Chapter 5: Perfect Competition

Instructions: These are the notes for Chapter 5. Make sure you review the material presented here and read the corresponding chapters on the textbook: **Chapter 13 on Mankiw.**

Characteristics

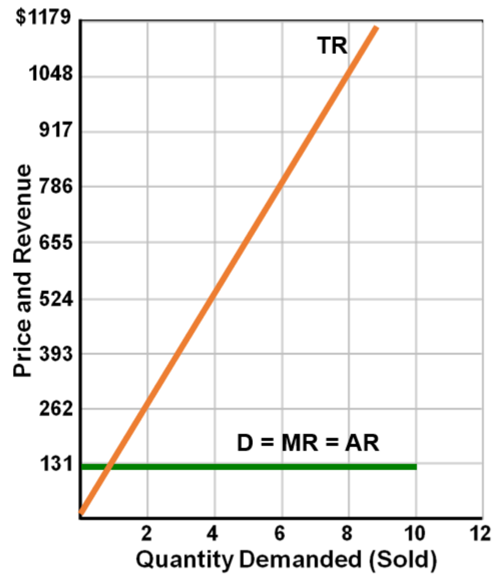
- Very large numbers of buyers and sellers.
- Each act alone hence cannot "collude" and influence the market price.
- Standardized product
  - Products are identical and buyers are indifferent.
  - Perfect substitution.
- "Price takers"
  - Buyers and sellers take market price as given.
  - Meaning they take what is given by the market equilibrium.
- No barriers in entry and exit.
- Perfectly elastic demand.
  - Hence the demand curve is a horizontal line!

Total, Average, and Marginal Revenue

- **Total revenue.** $\text{TR} = \text{P} \times \text{Q}$
- **Average revenue.** $\text{AR} = \text{TR}/\text{Q} = \text{P}$
- **Marginal revenue.** $\text{MR} = \Delta\text{TR}/\Delta\text{Q} = \text{P}$
- $\text{MR} = \text{AR} = \text{P}$ happens because of pure competition, i.e. firms can not influence price.

Total Revenue, Average Revenue, and Marginal Revenue

Firm's Demand Schedule (Average Revenue) Q_D	P	Firm's Revenue Data TR	MR
0	$131	$0	
			$131
1	131	131	
			131
2	131	262	
			131
3	131	393	
			131
4	131	524	
			131
5	131	655	
			131
6	131	786	
			131
7	131	917	
			131
8	131	1048	
			131
9	131	1179	
			131
10	131	1310	



Profit Maximization

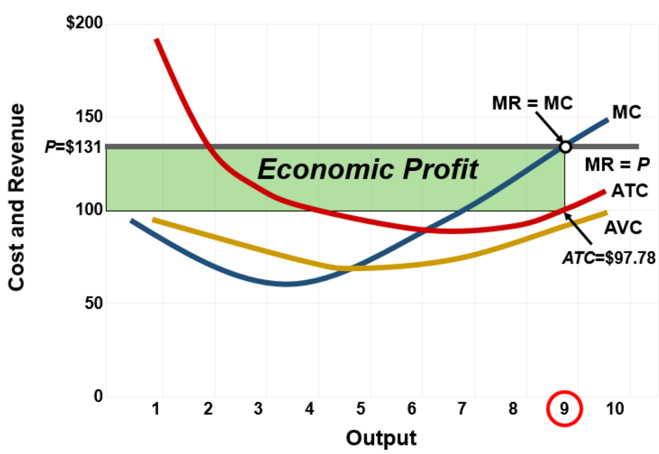
- **Firms problem.** How many goods should I produce to maximize my profit?
- The solution is to produce where MR=MC.
- To see this, consider a firm producing too little.
  - This means MR is very high and MC is very low.
  - Expanding production brings profit.
  - However, as the firm expands, MR goes down and MC goes up.
  - Therefore stop where MR=MC.
- In the Perfect Competition case, it turns out MR=P! Therefore the full condition is to produce at MR=MC=P.

