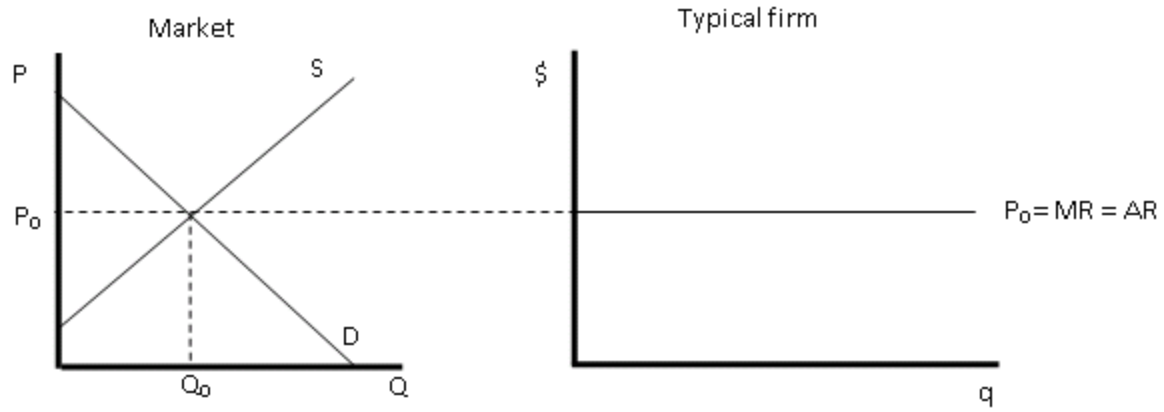
Lecture # 14 – Profit Maximization

I. Profit Maximization: A General Rule

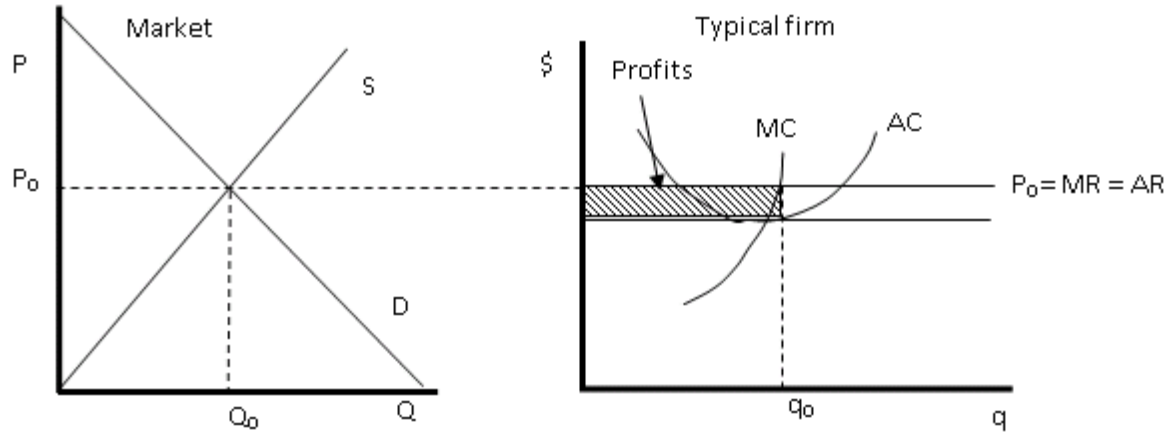
- Having defined production and found the cheapest way to produce a given level of output, the last step in the firm's problem is to decide how much output to produce. This is profit maximization.
- Profit = total revenue - total cost.
  - Total revenue -- the amount of money the firm gets from the sale of output.
  - Average revenue -- revenue per unit sold.
  - Marginal revenue -- revenue gained by selling one additional unit.
- Profits are maximized when *marginal revenue* = *marginal cost*.

II. Profit Maximization in Perfect Competition

- MC = MR maximizes profits for any market structure. What differs across market structures is marginal revenue. We begin by looking at perfect competition.
- Recall the features of perfect competition:
  1. Many buyers and sellers, so that price is taken as given
     - No one firm can influence price.
  2. Firms sell identical products
     - It doesn't matter who you buy from.
  3. Perfect information
     - Everyone knows their options.
  4. No barriers to entry or exit
     - Anyone who wants to enter the market (or leave the market if they are losing money) can.
- In perfect competition, firms are *price takers*.
  1. MR = P = AR in perfect competition.
     - Thus, an individual firm's demand curve is a straight line -- it is perfectly elastic.



