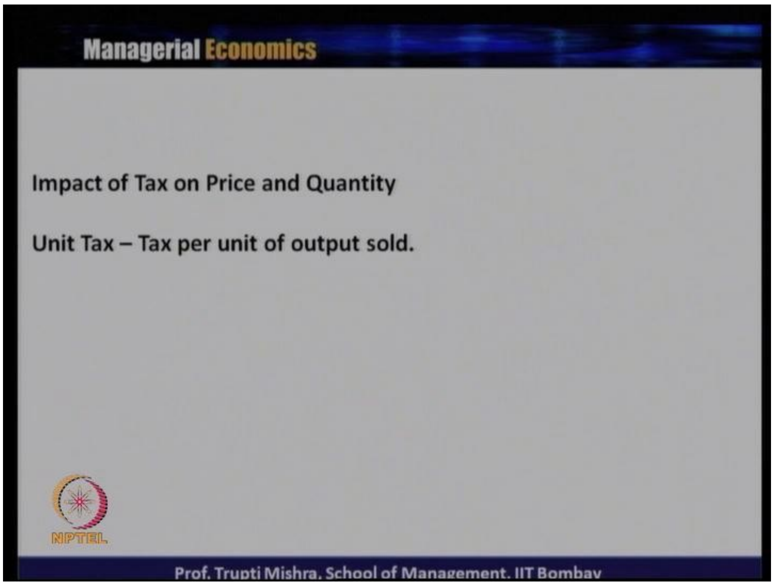
Managerial Economics
Prof. Trupti Mishra
S.J.M School of Management
Indian Institute of Technology, Bombay

Lecture – 28

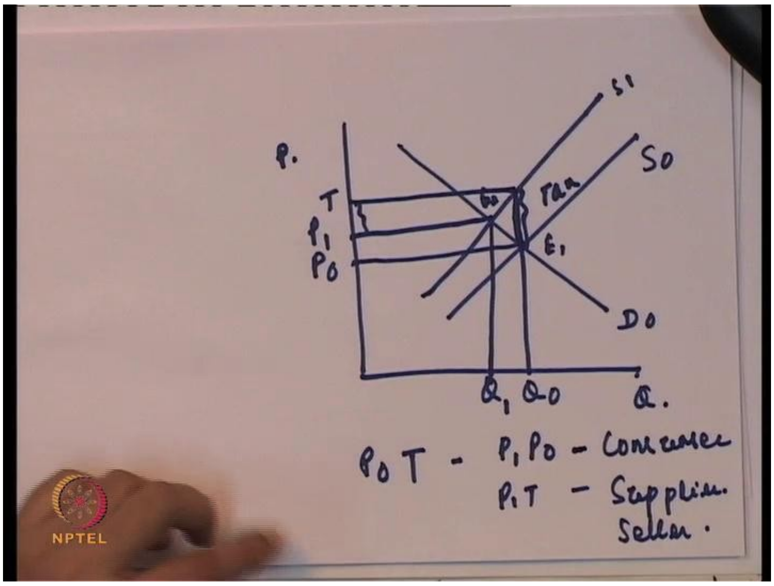
Elasticity of Supply - I

(Refer Slide Time: 31:12)



Then we will see, what is the impact of tax on price and quantity? In this case, we will take the case of the unit tax, which is generally the tax per unit of output sold, and we will see how it generally affects the price and quantity. And whenever, there is an imposition of tax, who generally takes the tax burden, whether it is the buyers, whether it is the seller that we will analyse or see through the graphical representation. So, this is in this case specifically we are talking about the unit tax which is that is tax per unit of output sold.

(Refer Slide Time: 31:54)



So, now let us see different cases and different scenario, how the tax burden get share in the supplier and the buyer. D 0 is the demand curve; S 0 is the supply curve; there is imposition of tax and the imposition of tax will represent through the decrease in the supply, and that leads to decrease in the supply from S 0 to S 1, now this is the equilibrium quantity; this is the equilibrium price, now there is imposition of tax and that leads to change in the supply from S 0 to S 1.

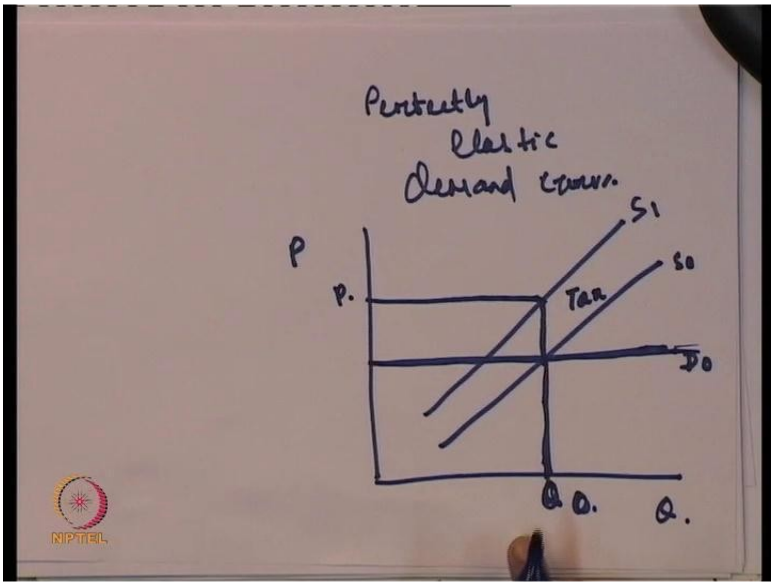
And here, we are representing the amount of tax through the change in the supply. So, this is the total amount of tax being imposed. When the supply moves from S 0 to S 1,the equilibrium point change from E 1 to E 2.In this case also, the price and quantity changes; quantity is Q 1and price is P 1; what is the total amount of tax? This is the total amount of tax. So, in this case, now who share the taxes over here, initially the demand curve is D 0, supply curve is S 0, equilibrium quantity is Q 0, equilibrium price is P 0.

Imposition of tax that leads to the shift in the supply curve from S 0 to S 1, and the difference between two supply curve gives us the tax, which is equal to P 0 T, and now this P 0 T, who is paying , how much of this P 0 T. Due to change in the supply, now the producer had increased the price from P 0 to P 1. So, this P 1 and P 0 is paired by the consumer, in term of increase in the price, and the rest of the tax, that is P 1 by T, that has to be paid by the supplier because, this part of tax is not being covered by the increase in the price. So, supplier or seller; So, imposition of tax is, there that leads to the shift in the S, that is decreasing the quantity, increasing the price, but the increase in the price is not equal to the amount of tax being imposed.

So, there is some more amounts left from the tax amount that is P 1 and T. So, this tax is the tax burden is share by both the consumer and the producer; P0 P1 is paid by the consumer in term of increase in the price and P 1 T is paid by the seller or paid by the supplier, because partly it has to be share for both the producer and the consumer. So, in case of unit tax imposed, if the both the demand and supply curve, they are maintaining their original slope, in this case or the original relationship, in this case partly it has been paid by the consumer in term of increase in the price, and partly it has been paid by the producer.

