PERFECT COMPETITION

LOS 18a: Describe the characteristics of perfect competition, explain why companies in a perfectly competitive market are price takers, and differentiate between market and company demand curves. Vol 2, pg 160-162

A perfectly competitive industry is characterized by the following features:

1. There are a *large* number of buyers and sellers, and each of them is *small* relative to the size of the market.
2. There are absolutely *no* barriers to entry or exit.
3. All producers sell an *identical* product.
4. Established firms have no advantage over new entrants.
5. There is *perfect information*. Buyers and sellers are all well-informed about prices.

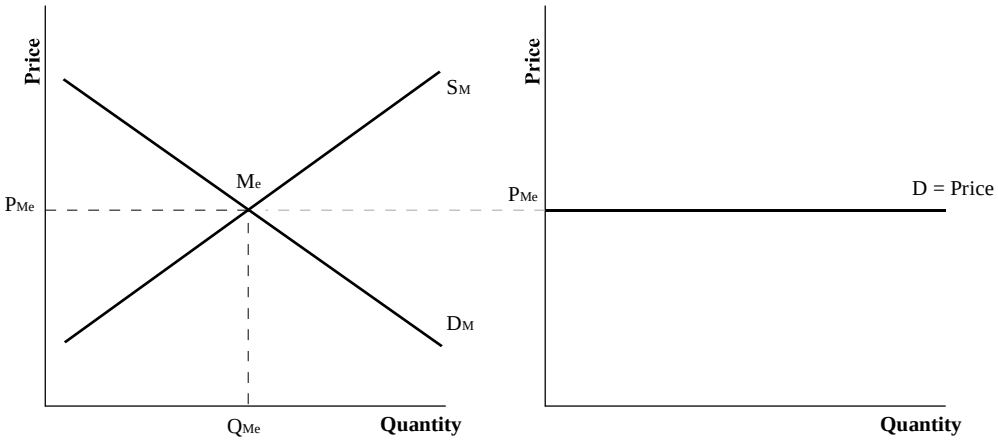
A firm's minimum efficient scale is the smallest quantity of output where the firm reaches its minimum long run average cost. Since each firm finds it efficient to produce a quantity that is small relative to the size of the market, there is room for a large number of producers.

Perfect competition arises when the minimum efficient scale of each producer lies at an output quantity that is very small relative to the size of the market.

Prices are determined by market demand and supply (Figure 1a). Since each seller is too small compared to the size of the market, she has to 'take' or accept the prices determined by the market. She cannot sell at a higher price because buyers are perfectly informed about prices and will simply go to some other producer who is selling at the lower market prices. Individual producers see no point in setting prices below market levels because they can sell as much as they want at market prices anyway. Therefore, the demand curve facing each individual producer in a perfectly competitive environment is perfectly elastic at P_{Me} (Figure 1b).

Figure 1: Perfect Competition

1a. Market **1b. Individual Firm**



Market demand and supply interact to determine equilibrium market price, P_{Me}, which no individual firm has the power to change.

LOS 18b: Determine the profit maximizing (loss minimizing) output for a perfectly competitive company, and explain marginal cost, marginal revenue, and economic profit and loss. Vol 2, pg 163-167

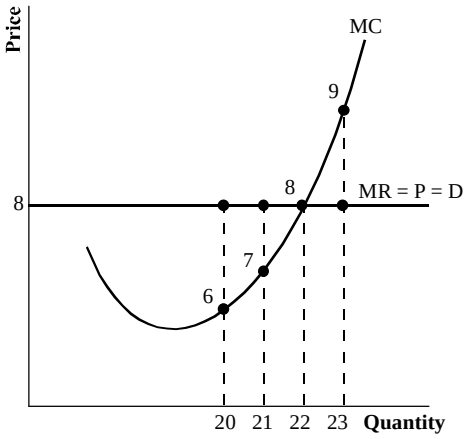
Each firm 'takes' the price offered by the market, so the only decision in each producer's hands is how much to produce. In Figure 2 we illustrate an individual firm's marginal cost curve and demand curve.

In a perfectly competitive environment, an individual firm can sell as many units of output as it desires at the given market price. If the price is $8/unit, each unit sold increases revenue by $8 so MR is constant at the same level as price ($8).

The key decision for the firm is to decide on how much it wants to produce in the short run. This decision is governed by the incentive to maximize profits. In Figure 2, profit maximizing output occurs at 22 units where the increase in revenue from selling the last unit (MR) equals the increase in costs from producing the last unit (MC).

