Economics of Health and HealthCare
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Lecture - 12
Long Run Production Function and Isoquant

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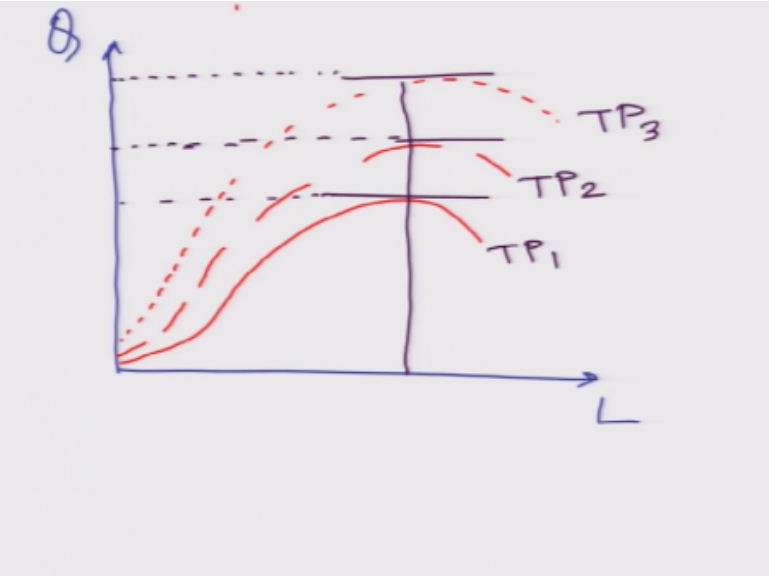

When we talk about long run curve as we said in a 2 factors of production, when we consider 2 factors of production both the factors are variable.

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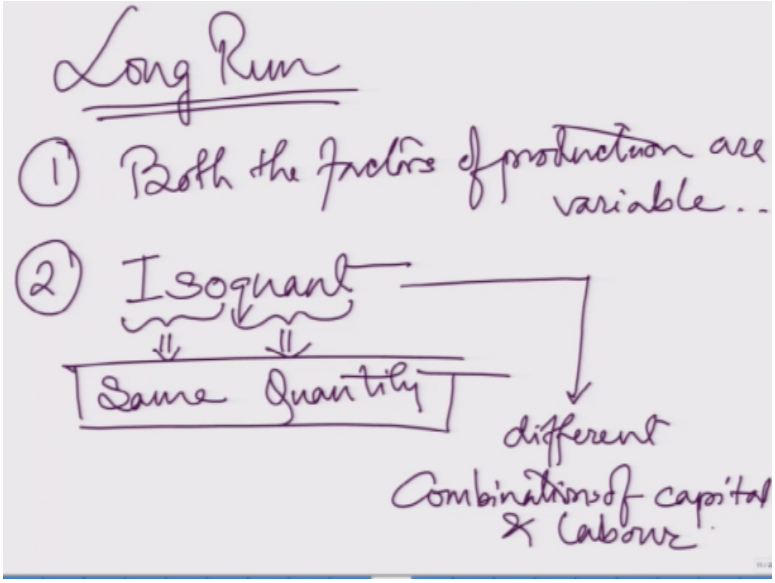

So here we are talking about long run production function where number 1, both the factors of productions are variable, where both the factors of production in a 2 factor production, both the factors of productions are variable and we understand the scenario based on an isoquant, where iso means same, quant means quantity, yes, isoquant, iso means same and quant means quantity, but what is the same quantity. We achieve a same quantity of output given different combinations of capital and labour.

So I go back to my indifference curve where the satisfaction was same with different combinations of 2 commodities x and y, apples and oranges, rasagulla and gulab jamun and so on and so forth, yeah, paracetamol and you know 2 different paracetamol, doctors and nurses, paracetamol and antacid whatever any 2 commodities and my satisfaction remains same. Here and different combinations of those commodities where my satisfaction is same on the same curve which is indifference curve.

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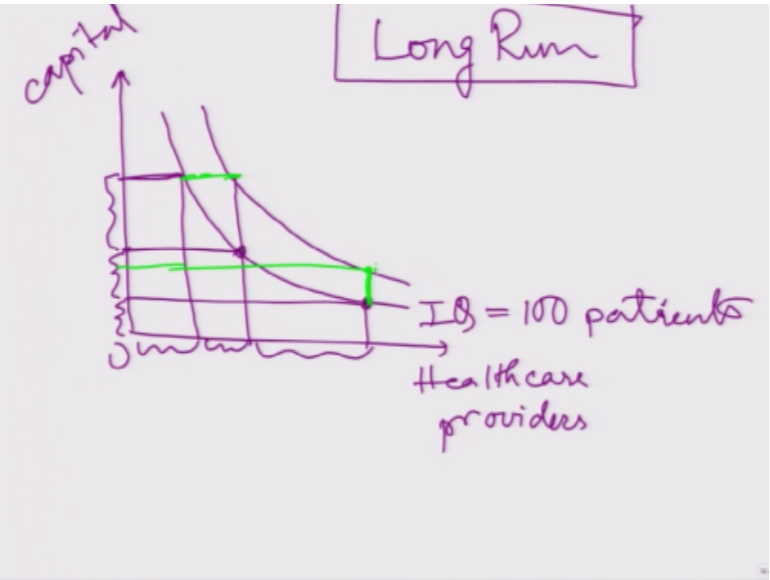

Here it is altogether same isoquant at the same curve I get different combinations of capital and labour which gives my IQ stands for isoquant, as IC for indifference curve and I get different combinations of capital and labour which eventually let us take that it is 100 units of you know or let us say 100 patients and over here we can take as doctors and nurses or something like that. You know doctors and some other capitals you know maybe capital it can be bed and other equipment.

