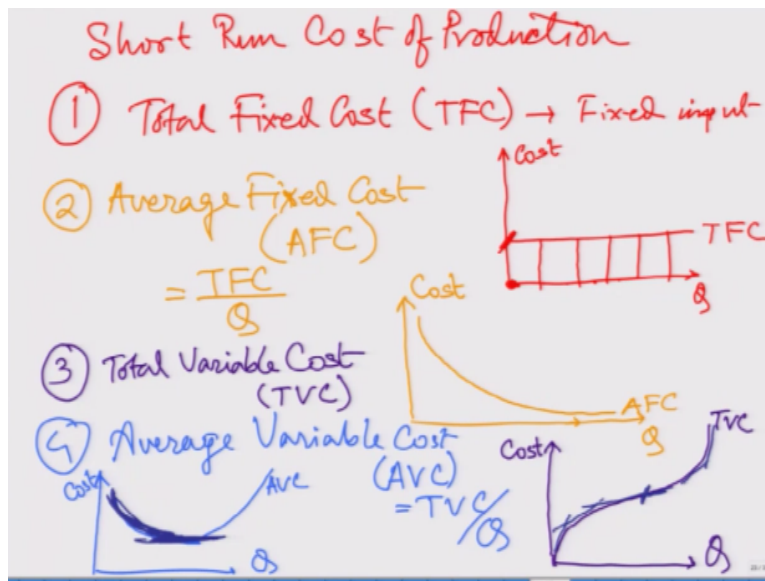


Economics of Health and HealthCare
Prof. Deep Mukherjee
Department of Economic Sciences
Indian Institute of Technology- Kanpur
Prof. Angan Sengupta
Department of Management, Amirtha Vishwa Vidyapeetham, Bangalore

Lecture - 15
Introduction to Cost Theory

Now in a short run cost curve we have several components of cost generally. The first one is fixed cost, first of all in a short run cost curve again you know in a short-run what happens that I can only change maximum one production factors of production. If I have 2 factors of production or 2 input firm, I can maximum produce 1 factors of production. So considering we are on a short-run production function or in a short run cost of production we will try to learn about different cost structures.

(Refer Slide Time: 01:01)



So in a short-run cost of production, the first one is fixed cost or you can write it as total fixed cost or TFC. Total fixed cost is the amount of cost even if production is 0, the amount of cost I need to spend or I need to incur that is my total fixed cost, that is, it is generally the rent of a hospital building you know even if I do not give any immunization the amount of immunization or the you know the vaccines I have procured that is my fixed cost right.

Even if they are not being utilized or if just only 1 bulb in our hospital building which is non-functional is on that is my fixed cost. So the total fixed cost is associated generally with the fixed input which is not varying. So the total fixed cost is associated with the fixed input.

Now you remember we are talking about a short-run production function or short-run costs of a production function where we will have fixed inputs right.

So a total fixed cost curve will look like a straight line parallel to the x axis where my x axis will show the quantity and y axis will show the cost that means when I increase my quantity my cost has remained same this is the fixed cost because my fixed input is not changing at all yes. When I increase my quantity my cost is remaining same. So this is my total fixed cost and this is the amount I have spent behind my fixed inputs yes.

So even if there is no production the output is 0, I incurred this amount of cost and whenever it is increasing, it is not increasing the total (()) (03:33) I mean quantity is increasing total fixed cost is not increasing so that is where total fixed cost is horizontal line parallel to the x-axis of course.

So the average fixed cost AFC is total fixed cost divided by the total production total output that is the average fixed cost and total fixed cost remaining same constant but the output being increased what happens this that numerator remains constant denominator increases that means average fixed cost will continuously go down.

Therefore, the average fixed cost curve will look like a downward sloping curve, you know this is my average fixed cost curve, this is my quantity, this is my cost, but it will never touch 0 because total fixed cost is not 0. So the numerator is not 0 and the number of quantity may increase to 1000 so it can tend to 0, but will never eventually be 0, if total fixed cost is not zero in a short run, yeah.

