Managerial Economics
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Lecture - 65
Oligopoly (Contd…)

We will continue our discussion on theory of Oligopoly, typically the Oligopoly form of market structure. And if you remember in last session we discussed, this is the most realistic form of market structure although when it comes to theory and when we talked about the determination equilibrium price and output, it is easy. It is not very certain like in case of perfect competitive market structure or monopoly market structure. So, in the previous session, we discussed about the features of Oligopoly. And one of the significant features of Oligopoly is that when one price one firm decides the price and output, generally they keep in mind that what will be the rival's action with respect to the change in their price and output.

And second is, even if they know that there is interdependence, but sometimes they ignore or they just assume the plan that has to be before and they never consider the revised plan into their action whenever they are fixing up this price and output. The different kinds of models are there on the basis of that how, what is the group behavior of the Oligopoly is. When they collude work for joint profit, generally we call it is a collusive Oligopoly and when they compete with each other on the basis of price or on the basics of non-price, like other factor than price, it is called as non collusive Oligopoly.

And in the context of non collusive Oligopoly, in previous class we discussed about the Cournot models, we discussed about the Stackelberg model, and we also discussed about the Kinked demand curve model. To sum up, we can say that Cournot model is one where two main outcome emerged from there; one is always the individual firm thinks that, they are not the rivals is not going to change their plan with the revised period, but practical that does not happen and that leads to a situation where may be one-third of the market is untapped; it is not being produced or supplied by any of this firm, if it is the case of a duopoly, specifically. And Secondly, the second outcome comes from Cournot model is that when linear demand curve and the cost of production is zero, generally the monopoly output is half of perfect competitive output and duopoly output is two-third of competitive output.

Then, we discussed about the Stackelberg model, and to sum up to Stackelberg model, we can say that it is a leader follower models. Once the firm gets sophisticated, they know that what is the revise plan of the or what is the reaction function of the other firms, how they are going to react to it, and generally they also consider the reaction when they are considering their own price and output plan. And in that process, they become the leader and the other firm has to follow it; but in the long run, if both the firms try to be leader, they get into the price war and in the last firm, it becomes a cartel when they feel that price war is not at all profitable.

Here, to note that oligopolies know that the price war is not going to benefit the benefit the producer or the seller; rather, it is going to benefit the consumer and that is the reason if you look at, they never get into price war and even if they are getting into price war, they stop at a point; they stabilize at a point beyond which they feel that if they are not covering the normal profit what is associated with the product.

Then we discussed about the kink demand curve and kink demand curve talks about two different kind of group behaviors of the oligopolies: One - when one firm decreases the price, other follows it and that is why we get the demand curve as the in elastic demand curve for specific firm. Because when others follow it, there is no more change in the quantity demanded and they have to even… if there is a change in the price, the consumer, they feel that other firm also they have changed their price. So, there is no significant increase in the quantity demanded of that particular firm.

And the second type of group behavior is that when one firm increases the price, other hardly follows it and in that case, the firm encounters a elastic demand curve. So, taking together this inelastic and elastic demand curve with respect to two situations, one increase in the price and second decrease in the price, the firm generally gets a kink demand curve which is kink between two different segment of the elastic and inelastic demand curve.

Corresponding to the kink, since there is a kink in the demand curve we get two level of marginal revenue curve: one with respect to the elastic segment of the demand curve and second with the respect to the inelastic segment of the demand curve. And since there is a kink and we get two kinds of MR curves, in between there is a gap between two MR curves and generally the marginal cost pass through that segment where there is no MR curves and that is the reason, even if there is increase in the cost still the equilibrium price and the output never changes. So, this typical model talks about the price rigidity as a part of the group behavior of the Oligopoly’s firm and how generally it affects the how generally it does not affect the equilibrium price and output. So, this is about the price or the non-price competition in case of the non collusive Oligopoly.

