International Trade: Lecture 14

Economies of Scale

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Motivation

- The models of comparative advantage we saw assumed constant returns to scale.
- If inputs to an industry were doubled, industry output would double as well.
- Many industries are characterized by economies of scale (aka increasing returns)
- Production is more efficient the larger the scale at which it takes place.
- Can we think of examples?

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- Although the mechanisms differ, they generate a similar intuition: the long-run equilibrium cost curve slopes downward in both cases.

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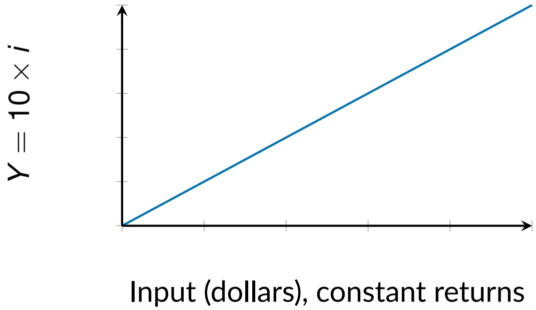

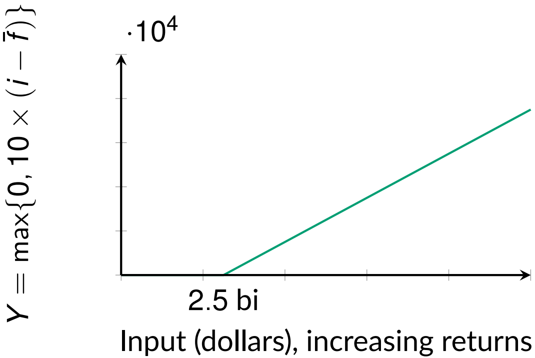

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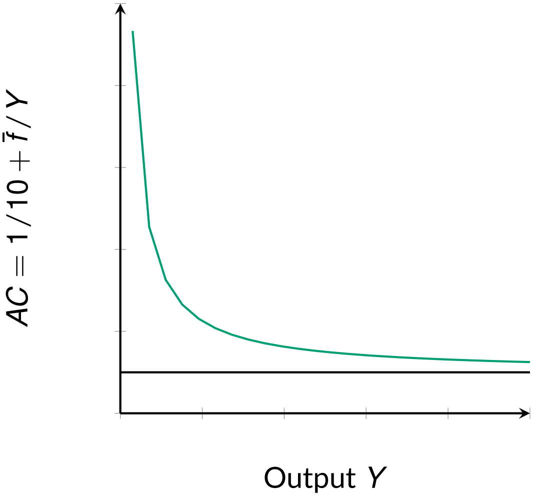

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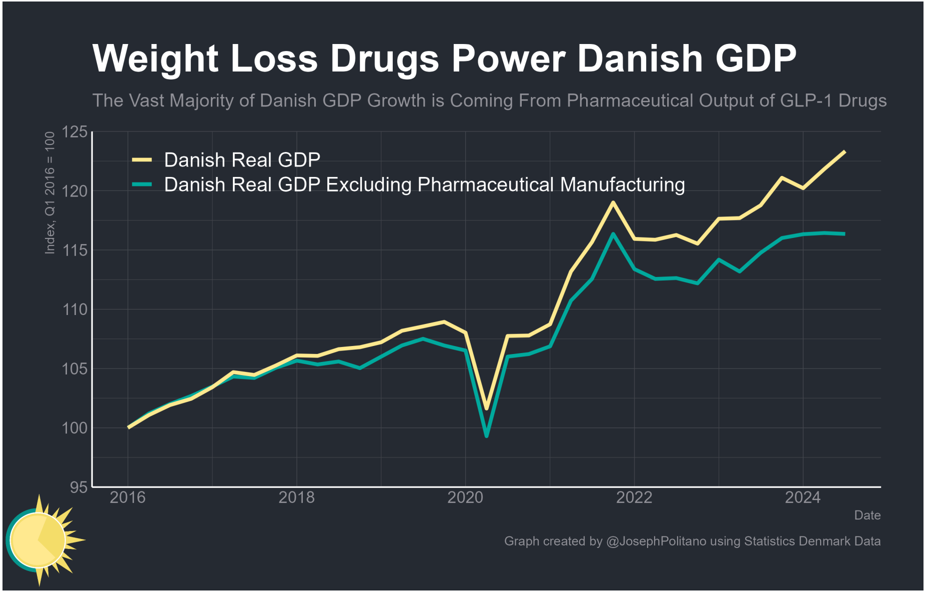
- Trade provides a vehicle for scale and innovation

Increasing returns and trade



Production and Cost

Let us understand the mathematics of increasing returns.