Now, we will introduce the concept of elasticity of demand and elasticity of supply, to this supply and demand curve, and then we will see, how the tax get shared between the consumer and the supplier; what happens, when there is a perfectly inelastic demand curve; what happens when there is a perfectly inelastic supply curve; What happens when there is a perfectly elastic and perfectly elastic demand curve and perfectly elastic supply curve.

(Refer Slide Time: 35:57)



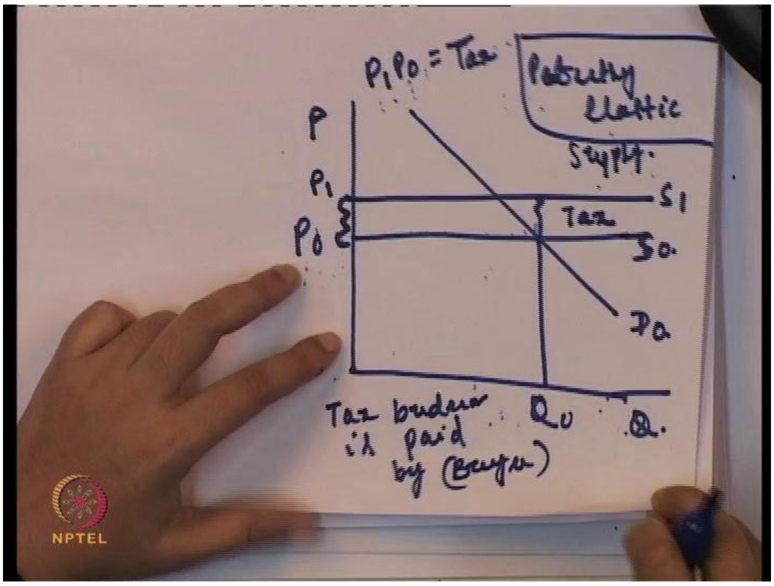
So, first we will take a case of a perfectly elastic demand curve. Now, what is the shape of a perfectly elastic demand curve? It is parallel to the horizontal axis. So, this is the demand curve. Now this is the supply curve; this is the quantity. Now there is a imposition of tax, that leads to shift in the supply curve from S 0 to S 1. Now, what is the amount of tax; the amount of tax is this much. Now, who is paying the tax over here, it is not that because price remains constant or very small change in the price; the quantity demanded changes, if you look at there is no change in the quantity demanded, and there is no change in the quantity demanded, the tax amount cannot be or may be.

If there is a possibility to increase the price, it is not possible here, and that is the reason if you look at, even if the quantity demanded is changing, what is the change in the price may be the change in the price is this much. So, now, who is paying the tax over here? Whatever may be the price, because any small change in the price that leads to change in the greater change in the quantity demanded, and that is the reason in this case the entire tax is paid by the supplier. So, in case of perfectly elastic demand curve the entire tax is paid by the supplier, because for any small change in the price; the quantity demand generally changes in a very; quantity demanded changes drastically, because this is a case of perfectly elastic demand curve, the consumer is more sensitive in this case that is the reason the entire tax burden is paid by the supplier, because they are not able to transfer the tax burden in term of increase in the price.
Because if they will increase the price, that will lead to shift in the quantity demanded and in term of that also, they are going to lose profit, if there is no sale of the product or if the quantity demanded decreases. Then we will see the second case that is the perfectly inelastic demand curve. So, in case of perfectly inelastic demand curve; demand curve takes a shape, which is parallel to price axis. So, this is your demand curve.

Now, this is Q 0; this is S 0; this is P 0; P 0 is equilibrium; price Q 0 is equilibrium quantity. Now imposition of tax S 1; this is the total amount of tax; this is the new price P 1, now what is the situation over here. Demand curve is perfectly inelastic, whatever may be the change in the price, it is not going to change the quantity demanded, and that gives us the flexibility for the producer to shift the entire tax burden to the consumer. So, this is the total amount of tax, and if you look at the increase in the price is just equal to the increase in the tax that is P 1 P 0 is equal to the total tax.

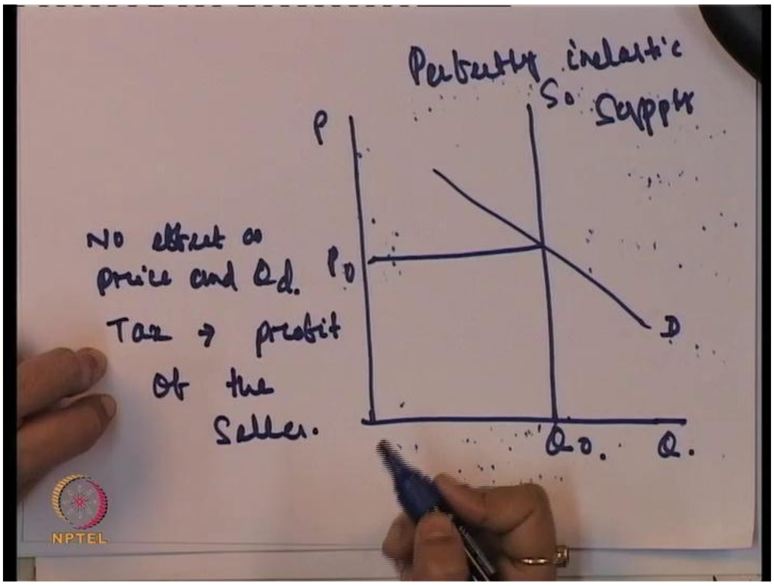
So, in this case the producer has shifted the entire tax burden to the consumer in term of increase in the price, and we can interpret here is that, in case of inelastic demand, perfectly inelastic demand, the consumer pays the entire tax burden, because there is no change in the quantity demanded even, if there is a change in the price, and that gives the liberty for the producer to shift the entire tax burden to the consumer. So, in case of perfectly elastic supply, the entire tax burden paid by the perfectly elastic demand, the entire tax burden is paid by the supplier, in case of inelastic demand, the perfectly inelastic demand the entire tax burden is paid by the consumer.

(Refer Slide Time: 40:44)



Now, we will see what happens, in case of perfectly elastic supply and perfectly inelastic supply; Q 0 P 0 P; perfectly elastic supply, imposition of tax moves S 0 to S 1, and there is a same imposition of increase in the price that is P 0 by P 1.So, in this case the amount of tax is getting transferred to the consumer in term of increase in price, because P 1 P 0 is just equal to the tax, and the entire tax burden is paid by the buyers, because the tax the total tax amount is shifted to consumer in term of increase in price.