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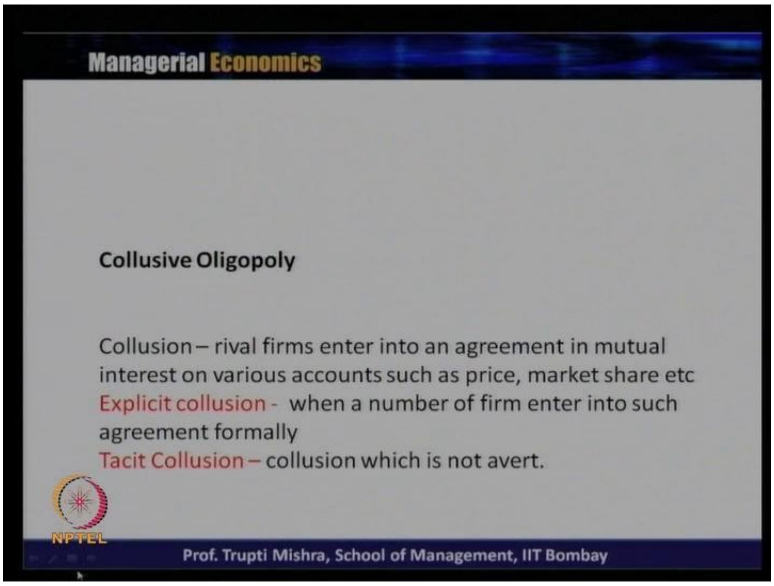

Today, we will discuss about the collusive Oligopoly. We will talk about two kinds of arrangements: one it is a cartel and second it is a price leadership model. In both these cases, it is a case of collusive Oligopoly model where the firms join together in order to maximize the joint profit.

Before getting into the model, let us understand what does it mean when you talk about collusion. So, collusion, when rival firms or all firms or all firms they enter into an agreement in mutual interest on various accounts such as price, market share. So, it is a, in a simple language to understand collusion, we can say it is an agreement where all the firms come together and they jointly decide about what is the price to be followed in the market and what should be the market share.

Two kinds of collusion may happen: One is explicit collusion and second one is the tacit collusion. Explicit collusion is one where a number of firms enter into such agreement formally; and secondly, a tacit collusion is collusion which is not avert, but still they are into the collusion. And why this tacit collusion comes into picture because if you look at it, there is no legalized version of collusion; typically, after cartel if you will find out opaque as a cartel, after that we will find out there is no legal form of cartel exists, whatever the form of collusion exists, that is in the form of tacit form.

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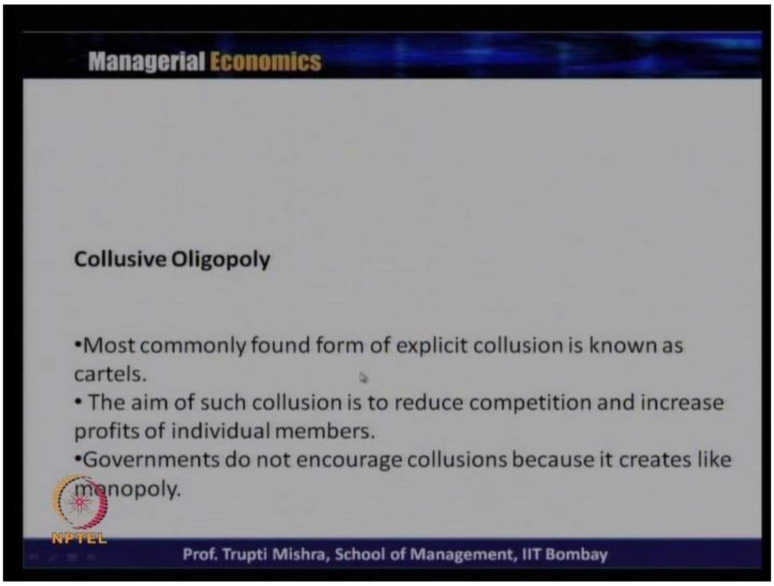

So, one, where formally they agree into collusion, formally they agree into a group and they work together for the joint profit maximization and output maximization and the other one is a tacit collusion where collusion which is not avert. So, most commonly if we will find form of explicit collusion, it is generally known as cartel. So, whatever the commonly found explicit collusion is known in cartel and what is the aim of this kind of cartel? The aim of such collusion is to reduce competition and increase profit of the individual member. So, obviously, when they collude together, work together for the profit maximization, that reduces the competition and increases the profit of the individual member.

