Perfect Competition

David A. Díaz

UNC Chapel Hill

Perfect Competition

- Perfectly competitive markets are characterized by
  1. Many buyers and sellers in the market
  2. The good/service being provided by sellers is identical
  3. Firms can freely enter/exit the market
- The goal of this lecture is to analyze how individual firms in these types of markets make optimal decisions.

Total Revenue and Related Measures

- Total revenue is given by $P \times Q$.
- Individual firms in a competitive market are price takers, so for any given quantity they sell, the price they sell for is the market price (constant).
- Two measures related to TR:
  1. **Average Revenue:** $AR = TR/Q = P \times Q/Q = P$.
  2. **Marginal Revenue:** $MR = \frac{\Delta TR}{\Delta Q}$.

Total Revenue and Related Measures

- For competitive firms, the price is fixed.
- So, when quantity increases by one unit, total revenue increases by the price.
- Thus, *for competitive firms* **only**, the market price is equal to the marginal revenue for each firm.

Profit Maximization

- The marginal benefit to a firm of producing an additional unit of output is their MR
- Their cost of producing an additional unit is their MC.
- Thus, they will produce as long as $MR \geq MC$.

Profit Maximization

- Thinking through this another way, we can express the change in profit from producing an additional unit of output as $MR - MC$.
  - If $MR > MC$, then profit is increasing.
  - On the other hand, if $MR < MC$, then profit is decreasing.
  - Given this, it must be that profit is maximized where $MR = MC$.

Profit Maximization

Example

Refer to Table 1. Suppose Sarah's Donut Shop is a firm in a competitive market, where the price of a box of donuts is $11. Fill in the blank columns and find the number of boxes that Sarah should sell to maximize profit. What is this profit if her fixed costs are $12?

Table: Sarah's Donuts

Quantity	*Price*	*Variable Cost*	*TR*	*MR*	*MC*
0	*11*	*0*	*0*	—	—
1	*11*	*$3*	*11*	*11*	*3*
2	*11*	*$8*	*22*	*11*	*5*
3	*11*	*$15*	*33*	*11*	*7*
4	*11*	*$24*	*44*	*11*	*9*
5	*11*	*$35*	*55*	*11*	*11*
6	*11*	*$48*	*66*	*11*	*13*