- Production function: $\underbrace{Y}_{\text{output}} = \underbrace{\ell^{\alpha}}_{\text{labor}}$ (Y units produced when using ℓ labor)

  $\implies \ell = Y^{\frac{1}{\alpha}}$ (ℓ required to produce Y units)

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- Profits per unit: $\frac{\pi}{Y} = \frac{PY - C(Y)}{Y} = P - AC \implies$ firms will produce output when $P \geq AC$.

Production and Cost

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- Average cost: $\frac{C(Y)}{Y} = wY^{\frac{1}{\alpha}-1} + \frac{\bar{f}}{Y} = \begin{cases} \frac{\partial}{\partial Y}\frac{C(Y)}{Y} > 0, & \text{decreasing returns to scale} \\ \frac{\partial}{\partial Y}\frac{C(Y)}{Y} = 0, & \text{constant returns to scale} \\ \frac{\partial}{\partial Y}\frac{C(Y)}{Y} < 0, & \text{increasing returns to scale} \end{cases}$

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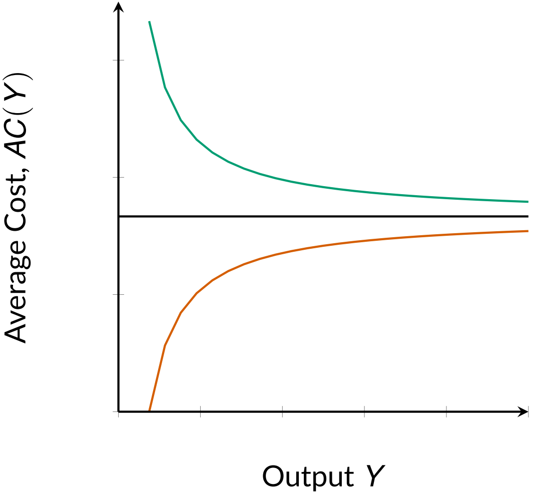

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- When $\bar{f} > 0$ and $C(Y) > \bar{f}$, $AC(Y)$ is decreasing in Y $\implies$ increasing returns to scale!

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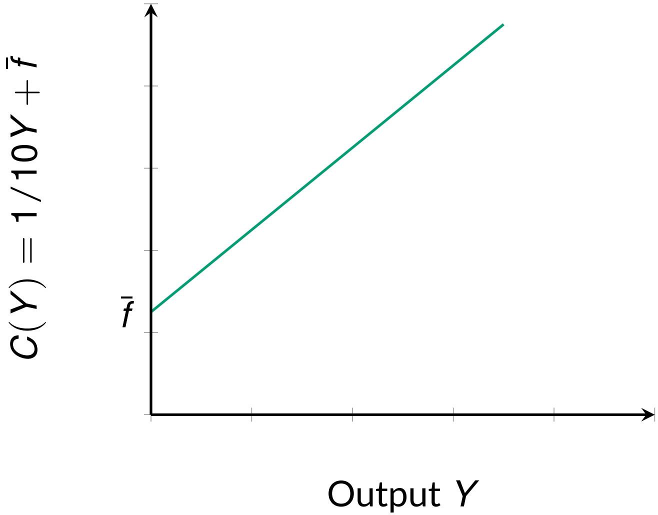
- **Variable cost:** $\$0.1$

- **Total Cost:** $C(Y) = \$2.5\text{billion} + \$0.1Y$

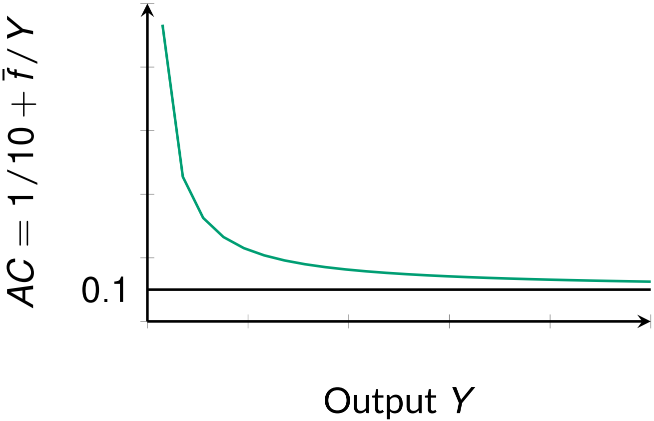
- **Production:** $Y = \begin{cases} 0 & \text{if } C(Y) < \$2.5\text{billion} \\ \ell = (C - \$2.5B)/(\$0.1) & \text{if } C(Y) \geq \$2.5\text{billion} \end{cases}$

