An Introduction to Microeconomics
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Lecture - 97
Cost Function in the Long Run

So, now let us talk about we have already talked about cost function in the long run and let us bring here return to scale that we learned earlier.

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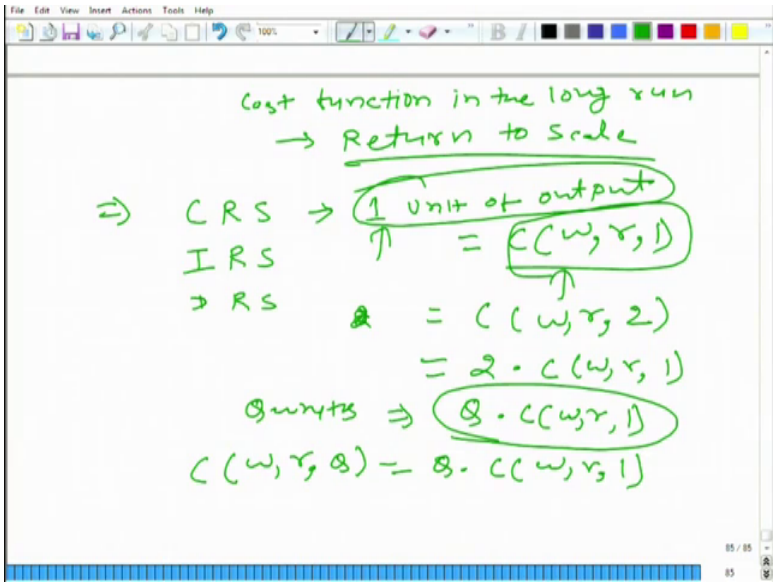

We learned return to scale in the context of production technology and we learned 3 different kind of return to scale 1 was CRS that is constant return to scale, then what we had IRS increasing return to scale and then we had DRS decreasing return to scale.

So, what do we mean by constant return to scale what do we get in the constant return to scale or when do we get the constant return to scale, when we can replicate the production process as it is; If we keep on replicating if we let us say if we are producing 1 unit if you are producing 1 unit of output 1 unit of output, of course in that case cost function is going to be a function of w r and of course 1.

If we have constant return to scale it means we can replicate this process again. So, for 2 units what would happen? We will do this twice because, the idea is to minimize the cost to produce 2 units and in CRS, what happens? It is same this production for the second

unit is exactly same as the production for the first unit and for the first unit we have already figured out this is the least cost way.

So, what do we mean when we are producing we are getting this cost twice. So, to produce 2 units what will happen? The cost is going to be of course this, but this is nothing but 2 multiplied by C of w r comma 1 is not it and so if we are producing Q units cost is going to be Q times of cost of producing 1 unit. So, that cost of producing that unit is minimized.

So, in the constant return to scale what do we get C of w r and Q is equal to Q multiplied by C of w r comma 1 that production process is being replicated again and again and again Q times, then only we are getting this constant returns to scale is it clear.

Student: Yes sir.

We come back to this, but let us see what happens in the increasing return to scale.

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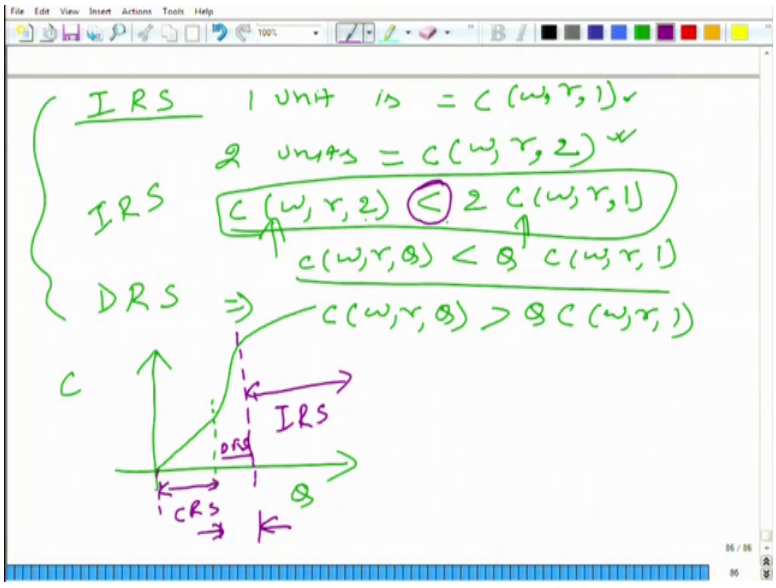

The cost to produce 1 unit is C of w r comma 1, when we produce 2 units the cost is going to be C of w r comma 2 can we talk about any relationship between these 2.