Profit maximizing output is the quantity where the difference between TR and TC is maximized. This level of output corresponds to the point where MC equals MR. At production levels lower than 22 units, an additional unit produced adds more to revenues than to costs. For example, the 20th unit adds $8 to revenue, $6 to costs, and therefore $2 to total profit. At production levels greater than 22 units, the cost of producing an extra unit exceeds the revenue from selling it. For example, the 23rd unit costs $9 and sells for only $8. There is no point in increasing production beyond 22 units given current prices and the firm's cost structure.

Figure 2: Profit Maximizing Output



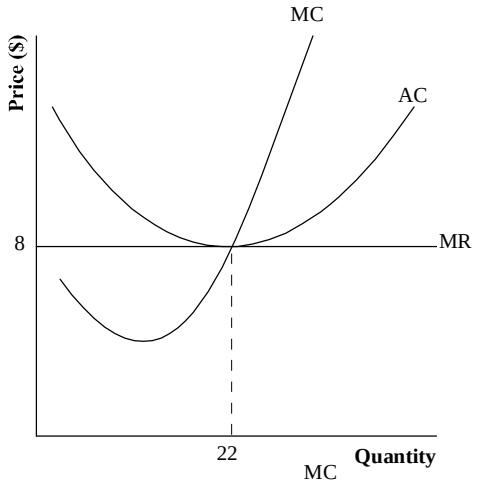
MR equals price only for price takers. As we shall see later, for firms facing downward sloping demand, MR is lower than price.

The 20th unit increases revenue by $8 (selling price) and costs $6 (marginal cost) to make.The increase in profit from 20th unit = $2.

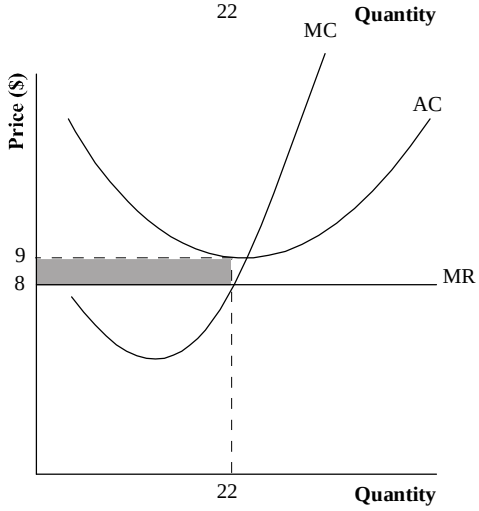
Unit	Price/MR	MC	Profit on unit
20th	8	6	2
21st	8	7	1
22nd	8	8	0
23rd	8	9	-1

Whether the firm makes a profit or a loss depends on the position of the AC curve relative to demand (which represents average revenue). Three possible scenarios are illustrated in Figure 3. If the average cost curve lies above the firm's demand curve, the firm will make economic losses (Figure 3b). However, the point where marginal cost equals marginal revenue will continue to be the quantity that the firm should produce. However, in this case, the corresponding quantity will define the *loss-minimizing* level of output.

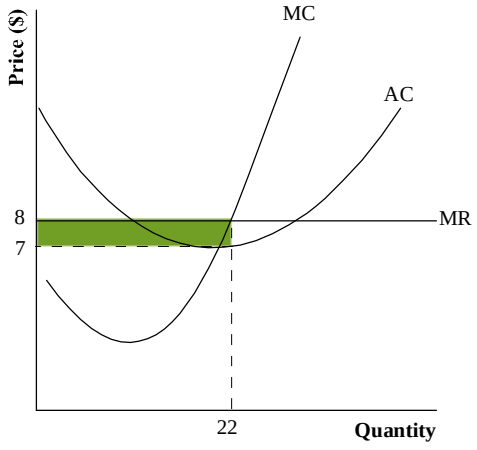
Figure 3: Possible Perfect Competition Scenarios in the Short Run



3a
Scenario A : Short run breakeven ⇨ Zero economic profit.
MC equals MR at the point where AC is at its minimum and the AC curve is tangent to the demand curve. Firms only make normal profits as price equals AC.



3b
Scenario B: Short run economic losses.
At the profit maximizing quantity where MC = MR (22 units) price is lower than average cost (AC). Therefore, the firm makes an economic loss. The firm earns $8/unit and spends $9/unit so loss/unit equals $1.
Total loss equals ($8 - $9) × 22 = $22, which is the area of the rectangle shaded in grey.



