

Chapter 14: Firms in Competitive Markets

Chapter Objectives

Little Picture: learning about the characteristics of competitive industries, including how much of a good or service they produce and at what level they price their products.

Big Picture: analyzing competitive industry behavior to obtain a better understanding of microeconomics, i.e., what forces determine the price (and market quantity) of a good or service.

This chapter covers the first type of industry in the market-structure spectrum, competition. We first encountered this structure in chapter 4 when we learned the (competitive) market supply-demand diagram. Having seen the competitive market in chapter 4, we are now going to see what the individual firms producing in that market look like, in other words, we are going to look behind the supply side of that market.

The spectrum of industry types we will look at in this course runs from **competition** (many buyers and sellers of identical products) to **monopolistic competition** (fewer sellers than competition, but differentiated products) to **oligopoly** (only several sellers of identical or similar products) to finally, **monopoly** (one seller of a product that has few if any close substitutes). That's the spectrum: competition to monopolistic competition to oligopoly to monopoly. (Unfortunately, Mankiw does not cover market structures in that particular order, from the most intense competition among buyers and sellers to the least.)

Competition, the first structure, is defined by three conditions. (What are they?) Next is an example of how a competitive firm decides how much it will produce, where

marginal revenue (MR) equals marginal cost (MC) or

MR = MC

Remember this equality, as it will come up again and again as we move along the market-structure spectrum from competition to monopoly. Why? The **profit-maximizing output rule** for ANY type of industry on the market-structure spectrum, from competition to monopoly is **MR = MC!**

To maximize profits, *all* firms (competitive, monopolistically competitive, oligopolistic, and monopolistic) produce where $MR = MC$. Always remember this because it's an easy exam question to answer. **Any and all business enterprises produce up to and including the point where marginal revenue (MR) equals**

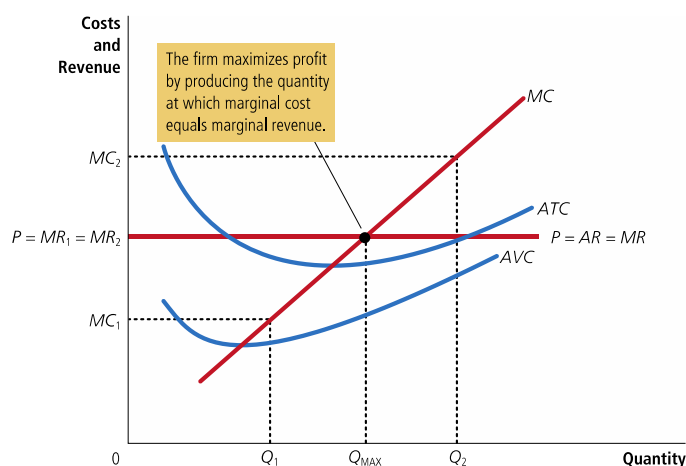
marginal cost (MC) and no further. $MR = MC$ is the profit-maximizing level of production for any type of business.

After setting up and graphing different types of costs for a competitive firm (as we did in the previous chapter for the cookies and lemonade examples), we finally arrive at our picture of the competitive firm:

FIGURE 1

Profit Maximization for a Competitive Firm

This figure shows the marginal-cost curve (MC), the average-total-cost curve (ATC), and the average-variable-cost curve (AVC). It also shows the market price (P), which for a competitive firm equals both marginal revenue (MR) and average revenue (AR). At the quantity Q_1 , marginal revenue MR_1 exceeds marginal cost MC_1 , so raising production increases profit. At the quantity Q_2 , marginal cost MC_2 is above marginal revenue MR_2 , so reducing production increases profit. The profit-maximizing quantity Q_{MAX} is found where the horizontal line representing the price intersects the marginal-cost curve.



Wow! What a convoluted mess of lines. Actually it's not bad at all when you spend a little time and take a closer look at it.

To build the analogy with what we were doing in chapter 4, recall how we horizontally summed up individuals' demand curves and arrived at the market demand curve. We started with a picture of individual demand, then derived market demand. The above is a picture of the individual firm. To derive market supply, all we do is sum up all the individual firms' MC curves and we get market supply.

