Managerial Economics
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Lecture – 27

Elasticity of Supply - I

We will continue our discussion today, on few more concept of theory of demand like Elasticity of Supply, or how the price and quantity changes, when there is a imposition of the taxes, and when there is a legal imposition from the government, when it comes to equilibrium price. How it the demand and supply, and whether it leads to equilibrium or whether it leads to surplus or deficit.

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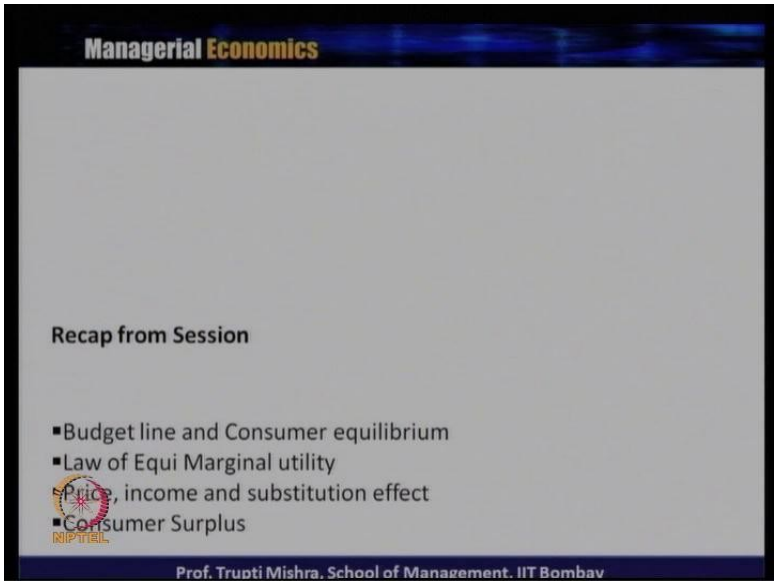

So, if you remember in the last class, we talked about the budget line, we talk about the consumer equilibrium, and if you remember consumer equilibrium is the condition, where the budget line is tangent to the indifference curve. And at that point, the consumer maximizes the satisfaction with a limited income constant. Then we discuss about the law of equal marginal utility, when the consumer has to make the choices between two goods with the limited income constant, how they generally take a decision.

And the thumb rule for this decision is that, whatever the money income, they are spending on each of these goods, at least they will get the same level of utility. Then we discuss about the price income and substitution effect, and if you remember, it has been calculated the price

effect, which is the summation of the substitution effect and the income effect. And price effect generally comes from the decreasing the income or increasing the income, which results in two other effects; that is income effect and the substitution effect.

Then we introduce the concept of consumer surplus; and consumer surplus is nothing but the change or may be the difference in the; what the consumer is willing to pay for it, and the the consumer is actually paying for it. Suppose if you plan for a typical range of goods, and when you are going to market and you are paying a different market price for it. Whatever, you would wish to pay for it, or billing to pay for it, and what actually you are paying, the difference is generally known as the consumer surplus. So, today we will take a numerical example to understand the concept of the consumer surplus.

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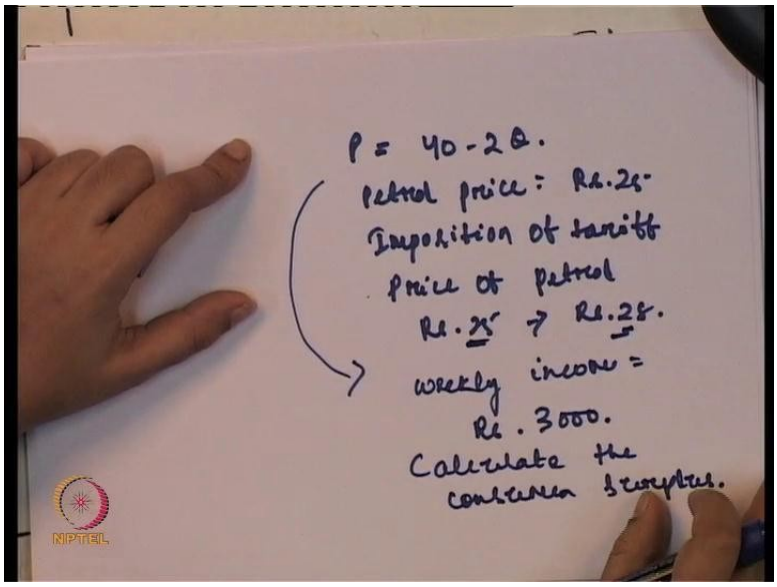

So, if the numerical example, we have one demand function, that is P is equal to 40 minus 2 Q, and suppose, this is the demand function of the petrol, and initially the petrol price is 25 rupees, and due there is a imposition of tariff from the government, and that leads to increase in the increase in the price of petrol from 25 rupees to rupees 28, then we have one additional information, the weekly income of the consumer is equal to rupees 3000, now we will see with the help of this information, how we can find out what is the consumer surplus.

So, we need to calculate the consumer surplus or maybe, we can say the loss in the consumer surplus, from due to increase in the price to from 25 to 28 per litre. Now, what is the first thing, we need to do, we need to draw the demand curve, and to draw the demand curve, what are the information given to us, the information is P is equal to 40 minus 2 Q. So, the value of slope is minus 2 intercept value is 40.