(Refer Slide Time: 42:13)

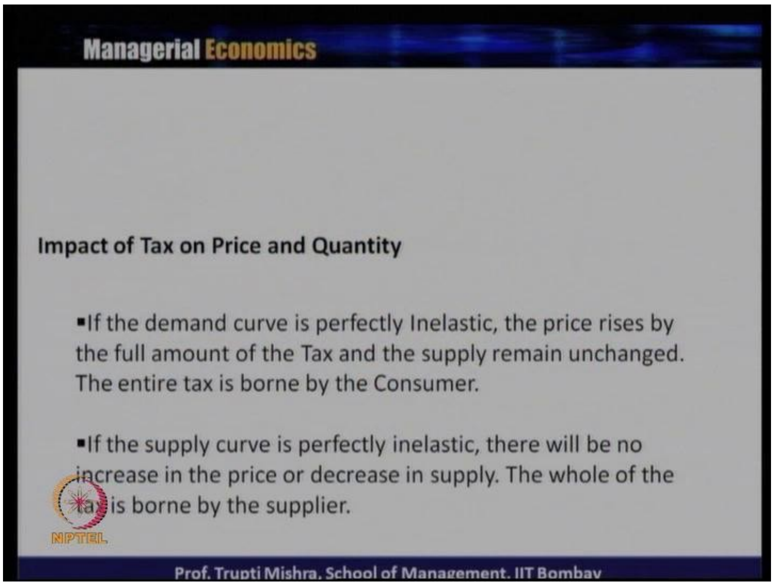


So, perfectly elastic supply curve, the tax is paid by the buyers then, we will see the case of the perfectly inelastic supply curve. So, in case of perfectly inelastic curve; supply curve takes a value that is parallel to the price axis. It means, whatever may be the change in the supply, it is not going to, whatever may be the change in the price it is not going to change the quantity supply. So, in this case no effect on perfectly inelastic supply, there is no effect on price and quantity, because imposition of tax will not lead to any change in the supply curve.

Rather, but when there is an imposition of tax, generally that reduces the profit of the seller. So, in case of inelastic supply curve, there is no effect on price and quantity demanded, that is the reason the consumer is not getting affected, but there is some influence on the seller, that is in term of change in the price, or in term of may be reduce quantity and that leads to reduce profit for the seller. So, when there is an imposition of tax, that leads to the fact that the tax burden get equally shared between buyers and seller, but when we introduce the concept of elasticity.

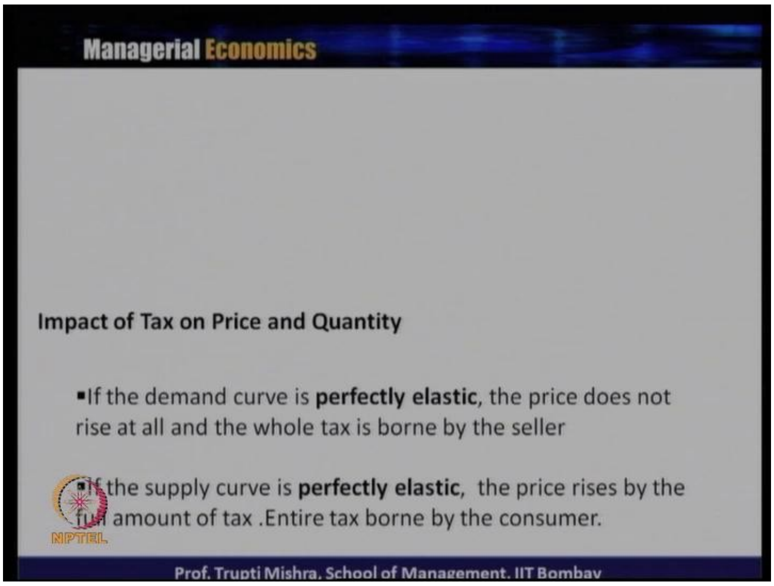
If the buyer is more sensitive, then it is the tax burden is more on seller, if the buyer is less sensitive, tax burden is more on buyer, similarly if the supplier is more sensitive, tax burden is more on consumer, if the supplier is less sensitive, generally that reduces the profit of the seller. Now, we will see the specific two cases like sale tax and excise tax, how that leads to change in the price or quantity demanded or how it affects generally the sellers and consumer. So, if you summarize the previous analysis of an imposition of unit tax.

(Refer Slide Time: 44:54)



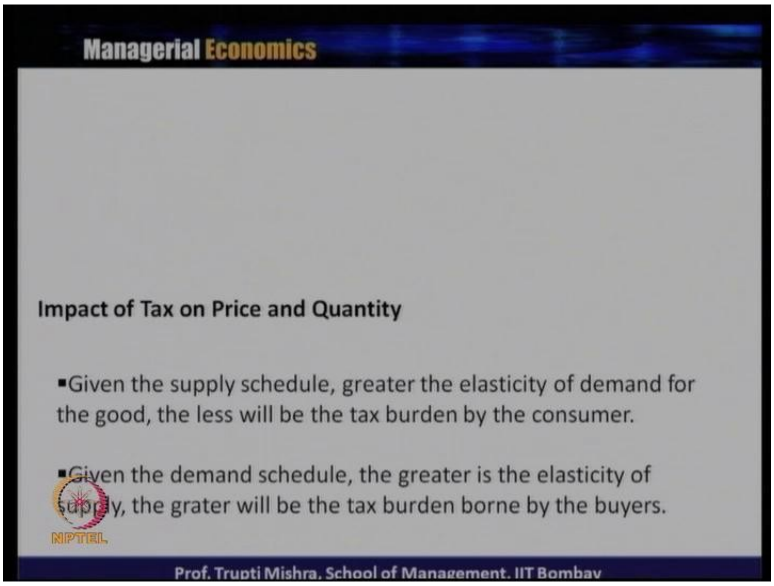
If the demand curve is perfectly inelastic, price increases by the full amount of the tax, and supplier remain unchanged the entire tax is borne by the consumer, if the supply curve is perfectly inelastic, there will be no increase in the price or decrease in the supply, the whole of the tax is borne by the supplier.

(Refer Slide Time: 45:07)



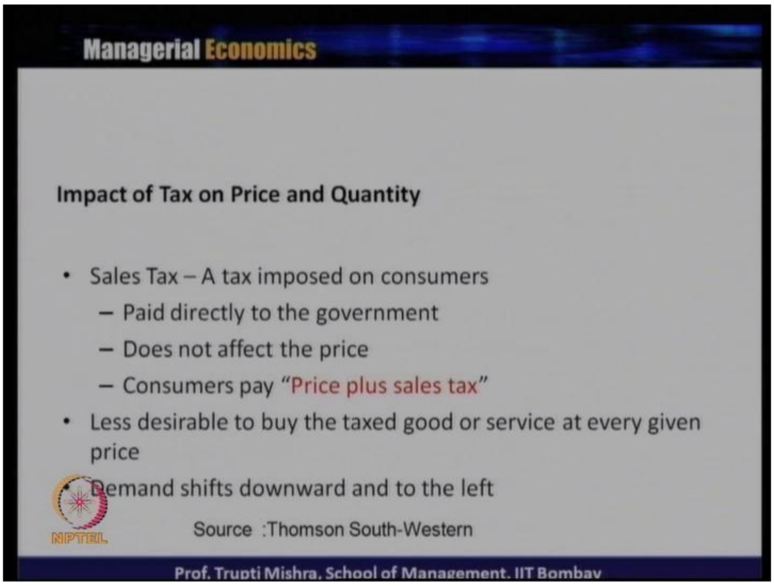
If the demand curve is perfectly elastic, the price does not rise at all and the whole tax is borne by the seller, if the supply curve is perfectly elastic price rise by the full amount of tax and the entire tax borne by the consumer.