From the picture above, the competitive firm produces Q_{MAX} , where (surprise!) $MR = MC$ (i.e., where the MR and MC lines intersect at the black dot in the diagram above).

Notice that the demand curve for the competitive firm above is flat and exactly equal to the marginal revenue (MR) curve which it sits directly on top of: $P = AR = MR$. (Keep in mind that average revenue [AR] is just another name for the demand curve.) If the firm produces goods or services at the level of Q_1 , it can clearly earn more in profit by producing in greater quantities since its production in the Q_1 range is

adding more to revenue (MR) than to costs (MC). This can be easily seen in that at Q_1 , the MR curve is higher than the MC curve, indicating that additional units produced will each end up adding more in revenue than costs to the firm, and thus add to profit (remember: profit = revenue - costs).

The opposite story can be found at Q_2 , where marginal (additional) costs at higher and higher levels of production are greater than marginal (additional) revenues. At that level of production, costs are being added to at a greater rate than revenues, hence marginal (additional) profits are negative and total profit is actually falling at levels of production beyond Q_{MAX} . Thus Q_{MAX} is the level of production where additional revenues are exactly balanced by additional costs. Profit at Q_{MAX} is at its maximum, which is why all firms want to produce where $MC = MR$.

Next comes the **shutdown rule**. That rule is $P < AVC$ and applies over the short run. In other words, if price falls below the *lowest point* on the average variable cost (AVC) curve over the short run, then the firm has to shut down to minimize its losses.

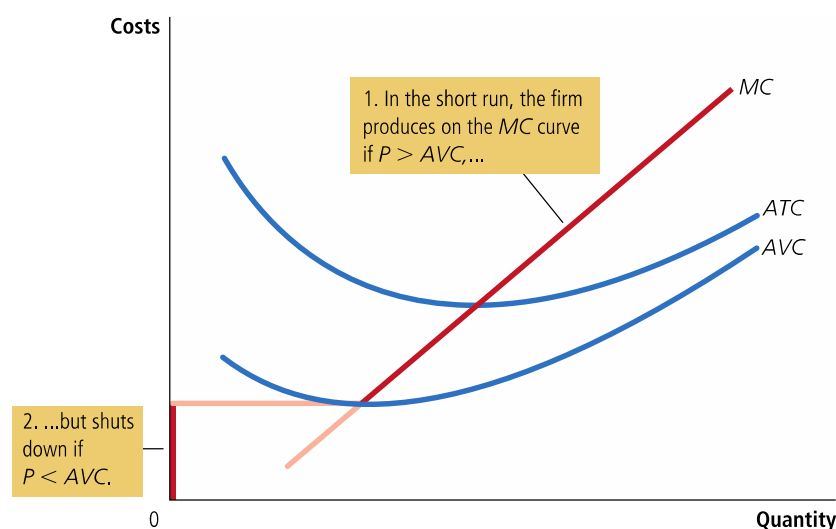


FIGURE 3

The Competitive Firm's Short-Run Supply Curve

In the short run, the competitive firm's supply curve is its marginal-cost curve (MC) above average variable cost (AVC). If the price falls below average variable cost, the firm is better off shutting down temporarily.

If you look at the diagram above you can see how this is the case. The top blue curve is the average total cost (ATC, with emphasis on *total*) curve. The blue curve below ATC is the average variable cost (AVC; emphasis on *variable*) curve. You can't have total costs without adding fixed and variable costs, simply because as we saw in chapter 13, a firm's total cost is the sum of its fixed and variable costs.

So where are fixed costs represented on the graph above?!

Not by an explicit curve but rather by the *area* between the ATC and AVC curves. All that area between the blue ATC and AVC curves represents fixed costs along the **Quantity** axis. If we shaded it in yellow it would look like a horn, starting wide in the low quantities and steadily narrowing at higher and higher quantities:

