Profit Maximization

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Perfectly Competitive Markets

It is essentially a market in which there is enough competition that it doesn’t make sense to identify your rivals. There are so many competitors that you cannot single out any one of them as an opponent.

Three Basic Assumptions

1. price taking
   • A price taking consumer is a consumer whose actions have no effect on the market price of the good or service s/he buys.
   • A price taking producer is a producer whose actions have no effect on the market price of the good or service it sells.
   • In general, for producers and consumers to be price takers there needs to be many independent firms and consumers in the market, all of whom, believe that their decisions will not affect prices.
   • Further there needs to be full awareness by consumers of the prices charged by all sellers in the market.

2. product homogeneity
   • Firms must produce identical or nearly identical products. That is, the products of all the firms in market must be perfectly substitutable with one another.
   • If a firm were to raise its price above the market price, it would lose all its customers.
   • Consumers must regard the competing products as equivalent. Are Cap’n Crunch a good substitute for Wheaties? Probably not. So the makers of Cap’n Crunch can increase prices without fear of losing all of its consumers to Wheaties.
   • Many firms go to great lengths to convince consumers that their product is different from seemingly identical products: (e.g. Champagne versus methode Champenoise).
   • Are two products the same or different? Ultimately, it is the customer who decides.

3. free entry and exit
   • We say there is free entry and exit into and from an industry when new producers can easily enter into and leave an industry.
   • Thus it is easy to for a buyer to switch from one supplier to another.
   • There should be no obstacles in the form of government regulations or limited access to key resources to prevent new producers from entering the market. (e.g. taxi cabs in NYC, prescription drugs)
   • There must also be no additional costs associated with shutting down and leaving an industry.
Profit Maximization

- We usually assume firm managers with to maximize profits, that is the difference between total revenue and total costs.
- We draw a distinct between economic profits and accounting profits
  
  economic profits = sales revenue − economic costs
  account profits = sales revenue − accounting costs
- Recall that economic costs include all relevant costs including opportunity costs.
- Profit maximization is consistent with maximizing the market value (i.e. stock price) of the firm.

Marginal Revenue, Marginal Cost, and Profit Maximization

- A firm’s profit is the difference between its revenue and its costs:
  \[ \pi(q) = R(q) - C(q) \]

  where
  \[ \pi(q) = \text{profits (not the number 3.14!)} \]
  \[ R(q) = \text{total revenue} \]
  \[ C(q) = \text{total economic cost} \]

- If the firm is in a competitive market we assume the firm faces a horizontal demand curve. Since the firm is a price-taker, the choice of how to sell \( q \) has no effect on the price.
  In this case \( R(q) = p \times q \). It is a straight line.
- If the firm can effect the price, we assume the firm faces a downward-sloping demand curve. At higher prices, the firm sell less output. The price it can charge depends negatively on the quantity it sells.
  In this case \( R(q) = p(q) \times q \) and the revenue function is curved.

- Marginal revenue is the change in total revenue generated by an additional unit of output. It is the slope of the revenue curve
- Profits are maximized where the slope of the profit function is zero
  \[ \frac{\Delta \pi(q)}{\Delta q} = \frac{\Delta R(q)}{\Delta q} - \frac{\Delta C(q)}{\Delta q} = 0 \]
  
  This implies that the firm maximizes profits when the marginal revenue is equal to marginal cost.
  \[ \frac{\Delta R(q)}{\Delta q} = \frac{\Delta C(q)}{\Delta q} \]
  \[ \frac{\Delta q}{MR} = \frac{\Delta q}{MC} \]

- Profit is maximized by producing the quantity of output at which marginal revenue of the last unit produced is equal to its marginal cost.

- For a firm in a perfectly competitive market (and thus facing a horizontal demand curve)
  \[ MR = p \]
  
  therefore at the profit maximizing quantity
  \[ MC(q) = p \]

- A price-taking firm cannot influence the market price by its actions. It always takes the market price as given because it cannot raise the market price by selling less or lowering the market price by selling more. Thus the additional revenue from producing one more unit is just the market price.
- For the remainder of the lecture, we will assume the firm is operating in a perfectly competitive market.
When is Production Profitable?

- Whether or not a firm is profitable depends on whether the market price is more or less than the firm’s minimum average cost.
- Recall
  
  If \( R(q) > C(q) \) the firm is profitable
  
  If \( R(q) = C(q) \) the firm breaks even
  
  If \( R(q) < C(q) \) the firm incurs a loss
- Since in a perfectly competitive market \( R(q) = p \times q \), if we divide both total revenue and total cost by \( q \) we get:
  
  If \( p > ATC \) the firm is profitable
  
  If \( p = ATC \) the firm breaks even
  
  If \( p < ATC \) the firm incurs a loss
- In other words:

  \[
  \pi(q) = R(q) - C(q) = (p - ATC) \times q
  \]
- As long as the market price is greater than the firm’s minimum average total cost the firm will be profitable.