(Refer Slide Time: 45:23)



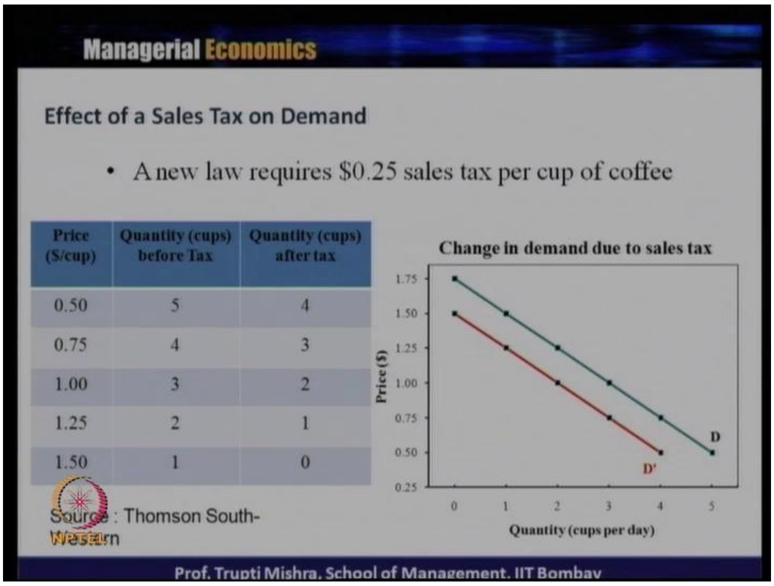
But given the supply schedule, the greater the elasticity of demand for the good the less will be the tax burden on the consumer, given the demand schedule, the greater is the elasticity of supply, the greater will be the tax burden borne by the buyer.

(Refer Slide Time: 45:38)



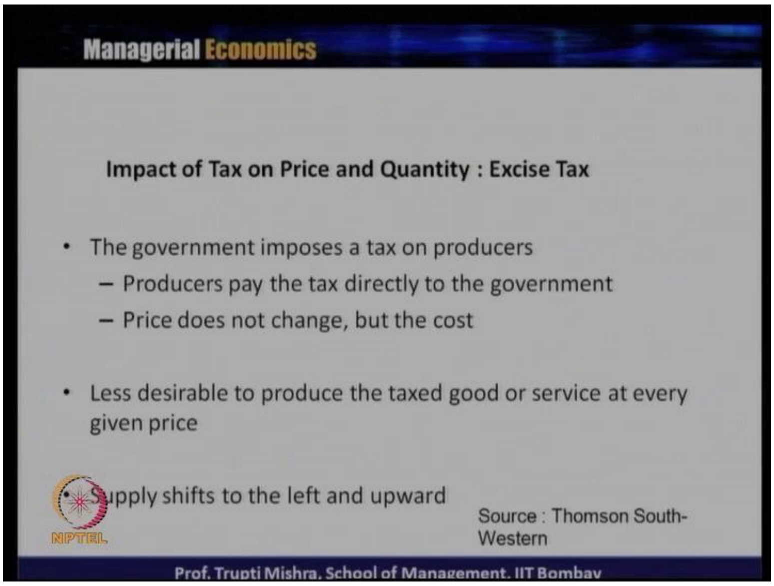
Then, we will introduce to new taxes, sale tax and excise tax, in order to understand; what is the impact on price and quantity. So, sale tax is the tax imposed on consumer paid directly to the government does not affect the price, consumers pay price plus sales taxes. So, tax is not the part of the price, less desirable to buy the tax good or service at every given price, demand shift downward and to the left, because there is a decrease in the demand, when there is an imposition of tax.

(Refer Slide Time: 46:11)



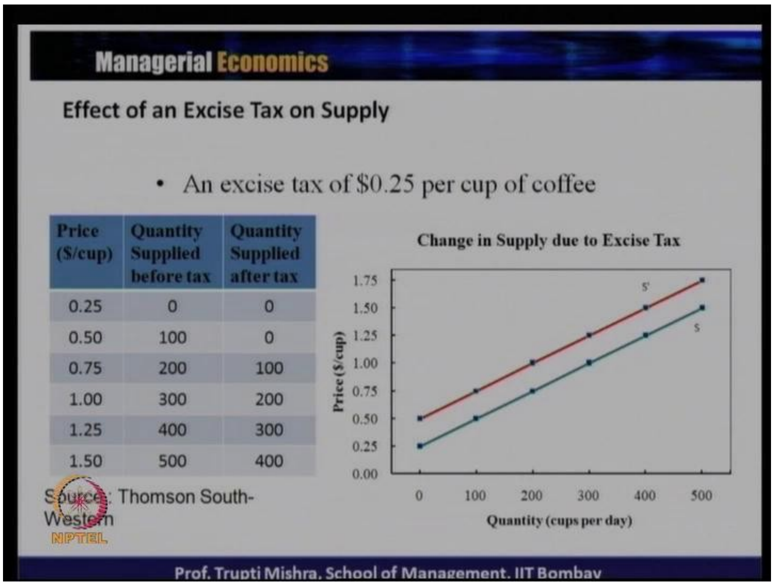
So, this is the effect of sale tax on demand. Suppose, a new law require 0.25 dollar sale tax per cup of coffee. So, if you look at the demand schedule on the left hand side of the graph, when the price is changing by 0.5 to 0.7521, if you look at there is a difference in quantity before tax, and after tax that leads to shift in the demand curve from D to D des.

(Refer Slide Time: 46:45)



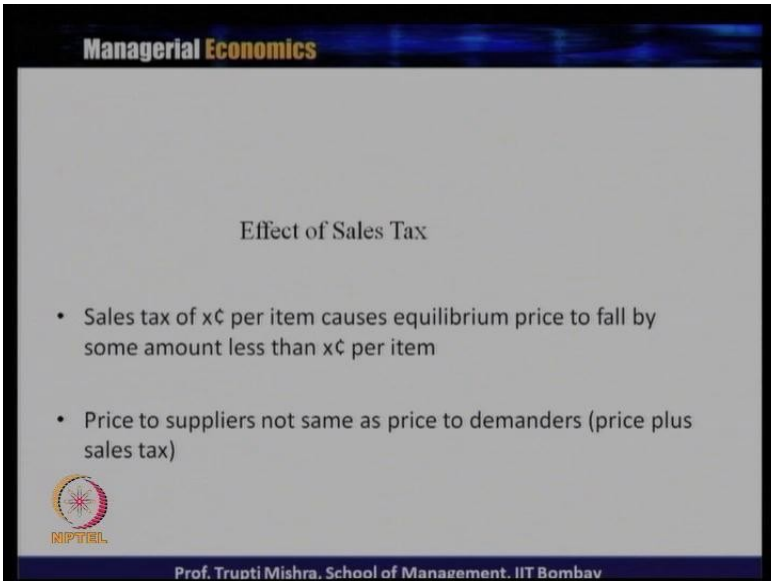
So, it means the effect of sale tax reduces the demand, then the government imposes tax on producer, in case of excise tax the government imposes tax on producer; producer pay the tax directly to the government, price does not change.