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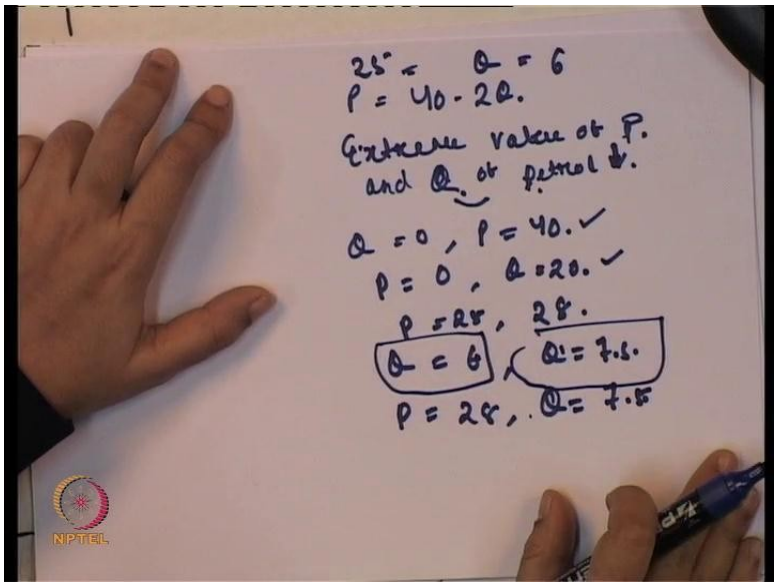

So, with this P is equal to 40 minus 2 Q, we will see, how we can draw the demand curve over here, first need to find out, what is the extreme value of P and Q; P and Q of petrol because, here P is the price, here is the good is petrol. So, we need to find out; what is the extreme value of P, and what is the extreme value of Q. So, putting Q is equal to 0, in the equation, we get P is equal to 40, and when we put P is equal to 0, then Q is equal to 20. So, joining this point, we will get the demand curve and substituting value of P by 25 and 28, we get the value of Q is equal to 6, and Q is equal to 75.

So, initially, we will put the value of P is equal to 25, we get the value of Q is equal to 6, and when we put the P value is equal to 28, we get the value Q, which is equal to 7.5, then, once we get the extreme value of P, we get the extreme value of Q, we need to when we get the put the value of P is equal to 25 and Q is equal to 28, we get value Q is equal to 6, and Q is equal to 7.5.

Now, the next task is that, how to find out the consumer surplus, because we know that there is a change in the quantity demanded, that is 6 to 7.5, when there is a imposition of tax from imposition of tariff, and that leads to change in the price from 25 rupees to 28 rupees.

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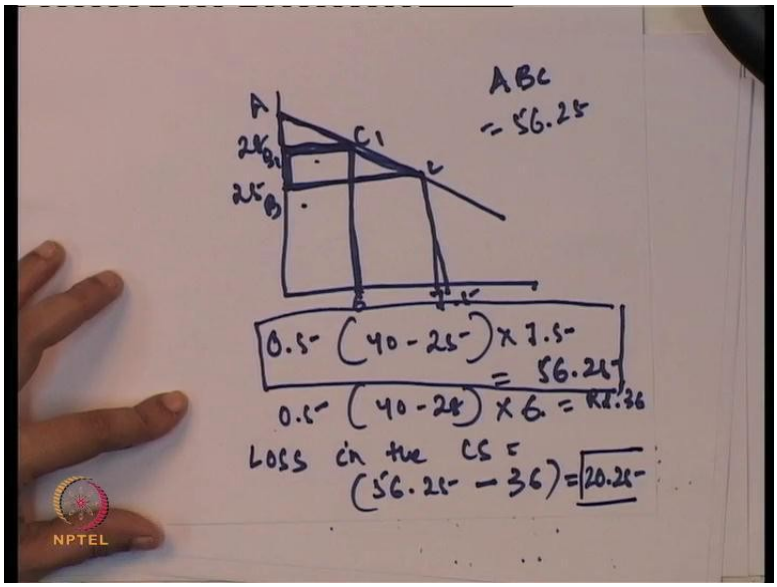

Now, let us see, how we can find that in case of the demand curve. So, this is 25; this is 28; this is may be 6; and this is may be 7.5.Now, how we will find out the consumer surplus. So, 0.5 multiplied by 40 minus 25 into 7.5; that give us the consumer surplus, when the price is equal to 25.Now, when the price increases to 28, then this is the 0.5; 40 minus 28 multiplied by 6. So, this will give us 6; this will give us 7.5, we get that is the, that gives us the value which is equal to rupees 36.

So, the first one is 56.25, and the second one gives us the value which is equal to 36. So, what is the loss in the consumer surplus; loss in the consumer surplus is 56.25 minus 36 which give us the value, which is equal to 20 into 25. So, this is price is 25, quantity demanded is 7.5, price increases from 25 to 28 quantity demanded is 6, when the price was 25; this is the total consumer surplus; this triangle, but when the price increases from 25 to 28; this is the consumer surplus.

Now, because of increase in the price, the loss in the consumer surplus is this area. So, this total area, suppose this is A; this is B and C, initially, when the consumer surplus is A B C, the total consumer surplus is 56.25, and how we have got this.

This is to find out the area of any triangle, what is the formula; the formula is half into base into price. So, 0.5 multiplied by 40.25, that give us the price, and 7.5 gives us the base. So, in this case 56.25 is the consumer surplus, price increase from 25 to 28, that leads to decrease in the quantity demanded from 7.5 to 6, and also this area is the loss in the consumer surplus.

So, the loss in the consumer surplus, how to find out? If you find out the area before change in the price; what is the area of consumer surplus, and what is the area of consumer surplus, after change in the price. So, after change in the price A B 1 C 1 is the change in the, or may be the new consumer surplus, that leads to how to find out what is the value for this again, the same formula to find out the value in a triangle that is 0.5 multiplied by base into price. So, 48 minus 28 is the price, and 6 is the base that leads to 36, and in this case the difference between the consumer surplus is 56.25 minus 36 lead to 20.25.

So, as we know, if you remember in the previous class, this loss in the consumer surplus is 2 parts, because the change in the consumer surplus is due to change in the price. So, the entire loss in the consumer surplus has 2 parts; one is the producer surplus, and second one is the dead weight loss. Producer surplus is, what the amount; what goes to the producer account, because of change in the price, and dead weight loss generally not a part of consumer account or the producer account, because it neither goes to the consumer nor goes to the producer.

This is basically the loss in the quantity demanded due to change in the price. So, now, in this case we have identified, what is the consumer surplus, before and after changing price, and we have also identified; what is the loss in the consumer surplus. So, the loss in the consumer surplus is 20.25; what we have got over here, now we will see; this 20.25; how much goes to the dead weight loss, and how much goes to the, into the account producer in the form of the producer surplus.