Profit Maximization - Graphic Approach

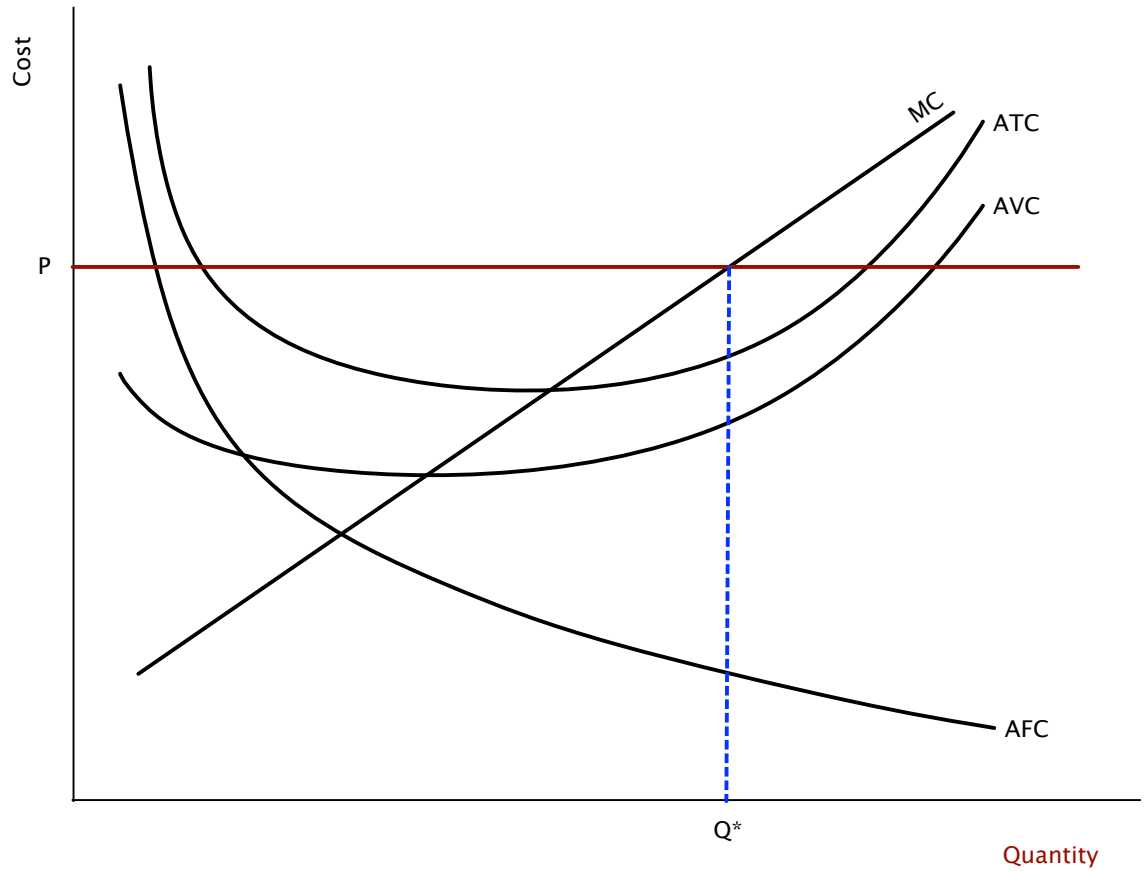


Figure: Perfectly Competitive Environment

Profit Maximization - Graphic Approach

- The price line is horizontal because the competitive firm is a price taker.
- Then, the quantity at which profit is maximized is found by tracing down from where the marginal costs curve and the price line (demand curve) intersect.

Profit Maximization - Graphic Approach

- If the quantity is below Q^*, then the marginal revenue is greater than the marginal cost. Thus, by increasing output, the firm can increase its profit.
- If the quantity were above Q^*, then the marginal revenue is less than the marginal cost. Thus, by decreasing output, the firm can increase its profit.