(Refer Slide Time: 47:15)



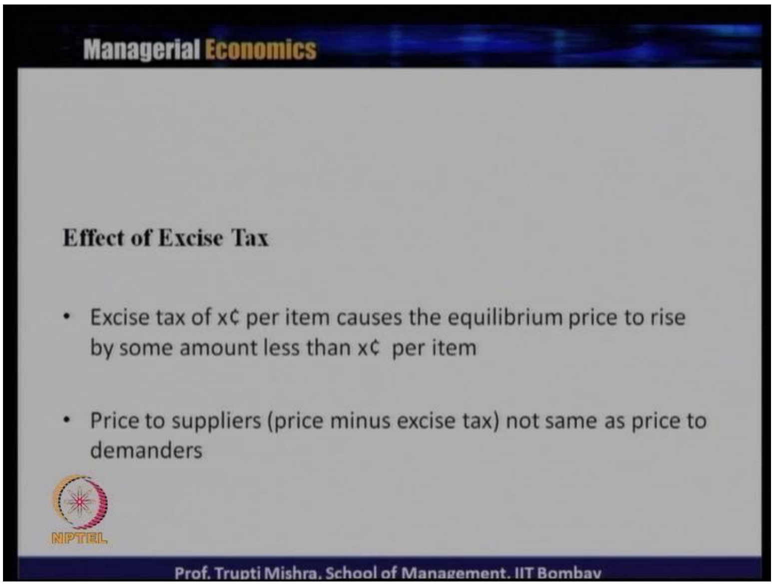
But the cost changes, because they are paying a tax to a less desirable to produce taxed goods, or service at every given price, supply shift to the left and upward. So, if you look at due to imposition of excise tax that leads to decrease in the supply and that lead to shift in the supply curve S to s dash. So, if you look at in this case, suppose there is excise tax of 0.25 per cup of coffee, that leads to change in the quantity, supply that is imposition of tax before and after, and that leads to decrease in the quantity supply and graphically the change in the quantity supply is represented from the movement from S to S dash.

(Refer Slide Time: 47:47)



So, irrespective of whether its sale tax, whether its excise tax, it generally reduces the demand and supply, in case of sale tax, that reduces the demand in case of excise tax, that reduces the supply. So, what is the effect of sale tax; sale tax suppose this x c per item equilibrium price to fall by the same amount less than x c item, price to supply are not same as price to the demander, because price plus sale tax is the price to the buyer.

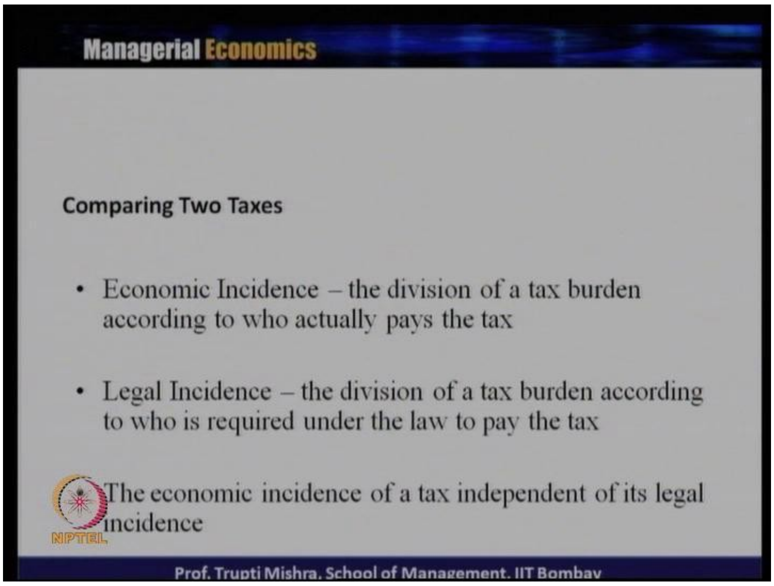
(Refer Slide Time: 48:18)



And what is the effect of excise tax; excise tax causes the equilibrium price to increase by some amount less than x c per item, price to the supplier, that is price to the minus excise tax is not same as the price to the demand.

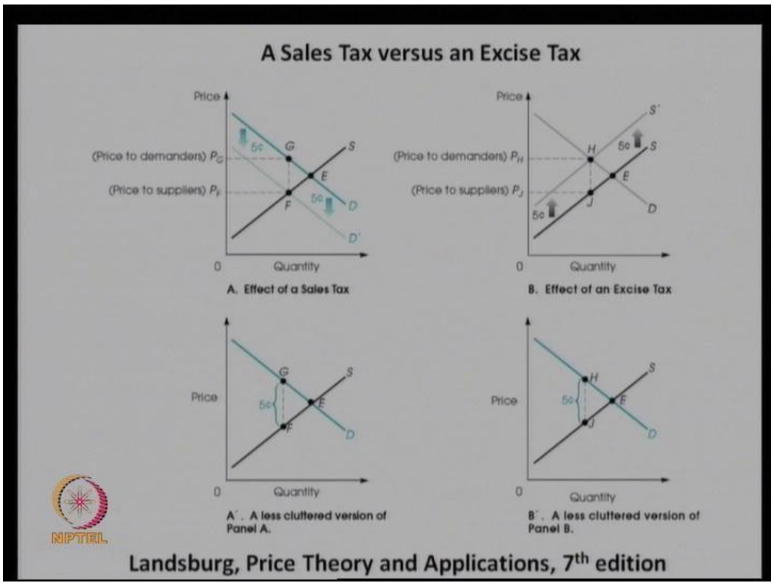
So, in case of sale tax the price to the consumer is on a higher side, and in case of excise tax, the price generally what is part of the cost also in the due course of time, generally they shift it to the consumer, but initially, when they are paying a excise tax whatever the price for them that is cost of production for tax, that is not equal to the market price, what the consumer they pay for it.

(Refer Slide Time: 49:12)



So, generally in case of imposition of sale tax reduces the equilibrium price, but in case of imposition of excise tax, it is reduces the equilibrium price. So, when you compare 2 cases, maybe there are 2 type of incidence; one is economic incidence; second one is the legal incidence. The division of a tax burden according to who actually pay the tax, that is on the basis of the economic incidence, and legal incidence is that the division of tax burden according to the, who required under the law to pay the tax. So, one is legally and another is the actually who is paying more. So, the economic incidence of a tax is independent of its legal incidence.