So, basically, the individual firms those who were not able to get profit, those who were not able to maximize profit, they were now in a position to maximize the profit because the firms work for the joint profit maximization; they fix up a price which gives at least some amount of profit to each of this firm. Government do not encourage collusion because it creates like monopoly and kills competition and when if there is no competition, that reduces the generation of employment and income and reduces also the innovation. So, explicit form of collusion is generally known as cartel and what is the outcome of cartel? If you look at the outcome of the cartel in the positive segment, it reduces the competition, reduces the competition, and the individual firm generally they get some profit out of it; earlier were not able to generate any amount of profit.

Generally, Government or the authority, they, never encourage this form of cartel or this form of collusion because ideally when the cartel goes for a long period of time, in the long run, they become a monopolist which is not beneficial for the consumer. It reduces the competition; it reduces the innovation; it reduces, also to some extent, the income and employment generation and that is why you will find authority, they, always put a restriction on the creation of the collusion or the creation of a cartel.

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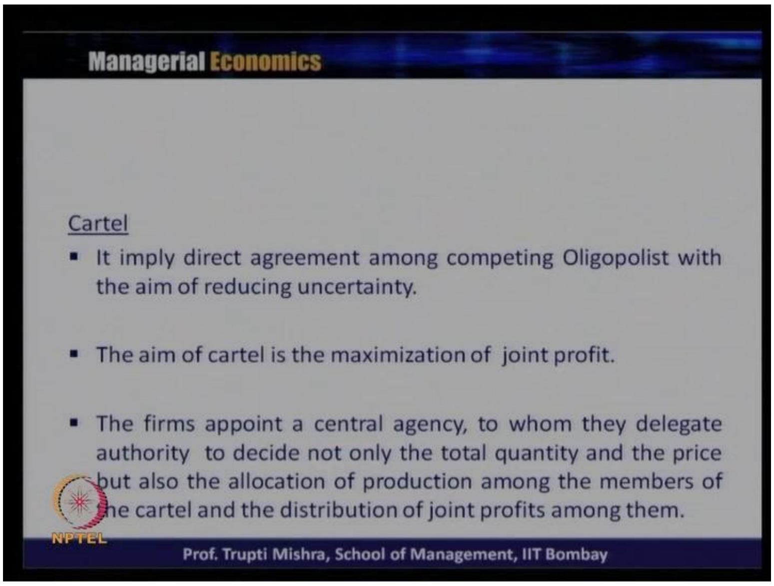

So, cartel, as we know, it is a direct agreement among the competing Oligopolist with the aim of reducing uncertainty. Now, what is the optimization problem for the Oligopolist over here? The optimization problem for the Oligopolist is to reduce the uncertainity. Aim of cartel is to maximize the joint profit. And how do they function? They appoint a central agency to whom they delegate the authority to decide not only the total quantity that is the output, the price, but also the allocation of production among members of the cartel and the distribution of joint profit among them.

So, the aim to form the cartel is to reduce uncertainty; objective is to maximize joint profit. And how do they function? They generally appoint the central agency in the consultation with all the firms. Whom they consider as the central agency and what is the role of central agency? The central agency decides: what should be the total market output, who should produce how much, what should be the total, what should be the price charged for the product, and also when the industry as a whole, market as a whole, they are getting profit, how it has to be distributed among the individual firms. So, the role of central agency is to decide about the price, output, and market share of the different firms and also how the distribution of the joint profit will take place between the different firms.

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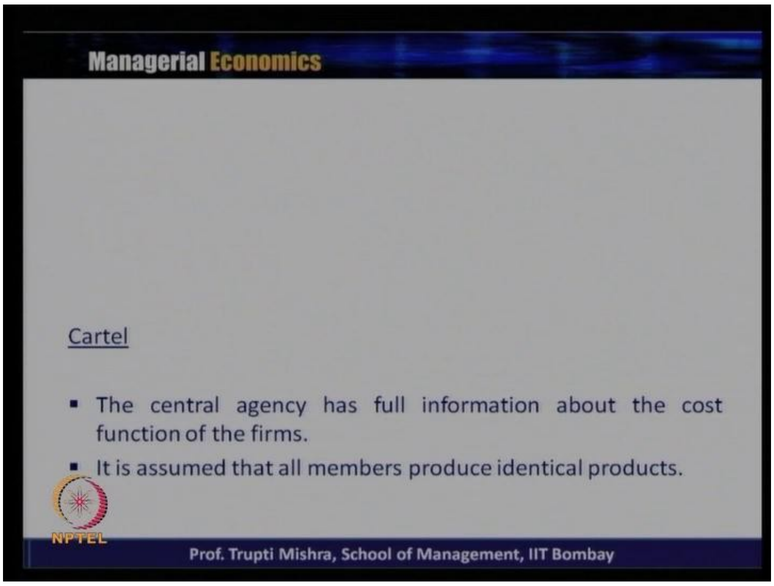