3c
Scenario C: Short run economic profits.
At the quantity where MC equals MR (22 units), the firm's price/unit is greater than its cost/unit (AC) so it makes an economic profit. The firm still produces 22 units. It earns $8/unit and spends $7/unit so profit/unit equals $1. Total profit equals ($8 - $7) × 22 = $22, which is the area of the rectangle shaded in green.

LOS 18c: Describe a perfectly competitive company's short-run supply curve and explain the impact of changes in demand, entry and exit of companies, and changes in plant size on the long-run equilibrium. Vol 2, pg 167-174

The question that we ask ourselves now is: Would a firm in perfect competition, remain in production if it were making an economic loss?

Recall that in the short run, a firm has fixed and variable costs of production. If the firm decides to shut down, it would still incur fixed costs in the short run and make a loss equal to total fixed cost. This loss can be reduced by continuing production and earning revenues that are greater than the variable costs of production. This surplus (excess of revenues over variable costs) would serve to meet some of the fixed costs that the firm is 'stuck' with in the short run. A firm should shut down immediately if it does not expect revenues to exceed variable costs of production. If the firm continues to operate in such an environment it would suffer a loss greater than just total fixed cost.

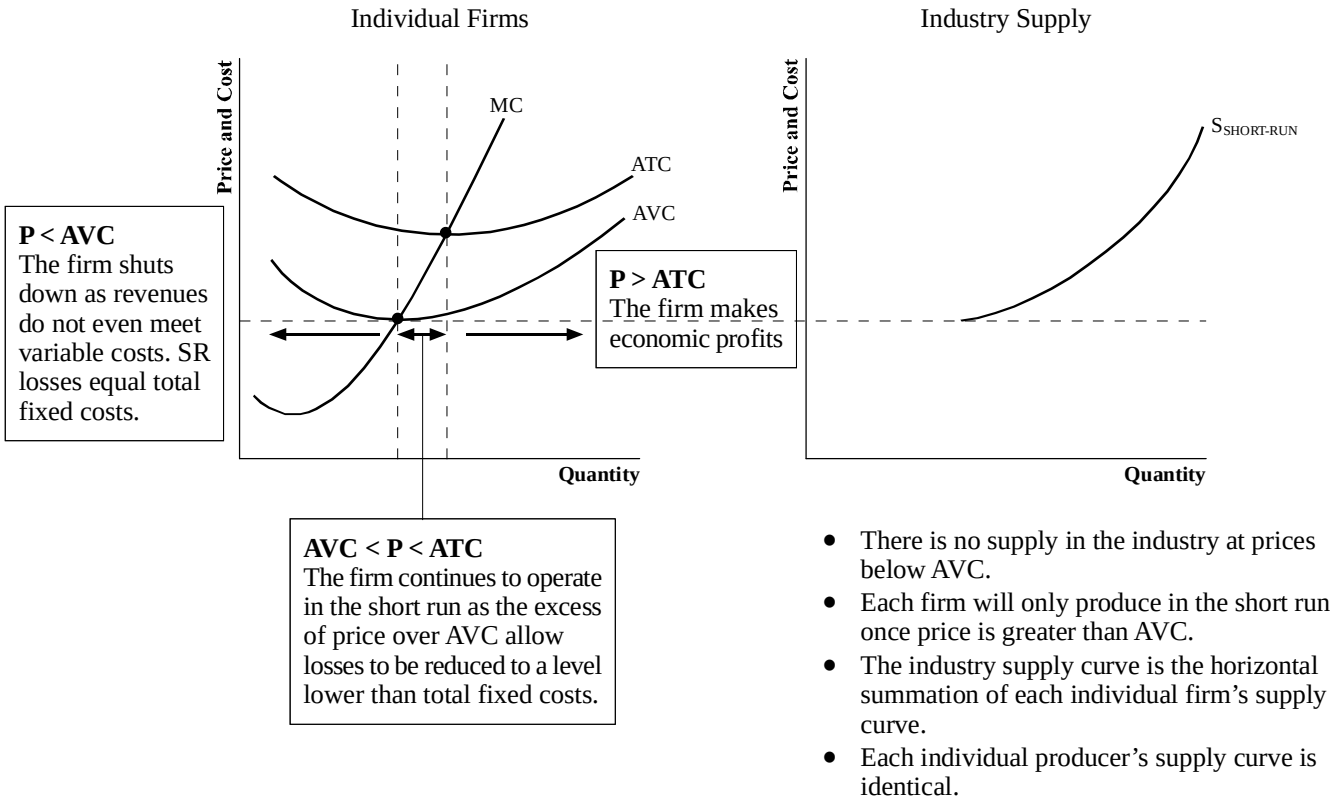
At this stage you must make sure that you understand two things:

- Given the prices prevailing in the market, a firm will produce at the output level where its marginal cost (MC) equals marginal revenue (MR). In a perfectly competitive environment marginal revenue equals price. In subsequent readings, we will see that marginal revenue for firms with downward sloping demand curves is lower than price.
- In the short run the firm will only continue to operate if its revenues enable it to at least meet its variable costs.

