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

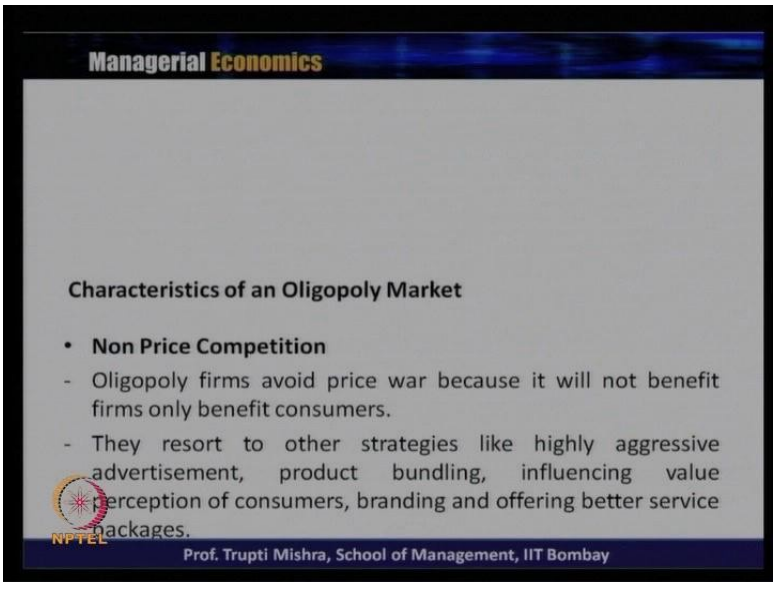
Lecture - 62
Oligopoly – II

There is entry barrier to the oligopoly market, and what are the entry barrier; huge investment requirement is there. So, someone should have the capacity for huge investment, if someone is trying to enter into the market, because they have to compete on the basis of product they have to compete on the basis of the price.

Strong consumer loyalty for the existing brands like there are many firms, but why only two firms they have the maximum market share, because the maximum market share is; because there is a strong consumer loyalty for those two firms, and that is the reason strong consumer loyalty for existing brand, generally posses as the entry for the other firms to enter in the market and operate in the market, then economy of scale like we are saying that there should be at least few large seller, and when they are few seller; obviously, with their scale of operation they have already achieved the economies of the scale.

So, when someone enter into the market, someone operate in the market they have to compete with them with a high cost of production, and which itself create a entry for the entry barrier for the other firms, we enter because they knows that, if they are entering in that market they have to compete with a high cost of production. So, there is interdependent decision making, as we discussed in the previous case the price and output, whether it is advertising budget, whether it is about the business policy, the firms they are dependent on each other, whether it is collusion, or whether it is non-collusion.

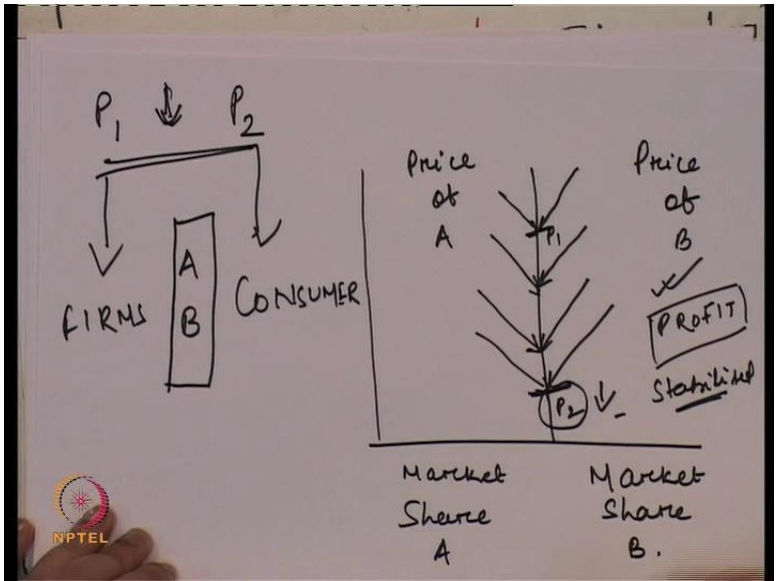
(Refer Slide Time: 23:19)



Also, there is a evidence of non-price competition, generally the oligopoly firms avoid price war, because it will not benefit the firms it only benefit the consumer, and they resort to other strategy like highly aggressive advertisement, product bundling, influencing the value perception of the consumer, branding offering better service package, and generally these are the strategy to get a good amount of sale rather than the competing on the basis of price.

Generally, we will say; why how graphically we will see how this price war is not leading a benefit to the producer, rather its leading a benefit to the consumer, and that is the reason, if you look at the oligopolies firm they have heard that competing each other in term of price, rather they compete with each other on the basis of the other strategy, like capturing the consumer segment understanding their value perception, or may be creating a brand loyalty for them or the additional, where the supplementary of basis along with the along with the product.

(Refer Slide Time: 24:26)

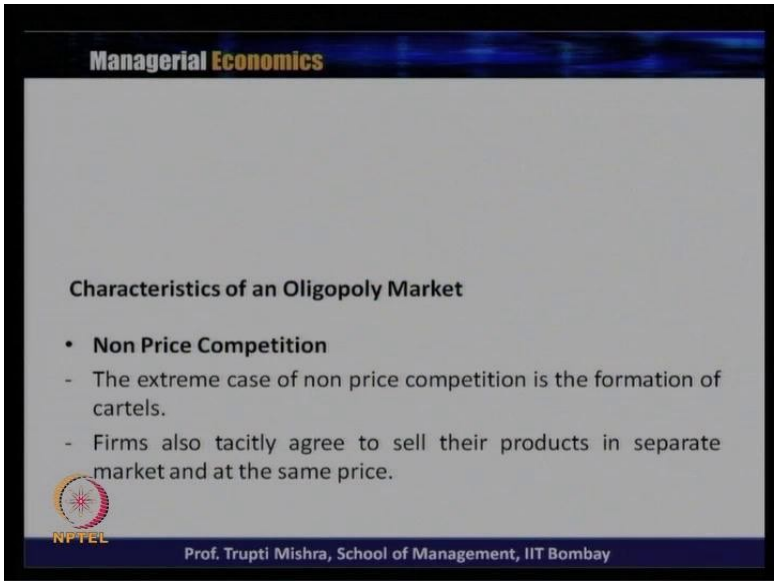


Now, when there is a non-price competition. So, if you consider this as the market share of A, and this is market share of B, suppose this, we will consider as the price of A, here consider the price of B, here A and B they are two firms, and we will see why they will not get into the non-price competition, suppose initially the price is P 1, now B will always feel that; this is the price P 1 to start with B will always feel that, if I lower the price, I will get a good market share, and since they are interdependent on each other, since B has lower the price; A has lower the price and gain a market share. Now B will follow that, and also B will reduce the price in order to increase the market share.

