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ECONOMIES OF SCALE

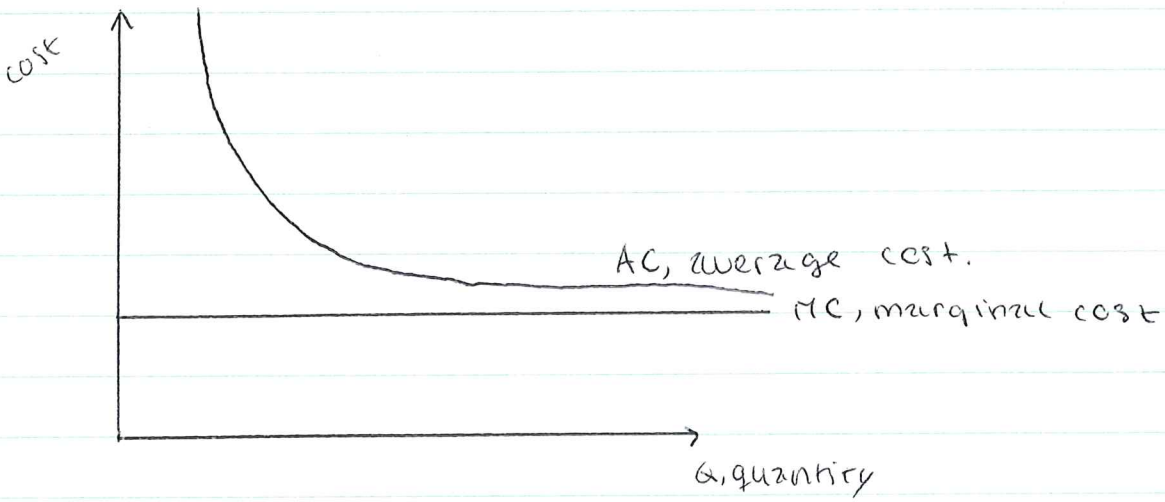
Economies of scale means increasing returns. When quantity produced increases, the cost of producing ~~one additional unit~~ decreases. This can be done by either dividing the fixed costs on more quantity or reducing the variable cost with better knowledge, technology, productivity, etc. We divide economies of scale into external economies of scale and internal economies of scale.

External economies of scale consider increase on returns depending on the industry, and not necessarily individual firms. Examples are advantages all firms within an industry can have due to specialized suppliers, labor market pooling and knowledge spillover. In external economies many firms, often view as homogeneous are considered.

In internal economies of scale the increase on return depend on the size of individual firms, and not necessarily the industry. Bigger, or more productive firms have a lower initial marginal cost ~~which~~/ cost function generally (also fixed cost divided on more output) which will give them an advantage.

In internal economies of scale often few, differentiated firms are considered.

The effect of increasing returns can be view as:



When increasing output the average cost will drop. After time it will get closer and closer to MC. Intuition behind this is the fixed cost which is divided by more and more quantity. (Ex: rents on the office, cost of machinery, etc)

In order to view the effects of the internal economies of scale, monopolistic competition will be used as the market structure.

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MONOPOLISTIC COMPETITION

To demonstrate internal economies of scale the framework for monopolistic competition is used.

- viewed as many firms, none of the firms have sustainable market share
- operate as monopolistic firms in short-term, but stabilize as perfectly competitive in long-run
- price determined by market (firms are price takers)
- the firms are considered to be symmetric. Same demand, same cost-function. They charge the same price.
- All firms works as profit-maximizing firms, meaning they optimize their profit, setting MR=MC.
- Market size without trade is constant.
- No transportation cost when opening for trade

Will start to derive relationships between average cost and number of firms, and price and number of firms to view the industry market within one economy.

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Will use these equations to derive the relationships:

(1) $Q = s\left(\frac{1}{n} - b(P-\bar{P})\right)$

(2) $C = F + cQ$

Q = demand function for the good (number of good Q demanded)

s = market size

n = number of firms

b = a constant > 0

P = price charged by individual firm

$\bar{P}$ = average price of product in industry

C = cost function

F = fixed cost

c = variable cost

Q = number of goods

Starting with the relationship between price and number of firms.

- since the firms are assumed to be symmetric $P = \bar{P}$
- That reduces (1) to

$$Q = s\left(\frac{1}{n} - b(P-P)\right) \Rightarrow Q = \frac{s}{n} \quad (3)$$

- will now find an expression for the price

$$Q = \frac{s}{n} - sbP + sb\bar{P}$$

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$$P = \left(\frac{s}{n} + sb\bar{P} - Q\right)\frac{1}{sb}$$

$$P = \frac{1}{nb} + \bar{P} - \frac{Q}{sb} \qquad (4)$$

Know that each firm will be profit-maximizing, setting MR = MC. Will first find MR.