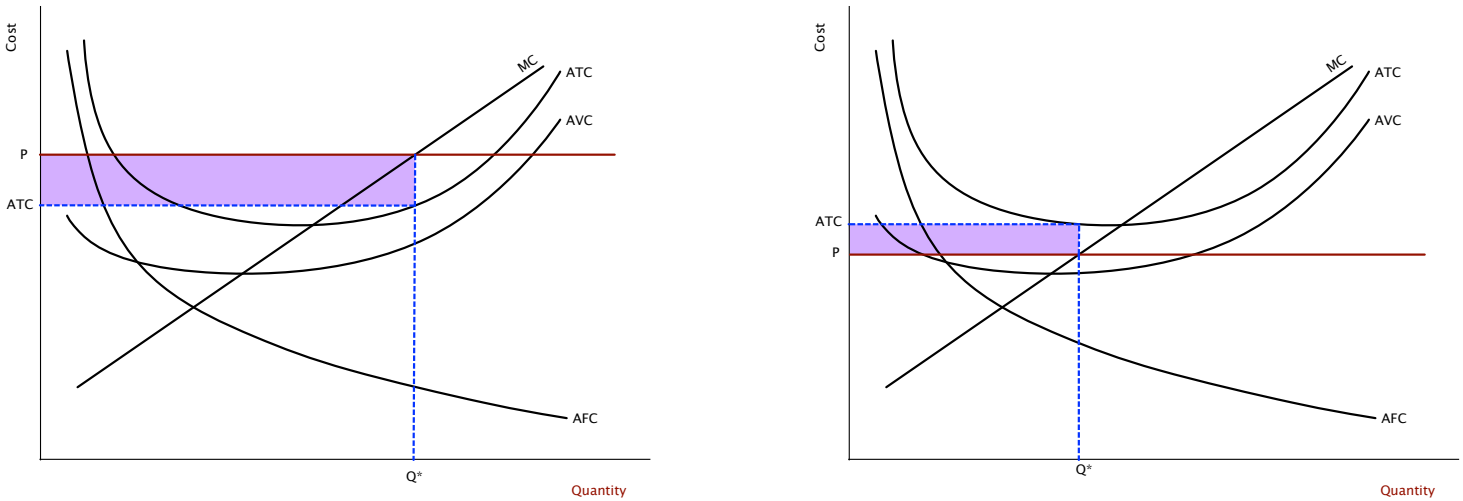
Profit Maximization - Graphic Approach

- Additionally, we can find profit from a graph. Rewrite profit as

$$\Pi = TR - TC = PQ - TC = (P - ATC) \times Q$$

Profit Maximization - Graphic Approach

Figure: Firm Profits



(a) Firm Making Positive Profit (b) Firm Making Negative Profit

Short-Run Operating Decision

- **Shutdown decision:** A *short-run* decision to cease production during a specific period of time.
- In the short run, a firm's fixed costs are sunk. Thus, when making its decision to produce in the short run, the firm only considers their variable costs.

Short-Run Operating Decision

- By shutting down, the firm would have a total revenue of $0.
- But, it would not have to pay its variable costs (though it still has to pay its fixed costs).
- Given this, the firm will only produce in the short run if $TR > VC$.
- **Shut down rule:** Shutdown if $TR < TC \Rightarrow P < AVC$.

Short-Run Operating Decision

- The portion of the *MC* curve above the *AVC* curve characterizes all the quantities at which a firm may produce.
- This portion of the marginal cost curve is the firm's short-run supply curve.