Now, again what will be the reaction of A, knowing that B has already reduced the price to get the market share, also A will reduce again, and reduce the price in order to get the market share, what will be the reaction of B; A has already reduced again to gain the market share, B will also reduce, this will continue again this will continued by B; this is the price P 2 now, at this point the firms A and B they will feel that, if they are going beyond this, it is nowhere getting profit for them rather they are going to make loss, and at this point, they will feel that they are not going to reduce the price below P 2 and P 2 will be generally a stabilized at this point at least the stabilized price of it, and if you are going beyond this any of the firm they are going beyond this, even if they are increasing the market share, they are not getting the profit, and since it is a oligopoly's firm they can decide their price and output, they are not going beyond this P 2 and that is how the non-price competition, generally takes place beyond this point, because when they are competing into a price were, they are competing on the basis of the price the output not beneficial from the benefit for the producer because, the output is there is a reduction in the price from P 1 to P 2, and this is not going to benefit the firms, rather this is going to the going to benefit the consumer because of decrease in the price from P 1 to P 2.

And that is the reason, they will not get into the price competition on the basis of price, or they will not get into the price were, rather they will prefer to resort to the other strategy like aggressive, advertisement, product bundling, capturing the value perception of the consumer influence, and branding and offering better service package they will just resort to that.

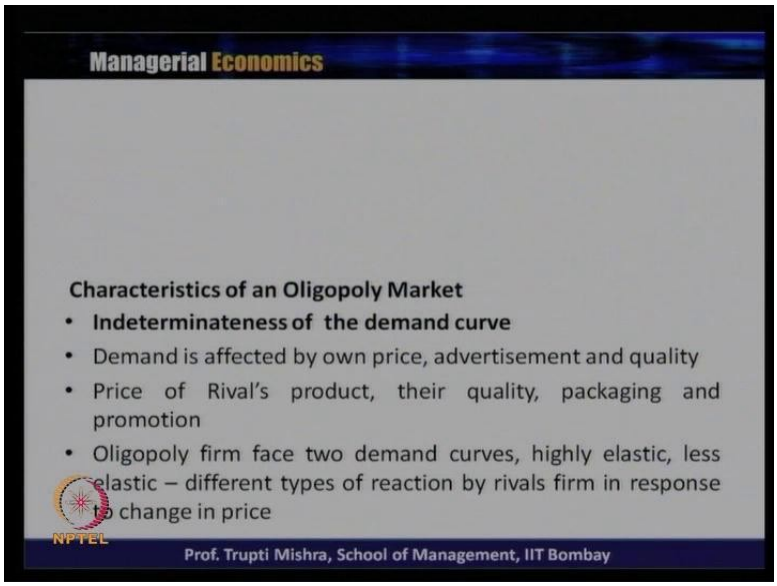
(Refer Slide Time: 28:24)



So, generally there is one more form of the non-price competition one is getting into better kind of strategy, like aggressive advertising bundling or may be better service package along with the product, but apart from this also, there is one more form of non-price competition, that is generally known as cartel, where they come together firms also tacitly they agree to sell their product in the separate market at the same price. So, generally they share the market, and its generally in the form of cartel, because they say, cartel is in the form with joint organization, joint profit maximization and they will just share the market, and they will say that you are going to sell in this market, I am going to sell in the other market, and two firms they will not get into each other market, and that way they generally maximize the profit.

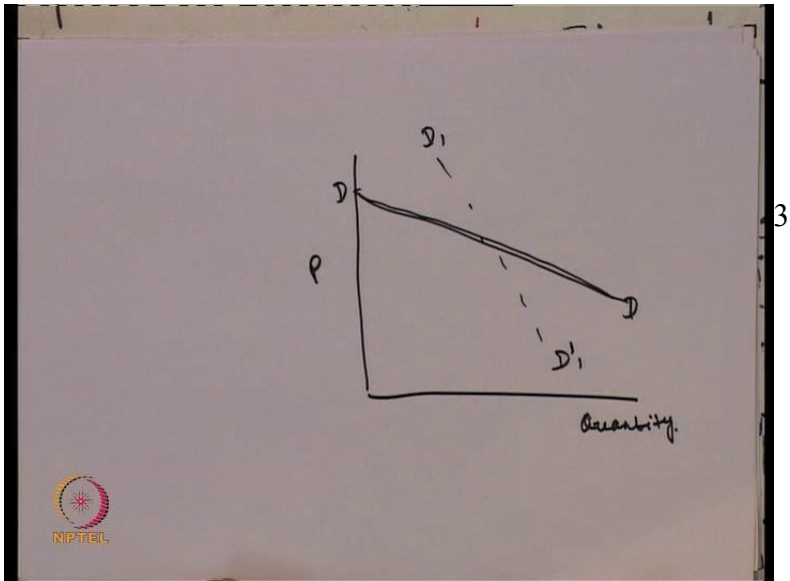
So, that is the reason; this actually the extreme form of non-price competition, sometimes it is not explicit, people because sometimes, the explicit collusion is not legal. So, generally the firms they comes into an agreement, they comes into a cartel where they share the market. So, they charge the same price, but both of them, they sell in the different market, and both of them, they maximize the profit. So, the uncertainty on the raise on the rival action on the basis of your price and output decision generally goes with that.

(Refer Slide Time: 29:39)



Then, the one of the interesting characteristic of demand curve, if we will find out a of oligopoly market will find out, there is no determinate demand curve, or there is no specific demand curve for the oligopoly firm; demand is affected by own price, advertisement and quality that is one point, also its get affected by the price of the rivals product, their quality packaging and promotion. So, that is the reason ,if you look at there are two kind of demand curve, we get it in case of a oligopoly firm; one which is highly elastic, and second less elastic ,and different types of reaction by rival firms in response to change in the price.

