a lower marginal cost $c_{\text{new}} < c_{\text{old}}$
- **Monopolist** adopts the new technology if: $\Pi_{\text{new}} - \Pi_{\text{old}} > F$
- A firm under perfect competition adopts the new technology if: $\Pi_{\text{new}} > F$

Other aspects of monopolies

- "Natural monopoly": if there is a minimum efficient scale, i.e., the minimum of average cost is only at very high output levels, there is only place for one firm in the market!
- Measure of monopoly power is the markup, μ, of price over cost:

$$\text{markup} = \frac{P-MC}{MC}$$

Sources of monopoly power

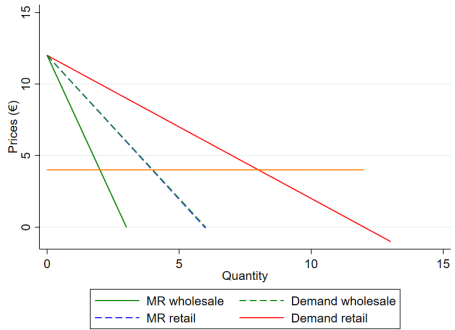
- “Natural monopoly”: public utilities, railway tracks, economies of scale
- Capital requirements on production or big sunk costs on entry (e.g., power plant)
- Law: Patents (17 years) or trade secrets (Coke)
- Exclusive or unique assets (minerals, talent)
- Exclusive location (popcorn shop in cinema—but in general you pay rent for these advantages)
- Regulation (TV, taxi, radio frequency bands)
- Collusion by competitors

Strategic entry barriers

- Excessive patenting and copyright
- Limit pricing (set price below monopoly price)
- Extensive advertising to create brand name to raise cost of entry
- Create intentionally excess capacity as a warning for a price war
- “Predatory pricing”: drive competitors from the market with prices below marginal costs

Double marginalization

Consider two monopolies, an upstream company (whole sale company) and a downstream company (retailer).

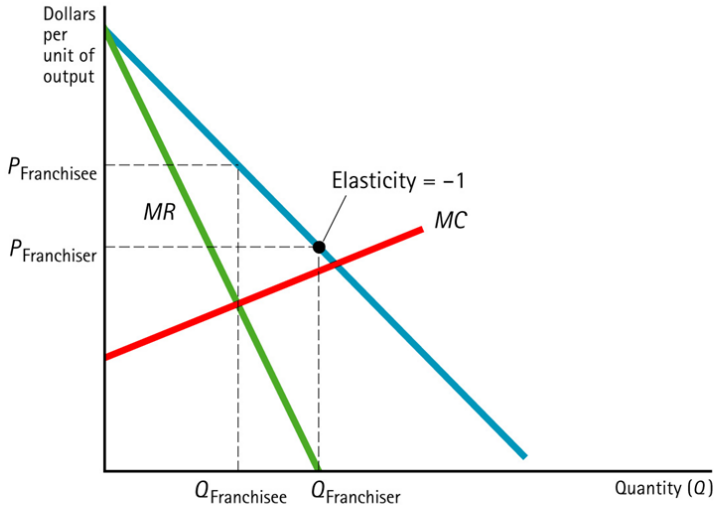


Notes: The downstream company's marginal revenue is the relevant demand for the upstream company; i.e. blue and green lines are the same! A chain of two monopolies results in even further welfare loss. This is easily seen, because the final MR curve is further to the left and prices increase.

Franchising

Consider two monopolies, a franchisor (upstream company, whole sale company) and a franchisee (downstream company, retailer).

- The franchisor maximizes profits by (i) setting all intermediate goods at marginal costs and (ii) extracting the monopoly rents of the franchisee by setting a high franchise fee
- The franchisor grants the franchisee a local monopoly
- The franchise fee drives the franchisee to set $P = MC$
- The franchisee benefits from overall branding and advertising


Dollars per unit of output
$P_{Franchisee}$
$P_{Franchiser}$
MR
Elasticity = −1
MC
$Q_{Franchisee}$
$Q_{Franchiser}$
Quantity (Q)

Mark-up pricing

Managers almost always say that “prices are related to costs”, but rarely that they depend on demand ...

1. The firm estimates the cost per unit of output of the product, usually average cost
2. The firm adds a markup, μ, to the estimated average cost

$$P = (1 + \mu)C.$$

Does mark-up pricing maximize profit?