Profit Maximization with P=$131

The Profit-Maximizing Output for a Purely Competitive Firm: Marginal Revenue– Marginal Cost Approach (Price = $131)

(1) Total Product (Output)	(2) Average Fixed Cost (AFC)	(3) Average Variable Cost (AVC)	(4) Average Total Cost (ATC)	(5) Marginal Cost (MC)	(6) Price = Marginal Revenue (MR)	(7) Total Economic Profit (+) or Loss (-)
0						$-100
1	$100.00	$90.00	$190	$90	$131	-59
2	50.00	85.00	135	80	131	-8
3	33.33	80.00	113.33	70	131	+53
4	25.00	75.00	100.00	60	131	+124
5	20.00	74.00	94.00	70	131	+185
6	16.67	75.00	91.67	80	131	+236
7	14.29	77.14	91.43	90	131	+277
8	12.50	81.25	93.75	110	131	+298
9	11.11	86.67	**97.78**	**130**	**131**	**+299**
10	10.00	93.00	103.00	150	131	+280

Profit Maximization (visually)



- Profit, $\pi = \text{TR} - \text{TC}$

$$\begin{aligned} &= \text{P}\times\text{Q} - \text{ATC}\times\text{Q} \\ &= (\text{P} - \text{ATC})\times\text{Q} \\ &= (131-97.78)\times 9 \\ &\approx 299. \end{aligned}$$

- The market allowed producers to make a positive profit in the short-run, i.e. P was high enough due to adequate demand.

- However, in the long-run, more firms enter the market until each firm gets zero economic profit.

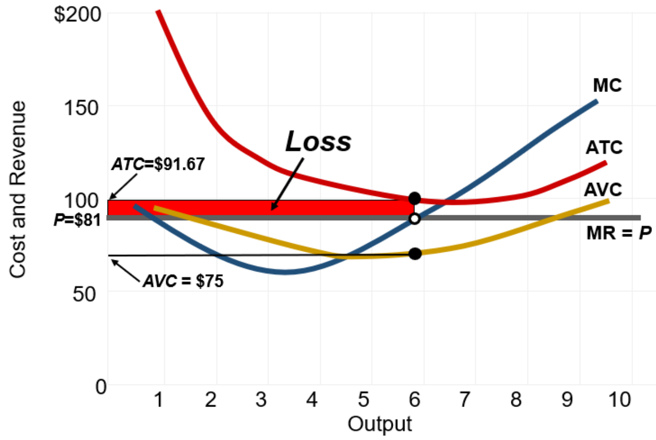
- What if the P was not high enough?
- In the short run the firm has two choices: produce or shut down
  - **Shut down**. Temporarily not to produce, but not get out of the business completely. This refers to a short-run decision while exiting the market would be the long-run decision to leave the market.
- Firm definitely loses money when market price is low. However, the loss from producing could be smaller than the loss if the firm shuts down because of pre-paid fixed costs.
- Boils down to either shut down or keep on producing at MR=MC=P!

An example with P=$81

The Profit-Minimizing Output for a Purely Competitive Firm: Marginal Revenue– Marginal Cost Approach (Price = $81)

(1) Total Product (Output)	(2) Average Fixed Cost (AFC)	(3) Average Variable Cost (AVC)	(4) Average Total Cost (ATC)	(5) Marginal Cost (MC)	(6) Price = Marginal Revenue (MR)	(7) Total Economic Profit (+) or Loss (-)
0						$-100
1	$100.00	$90.00	$190	$90	$81	-109
2	50.00	85.00	135	80	81	-108
3	33.33	80.00	113.33	70	81	-97
4	25.00	75.00	100.00	60	81	-76
5	20.00	74.00	94.00	70	81	-65
6	**16.67**	**75.00**	**91.67**	**80**	**81**	**-64**
7	14.29	77.14	91.43	90	81	-73
8	12.50	81.25	93.75	110	81	-102
9	11.11	86.67	97.78	130	81	-151
10	10.00	93.00	103.00	150	81	-220

- If shut down, lost fixed cost is $100.
- If firm produces 6 units, loss is ≈ $64.
- Stay in business and produce!