MR can be found by first finding R.
$R = P \cdot Q$.
Multiply Q into equation (4) gives

$$R = \frac{Q}{nb} + \bar{P}Q - \frac{Q^2}{sb} \qquad (5)$$

will now derivate it to get MR

$$MR = \frac{1}{nb} + Q\bar{P} - \frac{2Q}{sb}$$

$$MR = \underbrace{\frac{1}{nb} + Q\bar{P} - \frac{Q}{sb}}_{P} - \frac{Q}{sb}$$

$$MR = P - \frac{Q}{sb} \qquad (6)$$

Will now find the fuction to MC. Use equation (2) and derivate it with respect to Q gives

$$MC = c \qquad (7)$$

setting (6) and (7) equal to each other gives

$$P - \frac{Q}{sb} = c \quad \Rightarrow \quad P = c + \frac{Q}{sb}$$

know from equation (3) that Q can be expressed with s and n.

That gives us $P = c + \frac{1}{nb}$ (8)

This will be the ~~cost~~ price function in the market.

will now find the relationship between average cost and number of firms.

To find average cost we divide equation (2) by number of goods

$$AC = \frac{F}{Q} + c$$

Inserting equation (3) for Q gives

$$AC = \frac{F \cdot n}{s} + c \quad (9).$$

will now use equation (8) and (9) to show equilibrium price in market.

To get a feeling on how the graph will look, we'll start by deriving the functions

$$AC = \frac{F \cdot n}{s} + c \qquad (9)$$

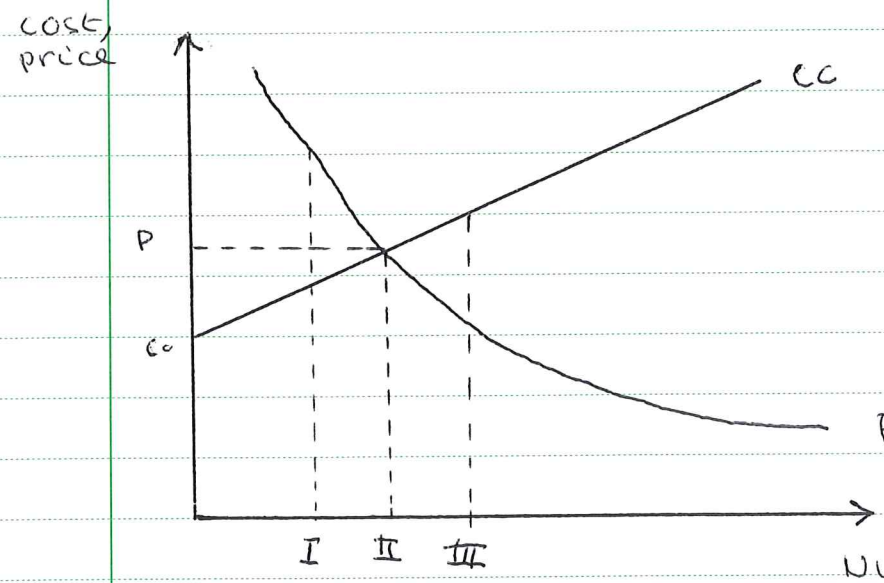
$$\frac{dAC}{dn} = \frac{F}{s} > 0 \Rightarrow \text{upward sloping}$$

$$\frac{d^2AC}{dn^2} = 0 \Rightarrow \text{linear}$$

$$p = c + \frac{1}{nb} \qquad (8)$$

$$\frac{dp}{dn} = -\frac{1}{n^2 b} < 0 \Rightarrow \text{downward sloping}$$

$$\frac{d^2p}{dn^2} = \frac{2}{n^3 b} \Rightarrow \text{Not linear. concave.}$$



This graph shows that the average cost, CC curve, will increase with more firms entering the market. Intuition behind this is the set amount of good demanded. More firms means less quantity each firm

to divide the fixed cost on. The graph also shows that the price function will decrease with more firms. This is due to competition, which will force market equilibrium price down.

The graph is ~~divided~~ showing three different cases for the industry in the short-term.