Total Cost



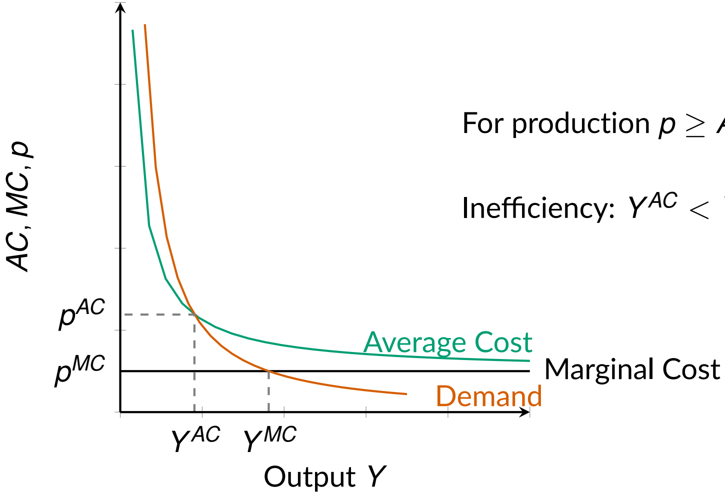
Output (Million)	TC (Million)
500	2550
1000	2600
1500	2650
2000	2700
2500	2750
3000	2800
3500	2850

Average Cost



Output (Million)	AC ($ per unit)
500	5.1
1000	2.6
1500	1.7
2000	1.3
2500	1.1
3000	0.9
3500	0.8
$\to \infty$	$\to 0.1$

Inefficiency in Markets with Increasing Returns



For production $p \geq AC$

Inefficiency: $Y^{AC} < Y^{MC}$

Micro diversion

Problems with Perfect Competition

If price is equal to marginal cost, no firm will undertake the costly research that is necessary to invent new ideas.

- Wedge between P and MC to remunerate innovators (e.g.: Patents assign monopoly power for 20 years to innovators)
- $P > MC$ (market power) has negative consequences: people priced out of market, lower overall surplus

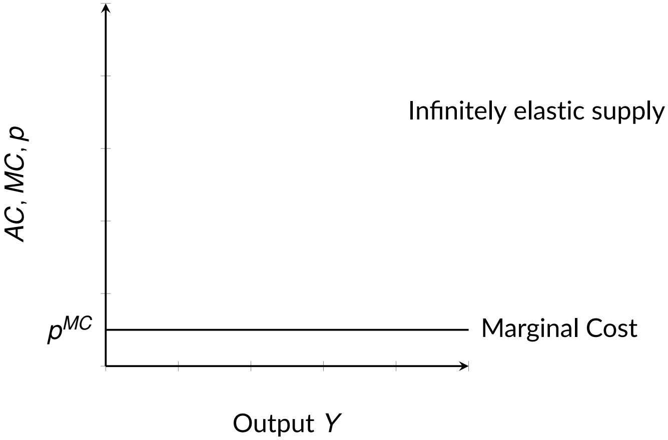
Supply in a Competitive Market

Firm **takes prices as given** and chooses labor to maximize profits

$$\max_{\{Y\}} \pi = PY - C(Y)$$

Solution for optimal C:

$$P = C'(Y) = MC$$



Logic of a monopolist

- Now suppose monopolists are large enough they now their supply influences prices

- In other words, they know prices $P(Y)$ are some function of output

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- To sell incremental unit, firm must lower price for all units
- e.g., suppose $P(Y) = (A/b) - (1/b)Y$, then $P'(Y)Y = -(1/b)Y$ and:

$$MR = P(Y) + P'(Y)Y = (A/b) - (1/b)Y - (1/b)Y = (A/b) - (2/b)Y = MC$$

Market Structures

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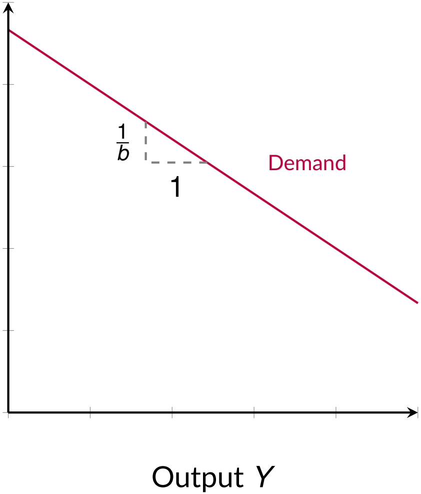
- Monopoly: One firms serves the entire market
- Oligopoly (duopoly): Several (two) firms serve the market and compete partially, each anticipating each others' rational actions
- Monopolistic competition: No reaction to other firms' supply
  - Products differentiated from competitors.
  - One firm per niche market
  - Competitors' supply (price choice) taken as given