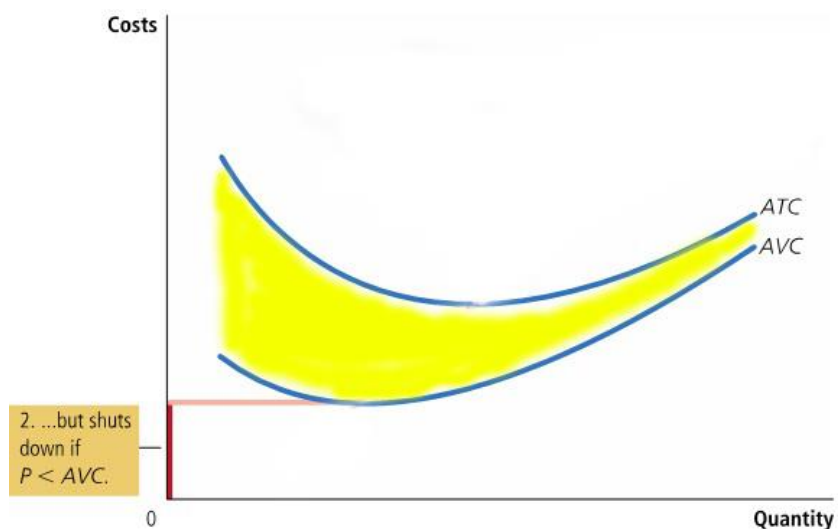


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This makes sense, given that fixed costs (per output) continually decline at higher and higher quantities. You can see this in [Figure 5 from chapter 13 \(reproduced below\)](#) where the AFC curve (fixed costs divided by quantity at all levels along the graph) steadily declines as quantity gets larger and larger:

Figure 5 from Chapter 13:

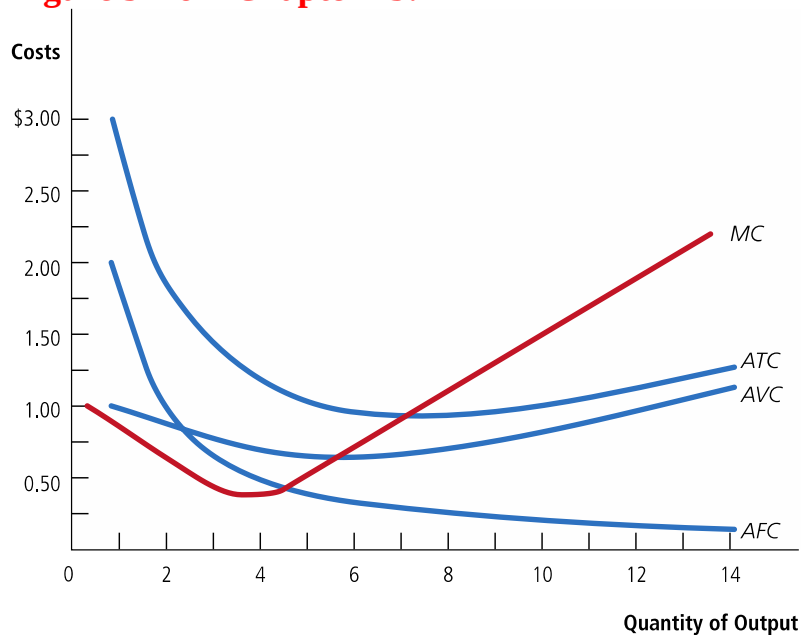


FIGURE 5

Cost Curves for a Typical Firm

Many firms experience increasing marginal product before diminishing marginal product. As a result, they have cost curves shaped like those in this figure. Notice that marginal cost and average variable cost fall for a while before starting to rise.

In Figure 3 above we're looking at *total* fixed costs (represented as an area), which are decreasing at higher and higher quantities as well.

In other words, what the shutdown rule is saying is that *over the short run* you can get away with not covering fixed costs (like rent paid on a building) but if you can't cover

variable costs, you definitely should (and usually must) shut down to minimize losses. In still other words, if you run a business, say a restaurant, you can get away with being late on a rent payment for your building (a fixed cost). By law the landlord can't forcibly evict you until at least a month later in most locales. However, if you don't pay your waiters, cooks, and *maitre d'*, they leave and you lose your ability to serve customers. Although losing the ability to cover variable costs doesn't always result in such a crippling blow to operations as in this restaurant example, it is wise in that case to just shut down to minimize losses. Better to go into Chapter 11 bankruptcy early, owing your creditors less rather than entering it later and owing them much more.