Now, how we will find out, how much amount goes to the producer? And how much amount goes to the dead weight loss? So, producer goes to the total amount, what goes to the producer is the increase in the price, and may be the whatever change in the price, and whatever the change in the quantity demanded.

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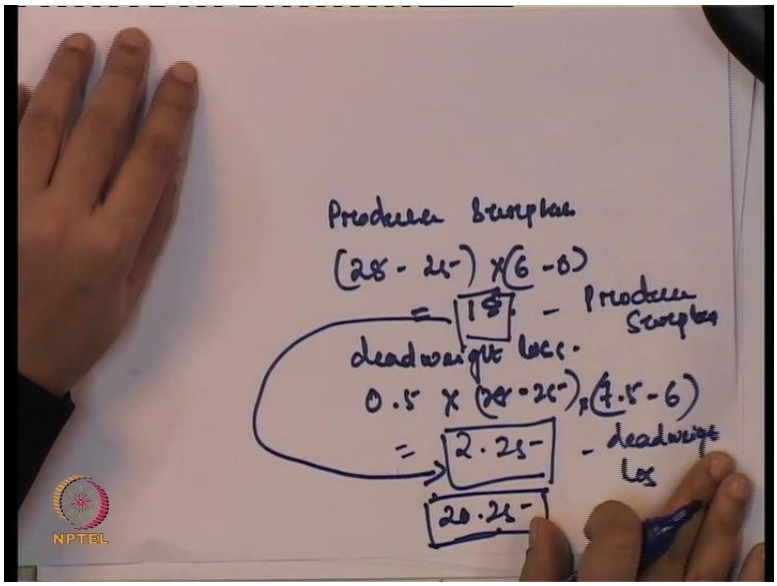

So, we will see, what is producer surplus over here, this is the change in the price 28 minus 25 multiplied by 6 minus 0. So, this comes to 18, and what is dead weight loss; dead weight loss, we need to again calculate in the area of the triangle. So, this is 0.5, then base into; that is 7.5 minus 6. So, base into height. So, that comes to 2.25. So, 2.25 is the dead weight loss, and 18 is the producer surplus, if you add 18 and 2.25, that gives us the loss in the consumer surplus, that is 20.25.

So, generally this consumer surplus also, the application of the consumer surplus in the real world scenario, when there is an imposition of tariff, or when the price changes, the market price changes generally, whatever the consumer surplus, the consumer is getting, that gets reduces, and the reduction in the consumer surplus partly goes to producer account in the form of increase in the price, and partly generally increases goes in the over the dead weight loss because, neither it is a part of the consumer account nor it is the part of producer account.

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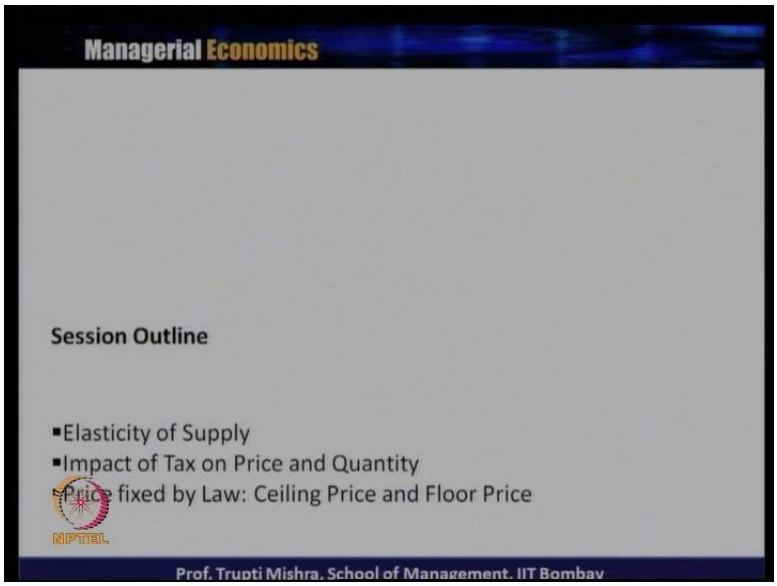

Then, we will come to some new topics today; new concept of theory of demand or some more concept of theory of demand, like elasticity of supply, it is just the counter part of just the relationship between price and supply. If you remember the same things, what we discussed in the context of price and quantity demanded in case of elasticity of demand, then when there is an imposition of tax, how it leads to, or what kind of effect it has on the price and quantity, and when the price fixed by law, or when the government fixes the price may be in term of selling price or the floor price; what happens to the quantity demanded; what happens to the price.

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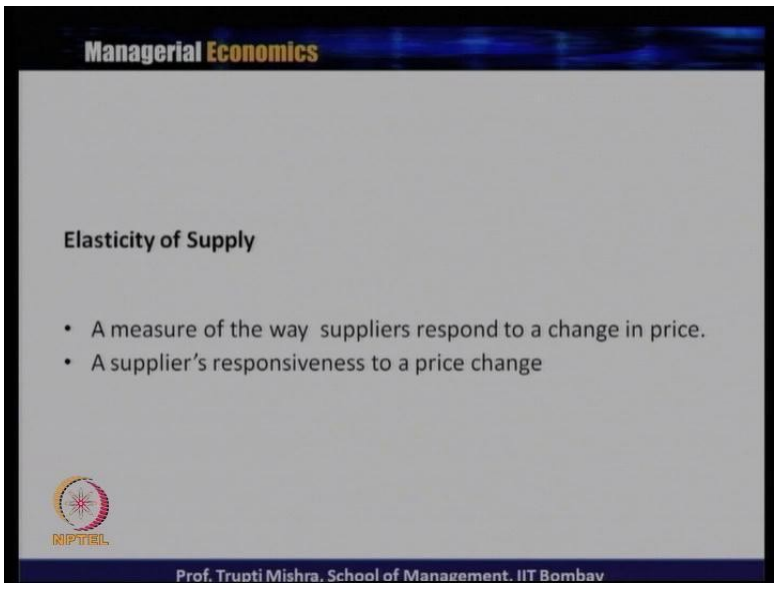

So, we will start the concept elasticity of supply and elasticity of supply is nothing but the relationship between the price and quantity supply. So, as law of supply says that there is a positive relationship between the price and supply. So, whenever there is a increase in the price, there is a decrease in there is a increase in the quantity supply, and whenever there is a decrease in the price, also there is a decrease in the quantity supply.

