Lecture 1

3/28/2016

The lower the quantity, the higher the price!

We can split the demand curve into high willingness to pay people and low willingness to pay people.

Important:

85% and above = A

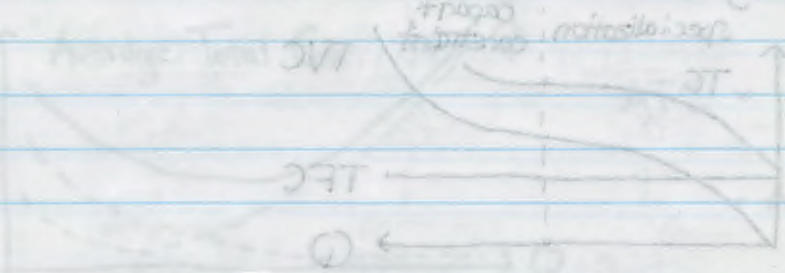
80% - 85% = A-

80% - = half a letter per 5% from this point forwards.

1 extra point = 4 points in final.

For some products, there is differentiation (things that have perceived or physical differences).

These such products are in need of differentiation.



3/30/2016 Lecture 2

Production Cost Structure:

1. Factors of production
2. Different types of costs
3. Short/Long run and & scale
4. Profit Maximization

Factors of Production

Raw Materials ....? Machinery? Investors? Money?

I. Labor
II. Land
III. Capital
IV. Risk (arguably the most important one)

Costs

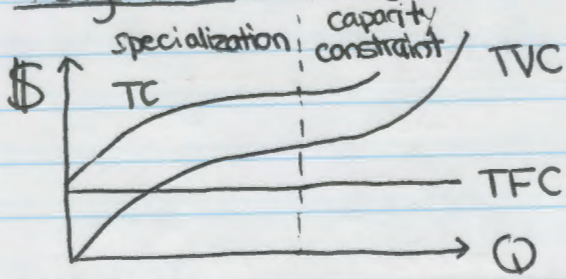
- Sunk - costs that cannot be recovered after they have been spent
- Opportunity - cost that is incurred by doing something instead of something else.
- Fixed - costs that do not depend on the level of production
- Variable - costs that change relative to the level of production

Q denotes quantity

Scale

Short Term - Time interval during which some, but not all costs are fixed.

Long Terms - All costs are variable eventually.



TFC - Total Fixed Cost
TVC - Total Variable Cost
TC = Total Cost

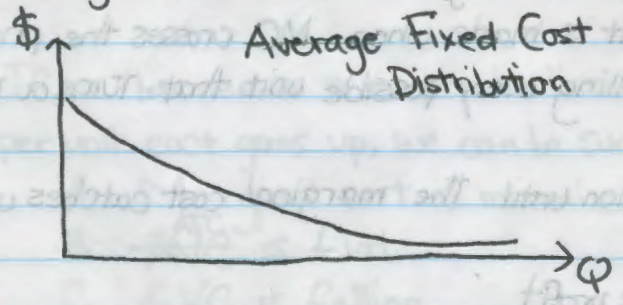
For variable cost, note that because of specialization, each additional unit of quantity will add slightly less to the TVC.

Unfortunately, as we go on- we will hit capacity constraints and variable cost will skyrocket. This is shown by the inflection points on the curve. $\frac{\partial Q^2}{\partial^2 \$}$.

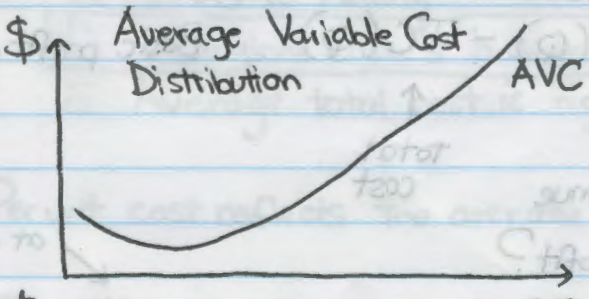
So what does total cost look like? Just shift TVC up by the TFC to get the answer.