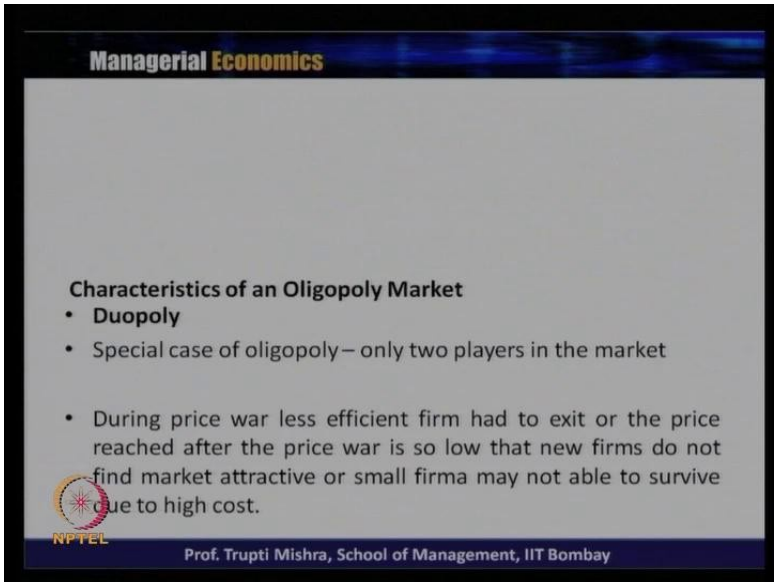
So, generally when you increase the price, rivals they will not increase the price, but when one firm decrease the price the other or they also decrease the price. So, in this case, if you look at we get one inelastic demand curve, and another elastic demand curve, and that is why there is no specific demand curve for a oligopoly's firm, because the demand gets change on the basis of in the firm's own price, advertising, and product quality, and also the rivals price product, and the advertising and other technique.

(Refer Slide Time: 

31:16)

So, we will see generally, how this two demands curve appears for a firm in case of a oligopoly market structure. So, this is one elastic demand curve, and here is one inelastic demand curve, and what is the difference between this elastic, and inelastic demand curve, in case of elastic demand curve, small change in the price, consumer they will react to it, because if there are number of others, and in this case the firms generally prefer to not to increase the price, generally to decrease the price, and this is the inelastic demand curve here, whatever the change in the price, pricing then they generally less response from the consumer, and here the firm they will prefer to increase the price.

(Refer Slide Time: 32:16)



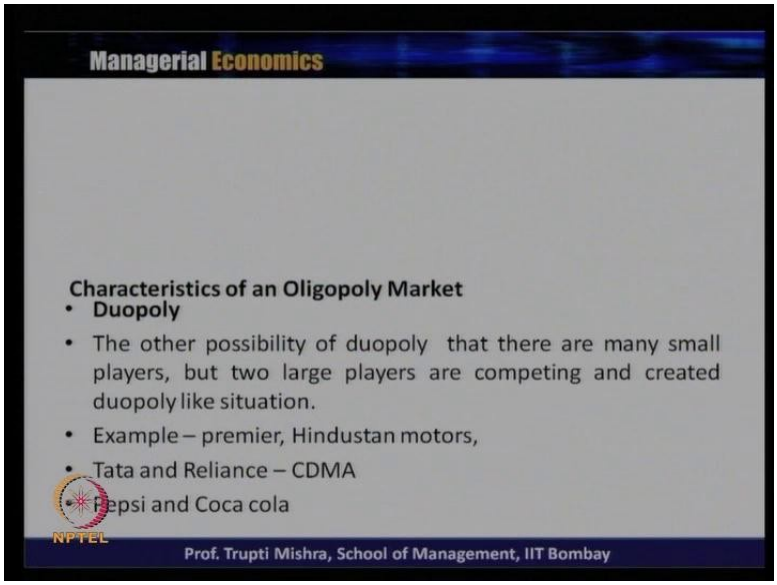
So, depends upon the rival action and reaction, we have two set of demand curve; one is elastic demand curve, and another is the inelastic demand curve, and since there are two kinds of demand curve, there is no specific determinate demand curve for the oligopoly firm, then we will talk about a special case of oligopoly that is generally known as duopoly, and in case

of duopoly there are only two players in the market. So, it is a case of special case of oligopoly only two players in the market, and generally how the oligopoly firm tends into a duopoly firm, during the price war generally the less efficient firm had to exit, or the price reached after the price war is. So, low that new firms do not find market attractive, or may be the small firm may not able to survive due to high cost.

And that is the reason the oligopoly firm leads into a duopoly firm, because if it is inefficient firm during price war they prefer to exit the market, or after the price war the price is. So, less that it is they find difficult to survive in the market and even. So, high cost of production is not suitable for the small firm, and they prefer to leave the market.

So, if you look at whatever the oligopoly's model, we have taken into consideration in maximum cases, we have analyzed this with the help of two firms typically not in oligopoly market, rather in a duopoly market. So, duopoly is a special case of oligopoly, it is a kind of market structure, where there are only three firms, and there are three players in the market, and they compete on the basis of price, on the basis of non-price to survive in the market and to get the market share.

(Refer Slide Time: 33:48)

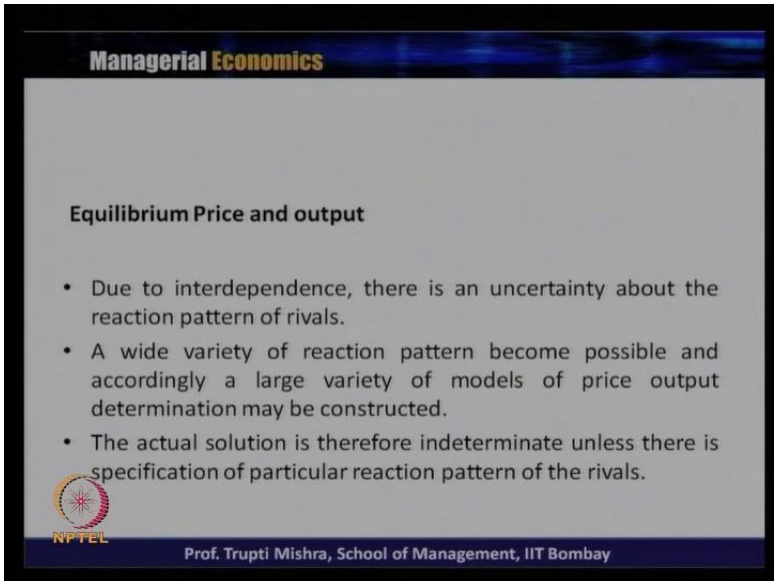


The other possibility of duopoly is that there are many small players, but two large players are competing and created a duopoly like situation. So, there are may be many small players, but when it comes to the market share, there are only 2 large player, they are competing and created a duopoly like a situation. So, if you look at before this Maruti Suzuki came into

picture, before this Maruti Udhyogh limited came, or before this joint venture started, there were two specific or the significant company in case of a car industry, that is premier and Hindustan motor similarly, when you talk about a CDMA technology there are only two major player; one is Tata and Reliance, but still opportunities are many there are many more players is coming into the market.

And the classic example in this case, we take duopoly is the Pepsi and Coca Cola over the year, they are just it they have just made this market as a duopoly market, because they are having the maximum market share similarly, if you take about talk about the news paper industry, there may be many news paper industry, but when it comes to which one the significant, or which one the specific, there may be only a we talk about the Times of India, we talk about the telegram and against the reason specific in Mumbai may be it is a Times of India or DNA or may be when it comes to Chennai, its again Times of India is Hindu, you go to Delhi may be again its Times of India, and some other. So, there are two players generally, they take a maximum market share, or the largest market share, and they turn the oligopoly market into a duopoly market.