Maximizing Profits in the Short-Run

- In the short-run we assume the firm’s capital input is fixed and must vary its other inputs (labor and materials) to vary output.
- In the short-run, even if the firm is unprofitable because the market price is below its minimum average total cost, the firm may want to stay in business and continue producing. Why?
  
  - Total cost includes fixed cost – cost that do not depend on the amount of output produced. In the short run, fixed cost must be paid, regardless of whether the firm produces or not.
  
  - Since a fixed cost cannot be changed in short run and must be incurred whether or not the firm produces, it is irrelevant to decision whether to produce or not.
- The minimum average variable cost is equal to the shut-down price, the price at which the firm ceases production in the short run.
- When the price is greater than the minimum average variable cost, the firm should produce in the short run.
- In this case, the firm maximizes its profit (really minimizes its loss) by choosing the output quantity at which marginal cost is equal to the market price.
- This means that whenever price falls between minimum average total cost and minimum average variable cost, the firm is better off producing some output in the short run. The reason is that by producing it can cover its variable costs per unit and at least some of its fixed cost, even though it is operating at a loss.

- Variable costs, however, do matter.
- Figure 8.3
- Profits are maximized at point A where \( MC = MR \) (which since we are in a perfectly competitive case is \( p \)).
- When the market price is below minimum average variable cost, the price the firm receives is not covering its variable cost per unit. A firm in this situation should cease production immediately.
  
  - Why? Because there is no level of output at which the firm’s total revenue costs its total variable costs – the costs it can avoid by not operating.
  
  - The firm maximizes its profits by minimizing its losses.
  
  - It still incurred the fixed cost in the short run but will not incur any variable costs.
The Competitive Firm’s Short Run Supply Curve

- The firm’s short-run supply curve tells us how its profit-maximizing output decision changes as the market price changes.
- As long as the market price is above the shut-down price, the firm’s short-run supply curve corresponds to its marginal cost curve.
- Below the shut-down price, the firm suspends output in the short-run.
- Anything that shift the firm’s marginal cost curve, shifts the firm’s short-run supply curve
  – price of an input

The Market Supply Curve

- Let’s go from an individual firm to a market short-run supply curve.
- We assume the number of producers in an industry is fixed in the short run. So the industry supply at any price is the sum of the quantities that each established firm supplies at that price.
- The short-run supply curve is derived by horizontally summing the supply curves of individual firms.
- The short-run market supply curve shows the quantity supplied in aggregate by all firms in the market for each possible market price when the number of firms in the industry is fixed.
- Because each firm’s supply curve coincides with its marginal cost (over the range of prices for which the firm is willing to produce positive output), the industry supply curve tells us the marginal cost of producing the last unit supplied in the market.

Producer Surplus

- Recall that earlier we defined consumer surplus as the area between the demand curve and the market price. There is an analogous concept for price-taking firms: producer surplus.
- Producer surplus is a measure of the monetary benefit that producers derive from producing a good at a particular price.
- Producer surplus is the difference between the amount the firm actually receives from selling the good in the marketplace and the minimum amount it must receive in order to be willing to be willing to supply the good to the marketplace.
- Figure 8.11 – Producer surplus for a firm
- Figure 8.12 – Producer surplus for a market

Output in the Long Run

- In the long-run a firm can alter all of its inputs. It can also chooses whether to enter or exit markets.
- In the long run can choose whether to incur any fixed cost. If over the long-run a firm cannot cover its fixed cost, the firm will make consistent losses and the firm will want to shut down and exit the market.
- In the long run firms will exit the market if the market price is consistently less than their break-even price – their minimum average total cost.
- However if the the market price is consistently above the break even point, not only will the firm keep producing and making a profit, but new firms will enter the market.
• Let’s consider this in more detail. Assume there are many firms currently active in a market and many of the potential producers. Further assume all firms face the same costs.

• If the market price is above the break-even point, new firms will enter the market. This will shift the industry supply curve to right. Move down the demand curve.

• This process keeps occurring until all firm make zero economic profits.

• Remember when are computing economic profit we are including opportunity costs (which do not show up in accounting profits). So these costs include the return a business owner could get by using his or her resources elsewhere.

• Because of entry and exit, an increase in prices attracts more entrants in the long run, resulting in a rise in industry output and thus downward pressure on prices. A fall in prices induces existing producers to exit in the long-run, generating a fall in industry output and upward pressure on prices.

• Entry and exit has the effect of flattening out (i.e. making more elastic) the long-run supply curve.