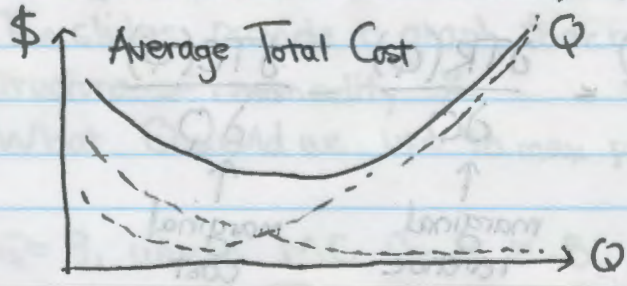
$TC = TFC + TVC$

Average Fixed Cost (AFC) = per-unit fixed cost



$AFC = \frac{TFC}{Q}$





$ATC = \frac{TFC + TVC}{Q}$

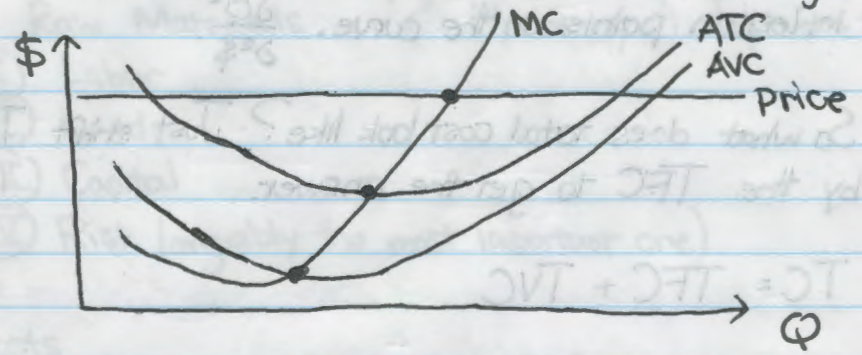
$= AFC + AVC$

Let's assume that we sell our product at a fixed price regardless of the amount that we actually produce. (Visualize a horizontal line on the graphs on the previous page).

Marginal cost $\frac{\Delta TC}{\Delta Q} \rightarrow \frac{\partial TC}{\partial Q}$

discrete continuous

The increase in total cost brought up by change in quantity



MC will pass through the minimums on the AVC and ATC curves
Maximum profit is made when MC crosses the price line, because it represents selling every possible unit that turns a profit.

Increase production until the marginal cost catches up to the price.

Note* Π denotes profit

$\Pi(Q) = TR(Q) - TC(Q)$ Basic profit modeling

↑ total revenue ↑ total cost

How to max profit? ← at optimum, MR = MC

$\frac{\partial \Pi(Q)}{\partial Q} = \frac{\partial TR(Q)}{\partial Q} - \frac{\partial TC(Q)}{\partial Q}$

↑ marginal profit ↑ marginal revenue ↑ marginal cost

Discussion 1 4/1/2016

TA email: aysanrangchian@ucla.edu - 2 hour response time

① Opportunity cost needs to be included in calculating costs. Which of the following should NOT be included?

A. VC - Variable Cost
B. Unskilled labor cost
C. Skilled labor cost
D. Patent Cost
E. Sunk Cost

② As the production level increases, AVC and ATC levels get closer and closer. Why? When does AVC and ATC cross?

ATC = AVC + AFC and AFC approaches 0. They will not intersect because AFC never crosses 0.

③ If we increase the production by more units and the per unit cost goes up, we can be sure that:

A. Marginal cost is minimized
B. ~~AVC~~ ATC is flat.
C. AVC is falling
D. Marginal cost is higher than average total cost
E. Average total cost is higher than marginal cost.

Per unit cost reflects the average total cost

④ The slides provide a graph that represents the cost structure of commodity X.
What Q would we use to max profit if the price is 8?

Q = 9, where M.C for 9 = 8.

Note that if price is 5 it is better to produce 7 instead of 1, because we only lose $1 instead of $10.

(5) See the exercise in the slide. There is another graph.

