

McPeak  
Lecture 8  
PPA 723

Costs.

We are leaving selling price / revenue out of the picture for the moment, but we are adding in the issue of input costs.

Economic cost. Includes both the explicit and the implicit cost. Full accounting of cost to society.

There are counterfactual, competing allocations that underlie this concept.

“Opportunity cost” of time is the idea for the implicit cost.

What you could have done with that time – the cost of leisure includes the foregone income if you could have had if you worked instead; the cost of staying home to care for children includes the foregone wages you could have gotten; the cost of studying includes the foregone income you could have gotten...

These costs plus the explicit costs (leisure the cost of the gas and bait and dock fees for your fishing trip; child care the strollers, slings, toys for home; the studying the books, tuition, fees,...) lead to the full cost.

Coming to study here for a year has both an explicit cost of what you pay to attend and an implicit cost in terms of the foregone earnings opportunity of the year you spend here.

You bought that year from yourself in a sense.

[This gets us towards thinking about zero economic profit. The next best alternative is another form of investment that earns a positive rate of return (more on this later).]

If you own a piece of land and choose to build a house on it, the full cost of building the house are the material, labor,...costs plus the current value of the land (by building you are not selling the land).

In a perfectly competitive market with no externalities and no dynamic implications, market price reflects economic cost.

If this is not the case, economic cost can deviate from market prices.

Historical cost is not important, but actual cost is.

Concept of sunk cost – an expenditure that can not be recovered but for scrap value.

486 computers.

Soviet economic planning details.

The value of these is what the market will bear currently, not what it cost when you obtained it.

Short run costs.

Fixed cost- the production expenses of the firm that do not vary with output.

Costs of inputs the firm can not feasibly vary in the short term.

Variable cost- production expenses that change **with the quantity of output produced.**

Total cost is variable cost plus fixed cost.

Three average cost measures are derived from the fact that:

$$TC=VC+FC.$$

Divide through by  $q$ .

$(TC)/q$  is average cost. Total cost divided by units of output produced.

$(VC)/q$  is average variable cost. Variable cost divided by units of output produced.

$(FC)/q$  is average fixed cost. Fixed cost divided by units of output produce.

$$AC=AVC+AFC$$

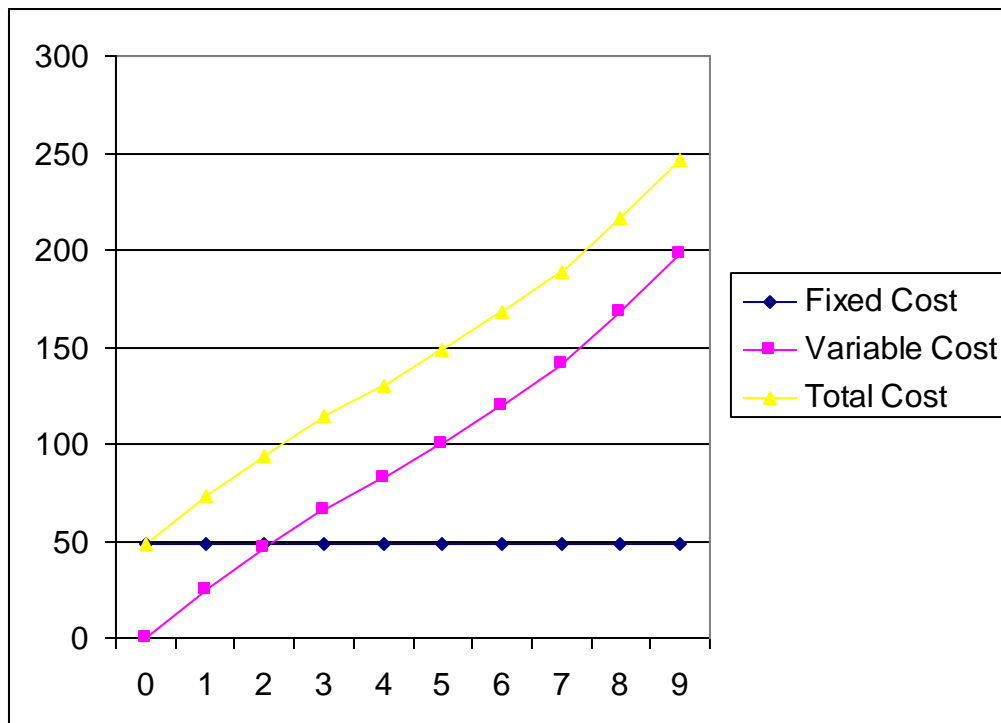
In addition, we can add in one more cost concept. Marginal cost is the amount by which the firm's cost changes in order to produce one more unit of output.