It means there is a positive relationship between price and quantity supply, but elasticity of supply will help us to identify; what is the magnitude of change in the quantity of supply, when there is a change in the price. So, suppose, if price changes by 2 percent; where the quantity supply also changes by 2 percent, or the quantity supply changes more than 2 percent, or quantity supply changes less than 2 percent; what is the sensitivity of the sellers, or what is the sensitivity of the supplier, when there is a increase or decrease in the price, that we capture through the elasticity of supply.

So, if the supply is more sensitive, generally the elasticity of supply is on a higher side, if the supply is less sensitive, then the elasticity of supply is on your lower side. So, if it is higher side, then it is elastic, if it is lower side, then it is a case of the in elastic supply. So, elasticity of supply is nothing but the measurement of sensitivity of the supplier with respect to change in the price in both the direction, when there is an increase, and when there is a decrease in the price of the goods.

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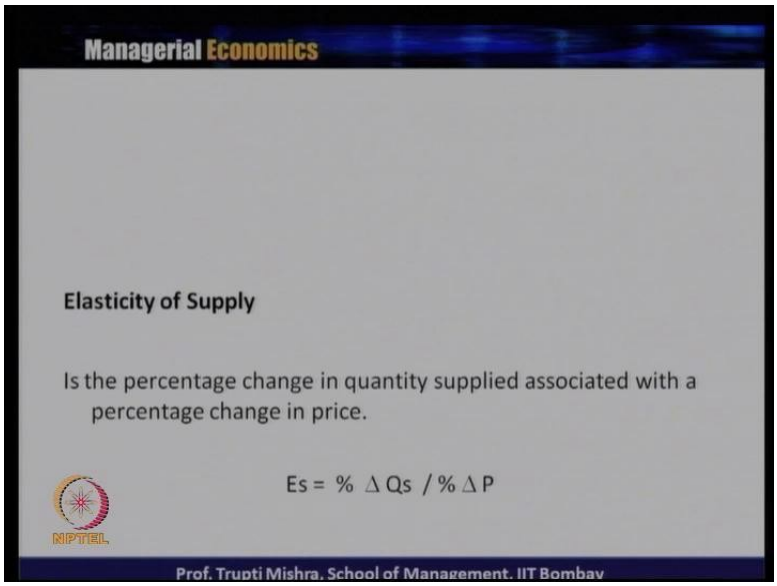

So, how to calculate this elasticity of supply? Generally we know that, when there is a change in the price that leads to change in the quantity supply. So, we will calculate the elasticity of supply using the percentage change in the quantity supply associated with the percentage change in the price.

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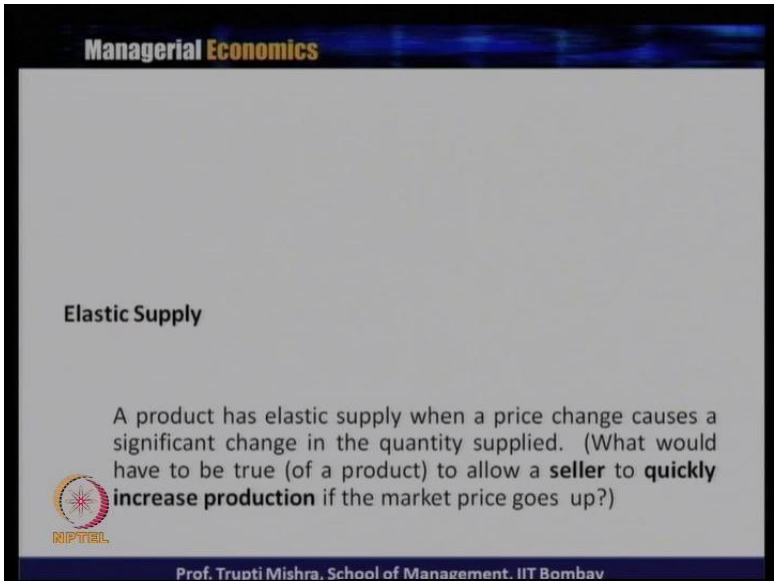

So, here quantity supply is the dependent variable and P is the independent variable, whenever there is a change in the P that leads to change in the quantity supply, and elasticity of supply that captures the percentage change in the quantity supply associated with the percentage change in the price. Now, what is elastic supply? a product has elastic supply when the price change causes significant change in the quantity supply; what would have to be true of a product to allow a seller to quickly increase the production, if the market price goes up.

So, we know that, whenever there is a change in the price, if there is a significant change in the quantity supplied, then this is the case of elastic supply, but here may be, when you take this to a real world situation, here the question comes, is it possible to produce the seller immediately, when there is a increase in the price.

Whether it is possible to increase the production immediately, because there is a time line required, or there is a time period request to produce the product. So, we can interpret in a different way that, whatever getting produced by the producer. Everything is not getting sold in the market, part of it always there in the inventory, or part of it always there in the stock,

and whenever there is a increase in the price that leads the supplier to supply more into the market for the consumer. But, when there is a decrease in the price they generally keep more in the inventory or in the stock. So, in this case, we can say that change in the price is may be less than change in the quantity demanded.