(6) You rented a space and equipment for $1000 for one month to produce commodity X. Before going ahead with the production you made the following forecasts: if you produce Q units, your total cost is $\frac{Q^3}{6} + 1000$. If you charge $50 per unit, would you produce? If so, how many?

$$\text{profit} = \underbrace{50 \times Q}_{\text{rev}} - \underbrace{\left(\frac{Q^3}{6} + 1000\right)}_{\text{cost}}$$

$$\frac{dP}{dQ} = 0 = 50 - \frac{Q^2}{2}$$

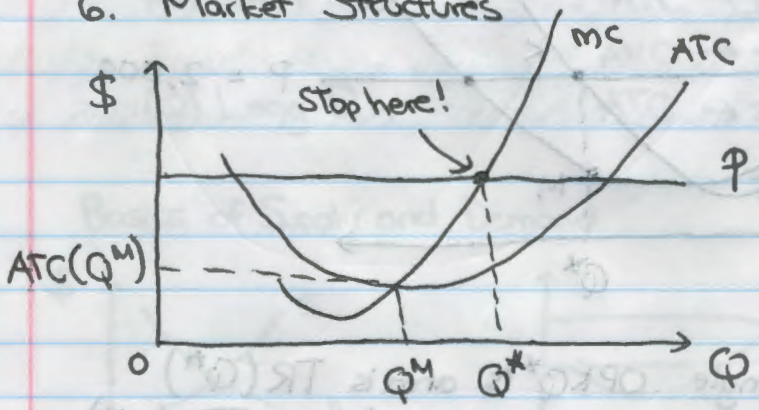
$$Q = 10$$

Lecture 3 4/6/2026

Law of Diminishing Returns - As you increase one factor of production while keeping the rest fixed, eventually the per unit output will go down.

Topics

1. Profit Maximization
2. Example
3. Short term & long term shut down rules
4. Supply Derivation
5. Long Run Average Total Cost → Economies of Scale
6. Market Structures



$\pi(Q) = TR(Q) - TC(Q)$

Q^* = optimum production level

$\pi(Q^M) = [P - ATC(Q^M)] \cdot Q^M$

$\frac{d\pi(Q)}{dQ} = \frac{dTR(Q)}{dQ} - \frac{dTC(Q)}{dQ} = 0 = MR(Q^*) - MC(Q^*)$

$P = MC(Q^*)$

$\frac{d^2\pi(Q)}{dQ^2} < 0$

Ex: $TC(Q) = \frac{125}{3}Q^3 + 1000 \qquad Q \geq 0.$

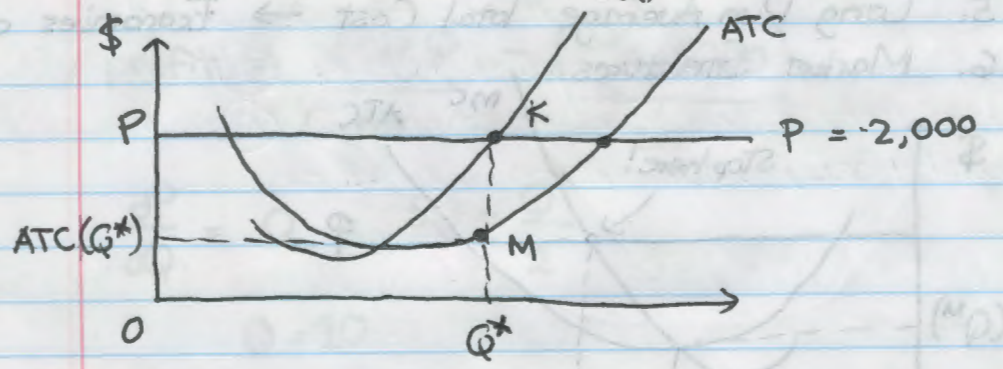
$\frac{\partial TC(Q)}{\partial Q} = 125Q^2$

Case 1: $P = 2{,}000$ $\qquad MC = P$

$125Q^2 = 2000$

$Q = 4$

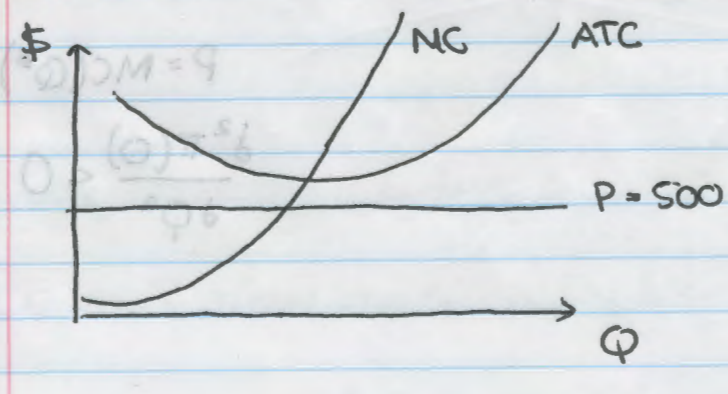
$\Pi(4) = \underbrace{2000 \times 4}_{\text{total revenue}} - \underbrace{\frac{125}{3}4^3 - 1000}_{\text{total cost}}$