- We can use P = MR = AR to show profits on a diagram that includes AC, MC, MR, and AR.
  - The vertical distance between average revenue (or price) and average cost is the average profit, or profit per unit.
  - Multiplied by the quantity sold, this becomes total profit.
  - Graphically, this is the shaded rectangle below.



- The shut down point
  - Recall that fixed costs are sunk in the short run. They must be paid whether or not the firm operates.
  - Thus, if the firm can cover its variable costs, it should operate in the short run, even if it is losing money.
  - The firm should operate as long as P >= AVC.
    - If P > AVC, the firm is making enough money to cover the variable costs of production, and also some money that it can apply towards its fixed costs.
    - It may lose money, but it would lose more if it shut down.
  - If P < AVC, the firm shuts down.
    - If the firm operated, it would not even make enough money to cover its variable costs.
  - The next page shows the numbers we will use in class.

Example of Profit Maximization

Example 1: Positive profits

Q	MR (=P)	TR	TFC	TVC	TC	AC	AVC	MC	Profit
6	25	150	25	103	128	21.33	17.17		22
7	25	175	25	119	144	20.57	17.00	16	31
8	25	200	25	138	163	20.38	17.25	19	37
9	**25**	**225**	**25**	**160**	**185**	**20.56**	**17.78**	**22**	**40**
10	25	250	25	187	212	21.20	18.70	27	38
11	25	275	25	221	246	22.36	20.09	34	29

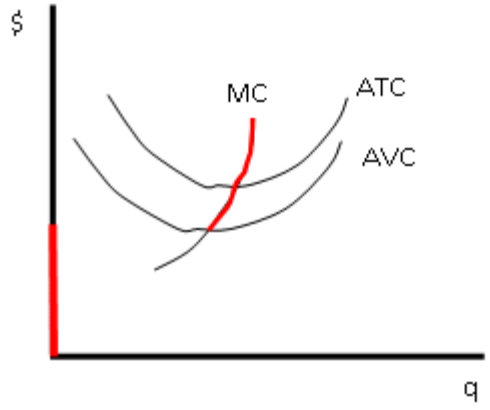
Example 2: Produce at loss because P>AVC

Q	MR (=P)	TR	TFC	TVC	TC	AC	AVC	MC	Profit
6	18	108	25	103	128	21.33	17.17		-20
7	**18**	**126**	**25**	**119**	**144**	**20.57**	**17.00**	**16**	**-18**
8	18	144	25	138	163	20.38	17.25	19	-19
9	18	162	25	160	185	20.56	17.78	22	-23
10	18	180	25	187	212	21.20	18.70	27	-32
11	18	198	25	221	246	22.36	20.09	34	-48

Example 3: Shut down because P<AVC

Q	MR (=P)	TR	TFC	TVC	TC	AC	AVC	MC	Profit
6	16	96	25	103	128	21.33	17.17		-32
7	16	112	25	119	144	20.57	17.00	16	-32
8	16	128	25	138	163	20.38	17.25	19	-35
9	16	144	25	160	185	20.56	17.78	22	-41
10	16	160	25	187	212	21.20	18.70	27	-52
11	16	176	25	221	246	22.36	20.09	34	-70