Enter and Exit Rules

The enter and exit rules apply over the long run. The exit rule is $P < ATC$, the enter rule is $P > ATC$. Again, remember that these two rules apply over the long run.

To make absolutely sure that we understand these rules, let's summarize where we are at this point in time: over the short run, the firm shuts down if it can't cover variable costs. By the time the firm reaches the long run, it still has to shut down if it didn't find a way to cover fixed costs by the end of the short run. So while the firm may have gotten away with not covering fixed costs in the short run, it certainly won't get away with not covering them over the long run. Rent on a building has to be paid, maybe not over the short run, but certainly by the long run if the firm does not want to get kicked off the property.

This is what the exit rule of $P < ATC$ is getting at. If this rule applies, then both fixed costs + variable costs (= total costs) are not being fully covered. (Likely fixed costs aren't being fully covered if the firm has not figured out a way to fully cover them in the short run.) The enter rule is intuitive from here. A firm should only enter an industry over the long run if it can initially and fully cover both its fixed and variable costs of operation.

Measuring profit is important. Recall that:

$$\text{Profit} = TR - TC.$$

Since, $Q = 1$, multiply both sides of the equation above by 1:

$$Q$$

$$\text{Profit} \cdot (1) = [TR - TC] \cdot \frac{(Q)}{Q}$$

$$\text{Profit} = \frac{[\text{TR} - \text{TC}]}{Q} \cdot (Q)$$

By definition, any total (e.g., TR or TC) divided by a quantity (Q) equals an average, therefore:

$$\text{Profit} = [\text{AR} - \text{ATC}] \cdot (Q), \text{ and since } \text{AR} = P:$$

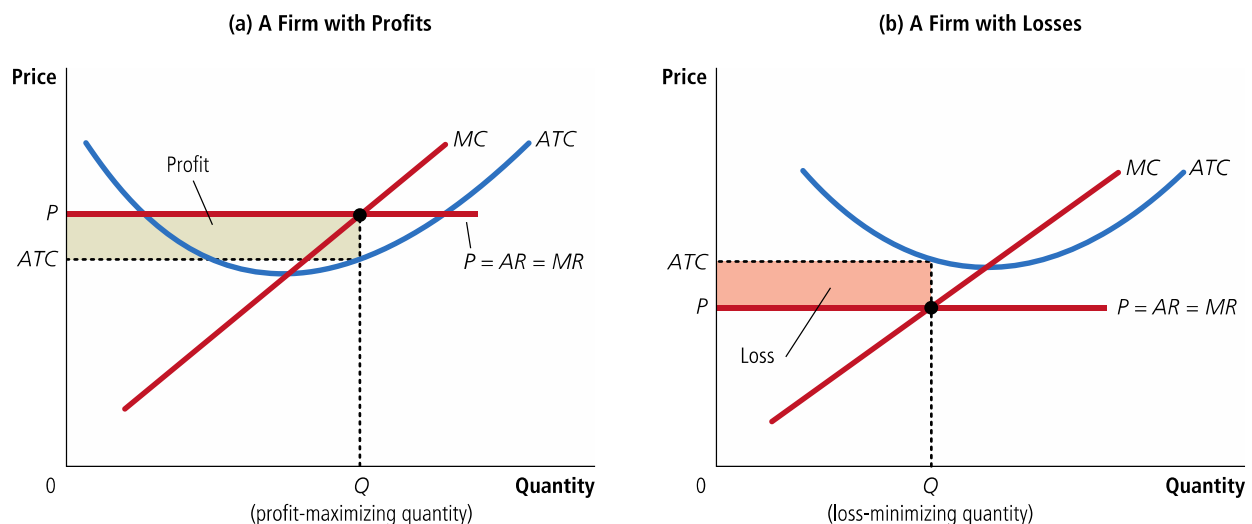
$$\text{Profit} = [P - \text{ATC}] \cdot (Q)$$

This last formula allows us to calculate profit. However, care must be taken in applying it.

FIGURE 5

Profit as the Area between Price and Average Total Cost

The area of the shaded box between price and average total cost represents the firm's profit. The height of this box is price minus average total cost ($P - \text{ATC}$), and the width of the box is the quantity of output (Q). In panel (a), price is above average total cost, so the firm has positive profit. In panel (b), price is less than average total cost, so the firm incurs a loss.