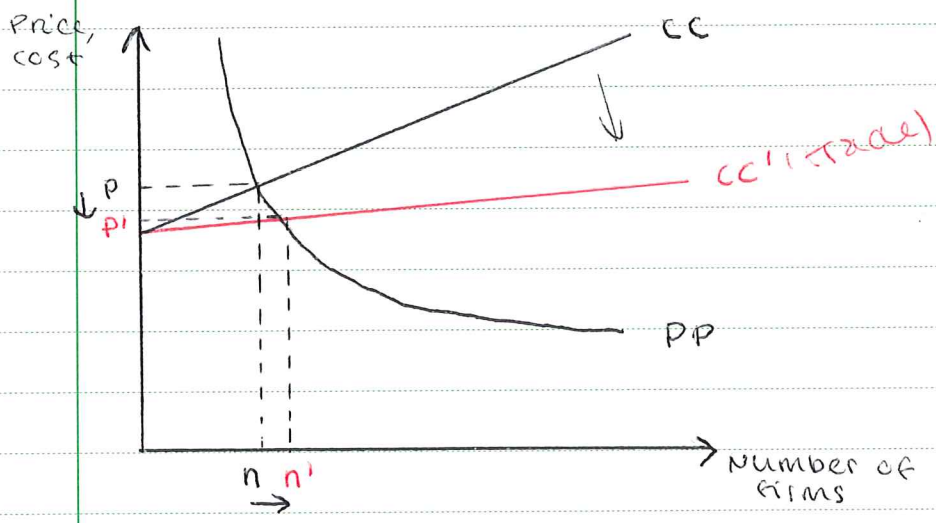
I. P > AC. This will create profit, and more firms will enter the industry.

II P = AC. only normal profit. Firms won't exit or enter the industry. Equilibrium.

III P < AC. This will create a loss for each individual firm, and firms will start to exit the industry.

In long-run it will stabilize around II. will now look at the economy when opening up for trade. Opening up for trade means increasing the market size, S. From the equations used to form the graph on the previous page, we can see that only equation (9) is dependent on S. Assuming that n is constant when first opening up for trade. With only S increased, AC

will now become less steep, but still start at the same point on the cost-axis, c. This is shown in graph below.



This graph shows us that when opening for trade, price function remains the same. The average cost will become less steep and intersect with the price function at a lower point. As discussed in (I), firms will experience P > AC, and more firms will enter. The new equilibrium shows that more firms will stay in the industry, and that the price will be lower with trade.

Effect of this can be summarized to PRODUCERS:

- lower AC due to bigger market
- Higher AC due to more firms.

More discussion around producers will come when discussing winners and losers.

CONSUMERS:

- lower price
- More firms → more variety in products

It is clear from the graph that the consumers of the goods produced in the industry will be better off due to lower price and more variety of products to choose between. This decrease in price is normal when viewing economies of scale. (From the models showing trade from comparative advantage the price converges to a price between the cheapest and the most expensive, here both countries can produce to a lower price than initially)

LOCATION:

It is hard to tell where the production will happen when two countries opens up for intra-industry trade (same, but differentiated product traded). However, one firm will be better off producing it only one place and export the good to consumer in both countries. This is to explicit the effect of economies of scale. within each country / economy the number of firms goes up, but if the firms of both countries were summed together before trade we can now see that the total number of firms have gone down.

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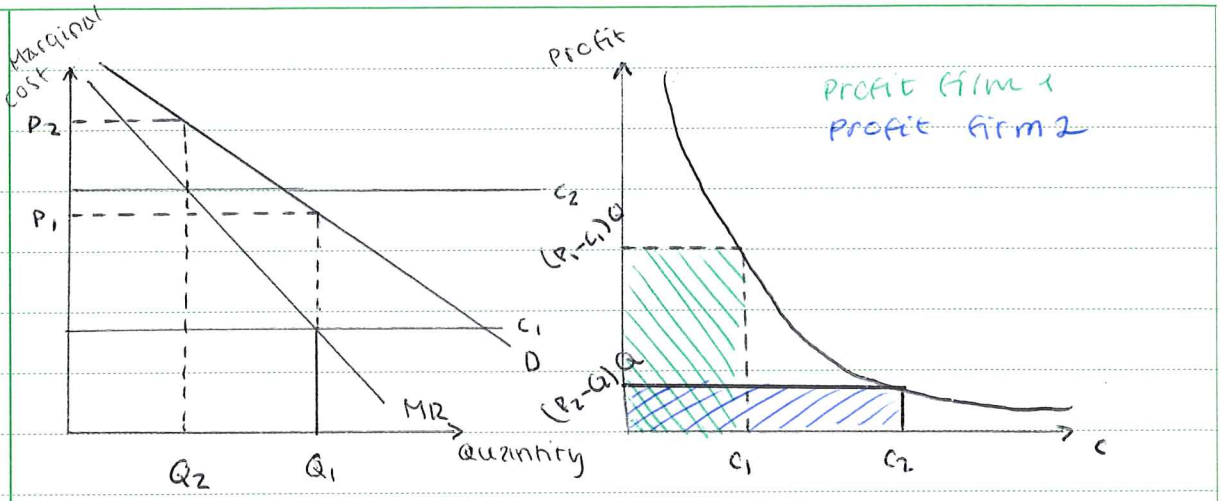
WINNERS AND LOSERS

Knowing that the total amount of firms have gone down, some must have losed when opening up for trade. Now we must remember that internal economies of scale take each individual firms size and productivity into account, and not necessarily the whole industry. That means that bigger and better-performing firms tends to survive and grow bigger with intra-industry trade while less productive firms tends to be out-competed. This means that the industry will now get rid of the least productive firms and become better-performing as a whole.