(Refer Slide Time: 35:33)

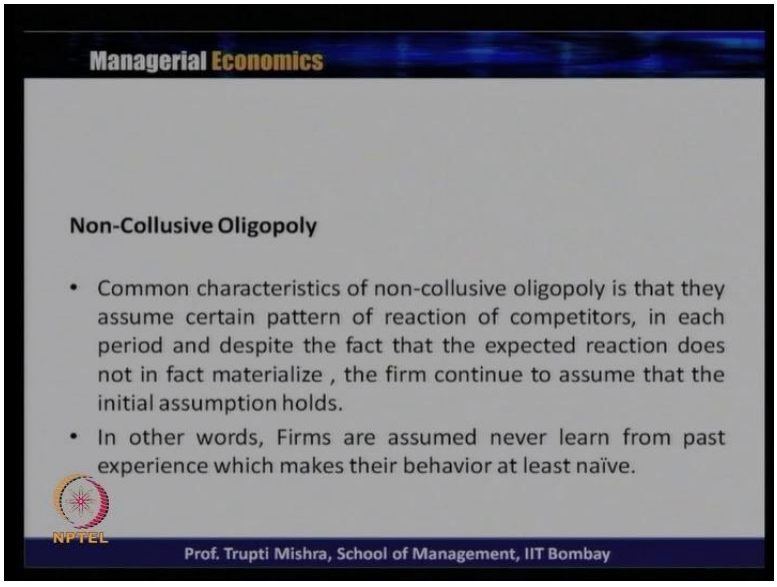


Now, what happens to the equilibrium price and output, since there is a interdependence , there is uncertainty about the reaction patterns of the rivals, may be sometimes it follow, sometimes it do not follows. So, there is interdependence that leads to uncertainty about the reaction pattern of rivals, there are wide variety of reaction pattern can be possible, and accordingly for each type of

reaction pattern, we have different variety of model of price and output determination, or it may be constructed. So, this reaction pattern goes in this direction, what should be the price and output determination, if the reaction pattern goes in a different direction, what should be the price and output determination.

However, the actual solution is therefore, in determinant unless there is a specification of particular reaction pattern of the rivals. So, there is nothing generic price and output equilibrium price and output case in case of your oligopoly market structure, it is all situation specific, and the situation is dependent on, how the rivals they are reacting to change in the price of the, or the change in the output change in the advertising change in the business coal of the other firm.

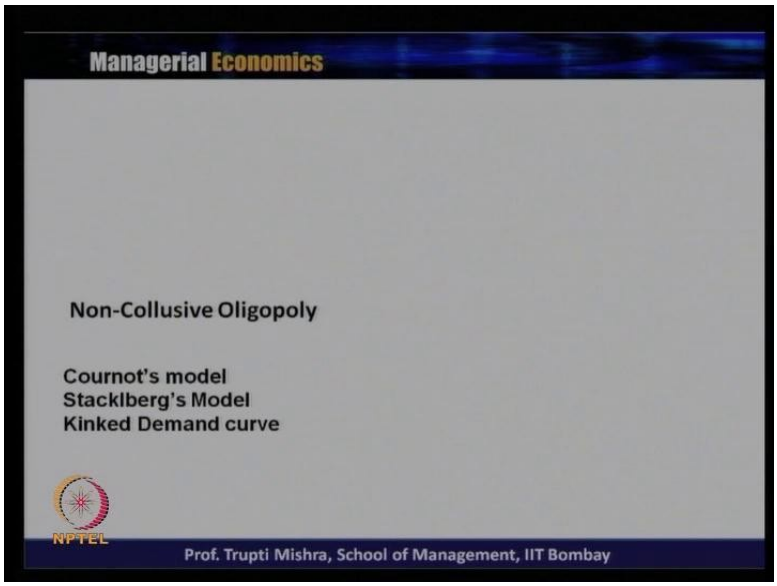
(Refer Slide Time: 37:16)



So, with each pattern of action and reaction, there can be separate price and output determination and each kind of price, and output determination, we can explain through a model at least few of them. So, what is the common, we will start with our discussion in case of a non-collusive oligopoly, few models in case of non-collusive oligopoly, and what is the common characteristic of a non-collusive oligopoly, the common characteristic of non-collusive oligopoly that they assume certain pattern of reaction of the competitor, in each period they assume that this is how the rivals is going to behave, if this is my action, and in each period and despite the fact that the expected reaction does not in fact materialize, the firm continue to assume that the initial assumption hold.

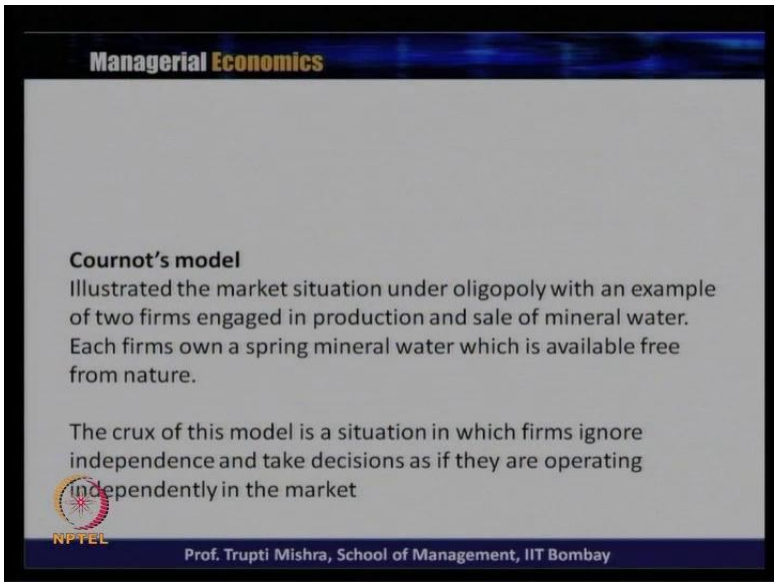
So, in one period, if they assume that reaction should be like this, and if it is not happening also, next period still the firm feels that the firm is continuing to assume in the initial assumption about the reaction pattern, to put it in a simple word, firms are assume never learn from past experience which makes their behavior at least naïve. So, they known's that the reaction sometimes does not match, whatever the expected reaction, what the firm thought of about the rivals, that they do not matches, but still they assume the same pattern of reaction in the next time period also and to put it simply, we can say that oligopoly firm, they never learn from their past mistake, and they acted as a naïve, and they start it again that this should be the reaction pattern of the rivals.