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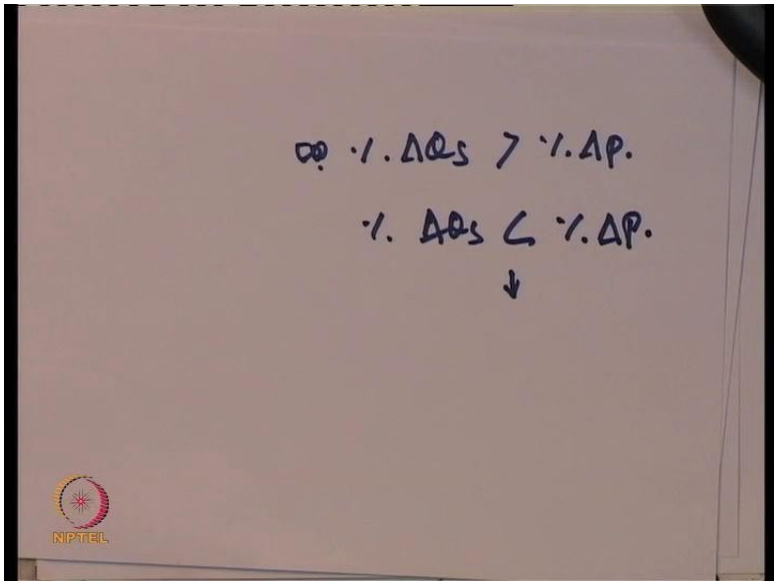

So, in case of elastic supply, the percentage change in the Q s has to be greater than the percentage change in the p. So, if it is infinite generally, it is a case of a perfectly elastic supply.

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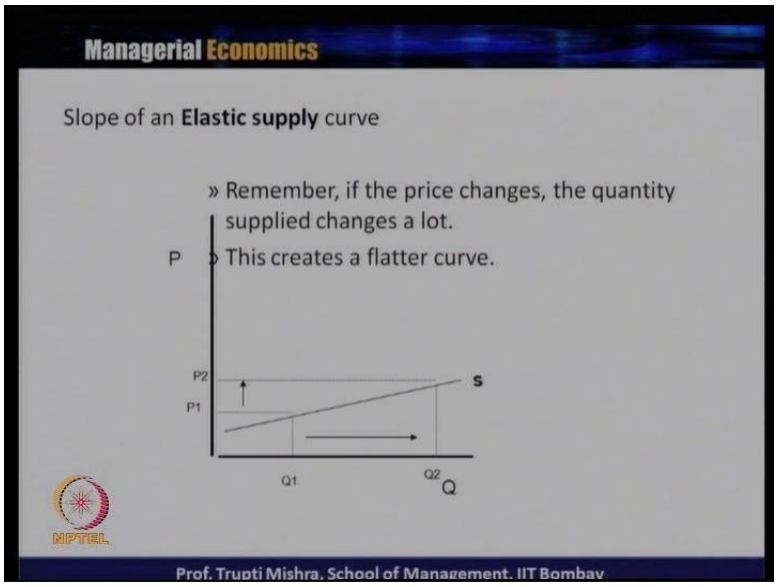

Now, we will see how we graphically represent this elastic supply curve, generally if you look at in case of highly elastic, whether it is supply, whether it is demand curve the slope is generally high, and that leads to the flatter supply curve. So, if price changes; the quantity supplied changes a lot, which means any small change in the price leads to a good amount of change in the quantity supply, and that is the reason the slope is on a higher side, and this creates a flatter curve.

So, if you look at the graph in the slide, Q is represented in the x axis, that is the quantity, and P is represented on the y axis that is the price, initially the price is P 1, quantity demanded is Q 1.Now, when the price increases from P 1to P 2, quantity demanded also increases from Q 1 to Q 2 and that leads to a greater change in the quantity demanded, when there is a small change in the price.

So, if you look at in the graph, then Q 1 and Q 2 is greater than much, much, much greater than P 1 and P 2, and we can interpret here, this is the case of elastic supply curve, because any small change in the price leads to a greater change in the quantity supply. So, in case of elastic supply curve; the supply curve is always flatter, and because the change in the quantity supply is more than the price associated with this, then we will see how it happens in case of an in elastic supply.

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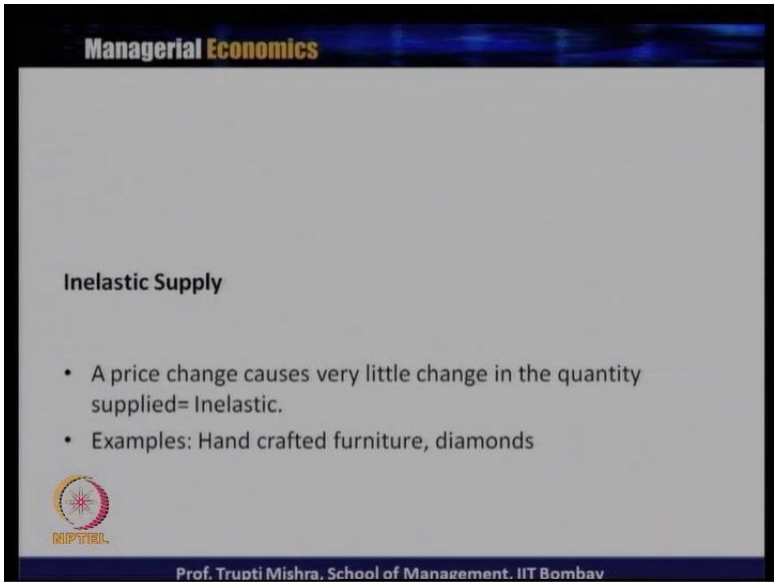

An in elastic supply is one, where the price changes causes very little change in the quantity supply, it means the percentage change in the quantity supply is less than the percentage change in the P, it means, it may happen because of 2 things, either the time required to produce the product is significant.

So, even if there is an increase in the price, still the producer will not going to supply more, or may be the product is the nature is something, that even if the price increases, the demand is not going to, may be price increase is not because of increased demand. So, in this case, even if there is supplying more, there is no market for the product, and that is the reason in case of inelastic supply, the change in the quantity supply is less in the change in the price.

And the typical example, if you can take of handicraft furniture or the diamonds, there the high value goods, and even if the price increases, it is not the demand is going to increase, or may be the time required to produce, because there is always a limited supply. So, even if the price increases, the supplier immediately not matching with the change in the price, and that is the reason, this is known; this type of goods comes under inelastic supply, because it cannot be match immediately, the increase in the price cannot be match immediately.