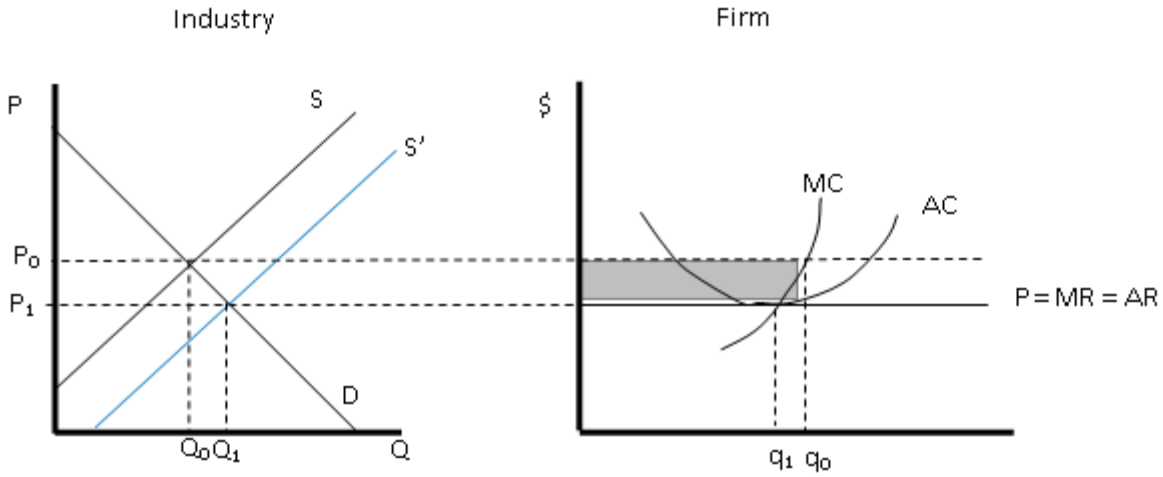
- We can use two lessons from profit maximization to derive the short-run supply curve for a perfectly competitive firm.
    - If P >= AVC, the firm produces where P = MC (because P = MR for a perfectly competitive firm).
    - If P < AVC, the firm shuts down.
    - Therefore, the supply curve is the MC curve above the AVC.



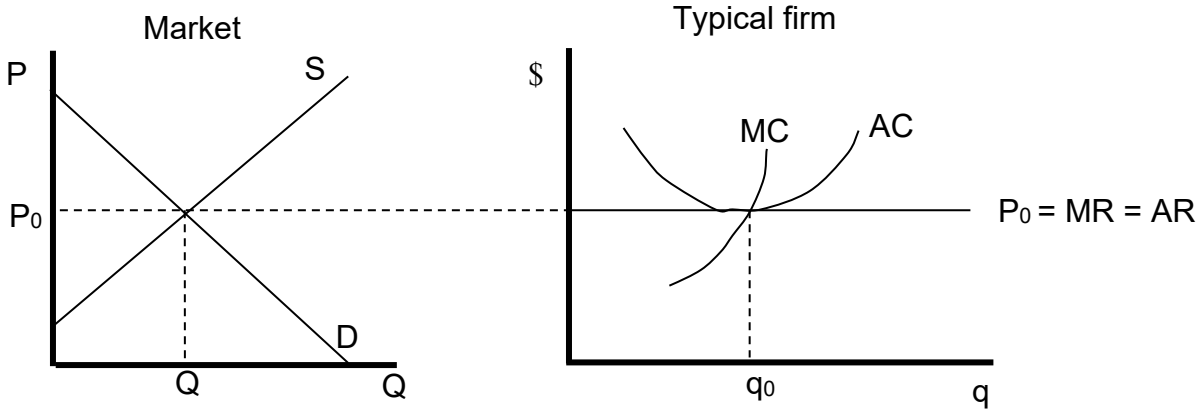
III. Profit Maximization in the Long Run

- In the short-run, firms are constrained by their fixed costs (such as the capacity of their factory). In the long-run, they can change all variables, so larger profits are possible.
- However, larger profits are *not* an equilibrium!!!
- If profits are being made, firms will enter the market.
    - This shifts the supply curve out, lowering the market price.
    - This occurs until there are no longer any economic profits.
- Similarly, if firms are losing money, firms leave the market.
    - This shifts the supply curve in, raising the market price.
    - This occurs until we reach zero economic profits.
- *Lesson*: in long-run equilibrium, there are zero economic profits.
- Definition of long-run equilibrium:
    - All firms are maximizing profits.
    - No firm has incentive to enter or exit, because all firms are earning zero economic profit.
        - Note that economic profits include opportunity costs
        - Thus, zero economic profit includes the value of your next best option -- what would you be earning if you weren't in your current business?
    - Price is such that $Q_S = Q_D$.

- Note that, to do the analysis, we typically use two graphs: an industry supply and demand diagram and the cost curves for a typical firm.
    - The intersection of supply and demand determines the market price.
    - The firm takes this as given and determines its quantity by comparing price to MC.
    - If firms are making positive profits (starting at P_0 and Q_0 below), other firms will enter the market.
        - This shifts out the supply curve (the blue supply curve), lowering the price and reducing profits for each firm.
        - The process continues until there are zero economic profits.
            - The price is at the bottom of the average cost curve.