With these two things in mind we can conclude that an individual firm's supply curve is the portion of its MC curve that lies above the TVC curve (Figure 4). At price levels below TVC, the firm will not be willing to produce as it would only extend its losses beyond simply total fixed costs. At price levels greater than AVC, the firm will remain in production in the short run and produce the quantity where marginal costs equal marginal revenue (loss minimizing level). Once prices exceed ATC, firms in perfect competition make economic profits.

All firms in a perfectly competitive industry produce an identical product and face identical cost curves. None of them will remain in production if prices are below AVC, so there will be no industry supply at lower prices. Firms would produce in the short run if prices were greater than AVC as they would be able to limit losses to a level below total fixed costs. Each firm's individual supply curve is identical, and the market supply curve is the horizontal summation of the individual firms' supply curves. Every firm in the industry has the same cost structure, faces the same price, and consequently produces at the same profit maximizing (loss minimizing) output level.

Figure 4: Short Run Supply Curves



Equilibrium in the Long Run

The three scenarios illustrated in Figure 3 are only possible in the short run. In the long run in a perfectly competitive industry, only one of those scenarios is possible because the industry adjusts in two ways:

1. Entry and Exit of Firms

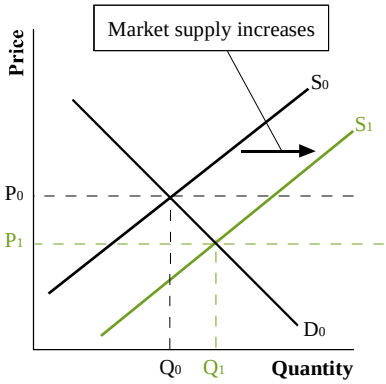
One of the key assumptions we made regarding perfect competition was that there are no barriers to entry or exit. Firms can enter the industry easily when they see persistent economic profits, and may leave if they foresee persistent economic losses. Let's see what happens under each scenario:

Economic Profits (Figure 5)

If the firms in a particular industry are making economic profits, entrepreneurs will flock to the industry to capture some of the economic profits available. Remember that established firms enjoy no advantage over new entrants under perfect competition and each firm has an identical cost structure. The increase in the number of firms increases market supply to S_1 (Figure 5a). Consequently, market prices fall till they reach the point where price equals minimum ATC and economic profits are eliminated (P_1).

Figure 5: SR Economic Profits, LR Zero Economic Profits

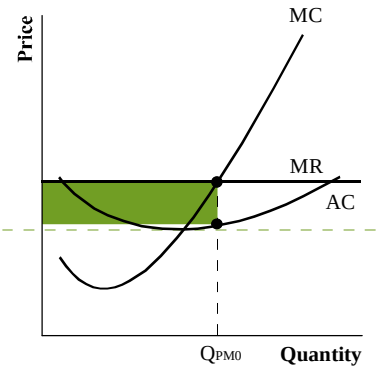
5a. Short Run and Long Run: Industry



SR: S_0 and D_0 interact to set prices at P_0.

LR: Other firms are drawn to the industry so industry supply gradually moves to S_1 to set LR market prices at P_1.

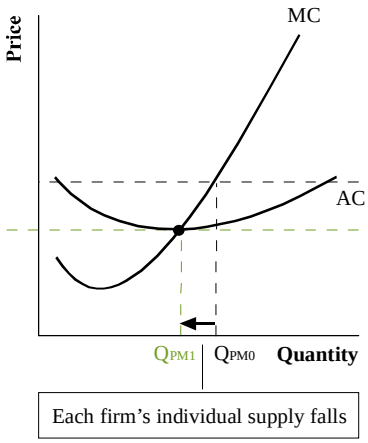
5b. Short Run: Individual Firm



SR: Each firm produces Q_{PM0} where MR = MC.

Prices exceed AC at Q_{PM0} resulting in economic profits (region shaded in green) equal to $(P_0 - AC) \times Q_{PM0}$.