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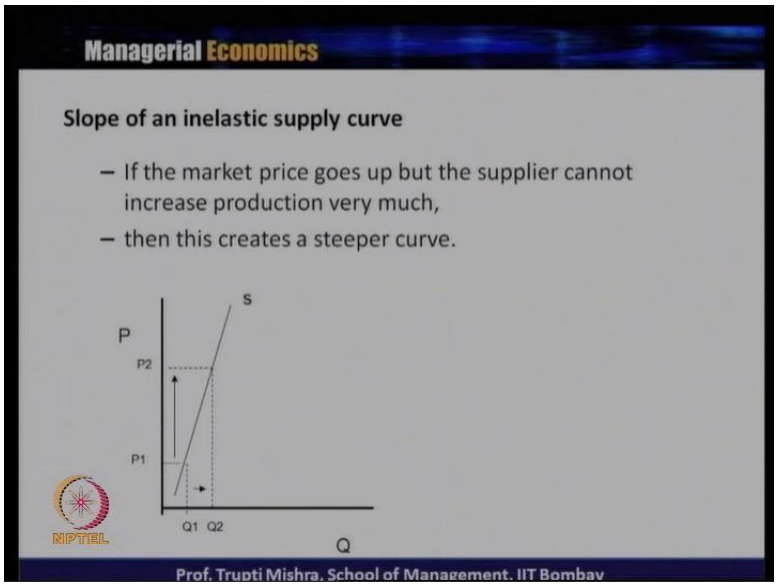

Now, we will see how the slope of the inelastic supply curve, if the market price goes up, but the supplier cannot increase production very much, this is the scenario of a inelastic supply curve, and this generally creates a steeper curve. So, in this case, if you look at P 1 is the initial price, Q 1 is the initial quantity demanded, and there is a increase in the

price from P 1to P 2, which is on a very higher side, and that leads to the subsequent increase in the quantity demanded from Q 1 to Q 2. And if you look at here, the Q 1 and Q 2 much, much, much less than P 1 and P 2. And that leads to the interpretation that the change in the quantity demanded is less than change in the price, and that is the reason, we get the steeper curve, and in case of inelastic supply curve, we always get a steeper curve.

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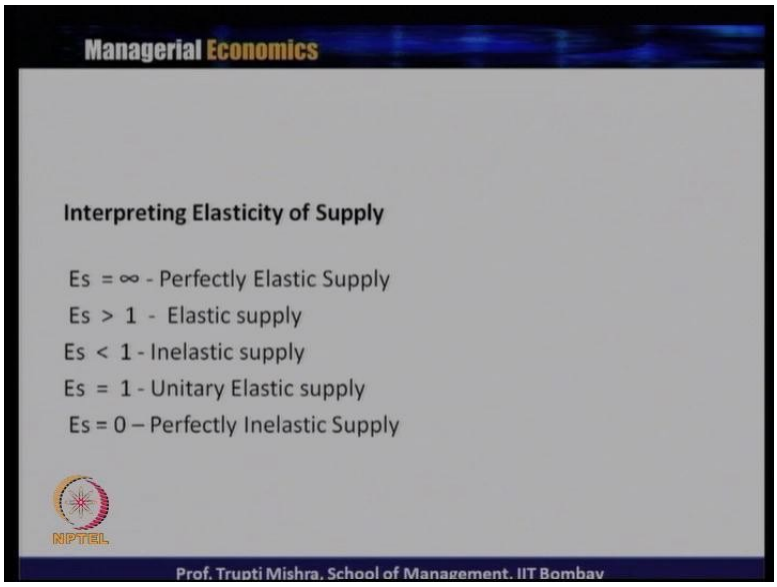

Now, we will interpret the different value of elasticity, if the elasticity of supply taking the value of 1, 0 or infinite or less than 0 or greater than 1, how we generally interpret the elasticity of supply. If the elasticity of supply is equal to infinite, this is the case of a perfectly elastic supply, it means, a small change or a negligible change in the price leads to a greater change in the quantity supply, if elasticity of supply is greater than 1, it is a case of elastic supply, as we discussed previously. If elasticity of supply is less than 1, this is the case of inelastic supply, what we just discuss a before this typical slide, then if elasticity of supply is equal to 1, this is unitary elastic supply, and how the changes takes place in quantity supply in case of unitary elastic supply.

The percentage change in the quantity supply is exactly equal to percentage change in the price; that means, 2 percentage change in the price leads to exactly 2 percent change in the quantity supply; elasticity of supply is equal to 0, that is the perfectly in elastic supply.

So, one extreme is when elasticity of supply takes the value which is equal to infinite, it means the negligible change in the price leads to a greater change in the elasticity of supply, and if it is 0, then it is a perfectly in elastic supply, that is the other extreme it means, even there is a significant change in the price, still there is almost in significant change in the quantity supply, or we can say there is no change in the quantity supply.

The reason being that may be the supply cannot be immediately matched with the change in the price, or may be the increase in the production cannot takes place immediately with the increase in the price. And that is the reason, we need to; we reached to another extreme of the elasticity of supply, that is perfectly inelastic supply, where, whatever may be the change in the price the quantity supply either do not changes or if it changes, that is if it changes very insignificantly.

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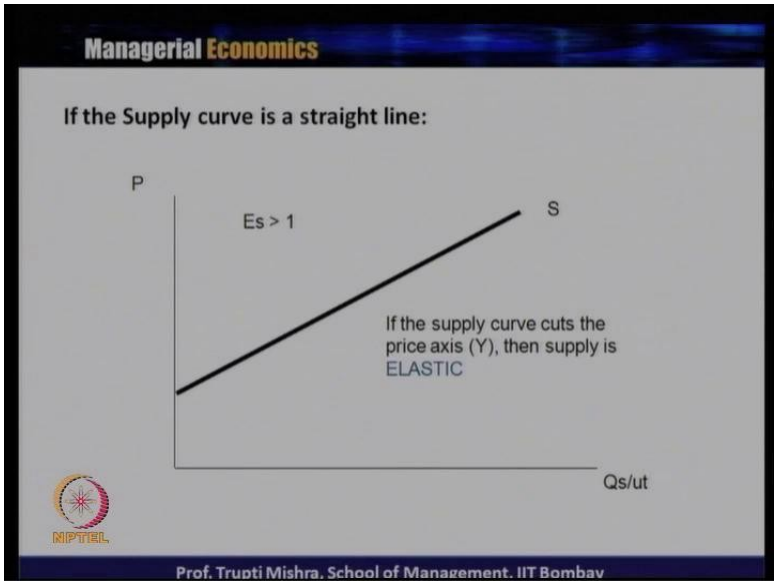