- Example: decreased demand
  - In our next example, we see what happens in a market when demand decreases
    - Demand for travel after the pandemic is an example.
  - We start by illustrating a market in long-run equilibrium.
    - Thus, the AC curve for a firm rests on the price that is determined by the market, so that there are zero economic profits.



  - The red demand curve represented the new demand. Lower demand leads to lower prices. Individual firms lose money.
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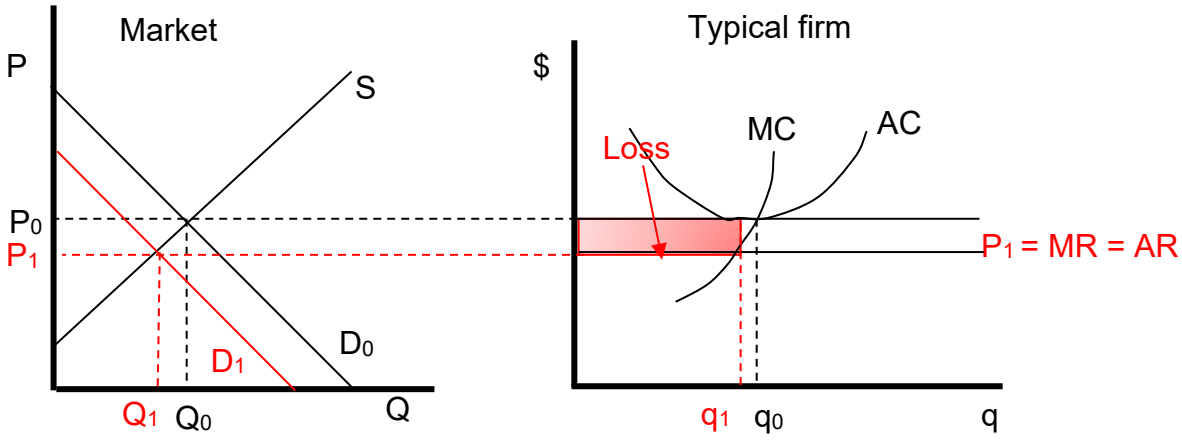
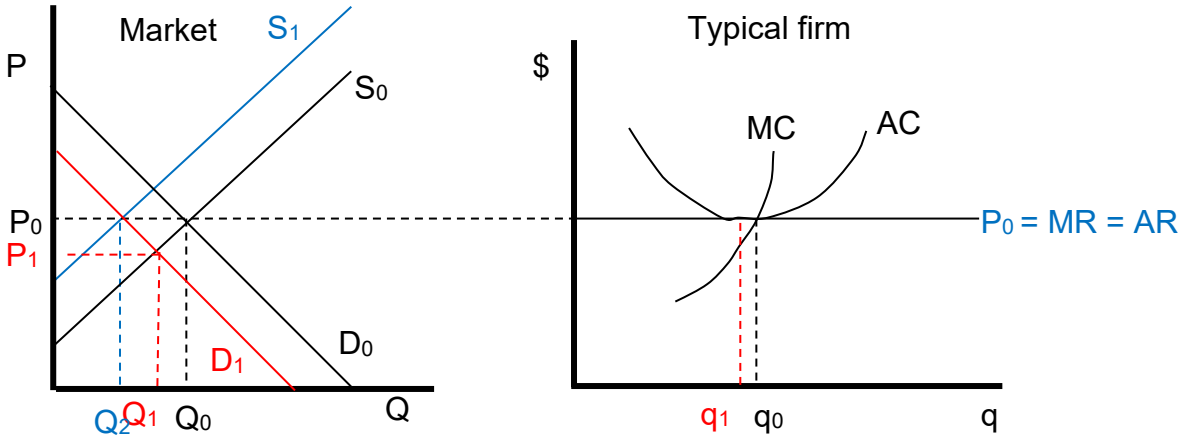


- Because firms are losing money, some firms exit the market.
  - This shifts the in curve in, raising prices.
  - Supply shifts out until firms once again earn zero economic profits. This is the blue line below. Note that prices return to their original level in this example.
  - Total quantity produced in the market falls even further, to Q_2.
  - However, the firms that remain in the market return to producing q_0. Total quantity falls simply because there are fewer firms.



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