(Refer Slide Time: 38:49)



So, we will talk about three different model, in case of a non-collusive model, and we will start with the Cournot's model, and whether its Cournot's model, whether its Stacklberg's model, or whether its Kinked demand curve model, in all these three models, we have not taken a case of your oligopoly market structure, in general rather we have taken it is a special case of duopoly, but there are only two firms, and we will see how the price output determination is done in this specific scenario under Cournot's model, under Stacklberg's model, or under kinked demand curve model.

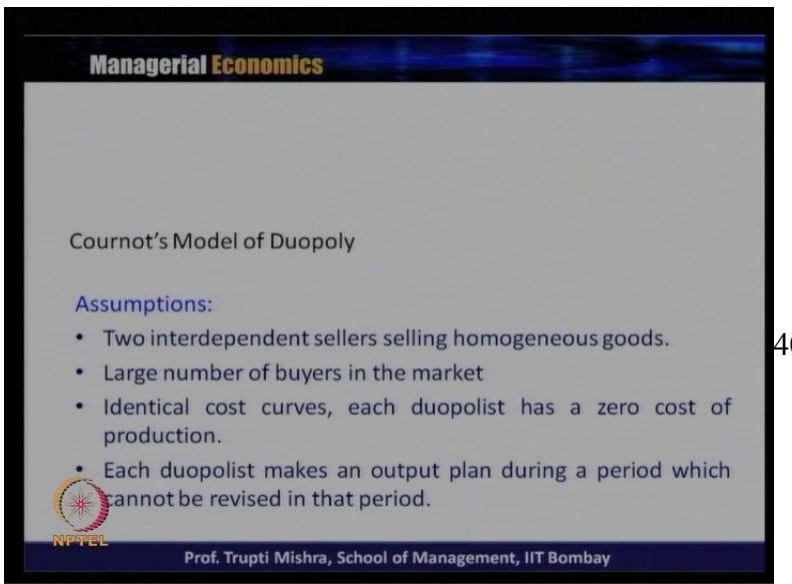
(Refer Slide Time: 39:20)



So, what is Cournot's model to start with, if you look at this Cournot's model illustrated a market situation under oligopoly with an example of two firms engage in production and sale of mineral water. So, there are two firms in the market, it is a two duopoly firm, it is a duopoly market two firms, and both the firms, they engage in the production, and the sale of the mineral water each firms own a spring mineral water, which is available freely from nature. So, they are into the business of production and sale of mineral water, each firm own a spring mineral water, which is available free from nature, they are not incurring any cost for this spring mineral water.

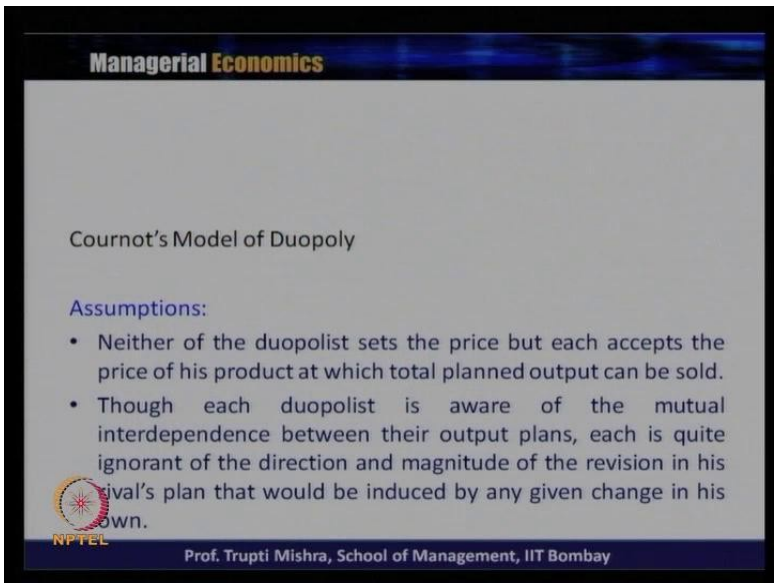
The crux of this model is a situation in which firms ignore independence and take decision as if they are operating independently in the market. So, there is a correction here, that in which firms ignore interdependence not that they both the firm, they are related to each other and they behave independently, and when they behave independently they hang into a situation, where they are not they are not getting the maximum profit, rather they would have got more profit, if they are taking the decision interdependently rather independently.

(Refer Slide Time: 40:50)



So, we take few assumptions to understand this Cournot's model of duopoly, two interdependent sellers selling the homogeneous good; the homogeneous good is the spring water over here, and there is large number of buyers in the market. So, if it is two sellers, but there is large number of buyers in the market; identical cost curve, or we can say in this case since the mineral spring they are getting it from the nature as free, it has a zero cost of production. So, this is a very specific case that we are getting something in zero cost of production, but here this is one of the assumptions that each duopolist has a zero cost of production.

(Refer Slide Time: 41:52)

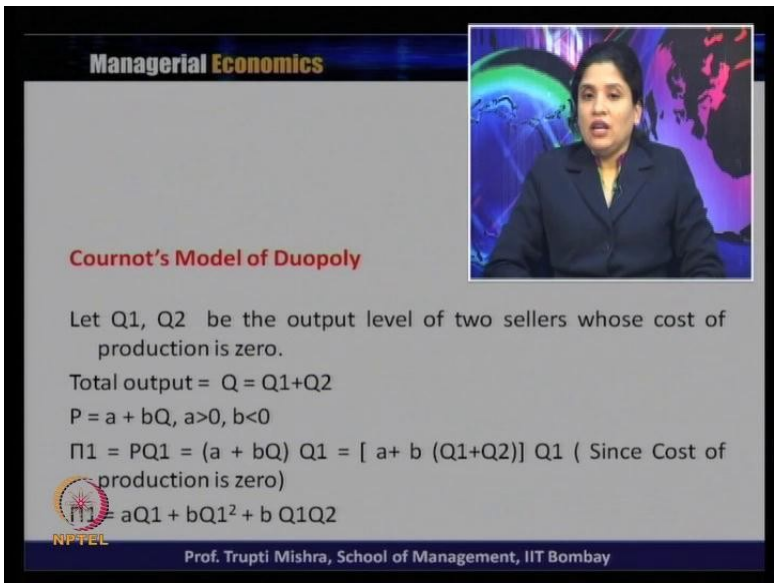


And since they have a zero cost of production ideally they have the identical cost curve, each duopolist makes an output plan during a period, which cannot be revised in that period. So, whatever the output plan for them in that particular period that cannot be revised in that period at least, if they want to revise they can do it in the next period, but that period they have to just go ahead with the whatever the output plan.

Neither of the duopolist set the price, but each accept the price at which total planned output can be sold. So, they are not the price take, price maker rather than the price taker, and they accept the price of each product at the which the total plan output can be sold, each duopolist, each firm is aware of the mutual interdependence between their output plans, but each is quite ignorant about the direction and the magnitude of the revision in which the rivals plan that would be induced by any given change in his own.