Short-Run Operating Decision

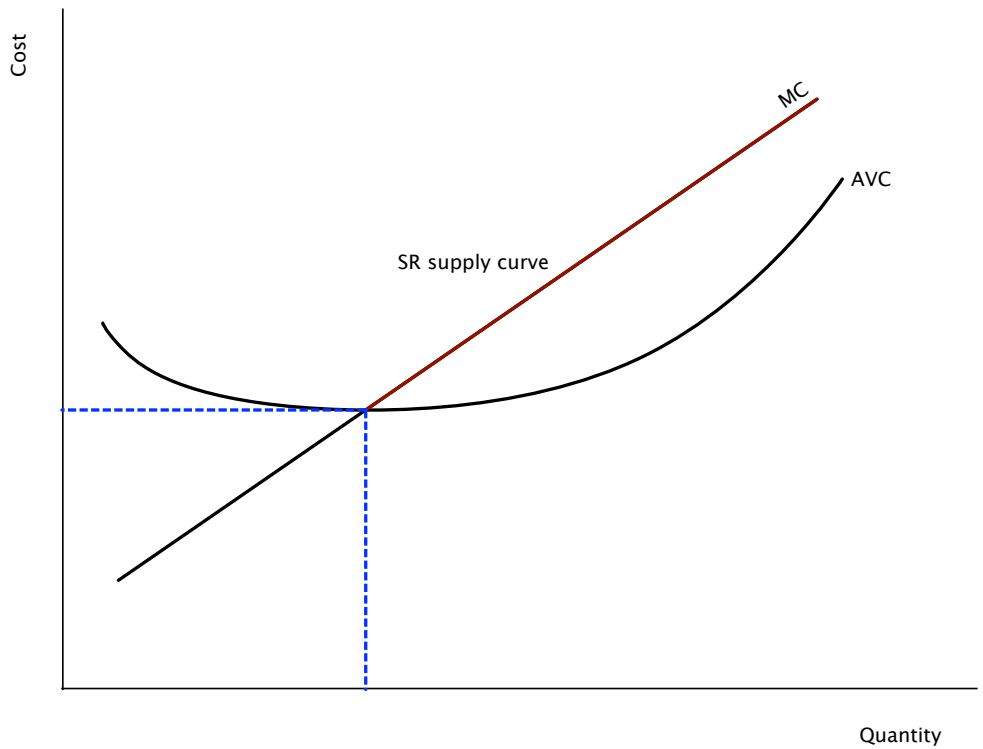


Figure: Firm's Short-run Supply Curve

Short-Run Operating Decision

Example

Karlye's Klipz is a hair salon operating in a competitive market. The store's total costs each month are $7,000. The salon has a yearly lease and pays $3,000 each month in rent (part of the $7,000 total monthly costs). All other costs change depending on how many haircuts are provided. The salon's haircuts are provided for $25 each and they receive 175 patrons a month. What can you say about the salon's short-run decision? What will its profit be?

$FC = 3,000$, $VC = 4000$.
$AVC = 4000/175 = \$22.86 < P$, so stay open.
$\Pi = \$25 \times 175 - \$7,000 = -\$2,625$. Profit if firms shuts down = -$3,000.

Long-Run Exit Decision

- **Exit decision:** A firm's *long-run decision* to leave the market.
- In the long run, if the firm exits the market then (1) it loses all its revenue, but (2) it saves both its variable costs and fixed costs of production.
- **Exit rule:** Exit if $TR < TC \Rightarrow P < ATC$
- From the perspective of a party that wishes to enter the market, they will only do so if the venture will be profitable. Thus, a firm will only enter a market if $\underline{P > ATC}$.

Long-Run Exit Decision

- The marginal cost curve above the average total cost curve characterizes the quantities the firm may produce if $P > ATC$.
- This portion of the marginal cost curve is the firm's long-run supply curve.

Long-Run Exit Decision

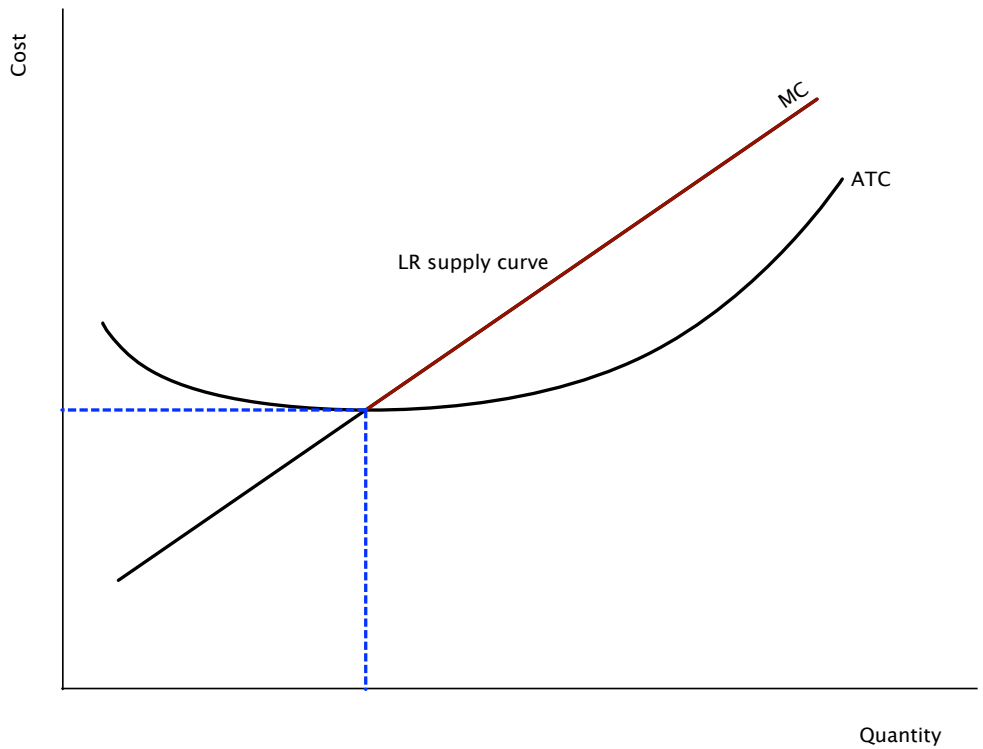


Figure: Firm's Long-run Supply Curve

Long-Run Exit Decision

Example

Consider Karlye's Klipz from Example 10.2. What can you say about the salon's long-run decision regarding exiting the market?