And then we can have different combinations of doctors and capitals, you know or healthcare providers, it can be doctor, nurse anything and capital. In a primary health center there should

be at least 1 doctor, 3 nurses and 1 male nurse, is total 5, we hardly have you know in any pedes we hardly have filled up that quota anyways. So this is the isoquant which gives and now you can see as it is a long run production function, we can see that both the capital are varying.

And then the labour can also vary, and while I am varying the capital and labour we are identifying all different combination which give me a desired level of outcome. So if I want to increase again more is better, I want to increase my production, you know I can either increase capital, I can increase my capital keeping the labour same or I can increase my number of labour.

I can increase the number of labour keeping the capital same or if I want to go to this point I can increase my number of capital keeping the labour same so and you know it varies and then I can change both the capital and labour to remain on a higher isoquant that is upon you completely. So when in isoquant we have like the diminishing marginal return. So what happens if we plot this diminishing marginal return on isoquant what we see.

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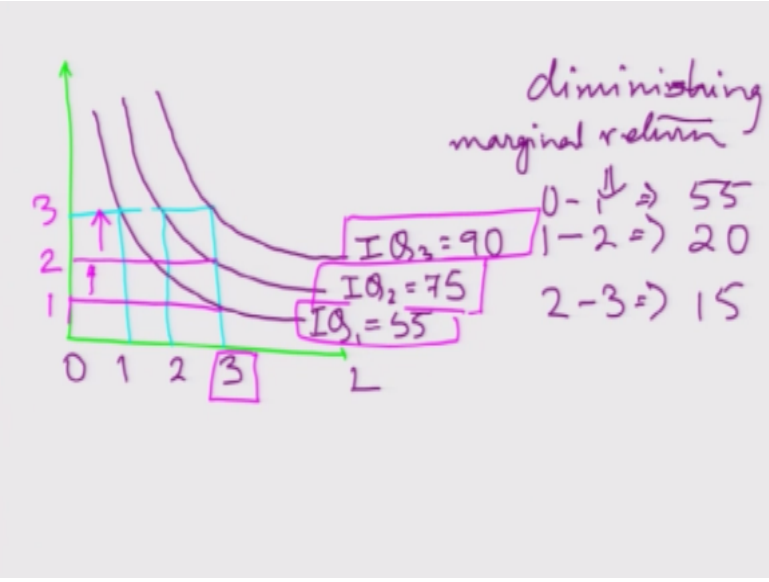

We can observe something like this, again as indifference curve 2 isoquants cannot intersect each other, they will only shift parallely. So if this Q or I can write it as IQ1 is 55, IQ2 is 75 and IQ3 as 90, okay, now what I observe is my labour is 1, labour is 2 and labour is 3. Now with this 3 labour when I increase my number of labour from 0, 1, 2, 3, I observe that the output is increasing by first 20 units and then 15 units, that means the marginal return with every single unit of labour is decreasing, right.

So diminishing marginal return is being followed when it increases from 0 to 1, it is by, or say I will keep it like say 1 to 2 it is by 20 units, from 2 to 3 it is 15 units or from 0 to 1 if you want to keep then it is by 55 units, yes there is a diminishing margin return and the same can be observed in terms of capital, if my labour remains fixed at 3, and my capital increases from 1, 2 to 3, and I can see from 0 to 1 for capital, 0 to 1 it increases by 55 units.

From 1 to 2 it increases by 20 units 75-55 and from 2 to 3 it increases by 15 units, so diminishing marginal return is being followed here. Now when we talk about the slope, if you can remember the indifference curve, the slope is given by the substitutability, marginal rate of substitution right. The substitutability between 2 commodities, yes, now here in a similar way when we talk about the slope of you know isoquant, we talk about the trade-off between 2 inputs. Now that can be stated as marginal rate of technical substitution.