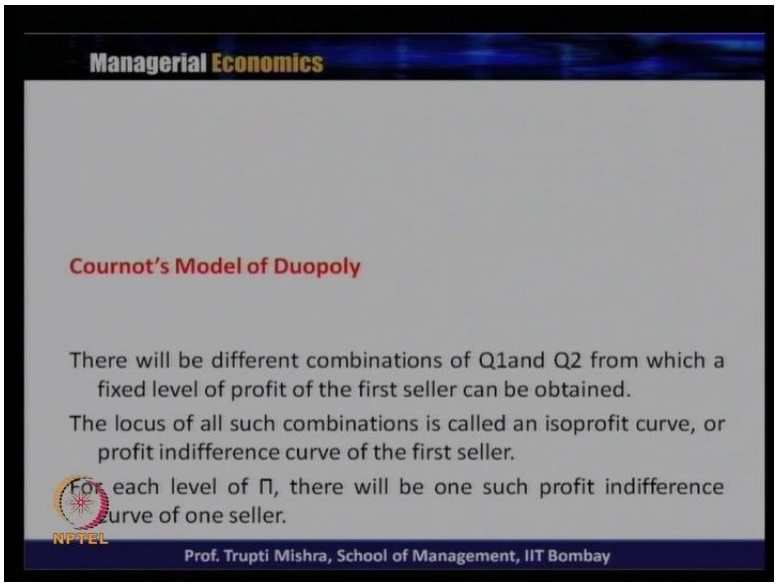
So, they knows that they are interdependent between each other, when it comes to output plan, but they are ignorant about the fact that, if he changing his plan if one firm is changing his output plan, what would be the revision in the rival plan, what with respect to the change in each plan. So, they are quite ignorant about the direction and the magnitude of the revision of the rivals plan, whenever they are doing any change to the plan.

(Refer Slide Time: 42:46)



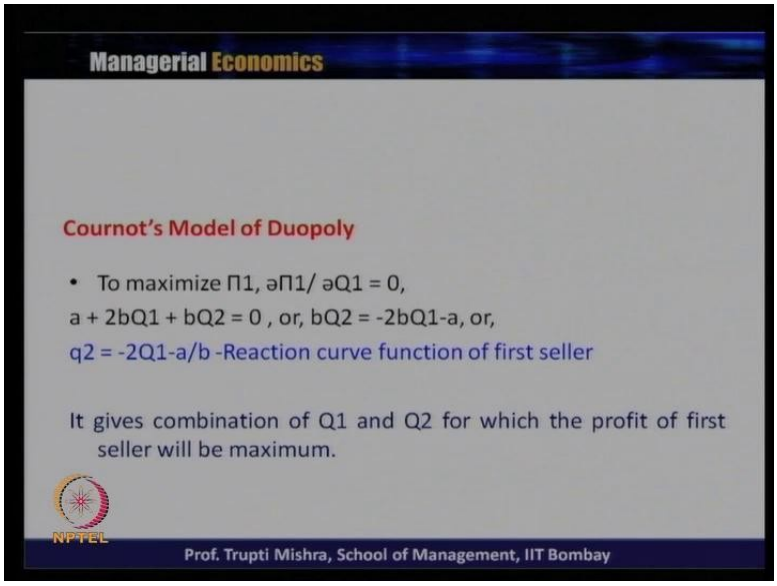
So, we will assume that Q 1 and Q 2 output level of two sellers, whose cost of production is 0. So, total output will be equal to Q, which is equal to $Q=Q1+Q2$ demand function or price function is that is equal to $P=a+bQ, a>0, b<0$, to find the profit of 1 that will come in the form of $\Pi 1$, we will get only P Q1, because the cost of production is 0. So, whatever the total revenue that has to be the profit. So, $\Pi 1=PQ1=(a+bQ)Q1$ that is equal to $(a+b(Q1+Q2))Q1$and $\Pi 1=aQ1+bQ1^2+bQ1Q2$.

(Refer Slide Time: 43:34)



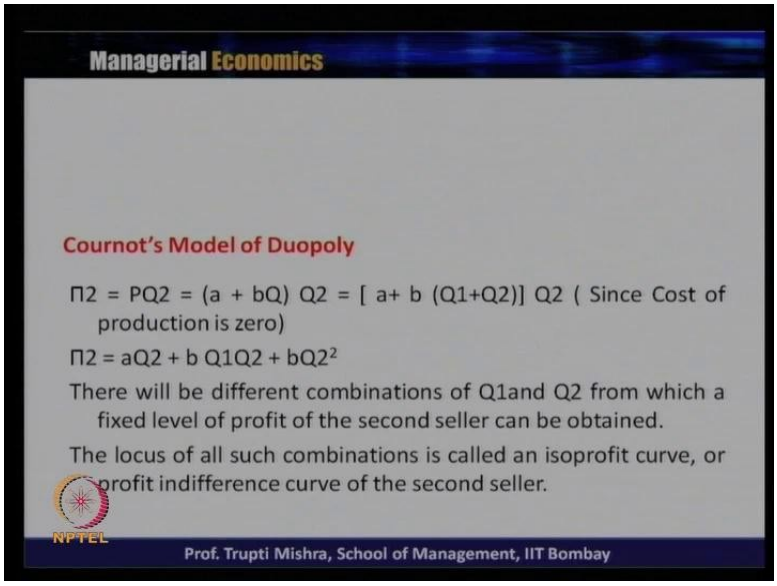
There will be different combination of this Q 1 and Q 2 from which a fixed level of profit of the first seller can be obtain, you get different combination of this Q 1 and Q 2, the locus of all such combination is called isoprofit curve, or the profit indifference curve for the first seller. So, locus of all such combination of Q 1 and Q 2, where the fixed level of profit will come that combinedly lead to a isoprofit curve for the first seller, or the first firm or the first duopolist, for each level of profit there will be one such profit indifference curve for one seller. So, if the profit level is different, they will get different isoprofit curve for the seller. So, first we find out the price then, we find out the revenue then, we find out the profit function, from the profit function, we get the level of profit by taking different combination of Q 1 and Q 2, and the combination of Q 1 and Q 2 which will give the fixed level of profit to the seller, that is generally known as the isoprofit curve.