5c. Long Run: Individual Firm



LR: Market price, P_1 is tangent to the AC curve at its minimum point. Profit maximizing quantity is now Q_{PM1}, which is lower than Q_{PM0}. In the long run, firms only make normal profits, or zero economic profits.

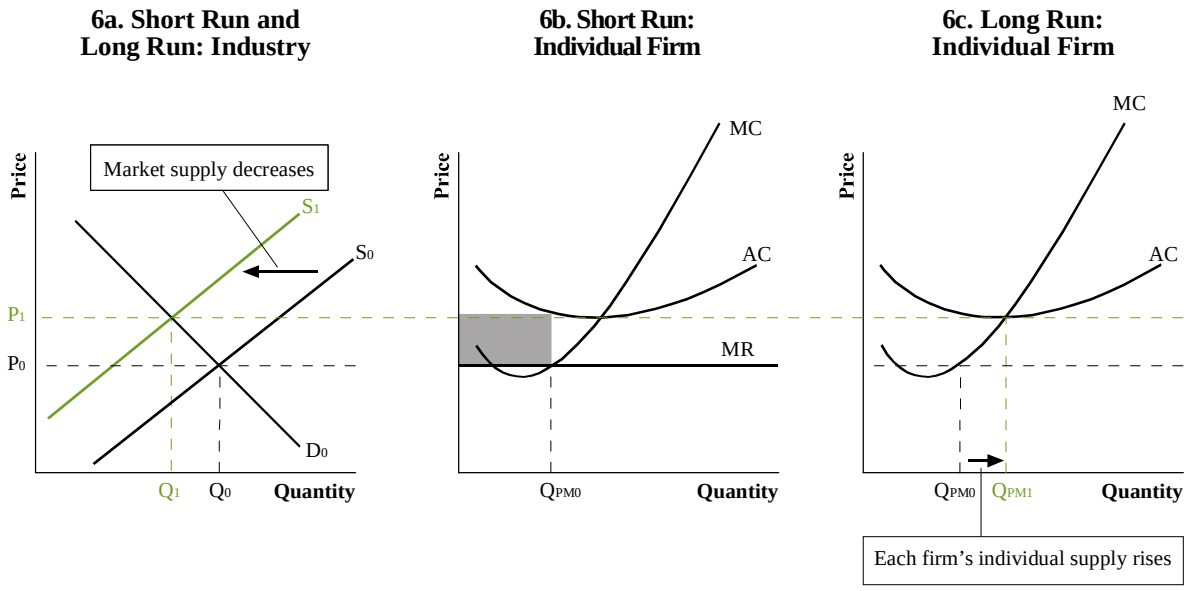
Remember the following conclusions from the analysis in Figure 5.

1. There are no LR economic profits in a perfectly competitive industry.
2. In the LR, price equals minimum average cost.
3. In LR equilibrium, each firm produces less than the amount it was producing when economic profits were being made in the industry ($Q_{PM1} < Q_{PM0}$). However, the industry as whole produces more than it was previously ($Q_1 > Q_0$).
4. The only viable explanation for this is that there must be *more* firms in the industry in the long run than there were when firms were making economic profits in the short run.

Economic Losses (Figure 6)

If an industry is making economic losses, participating entrepreneurs will exit in order to make at least normal profits elsewhere. There are no barriers to exit, and every firm has an identical cost structure. When firms leave the industry, supply falls, prices rise and eventually, economic losses are eliminated as illustrated in Figure 6. Remaining firms earn normal profits in the long run.

Figure 6: SR Losses, LR Normal Profits



SR: S_0 and D_0 interact to set prices at P_0.

LR: Some firms exit the industry so the industry supply gradually moves to S_1 to set LR market prices at P_1.

SR: Each firm produces Q_{PM0} where MR = MC.

AC exceeds price at Q_{PM0} resulting in economic losses (region shaded in grey) equal to $(AC - P_0) \times Q_{PM0}$.

LR: Market price, P_1 is tangent to the AC curve at its minimum point. Profit maximizing quantity is now Q_{PM1}, which is greater than Q_{PM0}. In the long run, firms only make normal profits, or zero economic profits.

