BUEC 311: Business Economics, Organization and Management
Monopoly

Fall 2020

Outline

1. Monopoly Profit Maximization
2. Market Power
3. Market Failure Due to Monopoly Pricing
4. Causes of Monopoly
5. Advertising
6. Networks, Dynamics & Behavioural Economics

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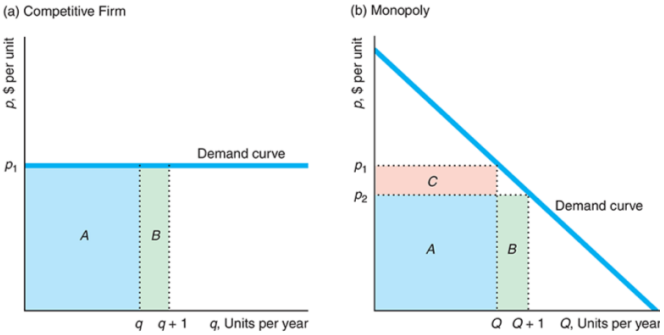
Monopoly Profit Maximization

- Monopoly: Sole supplier of a good for which there is no close substitute.
- Like a perfectly competitive firm, a monopoly maximizes profit by setting $MR(q) = MC(q)$.
- Key difference: Because a monopoly has no competitors, it faces a downward-sloping market demand curve.
  - This means a monopoly can alter its revenue by changing the price that it charges.
  - But there is a trade-off from lowering price.
    - More demand vs. lower price.

Monopoly Profit Maximization



	Initial Revenue, R_1	Revenue with One More Unit, R_2	Marginal Revenue, $R_2 - R_1$
Competition	A	$A + B$	$B = p_1$
Monopoly	$A + C$	$A + B$	$B - C = p_2 - C$

Price vs. Marginal Revenue

- A monopoly's marginal revenue from selling an additional unit must be less than the price of the unit.
- This means that the monopolist's MR curve will lie below the demand curve for any possible Q, and the shape of the MR curve will depend on the shape of the demand curve.
- In general:

$$MR = p + \left[\frac{\Delta p}{\Delta Q}\right] Q$$

where $\Delta p/\Delta Q < 0$.

Elasticity of Demand

- We can describe the shape of the demand curve at a particular quantity with the price elasticity of demand:

$$\varepsilon = \frac{[\Delta Q/Q]}{[\Delta p/p]} < 0$$

- ε indicates the percentage change in quantity demand from a 1% change in price.

- If demand is *inelastic*, $-1 < \varepsilon \leq 0$.
- If demand is *elastic*, $\varepsilon < -1$.

Marginal Revenue and Elasticity

- We can rewrite the monopolist's marginal revenue function in terms of the price elasticity of demand:

$$\begin{aligned} MR &= p + \left[\frac{\Delta p}{\Delta Q}\right] Q \\ &= p + p\left[\frac{\Delta p}{\Delta Q}\right]\frac{Q}{p} \\ &= p\left[1 + \frac{1}{[\Delta Q/Q]/[\Delta p/p]}\right] \\ &= p\left[1 + \frac{1}{\varepsilon}\right] \end{aligned}$$