$ATC = 7,000/175 = \$40 > P$, so exit in long run.

Market Supply in the Short-Run

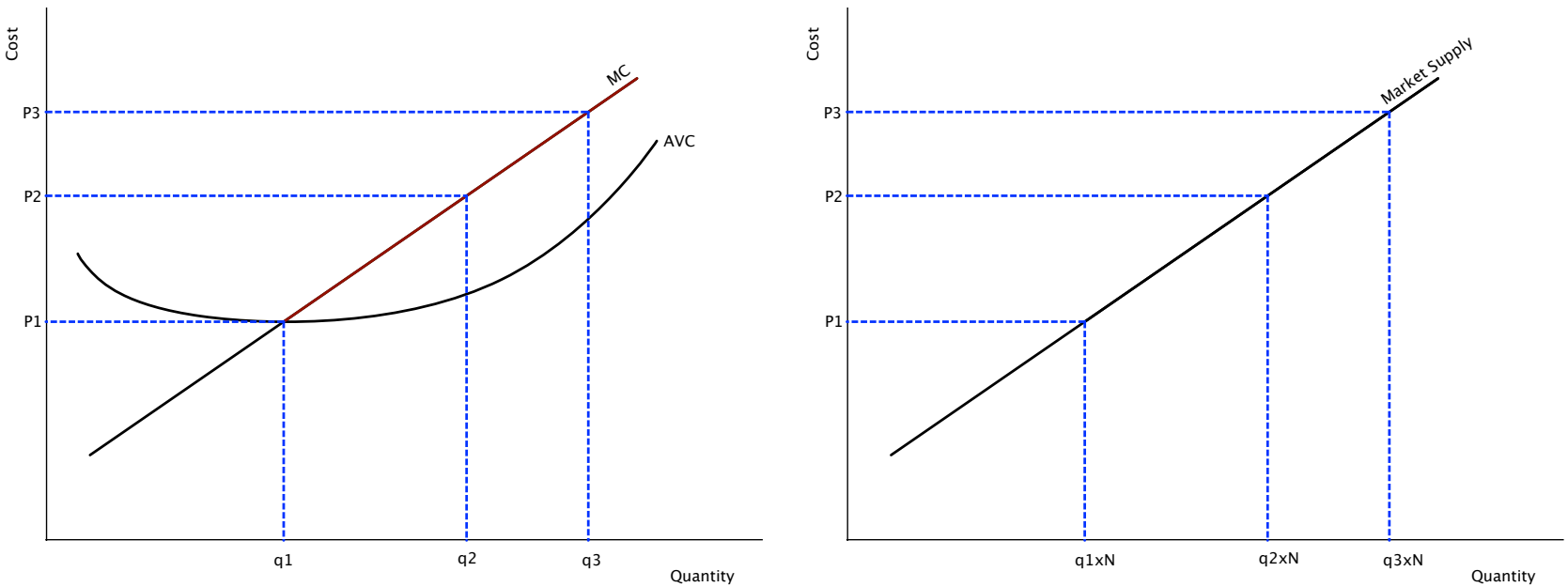
- We saw how individual firms in a competitive market make optimal choices. How do these individual firms collectively form the supply curve for a market?
- For any given price, each firm in a competitive market produces the quantity at which $P = MC$ (so long as $P > AVC$).

Market Supply in the Short-Run

- To derive the market supply curve (in the short run), we add the individual short-run supply curves.
- Since each firm is identical, the quantity supplied to the market at any given price is the quantity supplied by each firm times the number of firms in the market.