(Refer Slide Time: 44:50)



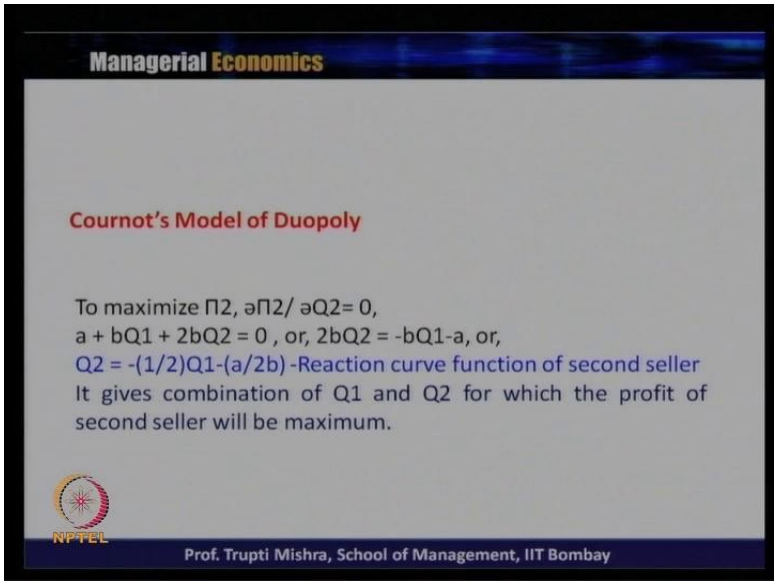
And for different level of profit, we will get a different level of isoprofit curve, to maximize this profit 1, we will take the first order derivative of the profit function that is $\frac{\partial \Pi 1}{\partial Q1}=0$. So, that is $a+2bQ1+bQ2=0$, simplifying this $bQ2=-2bQ1-a$, or $Q2=(-2Q1-a)/b$, and this is generally known as the reaction curve function for the first seller, and why this is known as the reaction curve function of the first seller because it gives a combination of Q 1 and Q 2 for which the profit of the first seller will be maximum. So, this reaction curve function gives the combination of Q 1 and Q 2 for which the profit of the first seller will be maximum.

(Refer Slide Time: 45:39)



Similarly, we will find out the isoprofit curve for the second seller and the reaction curve function for the second seller. So, $\Pi 2 = PQ2 = (a + bQ)Q2$ simplifying this $(a + b(Q1 + Q2))Q2$, and this will be also the profit because cost of production is 0, and $\Pi 2 = aQ2 + bQ1Q2 + bQ2^2$, there will be different combination of Q 1 and Q 2 from which this fixed level of profit of the second seller can be obtained, and the locus of all such combination of Q 1 and Q 2 is called as the isoprofit curve, or the profit indifference curve for the second seller.

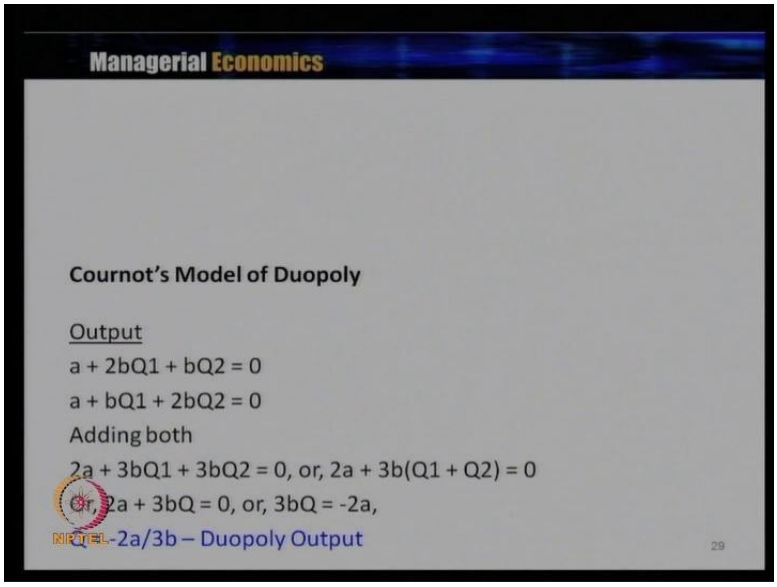
(Refer Slide Time: 46:22)



Then to maximize the pi 2 again, we will follow the same format that $\frac{\partial \Pi 2}{\partial Q2} = 0$. So, that is $a + bQ1 + 2bQ2 = 0$, simplifying this $2bQ2 = -bQ1 - a$, and $Q2 = (\frac{-1}{2}Q1 - \frac{a}{2b})$,. So, reaction curve function for the second seller, and what is the reaction curve function of the second seller, it gives a combination of Q1 and Q 2 for which the profit of the second seller is maximum.

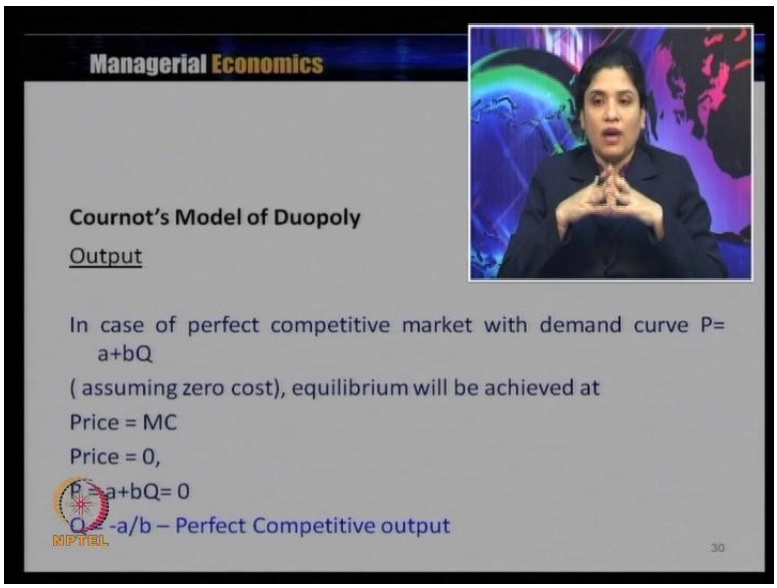
So, we have now isoprofit curve of the seller one, seller two, isoprofit curve gives the different combination of Q 1 and Q 2 which gives the equal level of profit, and reaction function gives us the level of different combination of Q 1 and Q 2 where the profit level will be maximum. So, we have set of reaction function and isoprofit curve for both the seller one and seller two.

