Microeconomics: Theory & Applications
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Lecture – 46
Price Discriminating Monopoly

Hello welcome back to the lecture series on Microeconomics. We have had the basic model of monopoly running. We have studied several aspects of monopoly, but we had assumed that the monopoly faces one type of consumer. But in reality we see many times the monopolist charges different prices to different categories of consumers right or different categories of buyers.

So, the consumer population is not homogeneous and the monopolist knows about it and the monopolist can certainly divide the entire consumer population into more homogeneous subgroups and this homogeneity comes from similar value of elasticity's. So, basically what we can say, we can say that the market is divided in various subgroups and these subgroups are basically dictated by different values of own price elasticity or price elasticity of demand.

For an illustration, we can site one example where a monopolist can charge different consumers different price for the same goods or the service. Let us take the case of Indian railways. Now when a person traveling by train say AC 3 tire or AC 2 tire coach then the person pays ticket fare, but there is a difference in the fare for different types of consumers right.

So, as we know for senior citizens actually the ticket fare is low and same is the case for a children. So, here the Indian railways discriminate and charges different prices for different groups of customers because, these different groups have different purchasing power and they are price elasticity of demand for this service is different.

So, now this is the example of a discriminating monopolist right. Now we are going to study a simple model of price discrimination there can be 3 types of price discrimination in theory, but we are going to study only one and that is called a third degree price discrimination model.

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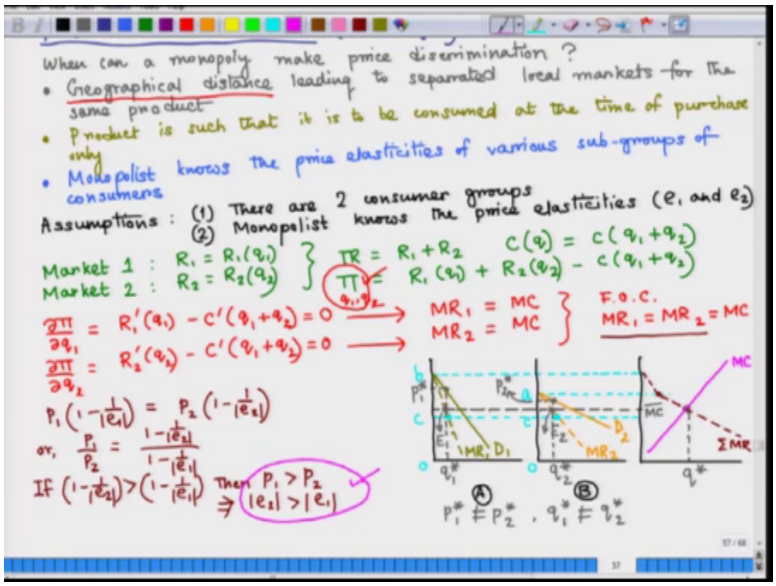

So, before we start with a formal analysis of price discrimination model let us study when can a monopoly discriminate between the consumers. So, to say we have to study when can the monopoly successfully divide the markets in different homogeneous subgroups with different price elasticity's.

So, there could be some geographical distance. The markets are separated. So, let us focus on this geographical distance. So, this geographical distance actually prevents the buyers in one market from making their purchase in another market right. So, price discrimination basically means that the monopolist can sale the same product in one market at a higher price and then in another market at a lower price. But the person who is purchasing from the market where the price is low cannot resell the product in the market where the market price is high and that could be due to the geographical distance.

Now, let us move to a second reason why a monopolist can successfully price discriminate. So, here we can say that if there is a product that it is to be consumed at the time of purchase only. So, there is no time lag between the purchase decision and the consumption. So, when is that possible? That is possible say in the case of patients visit to a doctor or when you know you are watching a movie in a cinema hall or a movie theater right.

So, there could be another case where, the monopolist can successfully discriminate. So, the third condition which is require to price discriminate is that the monopolist knows the

price elasticity's of various subgroups of consumers. This is a very critical condition later we will see that the difference in 2 or more markets for the same product will actually depend on this elasticity values ok. So, now, let us going to make a simple assumption; assumption is that so actually there are 2 assumptions. Assumption number 1 that, there are only 2 groups of consumers and the second assumption is that the monopolist, the monopolist knows the price elasticities which are e 1 and e 2. So, now, let us formally write down the model.