So this is my average fixed cost and total fixed cost, but there are variable inputs. So my variable inputs the costs associated to the variable inputs is known as total variable cost, the cost associated to the variable inputs is known as total variable cost and the total variable cost curve will look like a kind of sigmoid curve, S shaped this is my total variable cost here I have my cost and here I have my quantity that means when quantity increases the cost initially rises at a high rate, increases at an increasing rate.

So you know increases at a decreasing rate, so it increases fast and then the rate decreases, gets flattened and then it again increases. So the total variable cost is kind of a sigmoid curve

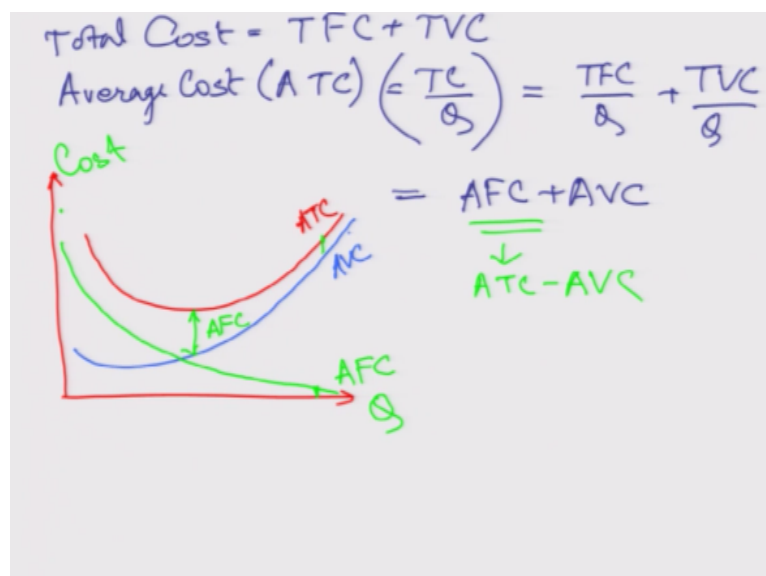
and if you see you get a new bike or a new vehicle initially as the you know the mileage is low the cost is higher you know the total variable cost is high and then slowly it starts decreasing but it never falls you know, it increases with the amount of kilometers you were running, the vehicle is running.

So the total variable cost keeps on increasing, but the rate of increment is declining flattening up and then after a certain while when it moved to a certain thousands of kilometer it again goes up because of high depreciation cost on wear and tear and the average variable cost can be given as the total variable cost divided by the quantity total variable cost divided by the output and it can be shown as a inversely U-shaped curve.

This total variable cost can be shown as an inversely U shaped curve and this is my quantity, this is my average variable cost, this is my cost. So the total average variable cost will first come down, will hit rock bottom minimum, will touch the minimum and then it again starts increasing because the total variable cost starts increasing at an increasing rate. So when it flattens you know at this period so your total variable cost increases at a decreasing rate right.

Total variable cost increases at a decreasing rate, the curve is being flatter, yeah, so and this stretch is shown by this part of the average variable cost where which is decreasing you know per unit cost is decreasing and after a certain while it starts increasing. So at this point it touches the rock bottom and then it starts increasing because it starts the total variable cost starts increasing at an increasing rate it becomes steeper.