Marginal Revenue

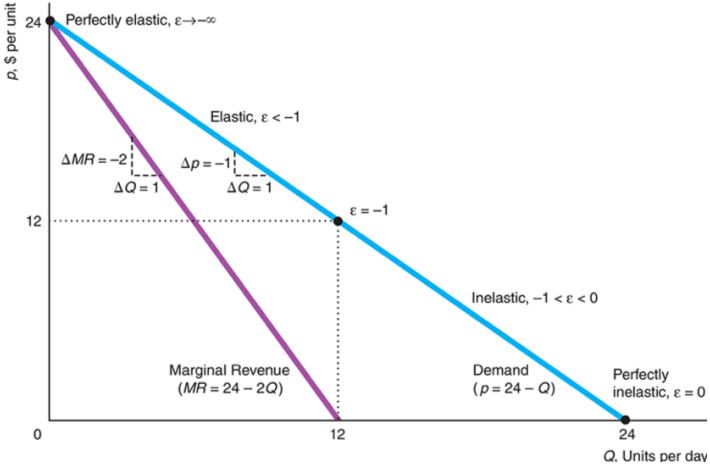


Figure: Demand and Marginal Revenue for p=24-Q

Marginal Revenue

Quantity, Q	Price, p	Marginal Revenue, MR	Elasticity of Demand, $\varepsilon = -p/Q$	
0	24	24	$-\infty$	↑ more elastic
1	23	22	−23	
2	22	20	−11	
3	21	18	−7	
4	20	16	−5	
5	19	14	−3.8	
6	18	12	−3	
7	17	10	−2.43	
8	16	8	−2	
9	15	6	−1.67	
10	14	4	−1.4	
11	13	2	−1.18	
12	**12**	**0**	**−1**	
13	11	−2	−0.85	
⋮	⋮	⋮	⋮	↓ less elastic
23	1	−22	−0.043	
24	0	−24	0	

Figure: Demand and Marginal Revenue for p=24-Q

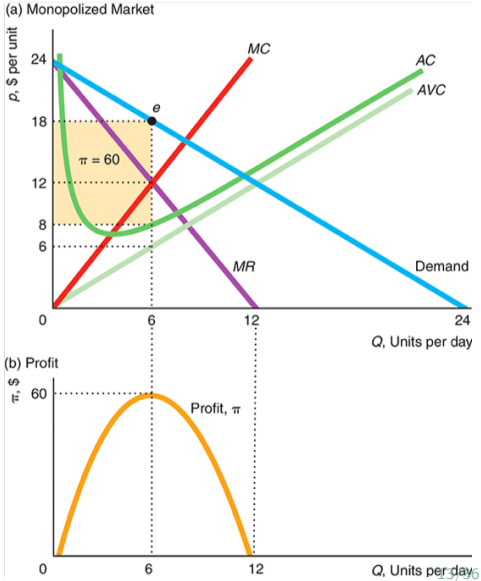
Monopoly Profit Maximization

- A monopolist maximizes profit such that $MR(Q) = MC(Q)$.
- This can be achieved by adjusting price or quantity.
  - The other variable is determined by the demand curve.
- Here, we will focus on the case when the monopolist sets quantity.

Two-Step Analysis

- Monopolists also use two-step analysis to maximize profit.
- Step 1: Choose Q to maximize profit.
  - This occurs where $MR(Q) = MC(Q)$.
- Step 2: Decide whether to produce or shut down.
  - Short run: Shut down if price is less than average variable cost.
  - Long run: Shut down if price is less than average cost.

Monopoly Profit Maximization



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Market Power

- Market Power: A firm's ability to affect the market price.
- The shape of the demand curve constraints a monopoly's ability to exercise market power.
- To see this, note that profit maximization implies:

$$\frac{p}{MC} = \left[\frac{1}{1 + [1/\varepsilon]}\right]$$

- Hence, a monopoly's markup increases as demand becomes more inelastic.

Market Power

- We can also measure a firm's market power using the Lerner Index, which is given by:

$$LI = \frac{p - MC}{p}$$

- This can be re-expressed in terms of the elasticity of demand:

$$LI = \frac{p - MC}{p} = -\frac{1}{\varepsilon}$$

- For a monopoly, the Lerner Index ranges between 0 and 1.

Market Power

	Elasticity of Demand, ε	Price/Marginal Cost Ratio, $p/MC = 1/[1 + (1/\varepsilon)]$	Lerner Index, $(p - MC)/p = -1/\varepsilon$
← more elastic less elastic →	-1.01	101	0.99
	-1.1	11	0.91
	-2	2	0.5
	-3	1.5	0.33
	-5	1.25	0.2
	-10	1.11	0.1
	-100	1.01	0.01
	$-\infty$	1	0

Market Power

- Firms can exploit the relationship between mark-ups and the elasticity of demand to ensure profits are being maximized.
- Recall, if profit is maximized:

$$\frac{p}{MC} = \left[\frac{1}{1 + [1/\varepsilon]}\right]$$

- Hence, with an estimate of ε, firms can ensure that p/MC is approximately equal to $1/[1 + [1/\varepsilon]]$. If it is not, then prices need to be adjusted.