Monopoly



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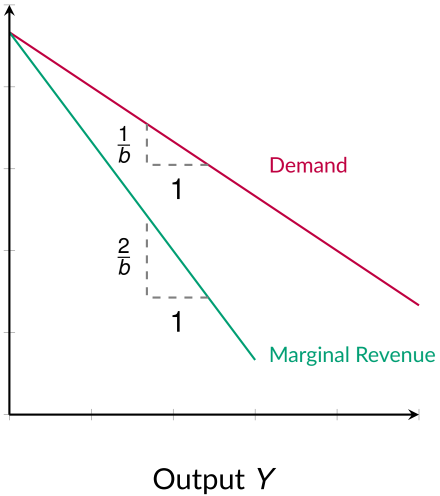

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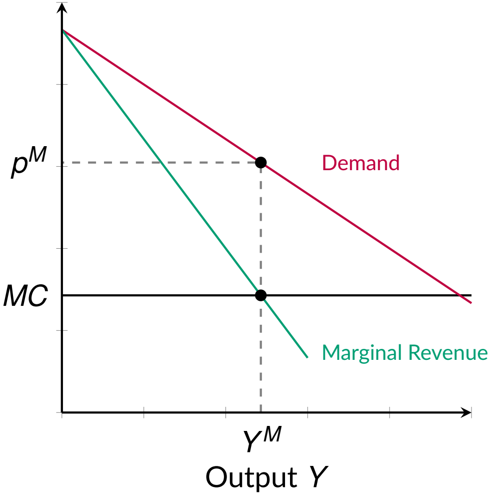

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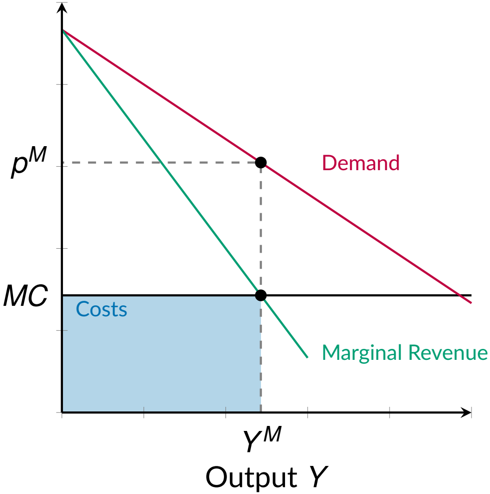

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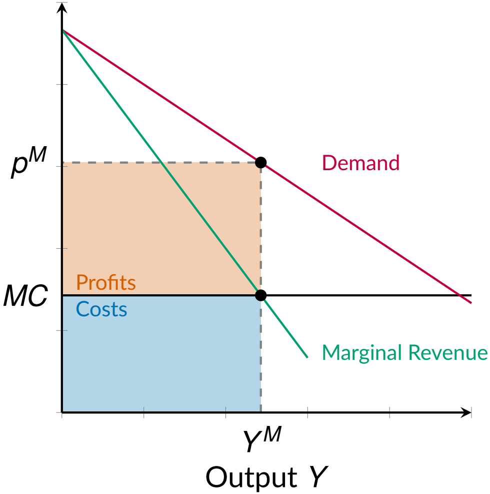