Markup-pricing will maximize profit if:

- $MC = MR \Rightarrow P = MC/(1 + 1/\eta)$

- Optimal Price: it is essential to know the elasticity of demand
- Marginal costs: these are typical known (however, firms rely often on average costs)

Optimal markup and price elasticity of demand

Price elasticity of demand	Optimal markup of MC (in %)
-1.2	500
-1.4	250
-1.8	125
-2.5	66.67
-5.0	25
-11.0	10
-21.0	5
-51.0	2

Notes: If demand is not sensitive to its price, a greater mark-up is optimal. Figure in Allen et al., Managerial Economics (8th ed.), p265.

Multiproduct firm

If firm has more than one product and they are not related, this does not change our analysis.

But if two products X and Y are complements or substitutes, this will affect TR differently:

$$
\begin{aligned}
TR &= TR_X + TR_Y \\
MR_X &= \partial TR/\partial Q_X = \partial TR_X/\partial Q_X + \partial TR_Y/\partial Q_X \\
MR_Y &= \partial TR/\partial Q_Y = \partial TR_X/\partial Q_Y + \partial TR_Y/\partial Q_Y
\end{aligned}
$$

Why are peanuts in bars “for free”, but you have to pay for tap water?

Demand interrelationships

If the firm increases the price of X and

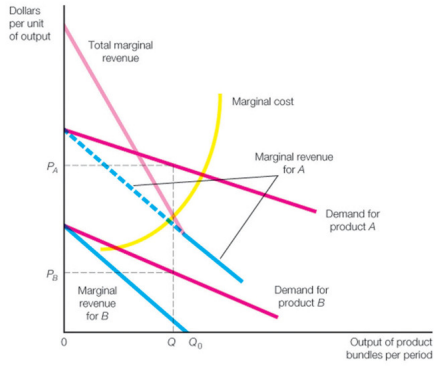
1. X and Y are complements
   - ☐ Demand for X falls
   - ☐ but at the same time
   - ☐ Demand for Y falls as well
   - ☐ $\Rightarrow$ Optimal price of X should be lower than without the complementary product Y!
2. X and Y are substitutes ...

Production interrelationships

Consider the joint production of X and Y:

- Example: by-products in plastic production, oil industry, ...
- Costs of separate production cannot be separated properly because
  1. Both products are always produced in same proportions or
  2. the production process allows to change the proportions

Joint production with fixed proportions



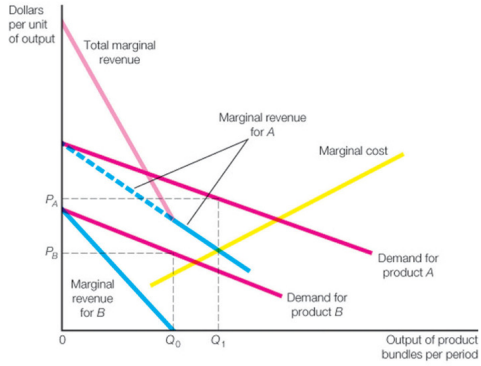
Notes: The intersection between the *Total Marginal Revenue Curve* (TMR), obtained from the *vertical* sum of the separate marginal revenue curves, and the marginal cost curve determines the optimal quantities (and prices). Figure 8.5 in Allen et al., Managerial Economics (8th ed.), p276.

Joint production with fixed proportions

The production of one good automatically produces the other

- Total marginal revenue, TMR: The summation of the two marginal revenues for individual products
- Pricing rule: $TMR = MC$.
- The marginal revenue (from both products) from producing one more unit should be equal the marginal costs.

Joint production with fixed proportion: Demand matters...



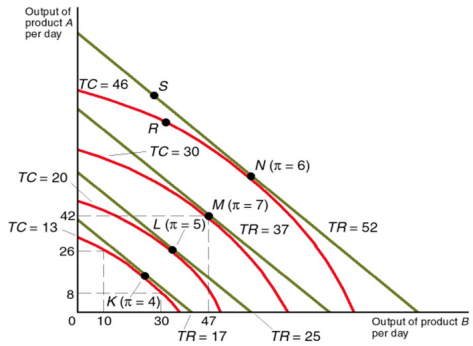
Notes: In this example, same as before but for lower MC, the intersection between TMR and MC is to the right of Q_0. Output of the first product is limited to Q_0 as there is no demand beyond that quantity. Figure 8.6 in Allen et al., Managerial Economics (8th ed.), p277.

Joint production with variable proportions

Since production of X and Y may vary, we need to examine

- Iso-revenues: all combinations of output levels of X and Y that have the same revenue
- Iso-costs: all combinations of output levels X and Y with same costs
- Tangency condition: profit is maximized, which occurs at a point of tangency

Joint production with variable proportions



Notes: The optimal output is determined by *isorevenue* lines and *isocost* curves. Isorevenue lines are the locations of all combinations of outputs which yield the same revenues. Isocost curves are locations of all combinations of outputs that have the same costs. The tangent point of an isorevenue line and an isocost curve that yields the highest profit determines the optimal output. Figure 8.7 in Allen et al., Managerial Economics (8th ed.), p280.