Now, what is the prerequisite for here to the central agency? The prerequisite for here if the central agency is they have full information about the cost function of the firm. How it helps when we talk about the cost function of the firm? How it helps because if they know the cost function, accordingly they will look at how much amount they have to produce by each of this firm. So, it is assumed that all members produce the identical product because if they are producing homogeneous product, the difficulty again comes here that who should produce which kind of product.

And since we are assuming here that, typically in case of cartel, this is assumed that all the firms, they produce the identical product and the central agency; they have the full information about the cost function of the individual firm: which one is high cost firm, which one is the low cost firm, who which firm is operating in which stage of the average cost, the firm is whether they are operating at the decreasing portion of the average curve, they are operating at the full capacity, they are operating at the minimum cost of the average cost, or they are operating at the increasing portion of the average cost curve.

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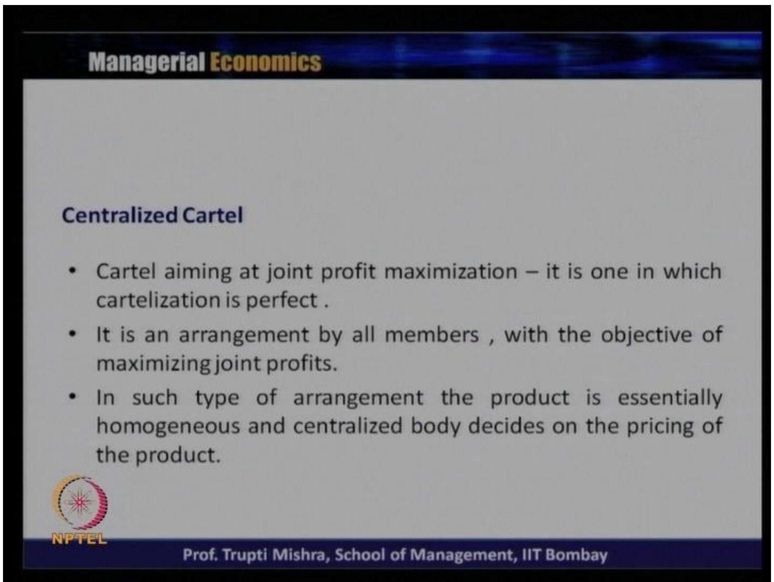

So, cartel aiming at joint profit maximization: It is one in which cartelization is perfect. So, we call about a perfect kind of cartelization where cartel made joint profit maximization. It is an arrangement by all members with an objective to maximize the profit and in such type of arrangement the product is essentially homogeneous. centralized body decides the pricing of the product.

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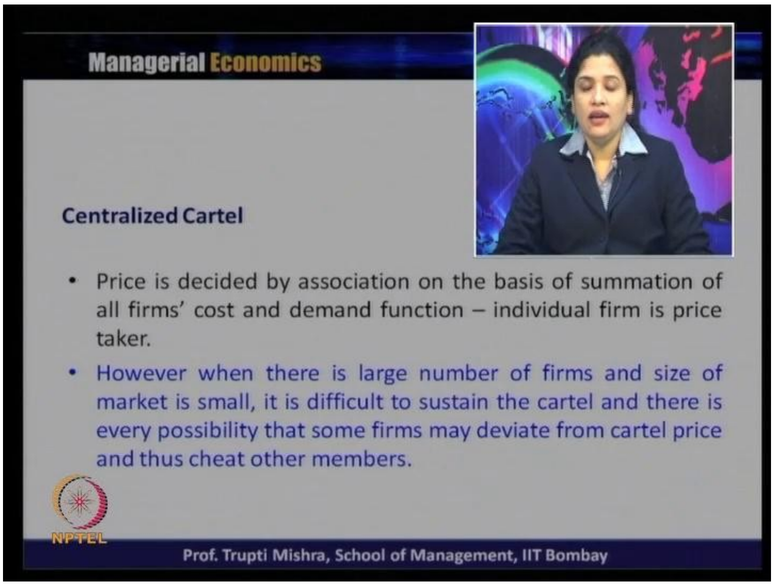