Market Power

- Market power is determined by the availability of substitutes, the number of firms in the market, and the proximity of competitors.
  - These factors all affect the elasticity of demand.

- Market power is lower if:
  1. There are better substitutes: better substitutes $\Longrightarrow$ demand is more elastic.
  2. There are more firms: more firms provides more choice for consumers $\Longrightarrow$ demand is more elastic.
  3. Competitors locate nearby: nearby competitors $\Longrightarrow$ demand is more elastic.

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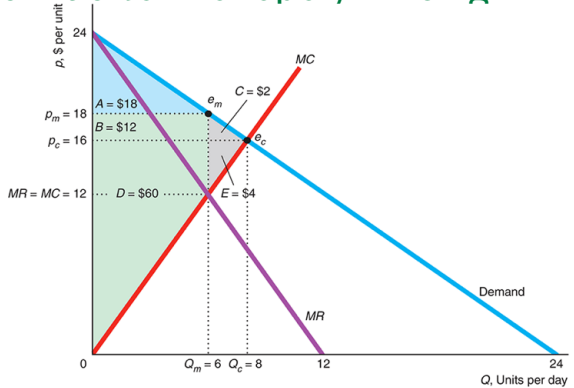
Market Failure Due to Monopoly Pricing

- Recall: Perfect competition achieves *economic efficiency*.
  - Perfect competition maximizes total surplus.

- A monopoly is *economically inefficient*.
  - A monopolist sets prices above marginal cost, so consumers buy less than the efficient level of the good or service.
  - This wastes potential surplus, resulting in deadweight loss.
  - Deadweight loss is inefficient.

- The inefficiency created by monopoly is an example of a market failure.
  - A market failure is a non-optimal allocation of goods and services.

Market Failure Due to Monopoly Pricing



	Competition	Monopoly	Change
Consumer Surplus, *CS*	$A + B + C$	A	$-B - C = \Delta CS$
Producer Surplus, *PS*	$D + E$	$B + D$	$B - E = \Delta PS$
Total Surplus, $TS = CS + PS$	$A + B + C + D + E$	$A + B + D$	$-C - E = \Delta TS = DWL$

Figure: The Deadweight Loss from Monopoly

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The Causes of Monopoly

- Monopolies arise from two main factors:
  1. Cost considerations.
  2. Government policy.

The Causes of Monopoly

- Cost-based monopolies can be due to:
  - Cost advantages: One firm has substantially lower costs than potential rivals.
    - The low-cost firm will be able to function as a monopoly if it is able to sell at a price so low that potential rivals would lose money if they enter the market.
    - These cost advantages can arise due to superior technology, better production methods, or control of an essential facility/scare resource.
  - Natural monopoly: One firm is able to produce total market output at a lower cost than two or more firms could.
    - That is: $C(Q) < C(q_1) + C(q_2) + \ldots + C(q_N)$.
    - This can occur due to economies of scale; a natural monopolist will have a strictly declining average cost curve.
    - Governments use the natural monopoly argument to justify granting monopoly rights to public utilities.