(Refer Slide Time: 47:32)



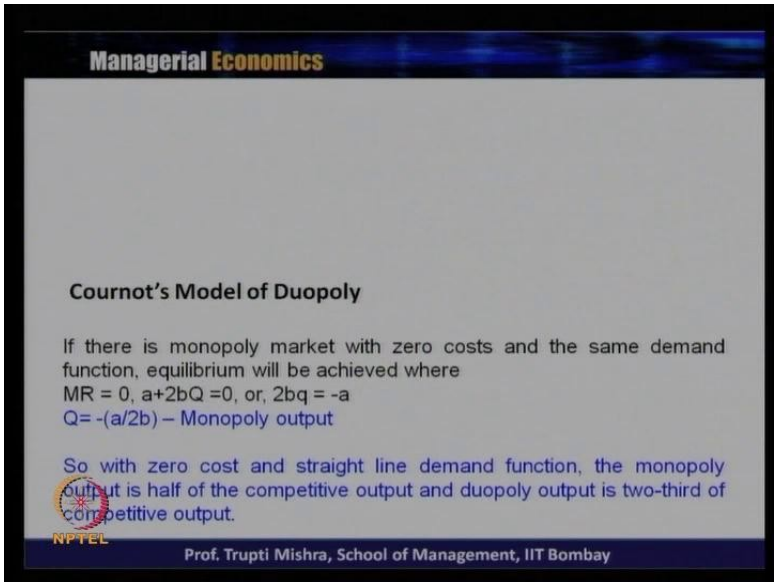
Now, how the output is dealt in case of the Cournot's model of duopoly; $a+2bQ1+bQ2=0$, that is our output; that is p Q; that is the whatever the output, we got it from our previous equation, $a+bQ1+2bQ2=0$, if you add both then it comes to $2a+3bQ1+3bQ2=0$, or this is the profit maximizing level of output. So, that is $2a+3b(Q1+Q2)=0$. So, $2a+3bQ=0, 3bQ=-2a$ simplifying this finding out the value of Q; $Q=\frac{-2a}{3b}$; this$Q=\frac{-2a}{3b}$ is duopoly output.

(Refer Slide Time: 48:12)



Now, if it is a case of a perfect competitive market with a demand curve P is equal to a plus b Q assuming zero cost, equilibrium will be achieved at the price is equal to MC. So, price is equal to 0. So, $P=a+bQ=0$. So, since marginal cost is equal to 0, we get price equal to 0, and price is $a+bQ$ that is equal to 0 and simplifying or solving it for a Q that will give us $Q=\frac{-a}{b}$; this is perfect competitive output. So, $Q=\frac{-2a}{3b}$ is the duopoly output $Q=\frac{-a}{b}$ is the competitive output.

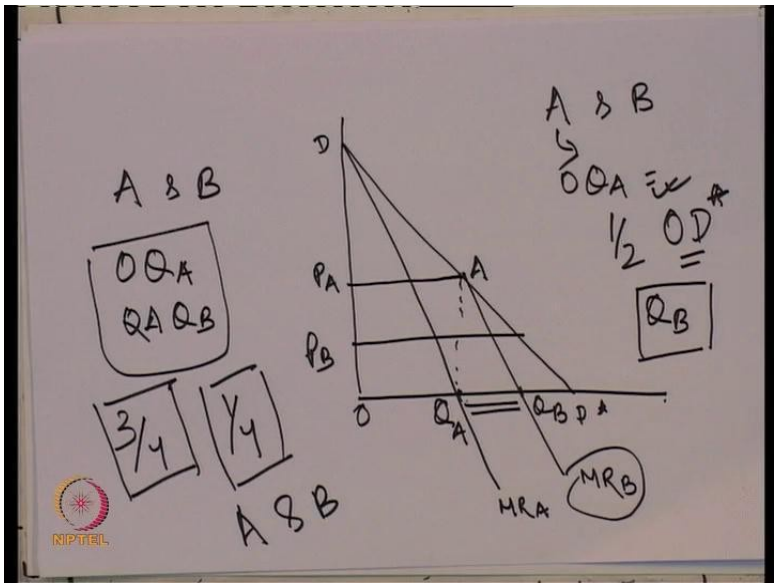
(Refer Slide Time: 49:01)



Then we will see the same demand function with a zero cost, what will be the monopoly output. So, if there is a monopoly market with zero cost and the same demand function equilibrium will be achieved, where marginal revenue is equal to marginal cost, since marginal cost is equal to 0, then marginal revenue has to be equal to 0, marginal revenue is $MR=a+2bQ=0, 2bQ=-a$ and $Q=\frac{-a}{2b}$ which is the monopoly output.

So, duopoly output is $Q=\frac{-2a}{3b}$, competitive output is $Q=\frac{-a}{b}$, and monopoly output is $Q=\frac{-a}{2b}$. So, with zero cost and straight line demand function the monopoly output is the half of the competitive output and duopoly output is the two-third of the competitive output. So, if there is a zero cost, and with a straight line demand function, the monopoly output is the half of the competitive output, and the duopoly output is the two-third of the competitive output.

(Refer Slide Time: 50:25)



So, with then, we will see this graphical representation of this Cournot's model, how this becomes the, how it comes to the equilibrium situation, or how generally this equilibrium is stable in case of the Cournot's model. So, this is $DD*¿$ corresponding there, we have marginal revenue of A; this is B; this is marginal revenue of B; this is Q_A; this is Q_B this is price of A; this is price of B.

Now, how this equilibrium takes place in case of Cournot's model, there are 2 firms A and B; firm A enter, they produce till marginal revenue is equal to marginal cost; demand curve is $DD*¿$; marginal revenue is through this we find this is the Q_A level of output OP_A is the price now, this Q_A is the half of the total output $OD*¿$, if you look at this $OQ_A$is the half of total output $OD*¿$. So, A produce OQ_Athat is half of the total demand now, firm B will enter, and assume that A will continue to produce one half of the total this 0, this total demand of the market and that will come as the OQ_B.

So, what the firm B they will do now, firm will be D, firm D will produce only Q_B because they know that firm a is going to produce half of the total market demand now, what is the market demand available, market demand is available as $Q_A D*¿$. So, you will just take half of it will produce assuming that the rest will get produced by the firm A now, what is the demand curve for the firm B, $Q_A D*¿$ that is the output, and $AD*¿$ is the demand curve for the firm B, and corresponding marginal revenue curve for B is MR_B.

So, what is the output of Q_B, they will produce at the point where marginal revenue and marginal cost as to be equal to 0. So, b will produce this Q_A Q_B this is the amount is going to produce, price is OP_B. So, now, combining this A and B together, how much they are producing; A produce OQ_A, and B produce Q_A Q_B, and B assume that since A is producing half of it is only produce the half of it. So, together this is only the three-forth of the market still there is one-four remaining.

So, this one-four remain not produced by either A or B, and next we will see that generally, how this one-forth remain not produce, when you take in the different time period, simply because that the firm B is not changing his assumption, or firm A is not changing in assumption, whenever there is doing a revised plan they are not looking into the rival action and reaction.

So, we will continue our discussion on Cournot's model in next class, again the graphical explanation of reaching to the equilibrium, we will take an example to understand this, and we will discuss about the Stacklberg's model and Paul Sweezy kinked demand model in our next session.