Price is decided by the association or the central agency on the basis of the summation of all firms' cost and demand function. And in this case, individual firms - they are not the price maker; individual firms they are the price taker. What price they take? They take the price that is decided on the basis by the central agency on the basis of firms cost and demand function. However, when there are large numbers of firms and size of market is small, it is difficult to sustain the cartel and there is every possibility that some firms may deviate the cartel price and thus cheat other members.

So, when the market size is small and there are large numbers, when it comes to the allocation of the production, generally it becomes very insignificant. And in this case, generally people, the firms they get motivated to charge a different price and cheat other firms. In that way, generally the cartel never sustains for a longer period of time because till the time that agreement is there; the trust among the firm is there that everyone has to, everyone is just following the central agency guideline regarding output and the price; till that time cartel will sustain; otherwise cartel will not sustain.

So, we will see that graphically. When we talk about the summation of the cost and revenue decides the price or they identify the price or they find the price on the summation of the marginal cost function and the revenue function, we will see that how this price is decided, how the price is going to be followed by both the both the firms or may be the number of firms in the market and what is the allocation, how the allocation takes places on that basis and what is the profit.

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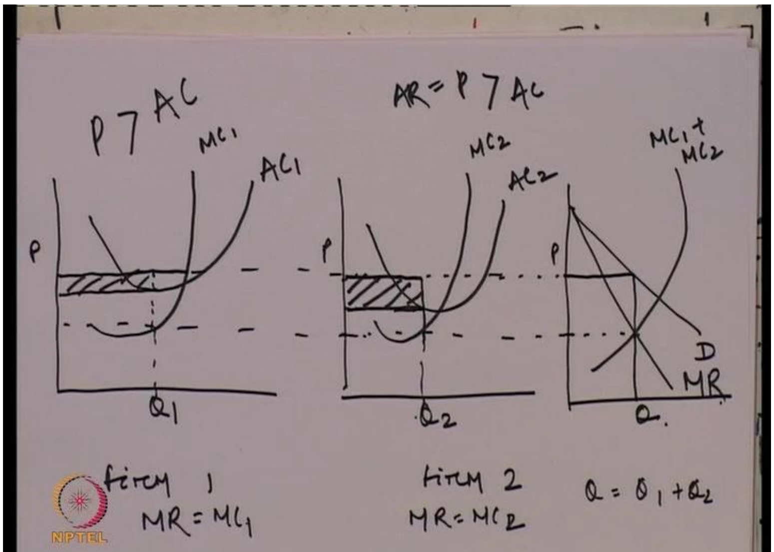

So, we will just have a graphical explanation of this entire cost and output determination or the price and quantity determination in case of a centralized cartel. So, we will just take a case of a duopolist to make it simple to understand. So, this is the demand curve; this the marginal revenue curve; this demand curve is the demand curve for the entire firm; marginal revenue curve is the summation of the marginal revenue curve of all the firms. This is the marginal cost function which is summation of marginal cost 1 and marginal cost two.

And how the price is determined in the market? We take the point where marginal cost is equal to the marginal revenue leads to the of equilibrium price or equilibrium output; so this is the Q and this the P; same P is going to followed by both the firms. So, this is the price that has to be followed by both the firms. So, we can call this is firm 2..

And firm 1 now, we get the average cost function for firm 1 and we get the cost function for firm 2. Then we get the marginal cost function for 1. We get the marginal cost function for 2. Now corresponding to this, we look at this MR. How this marginal cost function for the individual firms generally and on that basis we can find out what is the output level. So, output level is Q_2 here; output level is Q_1 here; this is the price; this is the price

So, price is decided on the basis of marginal revenue and marginal cost and in order to identify the quantity because whatever the price determined, that is followed by both the firms. Now, how the output will be allocated? Output will be allocated on the basis of the marginal revenue and marginal cost to 1; that will give the output level for firm firm 2. This will be the output level for firm one.