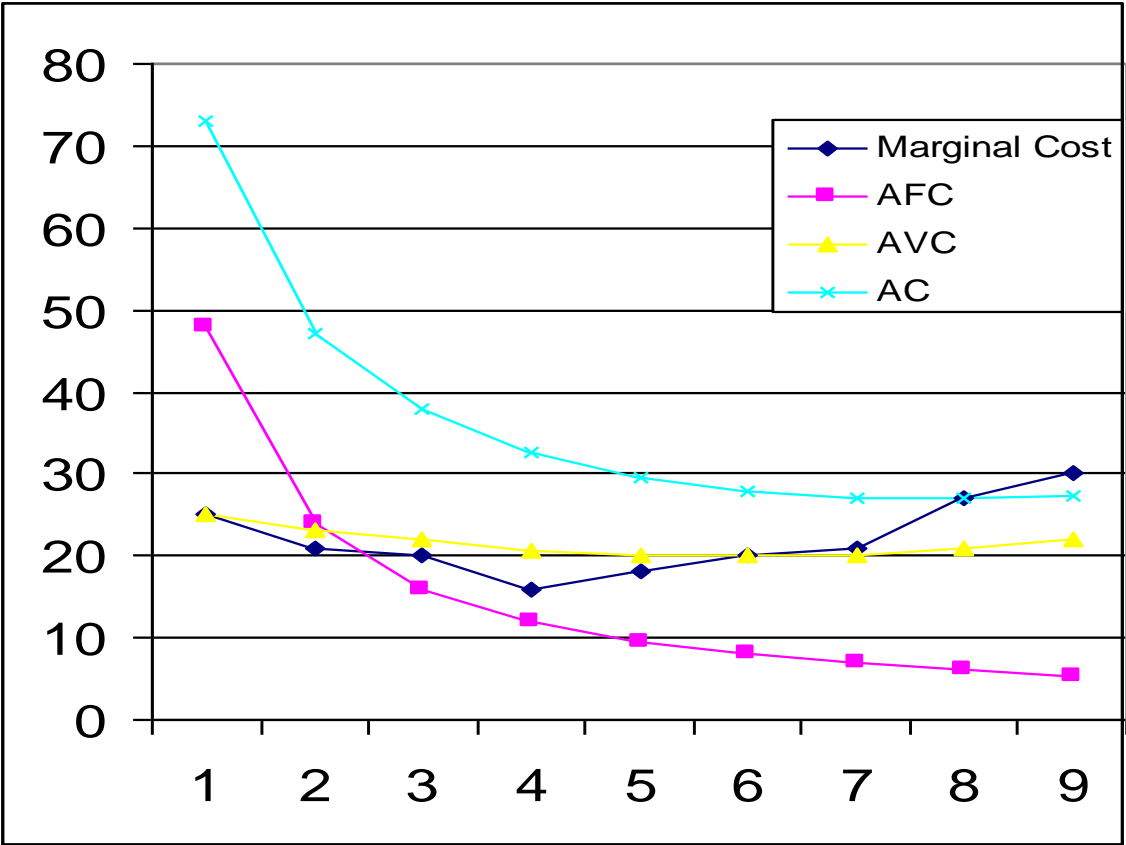
$$MC = \frac{\Delta C}{\Delta q} = \frac{\Delta VC}{\Delta q}$$

**WARNING - FOR THE FIRST TIME, WE ARE PUTTING CHANGE IN Q or Q IN THE DENOMINATOR. THIS IS IMPORTANT TO KEEP TRACK OF.**

## Example from the book

Output	Fixed Cost	Variable Cost	Total Cost	Marginal Cost	AFC	AVC	AC
0	48	0	48	NA	NA	NA	NA
1	48	25	73	25	48	25	73
2	48	46	94	21	24	23	47
3	48	66	114	20	16	22	38
4	48	82	130	16	12	20.5	32.5
5	48	100	148	18	9.6	20	29.6
6	48	120	168	20	8	20	28
7	48	141	189	21	6.9	20.1	27
8	48	168	216	27	6	21	27
9	48	198	246	30	5.3	22	27.3





The average cost curve is the vertical sum of the average variable cost curve and the average fixed cost curve (look back at numbers in table and this graph).