Market Supply in the Short-Run

Figure: Short-run Market Supply



(a) Individual Firm

(b) Market Supply

Market Supply in the Long-Run

- In the long run, we assume that firms can freely enter and exit the market. If firms already in the market are profitable, then entrepreneurs outside the market will enter.
- This will increase the number of firms in the market, which shifts the supply curve to the right.
- On the other hand, if firms in the market are not profitable, then they will exit the market. This shifts supply to the left.
- Finally, once this process finishes, the firms that do remain in the market make zero economic profit, known as normal profit.

Market Supply in the Long-Run

- From the profit equation, $\Pi = (P - ATC) \times Q$, we see that firms producing output have zero profit if and only if $P = ATC$.
- If firms in a competitive market set the quantity produced such that $P = MC$, and the process of entry & exit implies that $P = ATC$, then it has to be that at Q^*, $MC = ATC$.
- We know that if $MC = ATC$, then the firm has to be producing at the minimum of ATC.
- Thus, we have that firms in a competitive market will operate at their efficient scale and $P = \min ATC$ in the long run.

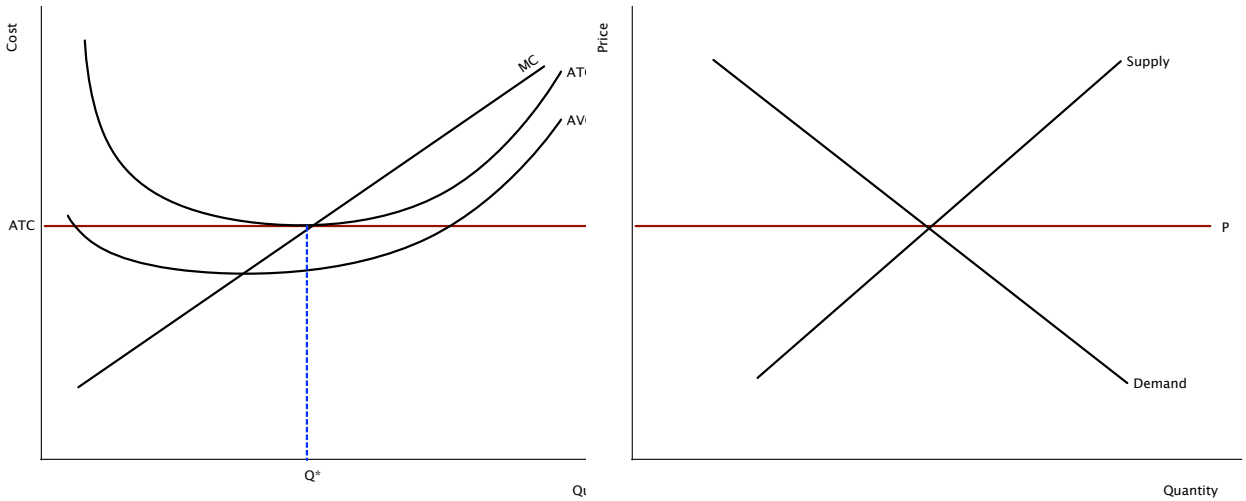
Market Supply in the Long-Run

Example

Suppose that the market for donuts begins at its long-run equilibrium. Draw a graph showing the quantity a seller in the market would produce, the MR at this quantity, the average total cost, and the firm's profit. Additionally, draw a graph showing the market for donuts.