So, as there are two different groups of consumers, we call them market 1 and market 2 because, if the monopoly wants the monopolist can create 2 different markets for 2 groups of consumers right. So, in market 1, the monopolist has a revenue function which is basically a function of the quantities it sells in market 1 and for market 2 it has a different revenue function because, not only it can price discriminate, but the demand function itself is different in this market and the new market or market 2 revenue function is given by R 2 ok.

So, my total revenue is basically R1 plus R2 right ok. So, now, what about the firms profit equation? Now note that the firm has or the monopolist has one cost function. So, we can write like this. So, given the revenue function and the cost function now we can write the profit function which is basically R 1 of q plus R 2 of q 2 minus C of q 1 plus q 2 right ok. So, how to maximize profit in this case? Note that, here this profit objective function can be maximized with respect to 2 decision variables q 1 and q 2.

So, these are basically the quantities that the monopolist decides to sell in market 1 and market 2 respectively ok. So, now, let us take partial derivatives of the profit function or the objective function with respect to the q 1 and q 2 decision variables right. So, these we lead to R1 prime q 1 minus C prime q 1 plus q 2 right, we need to set that equal to 0 similarly, del pi del q 2 will lead to R 2 prime q 2 minus C prime q 1 plus q 2 we need to set that equal to 0.

So, what do we get from this first order condition first one and the second one. So, from the first one, we say that marginal revenue in market 1 has to be equal to the marginal cost of production and from the second order condition we can say that marginal revenue in market 2 has to be equal to the marginal cost of production right ok. So, in a nutshell we can say the profit maximization first order condition for a price discriminating

monopolist is MR 1 equal to MR 2 equal to MC right. By following this mathematical exercise the monopolist can find out the equilibrium quantities to be sold in 2 different markets. So, basically the monopoly solvers q 1 star and q 2 star.

Now, let us look at a graphical exercise how the monopolist solves the problem because, that will help you to understand the working of a price discriminating monopoly model. So, now, let us look at the diagram. So, I will have now 3 panels of diagrams ok. So, in panel A I plot the case of market 1 which is given by the demand function D. So, this demand function gives rise to a marginal revenue function. So, let me draw that and this broken line gives basically the marginal revenue in market 1, so D 1 is demand curve for the market 1.

So, now let us look at the market 2 here I assume that the demand function has a different intercept and a different slope. So, let me have it somewhere here. So, the demand function here in this case has a lower intercept on the price axis and it has a higher slope. So, it is the demand function is more flat. So, we are talking about more elastic demand function in market 2.

So, correspondingly the market 2 will have the marginal revenue function also which is given by the broken line and this is MR 2 right ok. So now, how the monopolist is going to solve the problem? So after drawing the demand and marginal revenue functions for 2 different categories of consumers or two different markets how to proceed? So, here the trick is to go for horizontal sum of the marginal revenue curves ok.

So, how to do that? For that basically we have to start from one demand function suppose I start with market once demand function and marginal revenue function because, it has the highest intercept along the price axis. Then I have to go to the market 2 demand function and the marginal revenue function and again note the highest price ok. The intercept of the demand function and the marginal revenue function then basically, I say that if my price is higher than this intercept along the price axis in market 2 say given by point a then basically I know that only consumers from market 1 will be able to purchase the commodity because, there will be 0 demand in market 2.

Now, let us look at the intercept of the demand function and marginal revenue function in market 1 so, this intercept along price axis is denoted by say point b. So, if the market price is higher than ob then in that case there will be 0 demand in market one as well and

in market two as well. So, basically for prices up to level o a the demand emerges only from the market 1. So, if the market price is below o b, but above o a, then the marginal revenue curve which is relevant for the monopolist is basically the marginal revenue from market 1.