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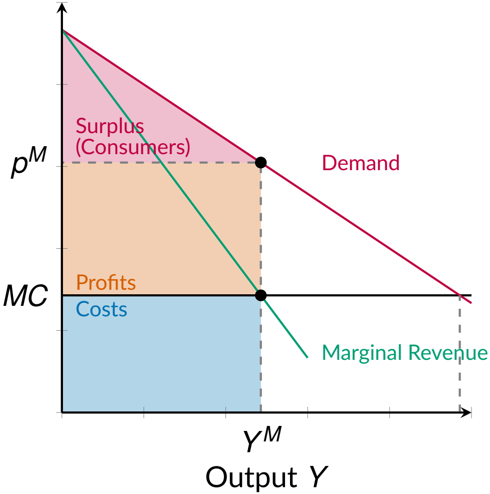
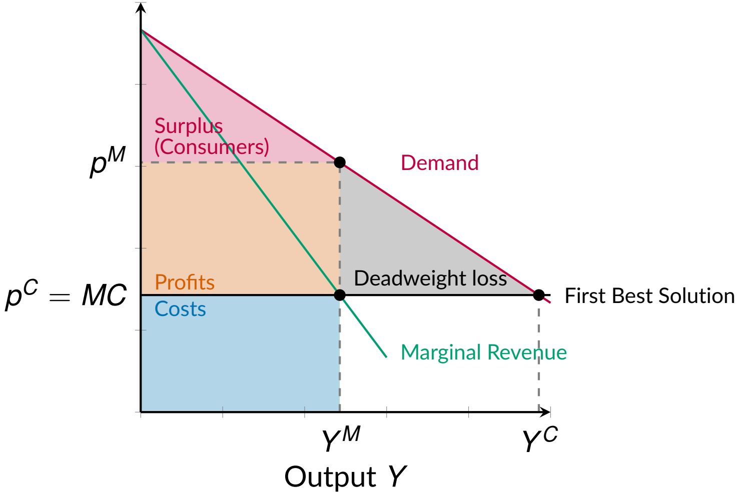


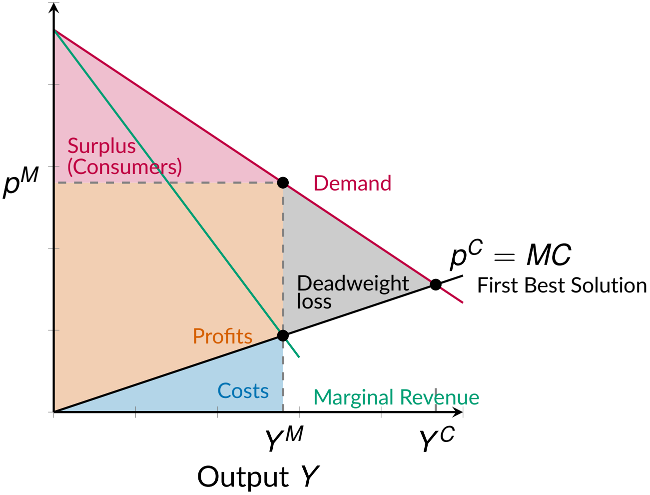
Surplus
(Consumers)
p^M
Demand
Profits
MC
Costs
Marginal Revenue
Y^M
Output Y

Monopoly



Surplus
(Consumers)
p^M
Demand
Profits
Deadweight loss
$p^C = MC$
First Best Solution
Costs
Marginal Revenue
Y^M
Y^C
Output Y

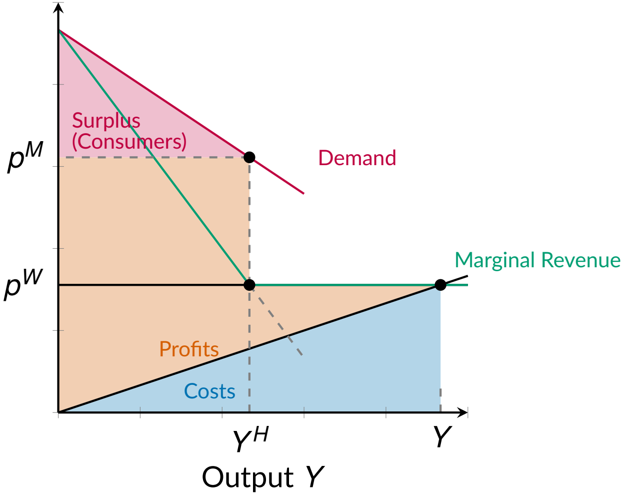
What if marginal cost function are different? (decreasing returns)



Product Market Segmentation

- Price Discrimination: Specific price to consumers by market segment
- Anti-competitive predatory pricing, or competitive response?
- Dumping: Price discrimination in international markets
- When exported, goods sold at lower price than in domestic market (or at cost)
- Two conditions need to be satisfied for dumping to be possible
  - Industries must be imperfectly competitive
  - Markets must be segmented (no arbitrage possible)

Pricing to Market by a Domestic Monopolist



Problems with Perfect Competition

If price is equal to marginal cost, no firm will undertake the costly research that is necessary to new products.

- Alternative solutions:
  1. Public funding of research and innovation (National Science Foundation, National Institute of Health) - reduces impact of fixed cost on AC
  2. Subsidize education in science and engineering - reduces cost of labor to produce ideas, so reduces fixed cost
  3. Prizes for innovators - reduces impact of fixed cost on AC