A single buyer

Monopsony

Markets where there is only one buyer

- Early research by Joan Robinson
- Buyers on a *competitive market* face a horizontal supply curve; they are price takers.
- A monopsony faces an upward-sloping supply curve, they are price makers.

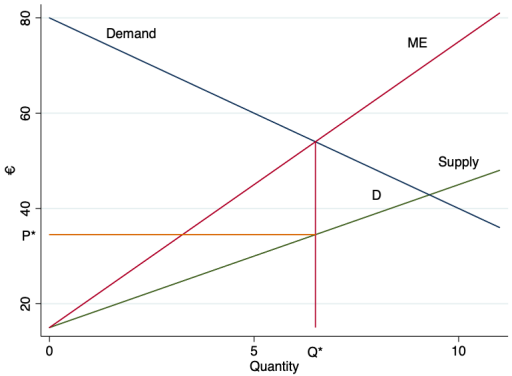
Discriminating monopsony

- The monopsonist **can** distinguish between sellers' reserve prices or workers' reservation wages and pays each differently (optimally at their reservation price or reservation wage).
- The supply curve is upward-sloping and co-incides with the marginal cost curve.
- The quantity bought (the number of workers hired) is the same as in a competitive market.
- There is not one single price, but each supplier is paid a different price.

Non-discriminating monopsony

- The monopsonist **cannot** distinguish between sellers (workers).
- If the monopsonist wishes to buy more raw materials (or to hire more workers), it has to pay the same greater price (wage) for all.
- The supply curve is upward-sloping; the marginal expenditures are above the supply curve.
- The monopsonist will purchase a quantity (hire the number of workers) where marginal expenditures are equal to the demand curve (which co-incides with the *marginal revenue product*).
- The monopsonist will pay a price below marginal cost.
- The quantity bought is less than in a competitive market; the price is lower than in a competitive market.

The optimal quantity that a monopsonist buys



Notes: A (non-discriminating) monopsonist faces an upward-sloping supply curve. The optimal quantity. Q^*, is given by the intersection of the marginal expenditure curve with the demand curve. The optimal price, P^*, the monopsonist *pays* is the price resulting from its purchase of Q^* units. The area D, a triangle in this diagram, indicates the loss in welfare due to unrealized trades.

Monopolistic competition (mcm)

In a competitive market, firms aim to create at least a “local monopoly”:

- Spatial differences: This is the true “local” aspect, e.g., a restaurant car on a train. Very difficult to switch to a different restaurant ...
- Product differences: Firms aim to convince consumers that their products are different to the competitors’ products, e.g., using brands
- In a monopolistically competitive market (mcm), managers have some pricing power, but because products are similar, the price differences a relatively small.
- In other words, in a mcm, the demand curve for an individual firm is not flat.

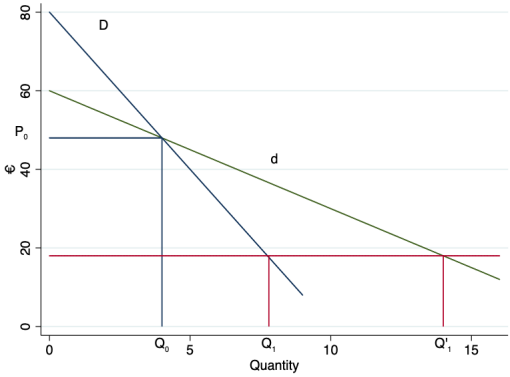
- Other conditions are as in a competitive situation, i.e., many firms and free entry into the market.

Prices in a mcm

What happens if firm changes price alone (dd) or if all firms change their prices (DD)?

- Consider a very small firm which changes the price, its demand curve is very flat
- Marketing is important: firms want to make their product “unique”
- If a product is “special”, the demand becomes more inelastic (steeper)
- If all firms change the price at the same time, no consumer can switch to competitor

MCM: One firm vs. all firms



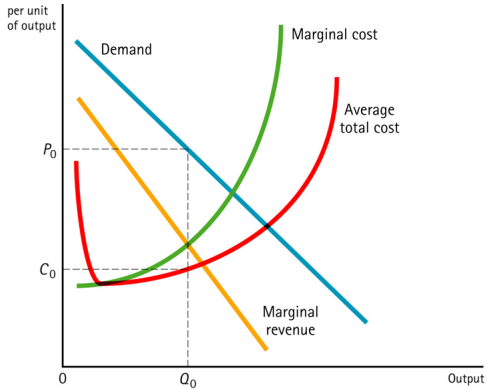
Notes: The effect of price changes in a market with monopolistic competition depends on how many firms are changing their prices. If one firm reduces the price from P_0 to P_1, the supplied quantity changes from Q_0 to Q_1'. If many or all firms change their prices, the overall demand curve, DD, pivots and the quantity supplied changes to Q_1.