(Refer Slide Time: 49:45)

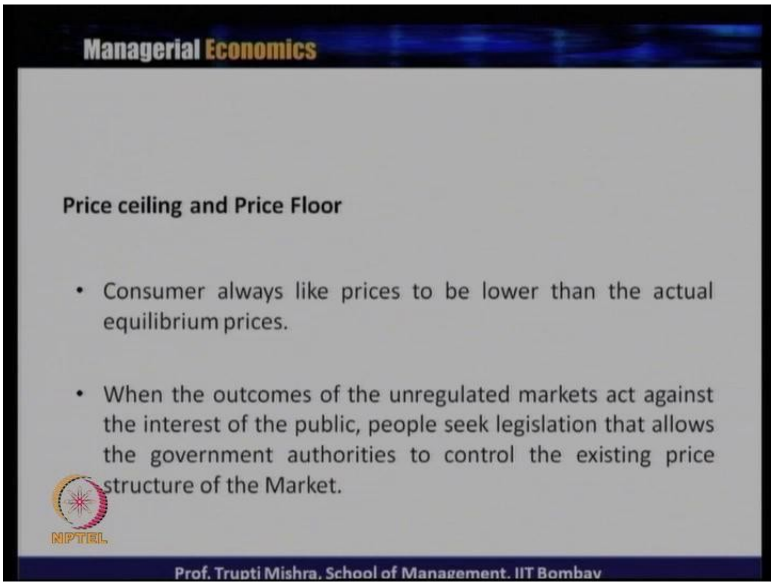


Now, this is the graphical representation of sales tax and excise tax, how it affects the demand. So, initially, if you look at the first graph, left hand top graph; the imposition of tax leads to the decrease in the demand from D to d dash, that leads to increase in the price from P f P g. So, the price to supplier is P f, whereas the price to consumer is P c, which includes the price plus the tax.

And in the right hand side, if you look at the top one, then imposition of excise tax leads to shift the or decrease the supply from S to S dash, and that leads to 2 type of price; one is the price to supplier, and the second is the price to demand. So, in both the cases, if you look at the price is changing. So, in the left-hand side, if you look at may be the graph, which is just below may be a less cluttered version of the panel A, in this case, the new supply, the new demand and may be the original supply gives us the change in the price.

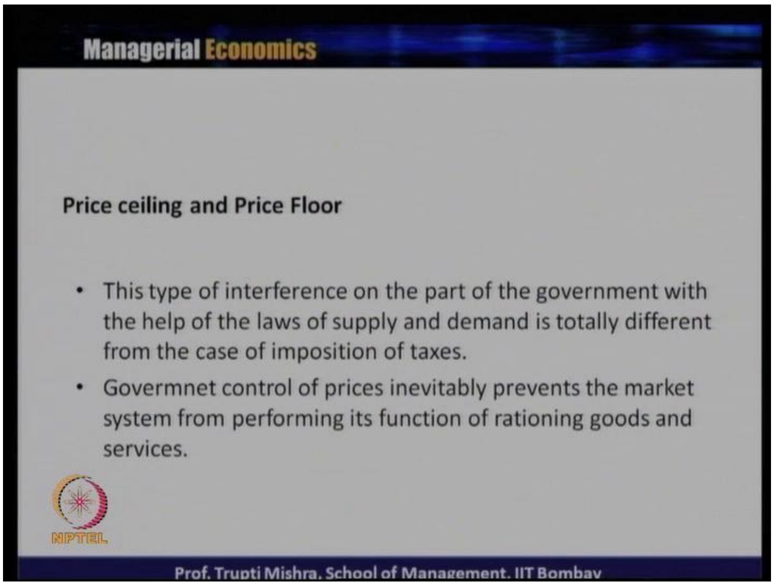
And similarly, in the right-hand panel, the lower graph, if you look it is again the change in the supply and change in the demand, and exactly whatever the change in the price. So, excise tax influences the producers, and generally sale tax influence the buying behaviour of the consumer whereas, excise tax influence the selling behaviour of the producer.

(Refer Slide Time: 51:25)



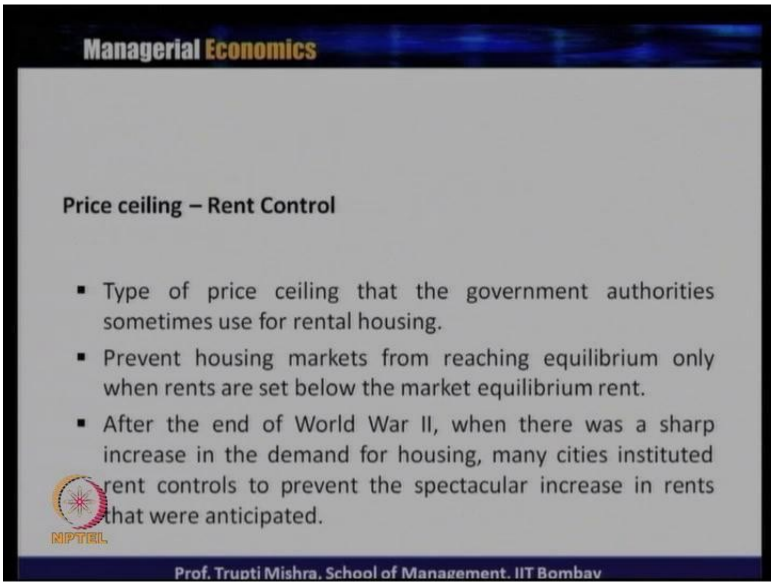
Then, we will discuss about the 2 specific cases, where the price is decided by the government, or the price is decided by the legally in case of the imbalances, and what happens to the situation. So, consumer, if you look at always like the prices to be lower than the actual equilibrium price, and when the outcomes of the unregulated act against the interest of the public, people seek legislation that allow the government authority to control the existing price structure of the market.

(Refer Slide Time: 52:18)



Sometime, it happens that they form; they collude; they make a joint collision and they decide the price, and in this case generally the interest of public, generally the government comes to picture and they fix up a price. So, this type of interference on the part of government with the help of law of supply and demand is totally different from the case of imposition of tax. This is not the case of taxes, and government control of price inevitably prevents the market system from performing its function of rationing goods and services.

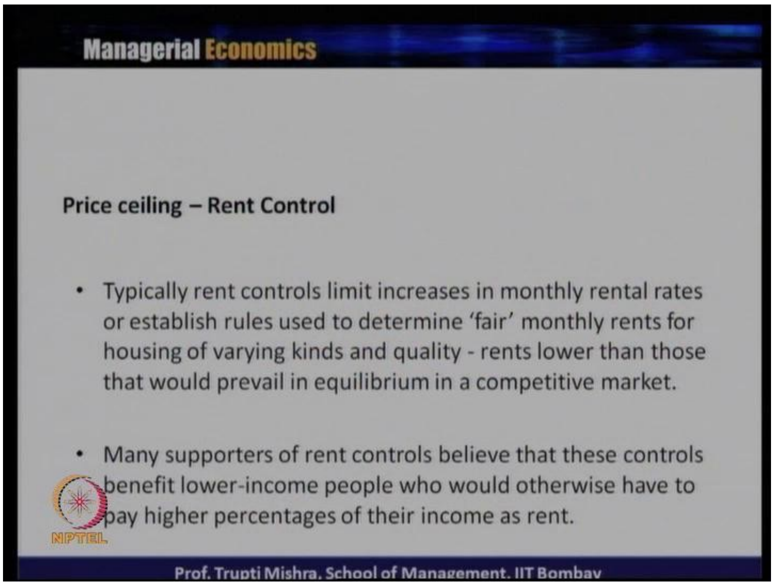
(Refer Slide Time: 52:33)



So, two type of cases; one is price selling and it is a type of price selling, that government authorities sometimes used for rental housing, and the specific case here is the rent control, prevent housing market for reaching equilibrium only, when the rents are set below the market equilibrium rent, and the typical example is the after the end of world war two, when there is a sharp increase in the price of the rent or the serve the increase in the housing price or the demand for the housing.