So, this in that following this, we get Q_1 is the level of output for firm 1 and Q_2 is the level of output for firm 2 and $Q=Q_1+Q_2$. So, how it happens in case of a profit maximization or a cartel aiming at profit maximization? The price is decided on the basis of the marginal revenue and marginal cost, and that price is followed by all the firms in the market. Here, specifically we have taken the example of duopoly to make this understand simple and on the basis of the marginal revenue and marginal cost of the specific firm we are finding out the level of output.

Now, what happens when this price is followed and this output is being produced by it? Now, in this case, this is the price. And corresponding to this level of output, what is the cost? The cost is this much because this is the average cost; this is the price. So, since corresponding to this level of output, average revenue or price is greater than average cost the firm gets this much amount of the profit.

Similarly, for this level of output, this is the average cost; this is the price. So, in this case also, price is greater than average cost and that is why the firm is getting profit. So, whether it is a case of high cost firm, that is compared to both the firm if you look at, firm 1 is the high cost firm and high cost firm still they are getting some amount of the profit and firm 2 they are low cost firm as compared to firm 1 and they are also getting the profit.

So, the basic objective of the cartel gets fulfilled here that even if the cost function of the firms in the cartel they are in the different they are in the different kind of cost function or they are in the different level, but when it comes to the maximization of the joint profit, all the firms at least get some amount of the profit. We will just take a numerical to understand this, that how this joint profit maximization happens. You are taking a specific demand function and cost function of the firms.

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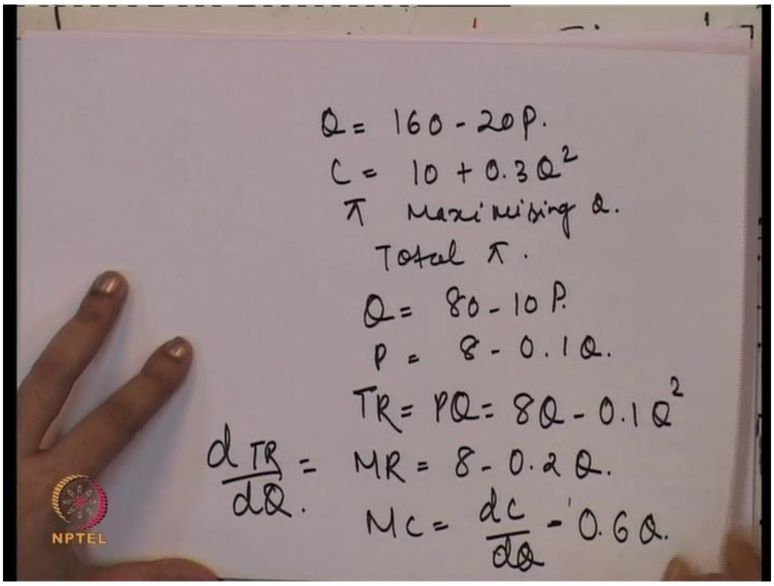

So, $Q=160-20P$ and $C=10+0.3Q^2$. Now, we find how, what is the profit maximizing output and what is the total profit. So, we can find out $Q=80-10P$; so we can get $P=8-0.1Q$. Total revenue is P Q; so we get $TR=PQ=8Q-0.1Q^2$. Marginal revenue is $MR=8-0.2Q$. So, marginal revenue is nothing but $MR=\frac{dTR}{dQ}$ and marginal cost is $MC=\frac{dC}{dQ}=0.6Q$; so that comes to 0.6 Q.

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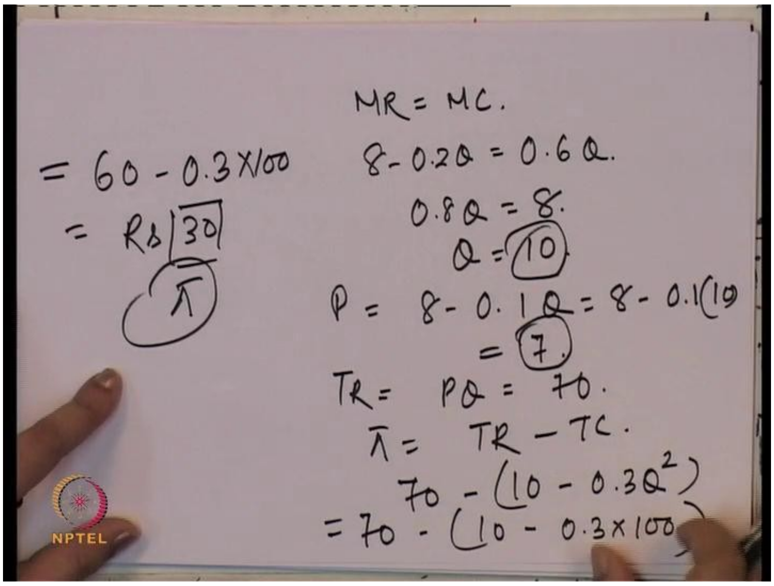