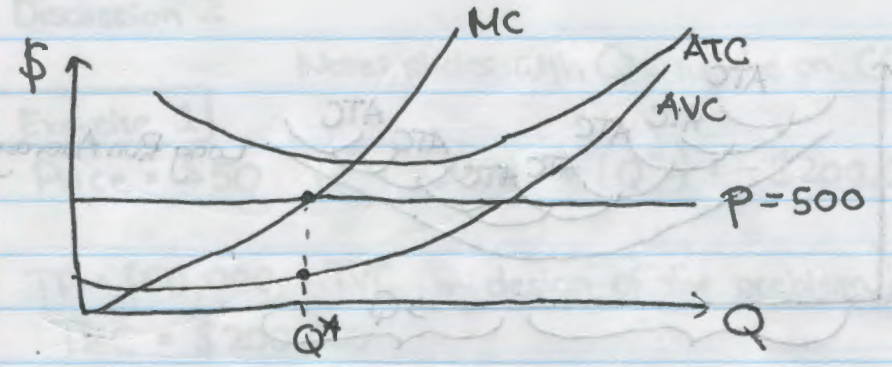


The rectangle $OPKQ^*$ is area is $TR(Q^*)$

The rectangle $ATC(Q^*)MQ^*O$ is $TC(Q^*)$

Note if $P = 500$ we have a negative Π! What is happening? This is the minimal loss point. Essentially, no matter what you do you lose money, but this point represents the Q that results in the least money lost.





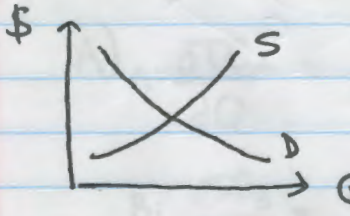
Note that since we suffer some sunk costs, we are in the red. However, all of us can recuperate a little bit if we sell anyway!

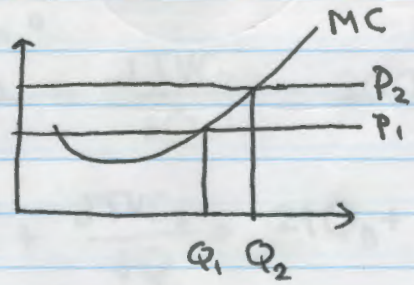
Shut Down Rule:

(1) Short Run → P > AVC → produce!
P < AVC → shut down

(2) Long Run → P < ATC → shut down

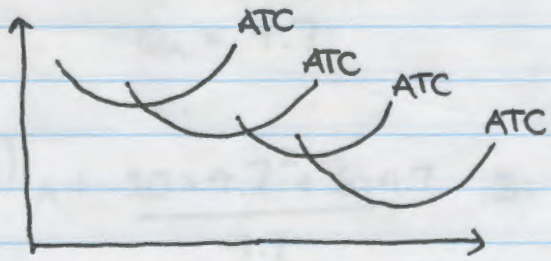
Basics of Supply and Demand





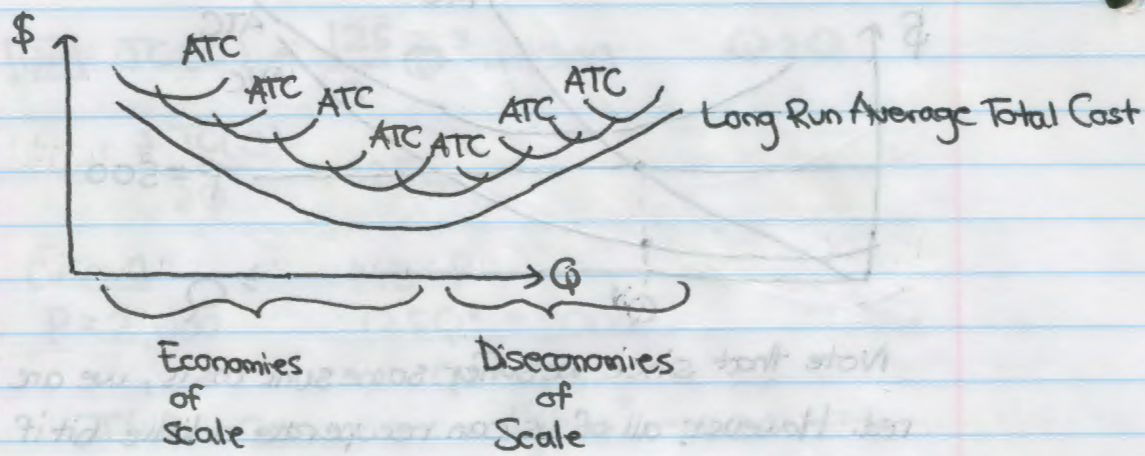
As price goes up, more companies produce and increase supply, fewer people by so decreased demands.

If you scale up your average total costs will decrease!



These are known as economies of scale.

If a firm is moving from one scale to the next without a 1:1 cost increase, a ratio of cost↑ : scale↑ that is <0 is called an <u>economy of scale</u>. ☺



This whole time we have assumed that price is fixed? When is this actually the case?

1. Product is homogeneous
2. Companies are small enough that it doesn't get a say in the price determination. (Size relative to industry).

Discussion 2

Note: slides with Q's will be on CCLE. I will upload them later.

Exercise 1

Price = \$50 $Q^* = 1{,}000$ $\pi(Q^*) = -\$200{,}000$

TR = \$50,000 = TVC (by design of the problem), so
TFC = \$200,000

So in the scenario where P = \$100, $Q^* = 3{,}000$, and $\pi(Q^*) = 0$,

$0 = \$300{,}000 - \$200{,}000 - TVC$
$TVC = \$100{,}000$

Exercise 2

$TFC = 400$ (A, B)
$TVC_A = 10Q_A^2 + 6Q_A$
$TVC_B = 12Q_B^2 + 4Q_B$

A) $A: \frac{\partial TC_A}{\partial Q} = \frac{\partial TFC_A}{\partial Q}^{0} + \frac{\partial TVC_A}{\partial Q} = 20Q_A + 6$

$B: \frac{\partial TC_B}{\partial Q} = \frac{\partial TFC_B}{\partial Q}^{0} + \frac{\partial TVC_B}{\partial Q} = 24Q_B + 4$

$20Q_A + 6 = 100$ $\quad$ $24Q_B + 4 = 100$
$Q_A = 4.7$ $\quad$ $Q_B = 4$

B) $A: \frac{10 \times 4.7^2 + 6 \times 4.7}{4.7}$ $\quad$ $B: \frac{12 \times 4^2 + 4 \times 4}{4}$

$= 53$ $\quad$ $= 52$

No! These guys are at their optimal value and still turning a profit!! If we shut A down we would have to compensate in B.

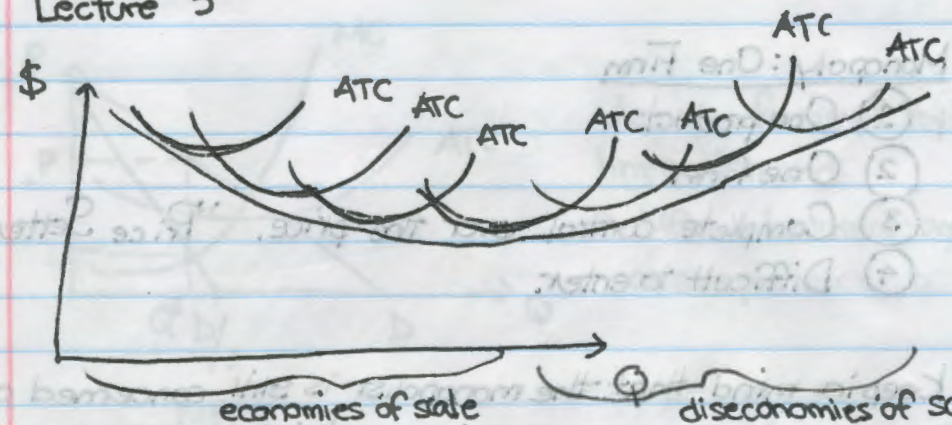
Which would change the cost!!!

