Worked Production and Cost

Half Week?

- Why we have only one module this week. There will be two next week.
- The next modules on perfect competition trough monopoly are the hard ones in the class.
- We are currently about two weeks behind the usual for in-person courses.

Exercise 1 (Groups)

Give three examples, with context, of: + Fixed input/cost + Variable input/cost

Give the reason why you think the input/cost is variable or fixed.

Nominate a speaker.

A few Rules on costs

- FC is fixed
- $TC = VC + FC$
- $VC(0) = 0$
- $AC = AVC + AC = \frac{TC}{Q} = \frac{VC}{Q} + \frac{FC}{Q}$
- $MC(Q) = TC(Q+1) - TC(Q) = VC(Q+1) - VC(Q)$ The non-calc definition varies by textbook. Caution.

Exercise 2 (Whole Class)

Fill in the blank and say why.

Q	TC	VC	FC	AC	AFC	AVC	MC
0	2						3
1	5						
3	12						

Exercise 3 (Groups)

Q	TC	VC	FC	AC	AFC	AVC	MC
0							
1		2	5				
4	20						x

About the diagrams

You tend to see two kinds in the book:

1. Linear Marginal Cost ($MC = \alpha q$):
   - $AVC = \frac{\alpha}{2} q$
   - Profit maximizing is just where lines cross.
1. Parabolic Average variable cost ($AVC = \alpha(q - m)^2 + b$)
   - Shows the increasing marginal product of labor, declining marginal cost range.
   - Infinities for low q.

Getting Diagrams Right is Key

You need to be able to see the relationships.

- The steps and graphical hints are mostly to help you see the basic relationships.
- There are a few mathematical requirements, e.g., MC cuts AC at the min of AC, but otherwise the hints are to give you enough space to see areas.
- The order is different depending if you are drawing linear marginal cost or parabolic AVC.

Steps: Linear Marginal

- Axis with labels. \$ or costs list, AC, MC, etc and q/t is fine.
- Draw in MC as a line with zero intercept
- AVC line half as steep as MC with intercept at zero.
- AC is hard:
  - AC = AFC + AVC
  - Starts far above AVC since AFC is large for small q.
  - Gets closer to AVC as q increases
  - Is cut by MC at the minimum.
  - Looks like a skewed parabola

Try it. Four people at a time in groups.

Steps: Parabolic AVC

- Axis with labels. \$ or costs list, AC, MC, etc and q/t is fine.
- Draw AC as a smile that covers about 2/3 of your graph.
- MC looks like a fish hook or Nike Swoosh that cuts AC at the minimum.
- AVC is hard:
  - AC = AFC + AVC
  - Starts far below AC since AFC is large for small q.
  - Gets closer to AC as q increases
  - Is cut by MC at the minimum.
  - Looks like a skewed parabola

Try it. Four people at a time in groups

So now what?

At this level, economics has a specific modus operandi

- Figure out what the actor wants, the objective function.
- Figure out the constraints, costs, income, . . .
- Maximize (or minimize) the objective function subject to those constraints.

We will assume that the goal of the firm is profits, Π, which we define as revenue less costs.

Warning

- Costs are more expansive to an economist.
  - We include opportunity cost.
  - Imputed salary of owner that takes no salary.
  - Impute rent when firm owns property, even things like desks
- Because Costs are Different – Profits are different.
  - Net Income, profit to an accountant, is always more than economic profit.
  - We include costs they don't

Implication

$$Accounting\ Profit - Opportunity\ Costs = Economic\ Profit$$

Just because you have positive accounting profits, net income, does not mean you have positive economic profits

Profit

$$\Pi = Rev(q) - Cost(q)$$

- Positive profit
  - Greater than can be achieved elsewhere in the economy for the same risk.
  - Expect net entry soon
- Zero or Normal Profit
  - Equal to what can be achieved elsewhere for the same risk.
  - No net entry or exit
- Negative: Less
  - Net exit

Note that risk is built in. The higher the risk the more profit needed.

Example

- A very safe 2% return may be positive economic profits.
- A very risky 15% return may be negative economic profits.

So what Does the Firm do?

Competitive firms observe a price and choose output to maximize profit.

- They can't control price and can only react.
- Profit, not maximum per unit.
- Calc people will see this as an optimization problem.

Forget this formula

$$\max_q R(q) - C(q)$$

Profit Max Q with Marginal Revenue and Marginal Costs

Steps

- Find q^* where $MC = MR$
- Start at q^* go to AC and hang a left.
  - That is AC^*.
  - Box is Total Cost, $TC^* = AC^* q^*$
- Start at Start at q^* go to $AR = P = MR = D_{firm}$ and hang a left.
  - That is AR^*.
  - Box is Total Revenue, $TR^* = AR^* q^*$
- Little box on top is profit.

Positive Economic Profits (AR $>$ Min AC)

Weird sunglasses shows up when there is positive economic profits.

Negative Economic Profits (AR $<$ Min AC)

Negative Profits

- No Weird sunglasses thing but a funny triangle.
- Does not mean you go out of business or exit.
  - But you could make more in another industry.
- There is a shut-down condition
  - If AVC $>$ AR, shut down
  - Not out of business.
- Why all stores are not 24/7.
  - The revenue from staying open (AR) is less than the costs of lights and labor (AVC).
  - Exit and Entry is a long term topic which we handle elsewhere.

Why Shutdown?

$$\Pi = TR - FC - VC$$

When TR<VC you are better off just paying FC and let $TR = 0$ and $VC = 0$.

$$\Pi = (TR - VC) - FC < -FC$$