Now, to find out the profit maximizing level of output, we need to follow the MRMC rule. So, MR has to be equal to MC. So, $8-0.2Q=0.6Q$. Simplifying this, 0.8Q will be equal to 8 and Q will be equal to 10; so $P=8-0.1Q$. So, $8-0.1(10)=7$ and that comes to 7 and total revenue is PQ. So, it has to be 70. Profit is total revenue minus total cost; so $\pi=70-(10-0.3Q^2)$. So, this is $\pi=70-(10-0.3(100))$; so that comes to $60-0.3(100)=30$; so that comes to Rupees 30. So, this is the profit, this is the price and this is the quantity.

So, now, what are the problems in case of centralized cartel or any form of the cartel? The basic aim is to maximize the joint profit and that they do by finding out a price on the basis of the marginal revenue and marginal cost, assessing the total cost function and total revenue function for all the firms. Now, what may be the problem when you if they are estimating the summation of the total cost or when they are estimating the summation of the total revenue for all the firms?

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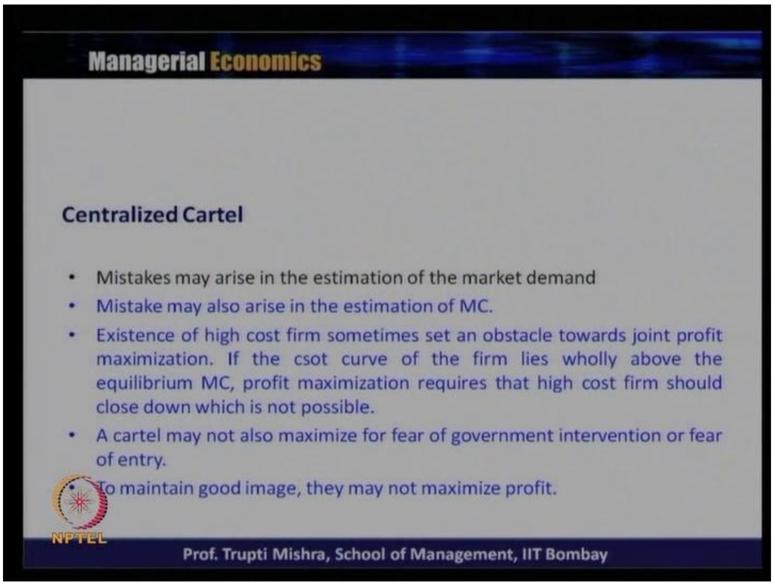

So, there may be a potential problem that there is may be a mistake may arise in the estimation of the market demand. It may also arise in the estimation of marginal cost. And whenever there is an existence of high cost firm, sometimes it sets an obstacle towards the joint profit maximization and if the cost curve of the firm lies only above the equilibrium marginal cost, profit maximization requires that high cost firm closed down which is not possible.

So, a cartel may not also maximize for fear of Government intervention or fear of entry; that is one more potential problem. And also sometimes the cartel to maintain good image, they may not maximize the profit. So, one is fear of Government; second one is to maximize the profit. And they feel that it is not going to create a good image for them and that is why they do not maximize the profit. Sometimes they feel that when they are maximizing the profit, when they are getting super normal profit, other firms may enter into the market. So, to make this is a entry barrier, they generally charge a low price and they do not maximize the profit. And also fear of Government regulation, they generally do not maximize the profit. So, as a whole, when the basic objective is to maximize the profit, but there are certain problems or certain inherent problems where the cartel, typically the Oligopolist, they are not maximizing the profit.