Exercise 3

$$\text{Benefit} = \frac{12{,}240}{2^{Q-1}} = 10 \quad \text{we get} \quad Q = 11.26$$

Think in terms of marginal cost!!

Lecture 5 4/11/16



Note that there are points where it doesn't make sense to increase scale because it actually worsens ATC if done so for that particular company.

A continuous scaling allows us to get the long run average total costs

Fixed Price (Perfect Competition)

1. Homogenous Product
2. Businesses are too small relative to industry to affect price
3. No control over the price → "price taker"
4. Entry is easy.

In the long run, positive profit invites new entry, so the industry supply will go up. The price will decrease and eventually eliminate positive profit. With perfect competition, in the long run there is zero economic profit.

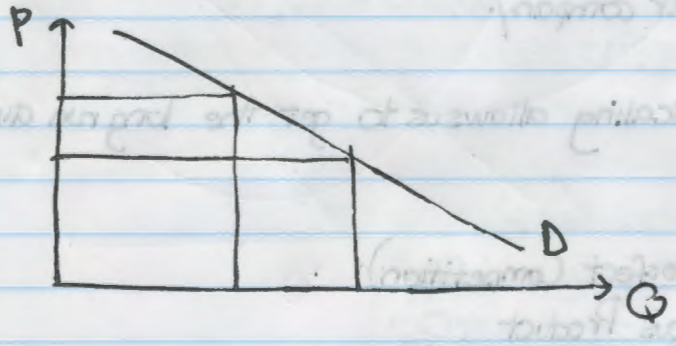
Market Structures

Perfect Competition ——— Monopoly

Monopoly: One Firm

1. One product
2. One firm
3. Complete control over the price. "Price Setter"
4. Difficult to enter.

Keep in mind that the monopolist is still concerned about the optimal price to max profit. This is still determined by the consumer.



Marginal Revenue ≠ Price (If you want to sell another item, you can't sell it at the same price).

$$TR(Q) = P(Q) \times Q$$

$$\frac{\partial TR(Q)}{\partial Q} = \frac{\partial P(Q)}{\partial Q} + P(Q)$$

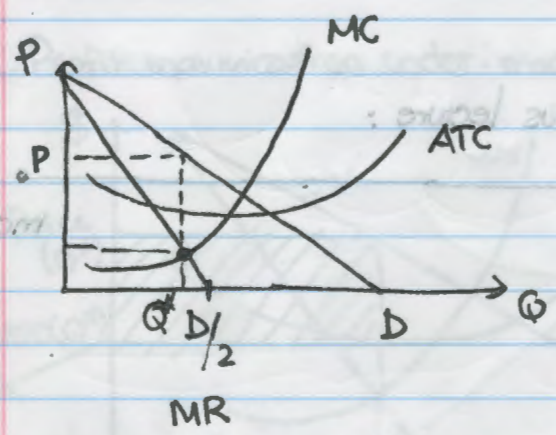
$$\pi(Q) = TR(Q) - TC(Q)$$

$$\text{FOC}: \frac{\partial \pi(Q)}{\partial Q} = \underbrace{\frac{\partial TR(Q)}{\partial Q}}_{MR(Q)} - \underbrace{\frac{\partial TC(Q)}{\partial Q}}_{MC(Q)} = 0$$

$$MR(Q) - MC(Q) = 0$$

MR(Q): Marginal revenue

MC(Q): Marginal cost



Assume for simplicity linear demand
→ MR will be linear and twice as steep.

Ex: Demand modeled as $P = 500 - 3Q$

$TR = (500 - 3Q)Q$

$TR = 500Q - 3Q^2$

$\frac{dTR}{dQ} = 500 - 6Q$

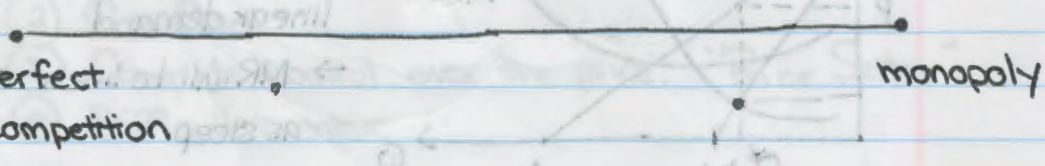
Demand has -3 slope
TR has -6 slope

How to become and stay as a monopolist?