Short-run and long-run outcomes in a mcm

Firms aim to behave like monopolists and set the price where $MR = MC$.

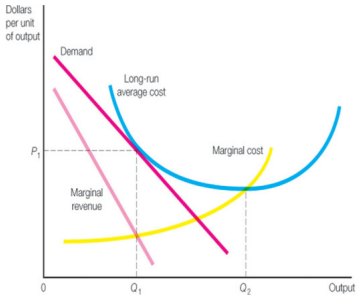
- This results in profits — remember, economic profits $\neq$ accounting profits!
- The potential to make profits attracts other firms to enter the market
- Each firm competes for a share of total demand and entry lowers the demand for the individual firm
- In the long run, profits disappear and the demand curve becomes tangential to the long-run average cost curve

Short-run equilibrium in a mcm



Notes: A firm in a mcm will produce Q_0 units of output as this is the quantity where $MR = MC$. The price is given by the demand curve, $P = P(Q)$, and is indicated by P_0. The firm will obtain profits of $P_0 - C_0$ per unit of output. Figure 8.9 in Allen et al., Managerial Economics (8th ed.), p284.

Long-run equilibrium in a mcm



Notes: In the long term, firms will enter the mcm and lower profits. Firms will produce where $MR = MC$, i.e., Q_1. The price is given by the demand curve, $P = P(Q)$, and is indicated by P_1. Note that MC are at a minimum at a greater quantity, Q_2. Figure 8.9 in Allen et al., Managerial Economics (8th ed.), p284.

- Profits attract entrants
- Market entry lowers demand the individual firm
- Zero profit condition met ($TR = TC$)
- Profit-maximization condition met ($MC = MR$)
- Production is not cost-efficient as long-run average costs not at minimum
- This is the “cost” of product variety

MCM

- Common type of market
- No interaction between firms
- Firm could reduce average cost by producing more
- Firms aim to bind their costumers to the firm:
  - Marketing and advertising is important (loyalty schemes, better taste, ...)
  - Product differentiation to achieve “local monopoly”

Optimal advertising rule

- Assume that prices and marginal costs do not change if a firm changes advertising only by a small extent. (This is plausible, if the firm is small.)
- Optimal advertising rule: as much advertising that
  Marginal revenue from an extra euro of advertising = $|\eta|$ (elasticity of demand):
  - Recall: $MR = P(1 + 1/\eta)$
  - An extra Euro of Adv should be equal to the additional profit gained
  - $\Delta Q(P - MC) = 1$
  - $\Delta Q = 1/(P - MC) \Rightarrow P\Delta Q = P/(P - MC)$
  - Substitute for MC=MR, then we see that
    - Left side is marginal revenue from advertising
    - Right side is elasticity of demand

Numerical example: Optimal advertising rule

Assume:

- η = -1.6
- Managers believe that an extra €100,000 of advertising will increase sales by €200,000, i.e., $E[MR] = 2$. ($E[\cdot]$ indicates the expectations.)
- A manager can increase profits by advertising more; $MR > |\eta|$.
- To maximize profits, the manager should increase advertising to the point where the return to an extra euro of advertising falls to 1.6.

Optimal advertising expenditure: advertising meant to increase brand consciousness of clients

- With little advertising, elasticity will be high, because product will be considered as easily substitutable to others,
- Increase advertising and elasticity will fall

Strategic advertising

A firm may choose between two strategies

1. Low-price strategy, “promotions” to increase the price elasticity:
   - Advertise price cuts to increase the price consciousness of customers
2. High-price strategy, to increase brand consciousness:
   - Price elasticity of demand should decrease (demand curve should get steeper)

Price elasticity and advertising

	Own-price elasticity of demand	
Brand	Advertised price change	Unadvertised price change
Chock Full o'nuts	-8.9	-6.5
Maxwell House	-6.0	*
Folgers	-15.1	-10.6
Hill Brothers	-6.3	-4.2

Notes: * Not statistically significantly different from zero. Katz and Shapiro, 1986, "Consumer Shopping Behavior in the Retail Coffee Market", Table 14, p443.

Price promotions

- Promotions increase the price elasticities of consumers
- Promotions have less effect on brand loyality
- The effects of promotions decay over time
- Price elasticity of disloyal customers is four times greater than of loyal customers
- The effects of advertising on brand loyalty erode over time and prices become more important to consumers.