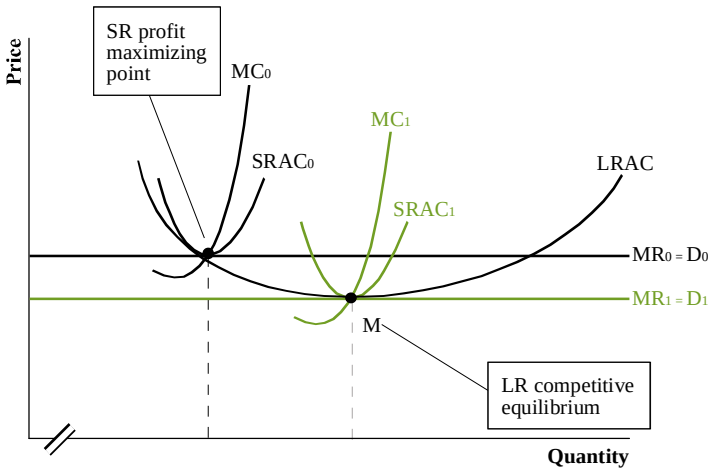
Important takeaways from the analysis in Figure 6:

1. There are no long run economic profits in a perfectly competitive industry.
2. Price equals minimum average cost in the long run.
3. Each remaining firm produces more than the amount it was producing when economic losses were prevalent in the industry ($Q_{PM_1} > Q_{PM_0}$). The industry however, now produces less ($Q_1 < Q_0$).
4. The only way this is possible is that there must be *fewer* firms in the industry in the long run than there were when economic losses were being made in the short run.

2. Changes in Plant Size

In the reading on output and costs, we learned that when plant size is increased, initially firms realize economies of scale (falling average costs), and later suffer from diseconomies of scale. A firm already operating at its minimum short run average cost in a perfectly competitive environment would make zero economic profits. However, there is always the incentive to increase plant size, move onto another (lower) short run average cost curve, which would give the firm a chance to earn economic profits. Firms will continue to increase plant size in the long run till they operate on the SRAC curve whose minimum point coincides with the minimum point of the LRAC curve (Point M in Figure 7). There is no point in expanding beyond this size as diseconomies of scale would set in and actually increase the firm's average costs.

Figure 7: Plant Size And LR Equilibrium



Each short run average cost curve has an associated marginal cost curve, which intersects it from below through its minimum point. If a firm moves from $SRAC_0$ to $SRAC_1$, it will also move from MC_0 to MC_1. Because the MC curve defines an individual firm's supply curve, the firm's move to MC_1 implies a rightward shift (increase) in individual firm supply. As more firms expand and move to their respective $SRAC_1$s, the market supply curve also shifts to the right. Consequently, prices fall to the level where $SRAC_1$ is at its minimum (P_1), and once again, economic profits are eliminated.

Conclusion: A firm might increase plant size to reduce average costs and realize economic profits, but its ability to do so will be limited because as more firms increase their respective plant sizes, industry supply will increase and prices will fall to the level where they equal the firm's new minimum average cost.

If firms in perfect competition are incurring economic losses some will exit the industry. Others, who can reduce average costs by cutting down production, will choose to downsize. Each of these actions will reduce industry supply to a point where economic losses are eliminated and replaced by normal profits for the firms remaining in the industry.