Natural Monopoly

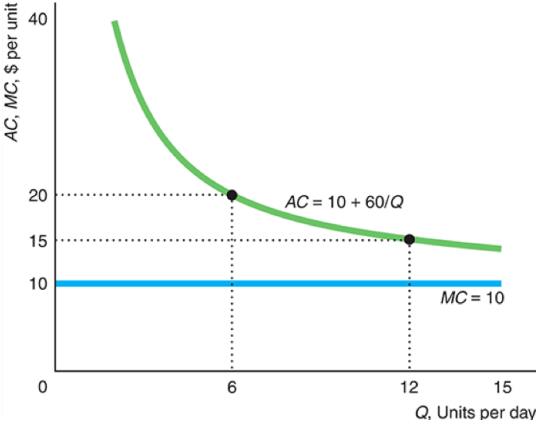

Figure: Natural Monopoly

Government-created Monopoly

- Monopolies can also arise as a result of governments:
  - Creating barriers to entry.
    - Governments can require firms to obtain a license to operate, or explicitly grant monopoly rights to a single firm.
    - If the government auctions off the monopoly rights, it can potentially capture the value of monopoly earnings. However, for political and other reasons, the government usually does not capture all future profits.
  - Granting patents.
    - Patents are exclusive rights granted to a patent holder for a specified length of time.
    - Patents only granted for new and useful product, process, substance or design.
    - Patent lengths vary across countries. Typically 20 years in both Canada and United States.

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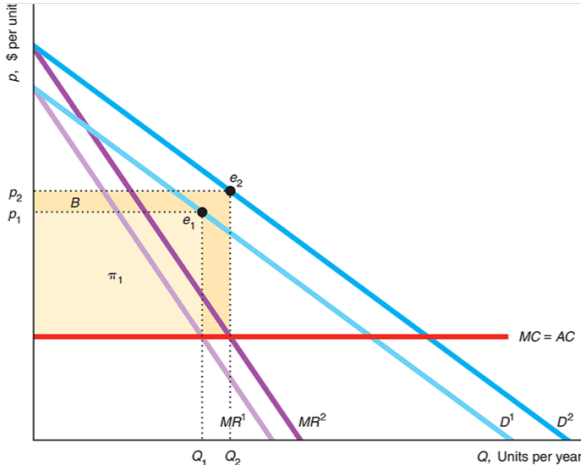
Advertising

- Unlike a perfectly competitive firm, a monopolist has an incentive to try and alter demand for its product via advertising.
- Goal of advertising: shift the demand curve outward and make it less elastic.
  - This means the monopolist can sell more units a higher price.
- A monopolist should only advertise if it expects net profit (profit minus the cost of advertising) to increase.
  - If the monopolist advertises, the quantity of advertising should be chosen such that the marginal benefit (the marginal revenue from additional unit sold) equals the marginal cost.

Advertising



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Networks, Dynamics & Behavioural Economics

- In some settings, the decisions of a monopolist are inherently dynamic due to the presence of network externalities in demand.

Definition (Network Externality)

A good exhibits a network externality if one consumer's demand depends on the consumption of the good by others.

- If a network externality is:
  - positive, the value to consumers grows as the number of units sold increases.
  - negative, the value to consumers falls as the number of units sold increases.

Networks, Dynamics & Behavioural Economics

- Many industries exhibit positive network externalities because consumers get a direct benefit from a larger network.
  - E.g. ATMs, Fax Machines
- Firms can also benefit indirectly from network externalities because they offer products that are complementary to a good or service that requires a network.
  - E.g. Software, "YouTubers"

Networks, Dynamics & Behavioural Economics

- The magnitude of network externalities can depend in part on human psychology, particularly due to consumer attitudes towards other consumers.
- Positive network externalities can arise because of *Bandwagon Effects*.
  - Individuals place greater value on a good when more people posses it.
- Negative network externalities can arise because of *Snob Effects*.
  - Individuals place less value on a good when more people posses it.

Networks, Dynamics & Behavioural Economics

- Positive network externalities can lead to a monopoly because a critical mass of consumers is needed.
- One large firm can end up dominating the market.
  - E.g. Windows OS; Youtube.
- But domination does not necessarily last forever.
  - E.g. Yahoo and Google; Netscape, Internet Explorer, and Chrome.

Takeaways

1. A profit maximizing monopolist earns positive profit by choosing its output to equate marginal revenue and marginal costs.
2. Market power depends on the shape of the demand curve.
3. Monopoly leads to market failure.
4. Monopolies can arise due to cost advantages, government policy and network effects.
5. Advertising can increase the profits of a monopolist.