When making the assumptions for monopolistic competition it was assumed that the firms had the same marginal cost and same demand even though this is not true when the products are heterogenous, or differentiated. Lets compare two firms with different marginal cost in a monopoly framework, where they are price setters. For simplicity, the demand curve remains the same.



Firm 1 will have a lower marginal cost than firm 2, hence intersect the MR-curve at a lower point. Since it behaves monopolistic it can charge a price at P_1 since the demand "allows" the firm to do so. It will charge a price P_1, and produce at Q_1 (this is due to MR=MC to optimize production). This is at a lower price and higher quantity than firm 2 will do. Even though firm 2 charge a higher price it can be seen from the profit graph that firm 1 will have a higher profit due to its low marginal cost. This strengthen the theory that huge firms/ productive firms with low cost will come out better when exposed to economies of scale. If a firm will win, lose or even exit the industry after trade can be viewed graphically. When the industry experience lower prices and more variety of products, each firms demand will decline.

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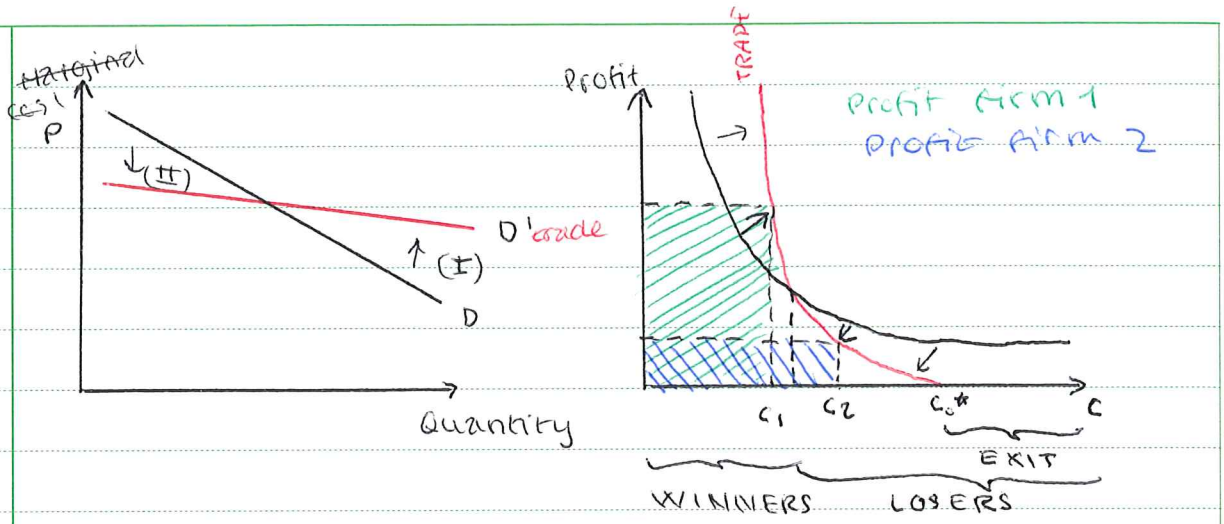

It can be seen from the graph to the left that when opening up for trade will create a less steep demand curve. This will affect each firms profit for how much they can charge each good. It can be seen that firms that initially would have been able to charge a low price (firm 1) will now be able to charge a bit more, marked as (I) in the graph. Firm 2 that initially charged a high price will now be able to charge less, marked as (II). This will again affect their profit, shown in graph to the right. Firms on the same side as firm 1 on the demand curve will now experience more profit, and comes out as winners. Firms on the same side as firm 2 will decrease their profit and come out as losers. Those who initially had a cost at c_0^* or higher will exit the market since they no longer can earn anything.

One of the assumptions for monopolistic competition was that there are no transportation cost with trade. This is not true in the real world, and one additional cost should be considered when expanding or starting to export. This additional cost can be put on the cost function. If considering firm 1 & 2 again, such additional cost might cause the cost to rise above the revenue. If this happens for instance to firm 2 it can be shown that they are only able to produce with profit inside one country, without being able to export. This again adds to the asumption that more productive firms has an advantage. They are also more likely to "survive" when opening for trade.

SUMMARY

- consumers are better off. Increased welfare with lowered prices and better consumption possibilities when expanding the product variety

- Producers migh become better or worse off. It depends on the mobility to those who lose from trade if they in total will be better off or not. If they fusion with other firms or are bought by bigger firms they will most likely in long-run be better as a whole.

in general, when opening up for trade it becomes easier to exploit the effect of economies of scale. This will increase the countries welfare.

Studies shows that in general it is better to trade, and compensate those who lose rather than being an autarky.