Supply Curve Review

- Height of the demand curve represented the marginal benefit or willingness to pay for a good
- Height of the supply curve will represent the price that producers must receive to be willing to produce another unit
  - Supply measures MC (more on this later)
  - For all but the last unit, the price received is greater than the minimum price needed to produce the good so there is a gain (PS)
  - PS is the area above S and below P and left of the quantity suppliers are selling
    - EXAMPLE: Binding price floor when govt. buys up excess supply

Efficiency

- Pareto efficient: a situation in which it is not possible to make someone better off without making someone else worse off
  - Contrast with equity: $1 for each student vs. $35 for one – both Pareto efficient
  - Pareto inefficient: show that removing a tax makes both consumer and producer better off in terms of surplus
- First Welfare Theorem: a competitive market results in a Pareto efficient outcome (under some assumptions that are not always true in real life or later in the course).
- Second Welfare Theorem: Any Pareto efficient outcome can be achieved via a competitive market given the ability to transfer wealth between agents.

Production and Firm behavior

- Production Function
  - Function machine: inputs (labor, capital(machines, buildings)) \( \rightarrow \) outputs (goods)
  - Definitions
    - Total Product TP = Q given some amount of input, X
    - Average Product AP = Q/X
    - Marginal Product MP = \( \Delta Q/\Delta X \)
  - Law of diminishing returns (Law of diminishing marginal product)
    - As the quantity produced increases, at some point the MP will be decreasing (note it can be increasing in the beginning, for small Q)
  - EXAMPLE: Homework 5 #1
    - Calculate AP and MP
    - Note that MP is put between the rows
    - Graph numbers
      - MP in between points
      - Note assuming can produce fractional units so smooth lines
      - MP crosses AP at max of AP
        - Story about relationships between MP and AP
  - Basic profit maximization
    - Define TR, MR, TC, and MC
      - MR = \( \Delta TR/\Delta Q \)
      - MC = \( \Delta TC/\Delta Q \)
    - Marginal Analysis
      - If can produce fractional units, equate MR = MC
      - If can’t produce fractional units then keep producing more as long as P >= MC and don’t produce if P < MC
      - EXAMPLE: Homework 5, #2
        - Focus on basic procedure – do optimal and producer surplus
• Cost function analysis
  • Define FC and VC
    ▪ FC: must pay these costs (in the short run) regardless of how many units are produced
    ▪ Long run: in long run can avoid paying FC – this is definition of long run.
    ▪ VC: usually labor costs, usually only incur them when producing something
    ▪ TC = FC + VC
  • Define ATC, AVC, and AFC
    ▪ ATC = AFC + AVC
  • EXAMPLE: Homework 5, #3
    ▪ Produce even if profits are negative
    ▪ Fixed costs don’t affect optimal production level, but to affect profit
  • Cost Graphs

  • Draw Graph
    ▪ Discuss AFC as dist btw ATC and AVC curves
    ▪ AFC falls with Q so gap between ATC and AVC shrinks
    ▪ ATC falling when MC below it and rising when MC above
    ▪ ATC is at a minimum when at Q such that MC = ATC
    ▪ Same applies to AVC
    ▪ Show optimal quantity choice on graph (P=MC), note graphs assume can produce fractional units, so this holds
    ▪ Show TC and VC areas on graph

  • Short-Run
    ▪ Firms are stuck in the business – can’t escape paying FC
    ▪ We’ve already seen that in the short-run it can be optimal to produce even when receiving a negative profit, since we will lose less than we will if we stop producing (“shut down”)
    ▪ When produce even though making a negative profit?
      ▪ \( \Pi_0 = -FC \) when producing nothing
      ▪ \( \Pi_1 = TR - TC = TR - FC - VC \) when producing a positive Q
      ▪ \( \Pi_1 \geq \Pi_0 \) (note indifference) \( \Rightarrow TR - FC - VC \geq FC \Rightarrow TR \geq VC \Rightarrow P \geq AVC \)
      ▪ So… in Short-Run, produce if \( P \geq AVC \), shut down if \( P < AVC \)
    ▪ Conclusion: supply curve (in short run) is upward sloping portion of supply curve above AVC
    ▪ Downward sloping portion would actually minimize profits (bad)

  • Long-Run
    ▪ In the long run, the firm has the option of quitting the business and avoiding FC
    ▪ When would we stay in an industry? \( \Rightarrow \) when profits are positive – making money
    ▪ \( \Pi \geq 0 \Rightarrow TR - TC \geq 0 \Rightarrow TR > TC \Rightarrow P \geq ATC \)
    ▪ So… in Long-Run, produce if \( P \geq ATC \), exit industry if \( P < ATC \)
Consultant Problems – implementing all of this stuff
1. Is profit being maximized? Is \( P = MC \)?
   a. If \( P > MC \) \( \Rightarrow \) produce more
   b. If \( P < MC \) \( \Rightarrow \) produce less
   c. If \( P = MC \) \( \Rightarrow \) producing the right amount, go to step 2…
2. Should the firm produce in the Short-Run? Is \( P \geq AVC \)?
   a. If \( P < AVC \) \( \Rightarrow \) shut down in the short-run (produce zero)
   b. If \( P \geq AVC \) \( \Rightarrow \) produce in the short-run, go to step 3…
3. Should the firm produce in the Long-Run? Is \( P \geq ATC \)?
   a. If \( P \geq ATC \) \( \Rightarrow \) produce in the long-run
   b. If \( P < ATC \) \( \Rightarrow \) exit the industry in the long-run

EXAMPLES

- Possible answers are: correct, inc \( P \), dec \( P \), inc \( Q \), dec \( Q \), shut down SR, ok SR exit LR
- Gerson notes: \( P=4 \), \( Q=20,000 \), \( TC=32000 \), \( ATC \) @ min, \( MC \) rising (ans. increase \( Q \))
- Gerson notes: \( TR=1800 \), \( TC=1200 \), \( VC=900 \), \( AVC=1.50 \), \( MC=3 \) rising (correct)
- Gerson notes: \( TR=200 \), \( FC=400 \), \( ATC=8 \), \( AVC=6 \), \( MC=12 \) rising (ans. Decrease \( Q \))
- Gerson notes: \( P=5 \), \( Q=1000 \), \( FC=400 \), \( AVC=6 \), \( MC=5 \) rising (ans. Shut down)

Relationships

- Relating Product discussion to Cost discussion
  - \( MC = \frac{w}{MP_L} \)
  - \( AVC = \frac{w}{AP_L} \)
- \( VC = \sum MC \)
  - Give example from HW6 Q3 (new problem sets HW6 PI Q1)
- Producer Surplus – this is the hardest thing to deal with (for me at least)
  - \( TR = PS + VC \) (show it on graph, note how \( VC = \sum MC \) is involved)
  - \( \Delta \Pi = \Delta PS \)
    - \( \Pi = TR – TC = TR – VC – FC = PS – FC \)
- Go over entire Production Relationships Handout