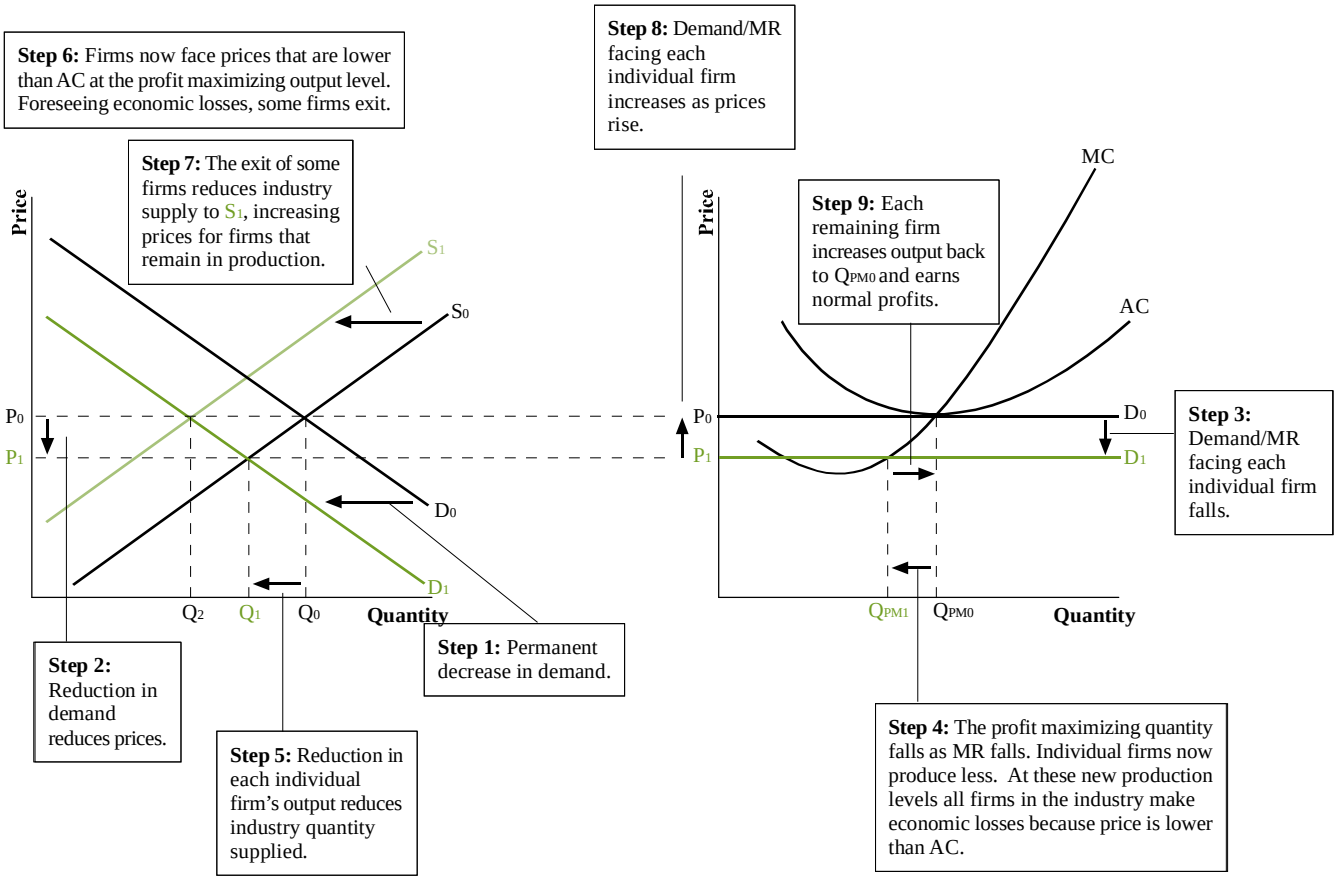
LOS 18d: Discuss how a permanent change in demand or changes in technology affect price, output, and economic profit. Vol 2, pg 175-179

1. Permanent Decrease in Demand for a Product

A permanent reduction in demand results in lower prices. Perfectly competitive firms that were previously making normal profits will now suffer economic losses. Lower prices force each firm to reduce output to point Q_{PM1} (Figure 8), where its marginal cost curve intersects the new (lower) marginal revenue curve. The reduction in each firm's output results in a decrease in quantity supplied from Q_0 to Q_1.

Economic losses prompt some firms to exit the industry. Their exit reduces market supply to S_1 and boosts prices for all remaining firms back to P_0. These firms see an upward shift in their individual demand curves and now once again produce at their original profit maximizing levels, q_{PM0}, where they earn normal profits

Figure 8: Permanent Decrease In Demand For A Product



2. External Economies and Diseconomies

External economies are factors outside the control of the firm that *decrease* average costs for individual firms as *industry output increases*. Examples of external economies are specialists who develop consulting practices when the number of firms in the industry (potential clients) increases. They use their experience and knowledge to help firms become more cost-effective and efficient, bringing average costs lower.

External diseconomies are factors outside the control of the firm that *increase* average costs for individual firms as *industry output increases*. An example of external diseconomies is how an increase in flights and number of airlines causes congestion at airports and results in longer waiting times and airport charges for all airlines, which increase average costs.

The LR industry supply curve shows how quantity supplied changes as market prices vary after all possible adjustments have occurred (including changes in plant size and changes in the number of firms in the industry).

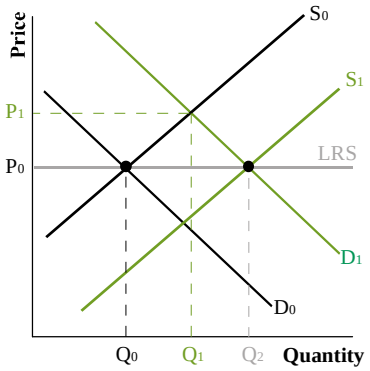
An increase in demand in a perfectly competitive industry results in higher prices, which attract new entrants. Over the long run, the entry of these new firms increases industry supply, which brings prices down to a level where economic profits are eliminated.