Student: Sir C of w r 2 would be greater than C of w r 1.

Less than C look at it C of w comma r comma 2 is going to be less than 2 of C of w comma r comma 1, why remember this is increasing return to scale if you double all the

inputs; what you get is output gets more than doubled. So, now we are talking about to produce 2 units of output. So, you do not need to double all the inputs.

Student: Yes sir.

Something less than you know it depends on the how great that scale is ok. So, you do not need to double. So, it should be something less than doubling and that is what we are getting here. So, in this case we get in IRS case what is true C of producing 2 units is less than twice of producing cost of 1 unit and remember this cost function is not just any cost of producing 2 units by any combination of inputs, but a particular combination of input that minimizes the cost of producing that particular level of output and similarly, if we extend the same logic what do we get in the decreasing return to scale.

Let me write it here for the Q unit C of w comma r Q it is going to be less than Q of and in decreasing return to scale we get opposite of this. So, basically what we get is it clear, cost would be to produce Q units the cost is going to be more than the Q times of the cost of producing 1 unit at the least cost combination of inputs, fine. So, if I draw a curve here of course, here we have defined globally but here I am going to use local concept what let me draw the total cost curve and here we have C here we have Q and if we have this this kind of curve, can I say in this shown in this zone it exhibits CRS and in this zone it exhibits can you tell me what does it.

Student: Sir, IRS.

Drs

Student: DRS.

Because see here the rate of increase of cost is higher than the constant return to scale, what did we learn just that it should be lower than here let us look at it is the. So, in this zone it is DRS cost has started increasing in this zone at higher rate and in this zone what we have is increasing return to scale, is it clear why we are getting it.

Student: We are increasing the Q by lesser amount then we are getting the same change in cost.

Ah So, it definitely what we have is decreasing return to scale in that case, now there is another way to look at this return to scale; what we can define is something called average cost, what is average cost ?

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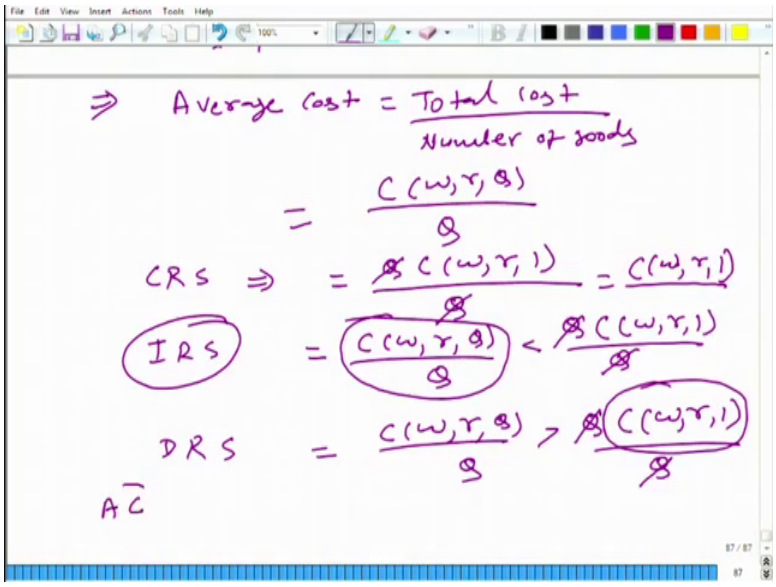

Student: Should be the cost of all the goods by total number of goods.

So, what is the average cost of we can simply define it by total cost divided by number of Goods.

Student: Goods.

So, total cost divided by number of goods, so what we have here if we use this to the cost functions what we get is in the constant returns to scale case, this is going to be equal to Q multiplied by C of w comma r comma 1 divided by Q. So, in the constant return to scale average cost is just the cost to produce 1 unit of, so for constant return to scale average cost is just the cost to produce

Student: One.

One unit of output how about in increasing return to scale this is and;

Student: It would be more than.

This is less than this is less than C of w comma r comma 1 divided by Q. So, what we get here is in increasing return to scale average cost is less than the cost to produce the first unit. So, what it means that your cost keeps on decreasing if you produce more and more and now I guess this graph will be more clear to you why in this zone, it is increasing return to scale, because average cost is decreasing and how do we get the average cost if we draw a line from origin to the that point of total cost curve.

So, in this zone it is increasing and when we have increasing return to scale it starts decreasing and that is what we are getting here and so let me complete this in DRS it is going to be C of w comma r comma Q divided by Q and this is greater than Q of C divided by Q and here the average cost is more than the cost of producing the first unit. So, we have learned about average cost.