- Profit, $\pi = \text{TR} - \text{TC}$

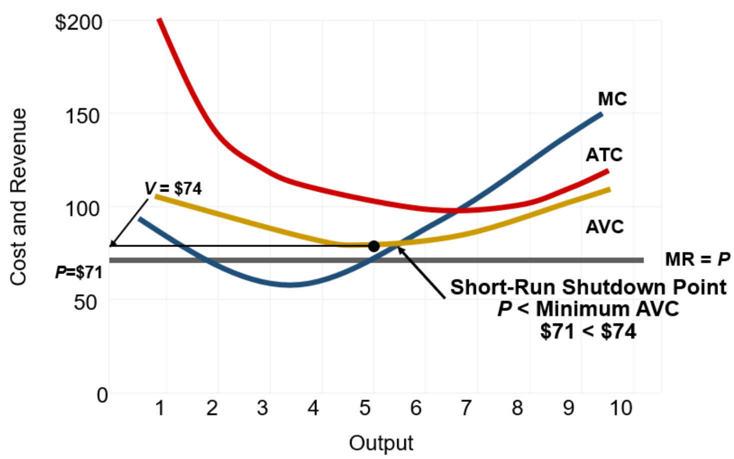
$$
\begin{aligned}
&= \text{P}\times\text{Q} - \text{ATC}\times\text{Q} \\
&= (\text{P} - \text{ATC})\times\text{Q} \\
&= (81-91.67)\times 6 \\
&\approx -64.
\end{aligned}
$$

What if P=$71?

The Profit-Minimizing Output for a Purely Competitive Firm: Marginal Revenue– Marginal Cost Approach (Price = $71)

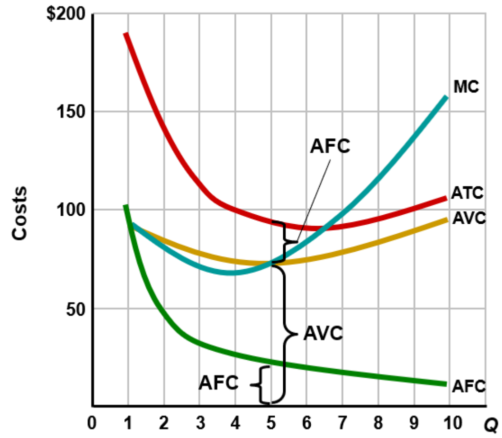
(1) Total Product (Output)	(2) Average Fixed Cost (AFC)	(3) Average Variable Cost (AVC)	(4) Average Total Cost (ATC)	(5) Marginal Cost (MC)	(5) Price = Marginal Revenue (MR)	(6) Total Economic Profit (+) or Loss (-)
0						$-100
1	$100.00	$90.00	$190	$90	$71	-119
2	50.00	85.00	135	80	71	-128
3	33.33	80.00	113.33	70	71	-127
4	25.00	75.00	100.00	60	71	-116
5	**20.00**	**74.00**	**94.00**	**70**	**71**	**-115**
6	16.67	75.00	91.67	80	71	-124
7	14.29	77.14	91.43	90	71	-143
8	12.50	81.25	93.75	110	71	-182
9	11.11	86.67	97.78	130	71	-241
10	10.00	93.00	103.00	150	71	-320

- If shut down, lost fixed cost is $100.
- If firm produces 5 units, loss is ≈ $115.
- Shut down!