Then we will say in atypical supply curve, what is the range of elastic or what is the range of in elastic, or even the supply curve is a straight line, then how we interpret the value. So, if the supply curve cuts the price axis, that is y axis then the supply is elastic. So, supply curve is a straight line. Elasticity of supply takes the value, which is greater than 1 and if the supply curve cuts the price axis y, then the supply is elastic, if the supply curve is a straight line, elasticity of supply takes a value which is less than one, and if the supply curve cuts the quantity axis x, then the supply curve is in elastic.

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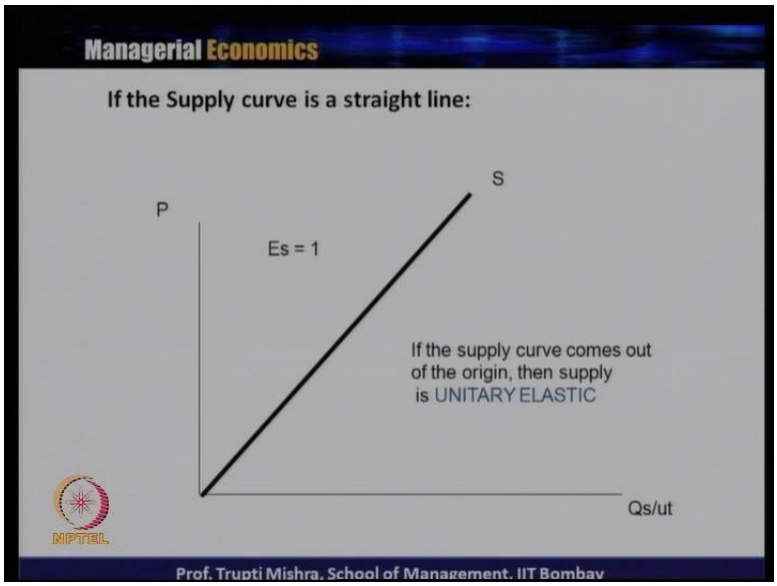

It means, if the supply curve cuts the quantity axis, this is the in elastic supply curve and if the supply curve cuts the price axis, then it is the case of elastic supply curve, if the supply curves come outs of the origin, then the supply is unitary elastic. So, if it cuts the price axis, then it is the case of elastic, if it cuts the quantity axis, then it is the case of inelastic, if it comes out of the origin, then the supply curve is unitary elastic now, if you summarize all this type of elasticity, whether it is equal to infinite, whether it is equal to 0, whether it is greater than one, less than one or equal to one.

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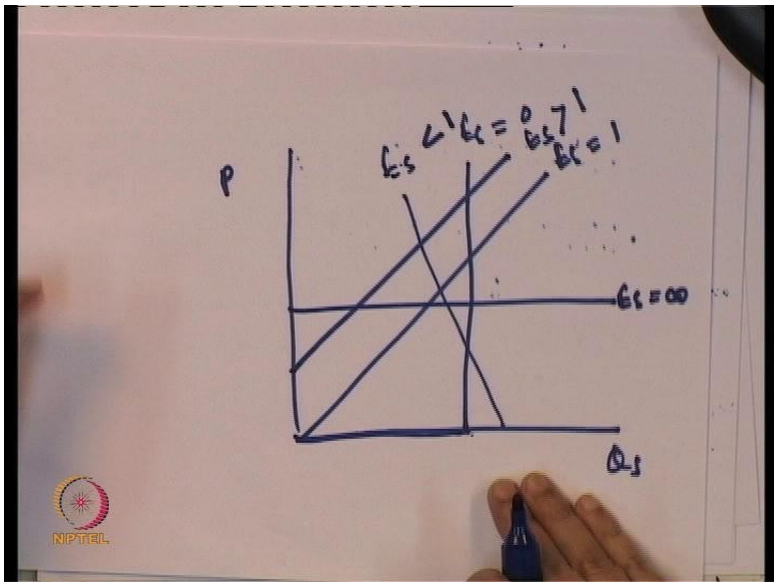

So, if you will take everything in one graph, then this is what gives us the elasticity of supply is equal to 1, then this gives us elasticity of supply is equal to 0, because there is no change in the quantity supply, even if the price is changing; this gives us elasticity of supply is equal to infinite. Whatever, may be the price change in the price, small change or negligible change in the price leads to a greater change in the quantity supply, then if it cuts may be the price axis, then elasticity of supply takes a value, which is greater than 1 and if it takes the quantity axis; cut the quantity axis, then elasticity of supply, which is equal to less than one. So, there are 5 type of elasticity of supply; elasticity of supply equal to infinite, equal to 0; 2 extremes; the midpoint is elasticity of supply is equal to 1, and in between these two, the range is elasticity of supply is greater than 1 that is relatively elastic.

And elasticity of supply is less than 1, which is relatively inelastic. So, we will see in a typically supply curve; which one is the elastic section; which one is the inelastic section, or we can say, which one is the elastic range, and which one is the in elastic range.