(Refer Slide Time: 08:50)



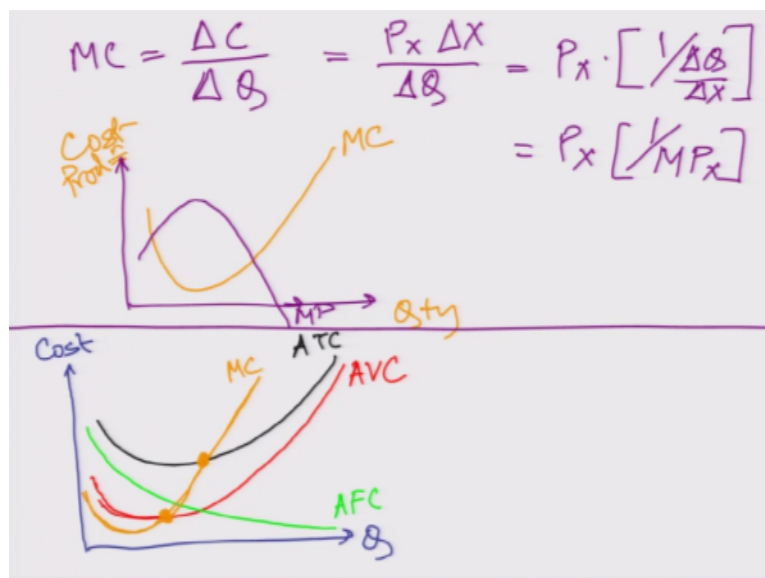
Eventually the total cost, total cost is the summation of total fixed cost plus total variable cost similarly average cost or average total cost you can write it either AC or ATC is the, this is the total cost/Q is total fixed cost/Q + total variable cost/Q. So the average total cost is nothing but average fixed cost, summation of average fixed cost + average variable cost and if I plot them I will get a curve like this.

My average total cost curve and this is my average variable cost curve and this is this difference is nothing but my so if this is my average variable cost this is my average variable cost and this is my average total cost then this difference is nothing but the average fixed cost which is like this and this difference is my average fixed cost right it is AFC is nothing but $ATC - AVC$.

So this amount is this amount, this amount is this amount and this amount is this amount yeah. So this is the difference and this is my average fixed cost and which is over here quantity and over here cost and finally the marginal cost curve or the marginal cost again marginal is incremental and which is changing which is incrementing that is the cost. Why cost changes that is because of the quantity.

Marginal product shows what changes the product, total product because of capital and labor so when we discussed or the marginal utilities, utility is changing because of number of commodity, similarly cost is changing because of number of production.

(Refer Slide Time: 11:20)



So my marginal cost curve will be given as change in cost by change in quantity being produced. So it shows that how much cost additionally I have to incur if I produce one extra unit of output. How much cost I have to produce if I have to incur one extra output and this C can be given as change in the number of say labor or whatever with the price multiplied by the price of labor.

So it can be changed in the price of X which is the unit or any factor which causing the change in cost multiply the price of that particular factor divided by ΔQ and eventually we can call it $P_x \cdot \frac{1}{\Delta Q / \Delta X}$, cannot we, so this $\Delta X / \Delta Q$ is inverse, $\Delta Q / \Delta X$ and this $\frac{1}{\Delta Q / \Delta X}$ is nothing but $1/\text{marginal product of X}$. Change in output because of change in input X.

So that is the marginal product in change in X. So MP had an inverted U-shape right. MP marginal product had an inverted U-shaped curve if you remember yes. Marginal cost have a U shaped curve. This is my marginal cost curve. So if MP was like this my marginal cost is like this. Yes, this is an U shaped curve just opposite. So this is my quantity and this is my cost for this marginal cost or production for the marginal product curve.

So therefore if I bring all this together if I bring all these curves together then I will have an average total cost curve, I will have average total cost curve, I will have an average variable cost curve. I will have an average fixed cost curve given my quantity and cost here, just keep it, this is my MP yeah and my marginal cost curve will be my marginal cost curve what colour shall I take I can take this orange one.

The marginal cost curve should be something like this, this is my marginal cost curve which will intersect the average variable cost and average total cost on it is minimum points, remember that, which will intersect. So the average total cost and average fixed cost closer to each other because the average fixed cost is being slowly smaller and smaller and smaller and this marginal cost curve will win on it is way to rise it will cut or intersect the average variable cost and average total cost on it is minimum point. Thank you.