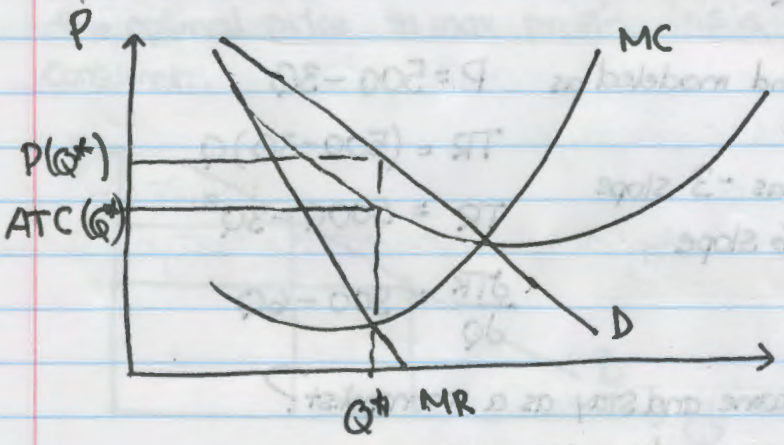
1. Buy up a key resource.
2. Acquire competitors
3. Undercut Prices
4. Patents
5. Natural Monopoly → Fixed-costs prevent establishment of more than 1 company.

4/13/2016 Lecture 5

Recall from the previous lecture:

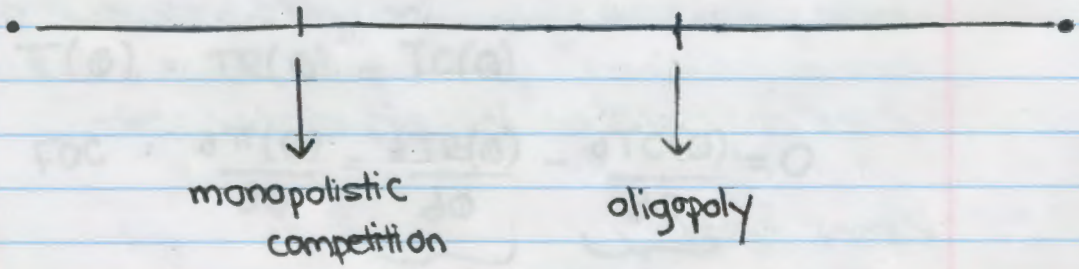


Natural Monopoly



The key here is to realize how close ATC and P are, at the ideal of production (Q^*)

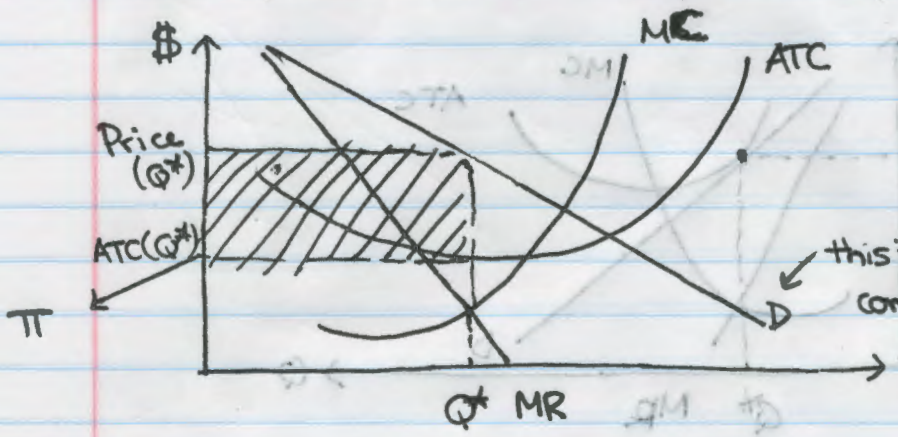
Between perfect competition and a monopoly we have