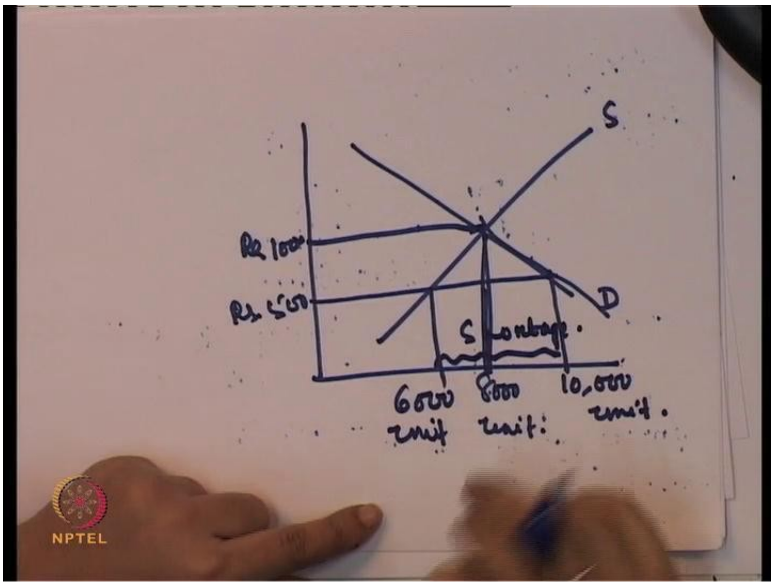
Many city instituted the rent control to prevent the spectacular increase in the rent that were anticipated, because there is a increase in the demand and that also leads the increase in the rent, and in many cases they practice this rent control.

(Refer Slide Time: 53:23)



Generally, how this can be applicable, in case of in case of controlling the rent to a level which is below the equilibrium rate. So, typically rent control limit increase in the monthly rental rate, or the established rule used to determine the fair monthly rent for housing or varying kind of quality. Rent, generally lower than that would prevail in the equilibrium in the competitive market, many supporter of red control believes, that this control benefit lower income people would otherwise have to pay higher percentage as their income as rent.

(Refer Slide Time: 53:59)

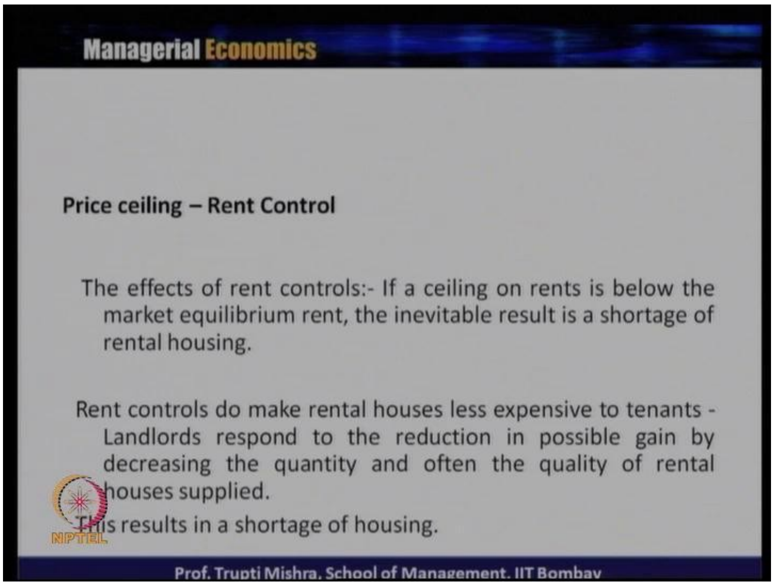


Now, how it works generally, if you look at; this is the supply of housing; this is the demand for the housing; price is nothing but the rent, suppose this price, in this case is 1000 rupees, and the quantity is may be suppose 8000 unit. Now, if the rent looks higher, generally the public seeks the legislation from the government to charge a lower price. So, in this case, if the governments fix up a rent which is equal to rupees 500 now, what will be the outcome; the demand would be more and the supply would be less.

So, if this is 10000 units, because of decrease in the rent, then it leads to increase in the demand for housing to 1000 unit, but the supply of housing will reduces to 6000 unit. So, this leads to shortage. So, whenever there is a rent control and the rent is set much below the equilibrium rent. In this case, the demand for housing is more than supply of housing which leads to shortage, then in this case, what is the way out, because rent was on a higher side that is the reason the public comes to the government support to fix up the rent.

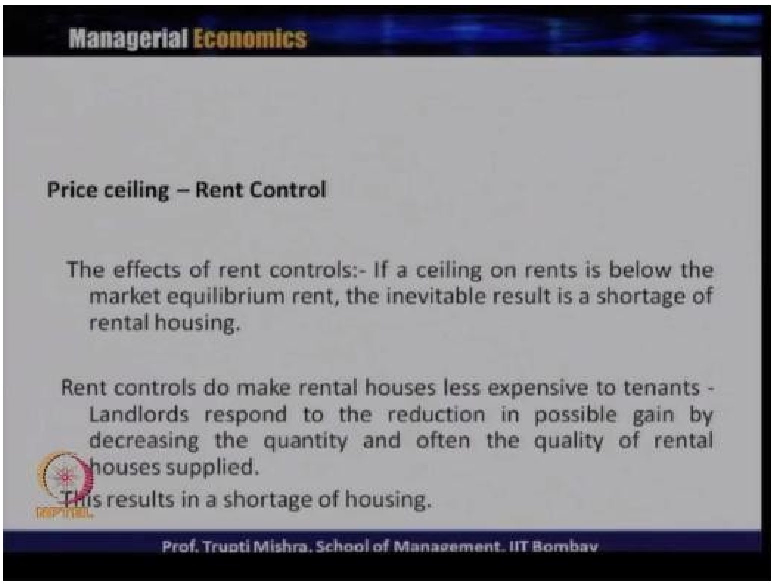
And if the rent is lower than the equilibrium rent, generally people they prefer a high demand for housing, and the suppliers reduces the supply. So, in this case may be one possible solution is to follow a non wrestling rent control, and what is the non wrestling rent control, or the non price may be solution, the non price solution is to the first come first serve basis. So, at a specific price even, if it is 6000 or even if the rent is 500, only people up to 8000, they will be entertained not more than 10000. So, in this case, the surplus can be captured on the basis of the first come, first serve. So, it is only 8000 units of housing, they are available at a price of 500, and they should the supplier will only.

(Refer Slide Time: 56:32)



There is binding on the supplier also to supply at least 8000 unit of the housing at the rent of 500, the second case, what we will deal here is the opposite of price ceiling is price floor. So now, what is price floor?

