

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

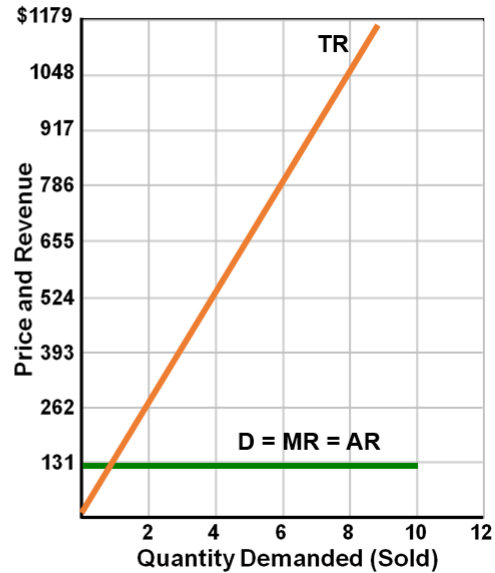
- Very large numbers of buyers and sellers.
- Each act alone hence cannot "collude" and influence the market price.
- Standardized product
 - Products are identical and buyers are indifferent.
 - Perfect substitution.
- "Price takers"
 - Buyers and sellers take market price as given.
 - Meaning they 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.** $TR = P \times Q$
- **Average revenue.** $AR = TR/Q = P$
- **Marginal revenue.** $MR = \Delta TR / \Delta Q = P$
- $MR = AR = P$ 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)		Firm's Revenue Data	
Q_D	P	TR	MR
0	\$131	\$0	
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	131



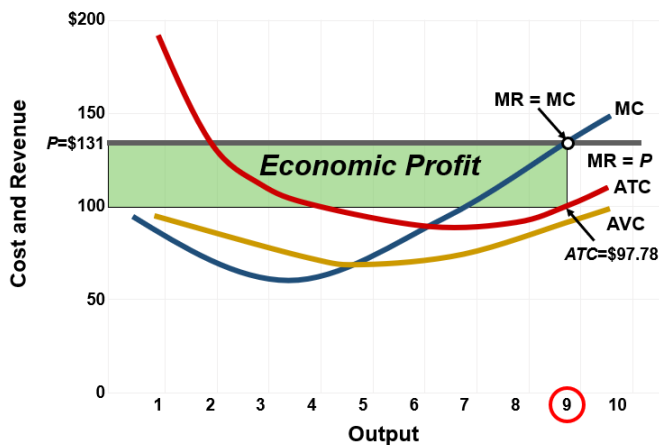
Profit Maximization

- **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, $\pi = TR - TC$

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

- 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.

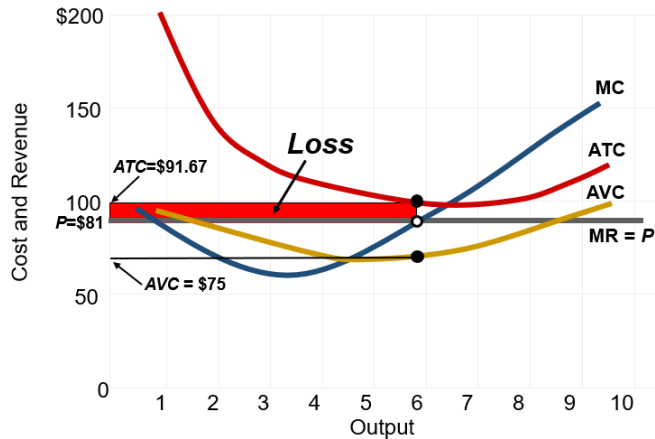
- What if the P was not high enough?
- In the short run the firm has two choices: produce or shut down
 - **Shut down.** Temporarily not to produce, but not get out of the business completely. This refers to a short-run decision while exiting the market would be the long-run decision to leave the market.
- 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 \approx \$64.
- Stay in business and produce!