- Profit, $\pi = \text{TR} - \text{TC}$

$$
\begin{aligned}
&= \text{P}\times\text{Q} - \text{ATC}\times\text{Q} \\
&= (\text{P} - \text{ATC})\times\text{Q} \\
&= (71-94)\times 5 \\
&\approx -115.
\end{aligned}
$$



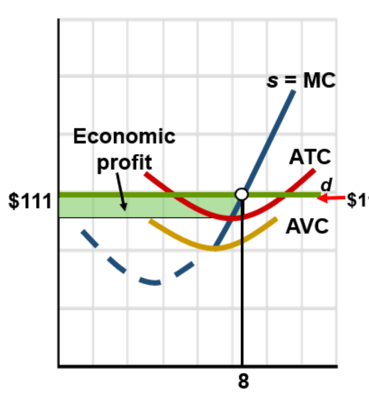
- One thing we can deduce from shut down vs. keep producing decision is that whenever firm produces, MR is always above AVC.
- We also know firm produces at MR=MC.
- Implies that when the firm produces, MC is always above AVC.
- Therefore, only the portion where MC>AVC is relevant! This portion is also the supply curve of the competitive firm.

Short-run Equilibrium

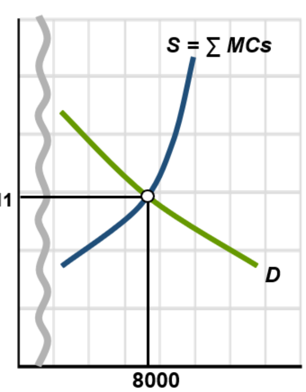
Firm and Market Supply and the Market Demand

(1) Quantity Supplied, Single Firm	(2) Total Quantity Supplied, 1,000 Firms	(3) Product Price	(4) Total Quantity Demanded
10	10,000	$151	4,000
9	9,000	131	6,000
8	8,000	111	8,000
7	7,000	91	9,000
6	6,000	81	11,000
0	0	71	13,000
0	0	61	16,000

- Columns 1-3 is the supply side of the market.
- Columns 3-4 is the demand side.
- Market equilibrium is at where quantity demanded equals quantity supplied.



(a) Single Firm

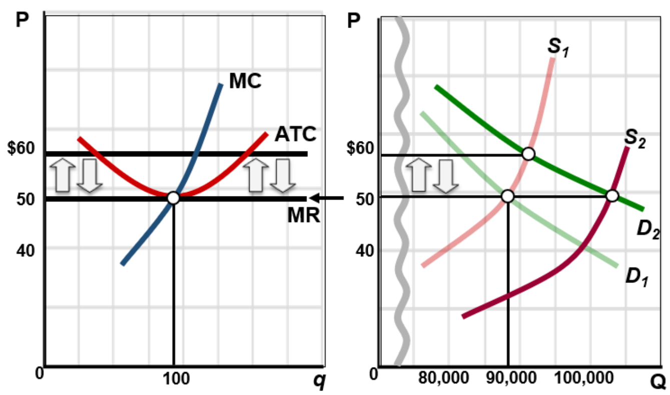


(a) Industry

- Given $111 price, each firm is willing to supply 8 units (profit maximized).
- Short-run quilibrium is at 8000 units where industry supply equals demand.
- Number of firms remains 1000 in the short-run.

Long-run Equilibrium

- What happens in the long-run if there is a positive profit?
- New firms enter the industry and eliminate any positive profits.
  - i.e. supply increases (shifts to the right). As a result, price falls.
  - Price falls until profits become zero.



(a) Single firm

(b) Industry

- Suppose demand shifts from D1 to D2. As a result of this, price increases from \$50 to \$60.
- P=MR=MC=\$60>ATC implies positive economic profits!
- Then, new firms enter and shift supply curve from S1 to S2. Price returns to \$50. At this level, zero profits (P=ATC).
- No more firms enter/exit beyond this point.

- In the long-run, both efficiency and equity are achieved.
- **Efficiency.** Producing goods in the least costly way.
  - i.e. the industry will produce at where MC curve intersects ATC curve's minimum due to price adjustments.
  - Price adjustments: the invisible hand!
  - Market will respond to changes in consumer tastes, resource supplies..
- **Equity.** Fair allocation of resources.
  - P is pushed down as much as possible where there are zero economic profits!

Question

- A perfectly competitive firm

  a. chooses its price to maximize profits.

  b. sets its price to undercut other firms selling similar products.

  c. takes its price as given by market conditions.

  d. picks the price that yields the largest market share.