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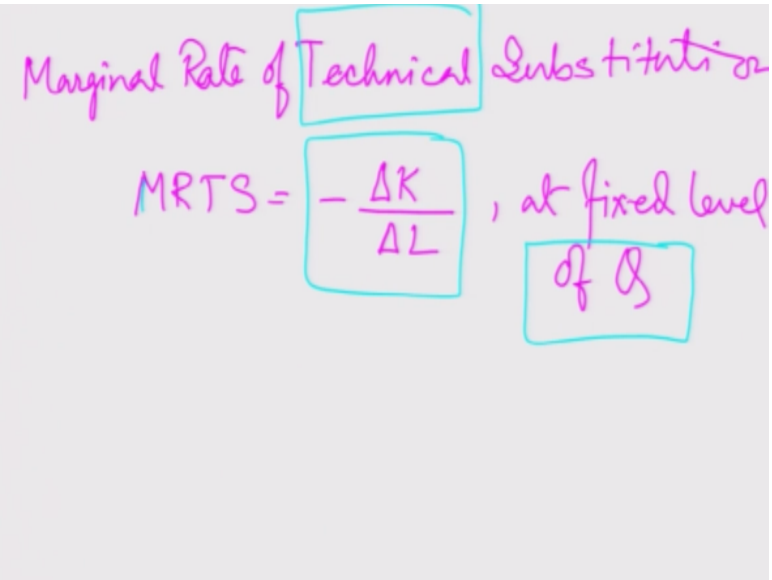

Marginal rate of technical substitution. What is different here? The difference is the word technical, the difference is the word technical, because it is a production process, marginal rate. So whenever it is marginal rate of substitution we are talking about the consumer behavior, substitution between 2 commodities, whenever it is marginal rate of technical substitution, we are talking about technology.

We are talking about some production process then it is like marginal rate of substitution between whenever it is technical substitution between 2 factor of production like marginal rate of technical substitution which we can state like MRTS is given the minus you can give

you cannot give it is upon you is the change in capital with respect to 1 unit change in labour. It can be the other way around as well, delta L/delta K.

So change in one factors of production with respect to change in the other factors of production at fixed level of Q or fixed level of output right because on an isoquant output is same and when I am at the isoquant I am trying to see the rate of trade-off substitutability between capital and labour, yes, and that is given by this delta K and delta L on a particular isoquant, where this output is fixed, yes.

Therefore, when we are talking about the slope of isoquant or marginal rate of technical substitution it gives us an idea that for 1 additional unit of capital how many labour I will sacrifice or vice versa for 1 additional unit of labour how many capital I need to sacrifice to remain or to produce a particular amount of output, yes. So this is the implication or this is the interpretation of this slope that with per unit capital or per unit increasing labour how much capital I am sacrificing.

Therefore, in marginal rate of technical substitution gives you an idea about that for.

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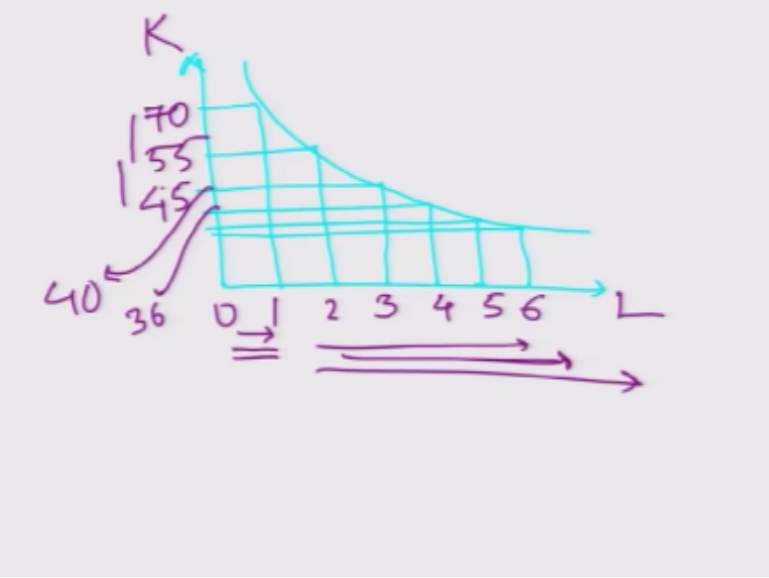

See 1 and we can see for 1 unit of labor with while increasing labor when it is increasing by 1 unit, 1 to 2, 2 to 3, 3 to 4, 4 to 5, 5 to 6 or 0 to 1. How many capital I am sacrificing? Say this is 70, this comes down to 55, this comes down. So here I have sacrificed 15 units, this may be my 45, this can be so here, 15 units, 10 units, this can be 40, this can be 36 or 37 and so on.

So the amount of capital I am sacrificing is coming down that is primarily because that technical and this is called the diminishing rate you know.

So what is happening when I am sacrificing, when I am at the lower level of labour input, I will require more and more of capital, when my labor input increases, I do not want my capital input is coming down and at a certain level I do not really want to you know sacrifice that many capital, because capital is also useful and very useful. So I will have to keep a basic minimum level of capital.

And with the further increase of labour, this labour input is being turning inefficient, which inefficiency has to be made up by the capital, the minimum level of capital because over here if I am causing inefficiency with more and more labour, I cannot afford to lose more and more amount of capital. So I am being you know kind of skeptical in terms of sacrificing the amount of capital, so when I am increasing my labour. So this is the diminishing or decreasing marginal rate of technical substitution, thank you.