- Profit, $\pi = TR - TC$

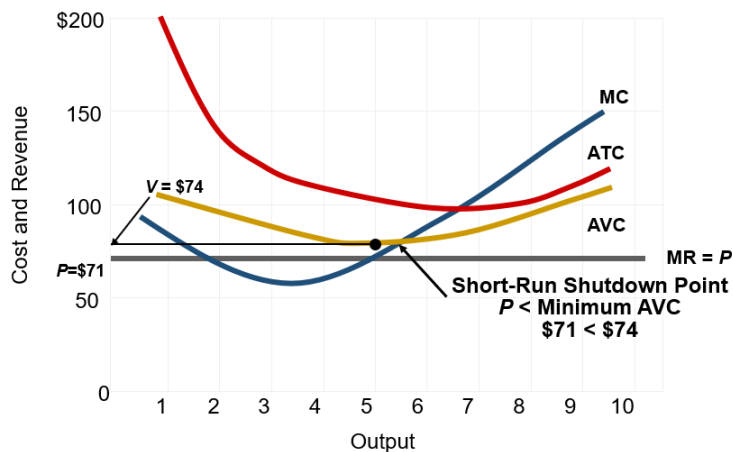
$$\begin{aligned}
 &= P \times Q - ATC \times Q \\
 &= (P - ATC) \times Q \\
 &= (81 - 91.67) \times 6 \\
 &\approx -64.
 \end{aligned}$$

What if $P = \$71$?

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

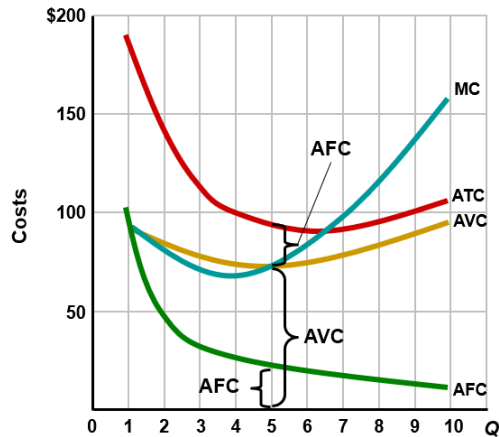
(1) Total Product (Output)	(2) Average Fixed Cost (AFC)	(3) Average Variable Cost (AVC)	(4) Average Total Cost (ATC)	(5) Marginal Cost (MC)	(5) Price = Marginal Revenue (MR)	(6) Total Economic Profit (+) or Loss (-)
0						\$-100
1	\$100.00	\$90.00	\$190	\$90	\$71	-119
2	50.00	85.00	135	80	71	-128
3	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 \approx \$115.
- Shut down!



- Profit, $\pi = TR - TC$

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



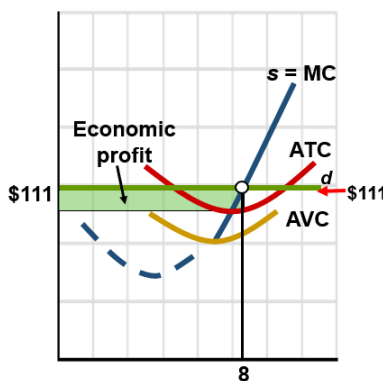
- One thing we can deduce from shut down vs. keep producing decision is that whenever firm produces, MR is always above AVC.
- We also know firm produces at $MR=MC$.
- Implies that when the firm produces, MC is always above AVC.
- Therefore, only the portion where $MC > AVC$ is relevant! This portion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

Short-run Equilibrium

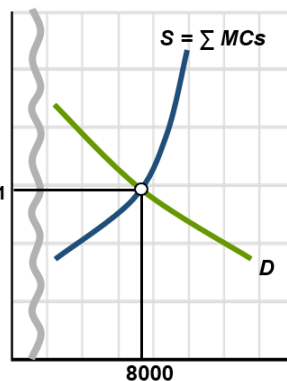
Firm and Market Supply and the Market Demand

(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

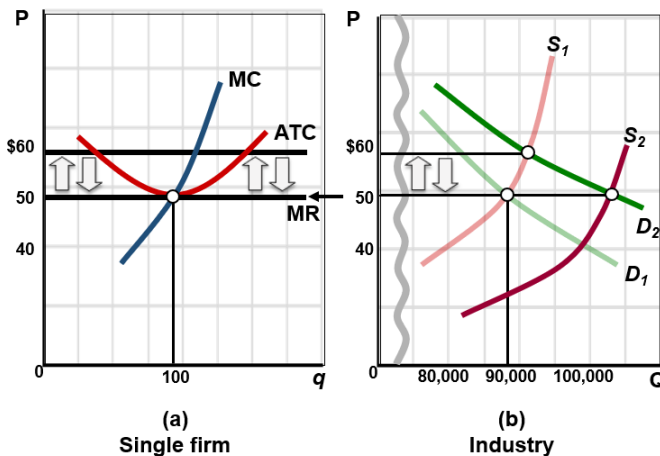


(a) Industry

- Given \$111 price, each firm is willing to supply 8 units (profit maximized).
- Short-run equilibrium 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.



- 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.