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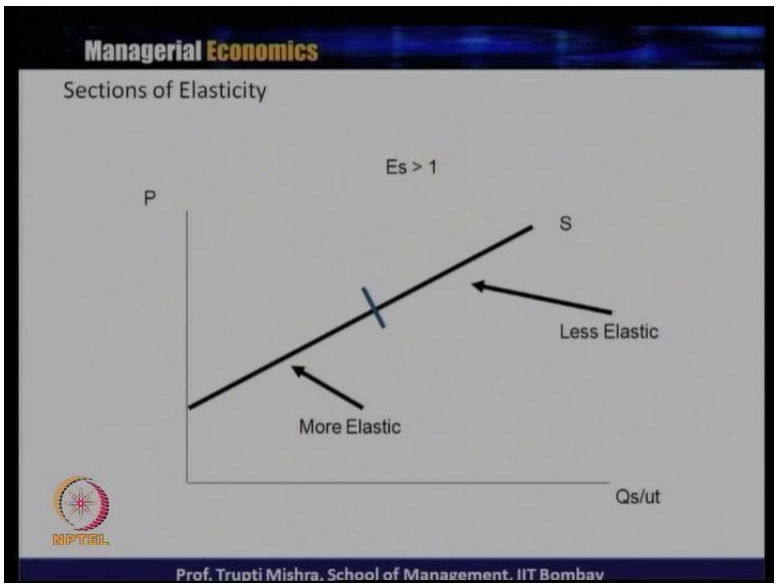

So, if you take the case of may be an elastic demand curve, which is much flatter, then the bottom section is more elastic, and may be the segment in the top, that is less elastic. So, in this case the elasticity of supply takes a value, which is greater than 1, and that is the reason, we have got a flatter supply, and here the bottom segment is more elastic and top segment is less elastic.

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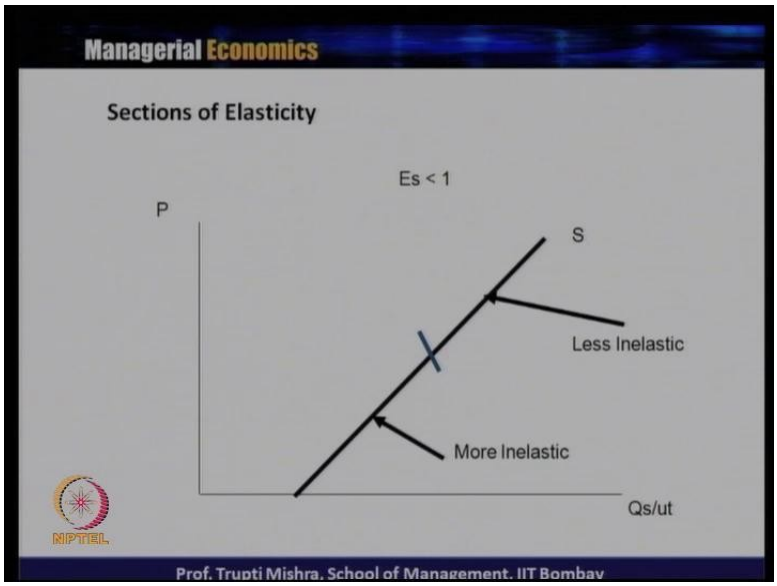

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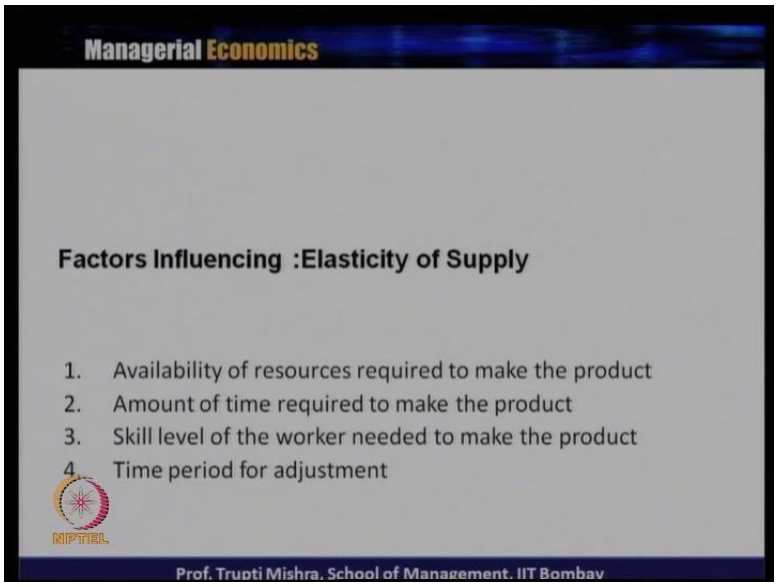

Similarly, if you take an inelastic supply curve, the bottom one is more elastic, and the top one is less elastic. So, in a typical supply curve in the different segment, we get the different value of elasticity of supply. Now, we will see, what are the factors, that influence the elasticity of supply like, or what is the specific factor those influence the supply has to be elastic or the supply has to be inelastic.

The first factor is the availability of the resources request to make the product, if the resources are may be available easily, or the resources are may be immediately it occur, in

this case the product is more elastic, because whenever there is a change in the price or increase in the price immediately this can be matched with the increase in the quantity supply by increasing the production.

Then, what is the amount of time required to make the product, that decides whether the supply has to be elastic or supply has to be inelastic, if the time required to make the product is high, then the supply curve is the supply is inelastic, because it cannot pay the change in the price immediately cannot change with the; immediately cannot match with the change in the quantity supply.

But if the amount of time required making the product is less, then in this case is the case of a elastic supply, because immediately it can be matched. So, the supplier can react to the change in the price immediately. Skill level of the worker needed to make the product, if the worker is skilled then may be the time required is less to produce the product.

And that is the reason, the supply curve is elastic, but if there is unskilled labor; the skill level of worker is lower or less, in this case generally the supply is inelastic, because a small change or may be a change in the price cannot be matched immediately, because the workers they are not may be that much skilled that they immediately match the requirement from the production, or the match the requirement of the increase in the supply.

The final one or the forth factor, which influence elasticity of supply is time period for adjustment, if larger is the time period to adjust with the change in the price, it is the case of more elastic, and if there is less time for adjustment, then the supply is inelastic or we can say less elastic. More is the time period for adjustment, more is the elastic supply, less is the time period for adjustment, less is the elastic supply, or we can say is the case of the inelastic supply. So, elasticity of supply generally measures the sensitivity of the supplier with respect to change in the price.

And it takes different value on the basis of the supplier's responsiveness, or the suppliers sensitivity for the change in the price, and accordingly it takes different value, and few factors, what we discussed just now, generally they contribute for influencing the supply curve to the more elastic or less elastic.