Market Supply in the Long-Run

Figure: Perfectly Competitive Market in Long-run



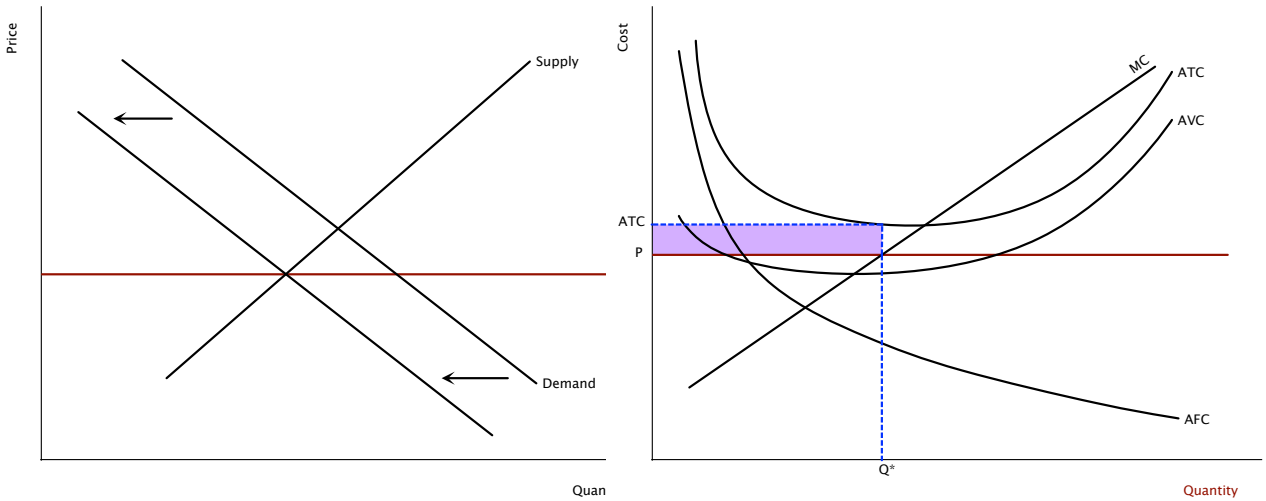
(a) Individual Firm (b) Market

Market Supply in the Long-Run

Example

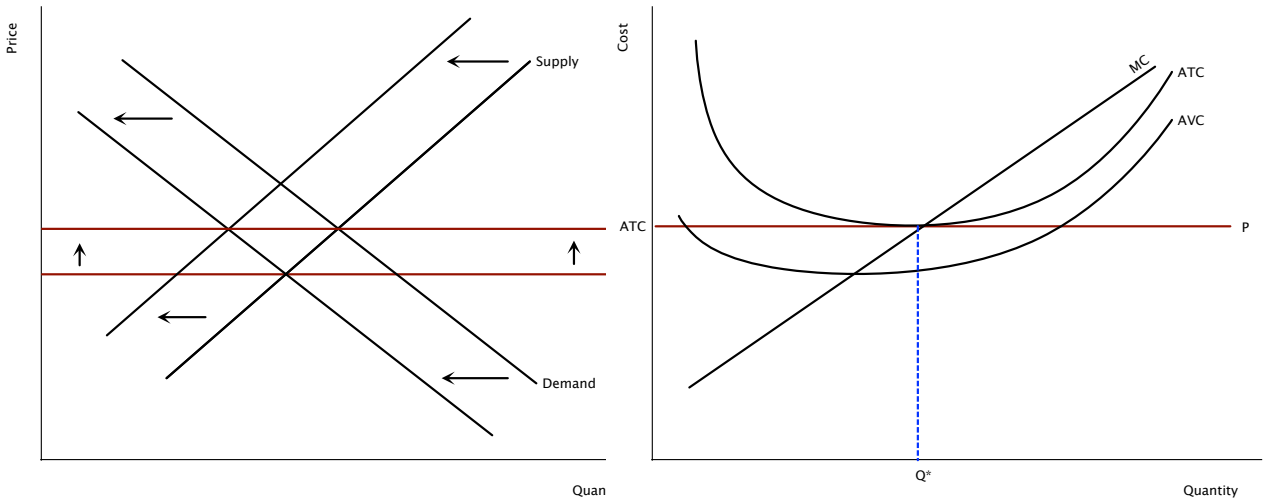
Now, suppose the surgeon general announces that donuts cause severe health issues. What happens to the market price for donuts? How will firms in the market be affected in the short-run? In the long-run? Draw graphs to support your answers.

Market Supply in the Long-Run



(a) Market in SR (b) Firms in SR

Market Supply in the Long-Run



(a) Market in Long-run (b) Individual Firms in LR

Readings and Assignments

- Today: Mankiw Ch. 14
- Next time: Mankiw Ch. 15
- Problem Set 3, section 2