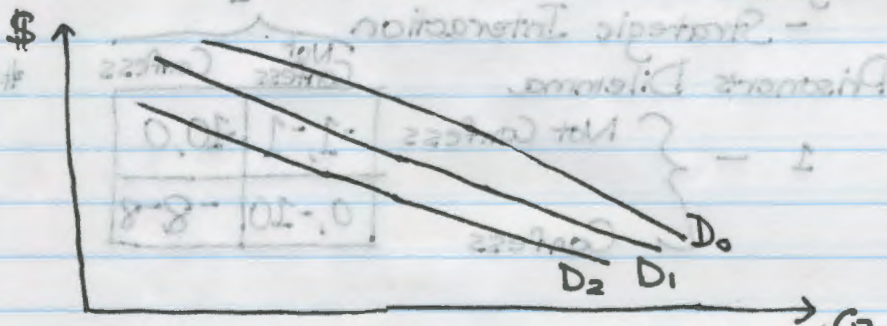
<u>monopolistic competition</u>

- product differentiation
- entry is easy
- close substitutes

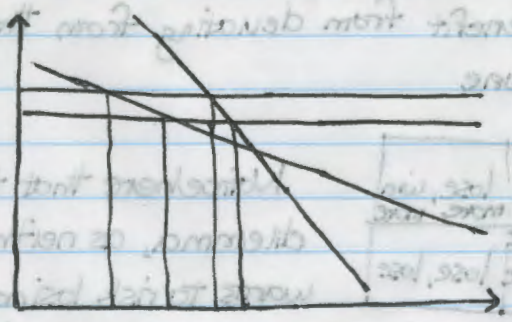
Profit maximization under monopolistic competition



Demand as entry occurs in monopolistic competition

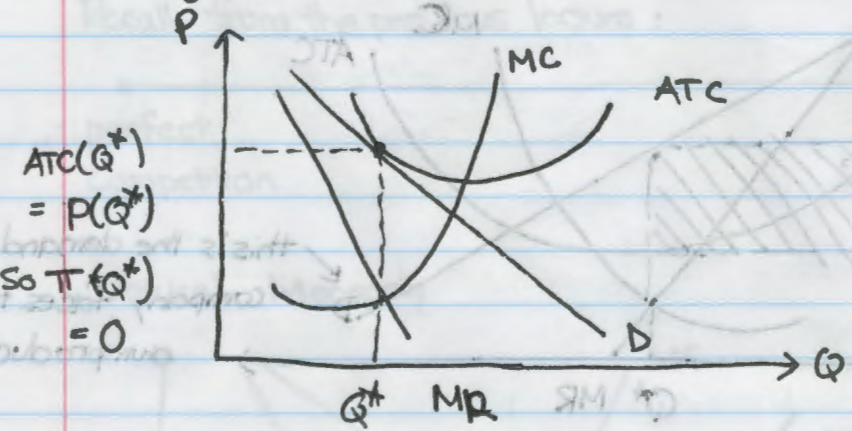


As competitors enter, the demand for each firm shifts left and becomes flatter.



How can we reverse this process of approaching 0 profit as more companies enter? Advertisement.

Long-term monopolistic competition profit = 0



Oligopoly:

- Strategic Interaction

Prisoner's Dilemma

1 — { Not Confess / Confess

2: Not Confess	2: Confess
-1, -1	-10, 0
0, -10	-8, -8

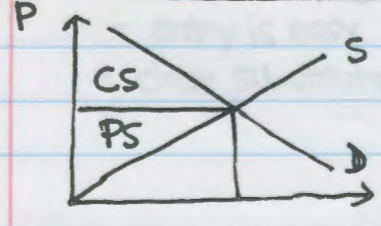
yrs prison 1, # yrs prison 2

The important thing to realize that there will always be a deviation except for the (-8, -8) cell. That is, for every cell, given that one person performs an action there will always be a person that will benefit from deviating from the cell and picking some other one

	invest small	invest big
invest small	win, win	lose, win more
invest big	win more, lose more	lose, lose

Notice here that there is a dilemma, as neither business wants to risk losing out both will opt to invest big

Price Discrimination



CS = Consumer Surplus
PS = Producer Surplus