In the diagram on the left above, the difference $[P - \text{ATC}]$ is positive. This obviously won't pose a problem when calculating profit with the formula of $\text{Profit} = [P - \text{ATC}] \cdot (Q)$. The calculation of profit consists of calculating the area of a rectangle, such as the tan rectangle in panel (a) above. In the case of panel (b), a loss is being incurred by the firm. In calculating profit, this means that the difference $[P - \text{ATC}]$ will be negative. In this case keep the negative value and don't drop it as was done when calculating elasticity back in chapter 5. Multiply the negative difference by quantity and you will have computed the total loss for the firm. It would've been nice if Mankiw had provided us some numbers in the graphs above, but let's put some hypothetical numbers in anyway for illustrative purposes:

For panel (a):

$$p = \$10$$

$$ATC = \$8$$

$$Q = 1,000$$

$$\begin{aligned}\text{Profit} &= [\$10 - \$8] \times (1,000) \\ &= [\$2] \times (1,000) \\ &= \$2,000 \text{ profit}\end{aligned}$$

For panel (b):

$$p = \$6$$

$$ATC = \$8$$

$$Q = 500$$

$$\begin{aligned}\text{Profit} &= [\$6 - \$8] \times (500) \\ &= [-\$2] \times (500) \\ &= -\$1,000 \text{ or } \$1,000 \text{ loss}\end{aligned}$$

Economic profit is an area that can trip up some students. Competitive firms remain in business at zero *economic* profit (not zero accounting profit). The total cost that's just being covered at zero profit includes the implicit cost of the business: what the resources of the firm could be earning in their next-highest valued use.

In short, it's like a rate-of-return concept. At zero economic profit, the resources in their current use are earning the same rate of return that they could earn in any other area of the economy. At positive economic profits, the resources in their current use are earning a greater rate of return than they could in most other areas of the economy. These profits draw resources from other areas of the economy in terms of new entrants into the industry. In that case, positive profits in the long run will dissipate to zero as the new entrants each grab a piece of the profit pie. At negative economic profits, the resources in their current use are earning a lower rate of return than they could in most other areas of the economy. These negative profits (losses), induce resources to exit the industry for other more profitable areas of the economy.

Discussion Topics (topics requiring examples are marked with an asterisk *)

Please copy these topics exactly as written--shortening them can cause you to omit follow-up questions and thus lose points.

1. market power*
2. Briefly define all three (3) conditions of a perfectly competitive market (provide an example of only one)*
3. price takers*

4. marginal revenue (provide a quantitative example)*
5. Complete and explain: *For competitive firms, _____ equals the price of the good.*
6. When a competitive firm doubles the amount it sells, what happens to the price of its output and its total revenue?
7. Complete and explain: *In essence, because the firm's _____ curve determines the quantity of the good the firm is willing to supply at any price, the _____ curve is also the competitive firm's _____ curve.*
8. shutdown vs. exit (provide an example of only one)*
9. shutdown rule ($P < AVC$; define verbally and provide a quantitative example)*
10. Complete and explain: *The competitive firm's short-run supply curve is the portion of its _____ curve that lies above _____.*
11. sunk cost (provide a quantitative example)*
12. Why might near-empty restaurants and off-season miniature golf courses stay open?
13. Enter/Exit Rule ($P > / < ATC$; define verbally and provide a quantitative example)*
14. Complete and explain: *The competitive firm's long-run supply curve is the portion of its _____ curve that lies above _____.*
15. Complete and explain: *At the end of this process of entry and exit, firms that remain in the market must be making _____ economic profit.*
16. **Profit** = $(P - ATC) * Q$ (explain the equation and provide a quantitative example of both profit and loss)*
17. Complete and explain: *The process of entry and exit ends only when price and average total cost are driven to _____.*
18. efficient scale (provide a quantitative example)*
19. Complete and explain: *...in the long-run equilibrium of a competitive market with free entry and exit, firms must be operating at their _____.*
20. marginal firm*
21. Complete and explain: *Because firms can enter and exit more easily in the _____ run than in the _____ run, the _____ supply curve is typically more _____ than the _____ supply curve.*