The minimum of the average cost curve is where the AC curve is crossed by the MC curve (look back at numbers in table and this graph).

AVC and AC fall when MC is below them, and rise when it is above them. [if the cost of producing one more unit of output is below the current average, the average calculated at the next point will be lower, if higher, then higher].

[can recall example of marginal person entering the room and changing average height in the room]

Return to the production function idea, and recall diminishing marginal returns to production.

Show production function.

X-axis is input level. Multiply by cost of the input.

Then we have output as a function of input cost.

Tip it over, and we have cost as a function of output.

Given input prices, the shape of the cost curve is determined by the production function.

The shape of the production function is determined by marginal returns, with the possibility of increasing returns to scale over low range of output and decreasing returns to scale over high ranges of output.

[show graphs]

This relationship between the production function and the marginal cost curve leads to the following relationship.

$MC = \text{change in cost} / \text{change in quantity}$ .  
[Cost is VC or C]

$MC = \text{cost of input times change in input} / \text{change in quantity}$ .

Remembering marginal product is change in quantity divided by change in input, we can state:

$MC = \text{cost of input} / MP$

A similar process holds for the Average Variable Cost, so that we can say:  $AVC = VC/q$  or cost of input \*input level / output level. This means  $AVC = \text{input cost} / AP$ .

Summary:

7 short run cost concepts.

Total cost.

Fixed cost.

Variable cost.

Average cost.

Average fixed cost.

Average variable cost.

Marginal cost.

Long run costs.

What is the value of fixed cost  $F$  in the long run when there are no fixed inputs? Zero, since all inputs can be adjusted.

[Note idea of avoidable cost. There may be costs in the long run that do not vary with output except in the binary sense].

Three long run cost concepts:

Total cost.

Average cost.

Marginal cost.

An isocost line. A line tracing out different combinations of inputs with given input prices that can be obtained at identical total cost.

The maximum amount of inputs that can be bought given input prices at a given total cost level.

Draw example for  $C=10$ ,  $w=2$ ,  $r=1$ . Then  $C=20$ .

Again, note that we are saying it is long run cost since two variable inputs, but could also have two variable inputs in short run if a third is fixed. The key here is that we assume there are two inputs to production and both of them are variable (K and L).

The slope is determined by the negative of the relative price ratio.

Discussion here of deriving the slope of the budget line from the cost function, and why the expression depends on whether you put K or L on the y-axis.

An isoquant is like an indifference curve.

An isocost is like a budget line.

However, there is a difference in how we treat a budget line and an isocost line. Remember the consumer had fixed income  $Y$  in the consumer theory section. Here there is nothing exogenous to cost, so we have to think about it differently. Firms are choosing cost level, while the consumer was not able to choose income level.

Producing in a way that is technically efficient (meaning?) and in a way that is cost minimizing is economically efficient.

We are technically efficient on the isoquant curve remember.

Draw isoquant / isocost and contrast points.

3 ways of conceptualizing how we arrive at an economically efficient, cost minimizing point.

- 1) Lowest isocost rule. Minimum cost subject to producing a given output level efficiently (being on an isoquant).
- 2) Tangency rule. The point where the isoquant is tangent to the isocost line. Where the slope of the isoquant (MRTS) is equal to the negative of the input price ratio.

$$\text{MRTS} = \frac{\Delta K}{\Delta L} = -\frac{\text{MP}_L}{\text{MP}_K} = -\frac{\text{wage}}{\text{rental}} = -\frac{w}{r}$$

- 3) Last dollar rule. Pick input bundle so that the last dollar spent on one input adds as much output as the last dollar spent on the other input.

$$\frac{\text{MP}_L}{w} = \frac{\text{MP}_K}{r}$$

The expansion path traces out the cost minimizing combination of inputs for each output level. If we look at the line traced out by the tangency points, we trace out a line of economic efficiency.

We can take the information from the expansion path to trace out a long run cost curve (note the use of the isocost and isoquant labels, which differs from what we did for the demand curve derivation).

[show derivation]