In constant-cost industries, supply increases by as much as the initial increase in demand such that prices return to their original levels in the long run. As a result, the long run supply curve is *perfectly elastic* (Figure 9a).

In industries with external economies (decreasing-cost industries), the presence of a larger number of firm lowers costs for all firms. As a result, the magnitude of shift in supply is greater than that of the initial shift in demand, and prices fall below original levels. The long run supply curve for decreasing-cost industries is *downward sloping* (Figure 9b).

In industries with external diseconomies (increasing-cost industries), an increase in demand boosts prices, but as more firms enter, average costs for all firms rise. Therefore, supply increases by less than the initial increase in demand. This results in prices that are higher than original levels, and a long run supply curve that is *upward sloping* (Figure 9c).

Figure 9: External Economies And Diseconomies



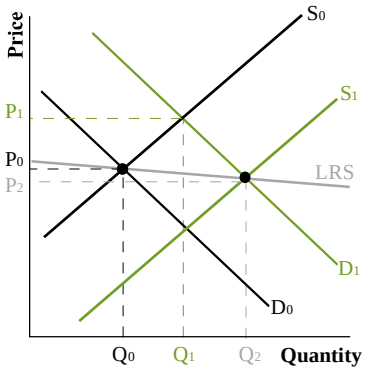
9a. Constant-Cost Industry

No external economies.

Short run: When demand increases to D_1, prices rise to P_1, and equilibrium quantity moves to Q_1.

Firms enter industry in search of economic profits. Therefore, supply increases to S_1, prices revert to P_0, and equilibrium quantity increases further to Q_2.

Long run: Flat LRS curve.



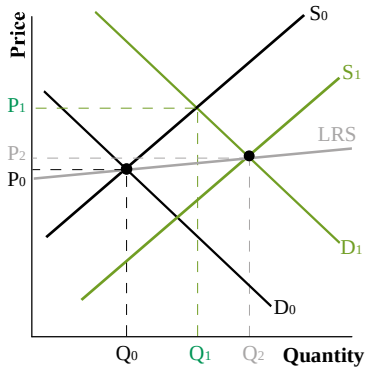
9b. Decreasing-Cost Industry

External economies.

Short run: When demand increases to D_1, prices rise to P_1, and equilibrium quantity moves to Q_1.

Firms enter industry in search of economic profits. The entry of more firms results in a decrease in costs for all firms. Therefore, the magnitude of the increase in supply is greater than that of the initial increase in demand. Prices end up at P_2, which is lower than original prices.

Long run: LRS has a negative slope.



9c. Increasing-Cost Industry

External diseconomies.

Short run: When demand increases to D_1, prices rise to P_1, and equilibrium quantity moves to Q_1.

Firms enter industry in search of economic profits. The entry of more firms results in an increase in costs for all firms. Therefore, the magnitude of the increase in supply is lower than that of the initial increase in demand. Prices end up at P_2, which is higher than original prices.

Long run: LRS has a positive slope.

3. Changes in Technology

Advances in technology usually result in lower costs, but require a significant initial investment. Once a firm makes the investing decision, it incurs the benefits of new technology in the form of lower average costs. Faced with the same prices, firms that are quickest to embrace new technologies realize economic profits as their average cost curves lie below those of firms that remain loyal to older production techniques. As the lagging firms see the users of new technology make economic profits, they also move towards adopting the new technology.

Firms that embrace the new technology are willing to supply more at current prices because they are now more efficient. The increase in supply puts a downward pressure on prices. As prices start falling, users of older techniques suffer economic losses, while users of the new technology continue to make economic profits. Gradually more and more firms either exit the industry because of economic losses, or adopt the new technology in pursuit of economic profits. Eventually old-technique firms disappear, and as more new-technology firms enter, supply increases and prices fall to a level where they equal the minimum average cost of new-technology firms. In the long run, perfectly competitive firms can never make economic profits.

Technological changes can only bring temporary gains to producers. They bring long term gains to consumers in the form of lower prices.

Some comments about perfect competition (Figure 10):

1. Perfect competition is *allocatively efficient* because:
   a. It results in an industry output where MC (supply) equals MB (demand).
   b. The sum of producer and consumer surplus is maximized.

2. Perfect competition also results in an *efficient scale of production.* In the long-run all firms produce quantity where average costs are minimized.

Figure 10: Efficiency Under Perfect Competition