So, we draw here the marginal revenue from market 1, so same slope I have drawn that. Now, what will happen if there is price which is between o a, o and a, so if the price is less than o a then there is demand from both the markets right. So, let me now think about a market price, say somewhere here right. Say a price c, so if the market price is o c say, then basically at that price there is marginal revenue coming from market 1 because, there will be demand in market 1 and then there will be demand from market 2.

So, there will be a marginal revenue corresponding to that in the market 2 as well. So, here the monopolist we will add these 2 marginal revenues and that is basically the horizontal summation of the marginal revenue curves from both of these 2 markets. So, there will be a kink here at this price o a and there after the marginal revenue becomes a flatter much flatter curve because, after that point it is basically some of the marginal revenue curves in market 1 and market 2.

So, we can say that this is basically giving my sum of marginal revenue curves in 2 different markets. So, now, let me superimpose an upward sloping straight line marginal cost curve right. So, we know that at the intersection point there will be equilibrium for the monopolist and the equilibrium level of output is q star.

Now the question is how the firm is going to allocate this q star amount of output in 2 markets and how much price you know they are going to charge. So, now, we need to use this MR equal to MC equal point and we need to note that the MC at which it equates the total marginal revenue curve and then we need to find out MR equal to MC intersection points. For that very level of marginal cost say MC bar right ok. And then we have to go back to our panel B and panel A diagram.

So, here we see that this constant MC cuts the marginal revenue 2 curve at point say E 2. So, that is the equilibrium found in market 2 and this MC cuts the marginal revenue 1 curve at point E 1 right. So at this intersection points now, the equilibrium of the monopolist in market 1 and market 2 to be obtained, so at this intersection point we find that firm gets q 1 star equilibrium level of output to be sold in market 1. Now the firm

will move up to the demand function and then from the demand function it reads the price that the consumers are willing to pay for this level of output and the monopolist charges that price and that is basically P star 1 right. So, similar exercise can be followed for market 2.

So, here again we drop this perpendicular line on quantity axis to find the equilibrium quantity to be sold in market 2. And again we move up to the demand function to read the price that the buyers are willing to pay for that level of output in the market right. So, from this point on the demand function we can see that price and the monopolist exactly charges that price. So, here we get a higher no we get a different market price Ps P 2 star. So, here you can see that there is a difference between P 1 star and P 2 star. So, what we get to see here the prices charged in 2 different markets are different and quantities sold in 2 different markets are also different. So, after this graphical illustration 1 point is clear.

So, the prices and quantities that the monopolist sets in different markets will heavily depend upon the slope and the intercept of the individual market demand functions. So, elasticity will play a big role. So, now, we are going to study the relationship between the prices that the monopoly charges in different market segments and the elasticity's corresponding to those market segments, again through mathematics ok. So, now, let us start with the first order condition.

Here we take only the first part of the first order condition MR 1 equal to MR 2; that is the profit maximizing first order condition for a price discriminating monopolist right. So, now, note that this MR could be expressed as a function of market price and the elasticity of demand. We have derived such expression earlier right. So, by employing that relation between price elasticity and marginal revenue, one can write for a price discriminating monopolist right ok.

So, now note that we can rewrite this as right. So, if 1 minus 1 over e 2 is greater than 1 minus 1 over e 1 then P 1 is greater than equal to P 2 right ok. So, that means, that e2 has to be greater than e 1 ok. So, note that here the elasticity is the way I have written, I did not write the modulus sign, but actually I am talking about the absolute value of the elasticity. So, now, let us put those modular sign back, so that you do not get confused. I

actually did not use the modular sign before. So, that I get less cluttered expressions, but let us bring them back, so that life becomes simple to compare numbers.

So, now let us go back to the discussion. So, if my P 1 is greater than P 2, then actually that implies that my elasticity in market 2 is basically higher than elasticity of demand in market 1. So, that is a very interesting result in this price discrimination model. So, note that, if the monopolist can successfully estimate the elasticity values then actually it can set different prices in different markets and that is now evident from this relationship between elasticity of demand and the market prices. So, this only proves our point number 3. So, this completes our discussion on price discriminating monopolist. So, we will continue our discussion on imperfect competition in the next lecture.