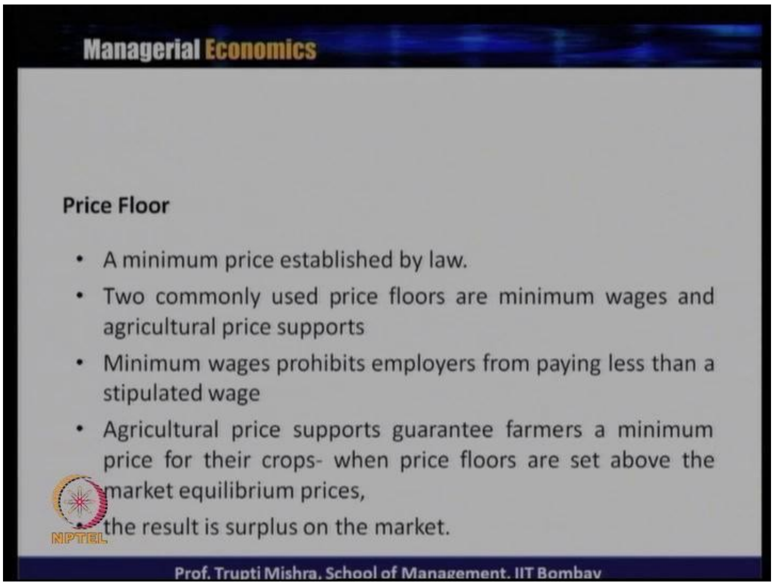
(Refer Slide Time: 56:31)



So, this effect of rent control is, if selling on rent is below the market equilibrium, then this inevitable result in the shortage of the rental housing, what we checked in the previous graph, rent control do not make rental house less expensive to the tenant.

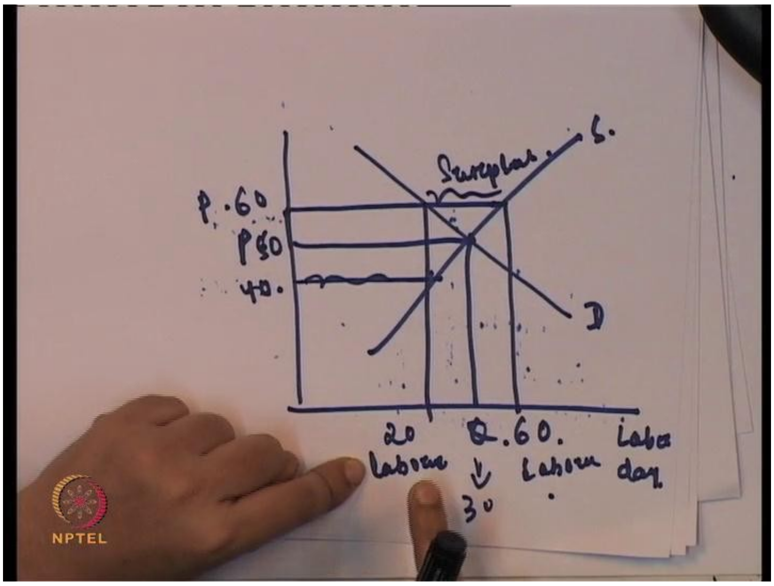
Landlords respond to the reduction in the possible gain by decrease in the quantity and often the quality of their rental houses supplied, results is shortage of housing, and then we will take the second case that is price floor opposite to the price ceiling. This is the minimum price that has to be given, or that has to be given by the supplier.

(Refer Slide Time: 56:19)



Now, what is the typical example here; the typical example is the minimum wage the producer has to pay a wage, which is at least, minimum that is said by the law. So, two commonly use the price floor are minimum wages and the agricultural price support, minimum wages prohibit employers from paying less than the stipulated wage, and agricultural price support generally guarantee farmers a minimum price of their crops, when price floor are set above the market equilibrium price. And generally, this results in the surplus and the market. So, let us see a graphical example of this minimum wage.

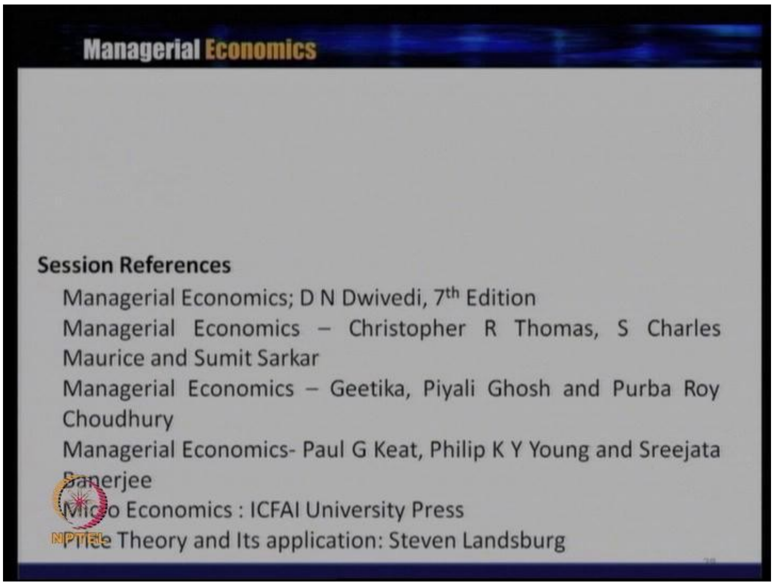
(Refer Slide Time: 57:54)



So, we have a demand curve; we have a supply curve; this is the equilibrium quantity; this is the equilibrium price now, what is the equilibrium price here? This is nothing but the wage. So, suppose this is 50 rupees is the wage, and this is the 30 laborers; this is the Labour Day. Now, if the minimum wage is set at 40, So, if the minimum wage is set at 60, which is as a higher than the equilibrium, in this case what would be the outcome, the demand would be more suppose 60 labourer will ready to work, when the wage is 60.But the supplier is ready to only give the employment to 20 laborers, when the minimum wage is fixed by legally and that is 60. So, in this case, what is the outcome; the outcome is surplus. So, in case of minimum wage, if the minimum wage is set above the equilibrium wage, that is equilibrium wage is 50.

And the minimum is 60, it means it is binding on the supplier to pay the wages equals to 60, in this case generally, the demand for the labour, or the demand for the employment will be more for that are 60 units, but whatever the supply of labour the procedure is only ready to give employment to 20 laborers. If the wage is set at 60, this lead to surplus in the market, and again it is a non price control will come the first come, first serve basis, this 20 labourer who are ready to work, they will come first 20 units will be entertained. So, in this case, if you look at the real problem again leads to something else, when the price is goes on a higher side or the wage is going on a higher side that leads to less employment. So, two cases; one is price selling, which is price fixed by the government

(Refer Slide Time: 1:00:21)



And the second one is the price floor; this is also price fixed by the government, and this is the minimum price may be in the first case, that is the maximum price that has to be followed in the market. So, with this we completed our second module that is on theory of demand and demand analysis. And we will start our third module, that is theory of production and cost from the next session onwards, and these are the session references, that is being followed few books few study material, that is being followed for preparing this specific session.