Petroleum Economics and Management
Prof. Anwesha Aditya
Department of Humanities and Social Sciences
Indian Institute of Technology, Kharagpur

Module - 09
Fundamentals of Petroleum Business
Lecture - 45
Cartel

Hi everyone. Welcome to the NPTEL course, Petroleum Economics and Management. I am your instructor Dr. Anwesha Aditya. So, we have come to the module 9 of our course and almost towards the end of module 9 where we are discussing the Fundamentals of Petroleum Business. So, today is our lecture number 45 in the course where we will be discussing about cartel and the condition for successful cartel.

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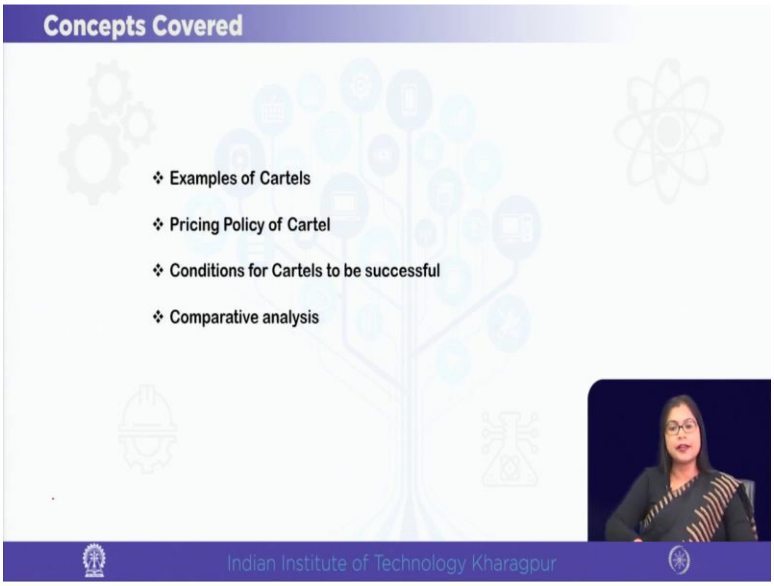

So, if you remember we have devoted quite a lot of time in analysing the market structure of the global petroleum industry. So, earlier we have explained the oil price movement from the point of view of OPEC and we discussed the structure of OPEC and OPEC plus we have explored the views of the literature on whether is OPEC is a successful cartel or not and then we also dealt with quite a lot of empirical data to validate whether OPEC is a successful cartel or not.

Now, we have also seen how the OPEC countries are dependent on oil rents in the GDP. However, we have seen also that from the 21st century onward the countries are diversifying. So, the contribution of other sectors like manufacturing and service sector in these countries are increasing and oil rents are gradually declining, because the countries realize that it is not good to be entirely dependent on oil.

But till these countries the OPEC countries especially they have a leadership position in the market of oil as we have already seen that the literature is not conclusive. There are different views, opinions in the literature whether OPEC is a successful cartel or not, because many economist pointed out that OPEC does not exert the price power that it can given its market power.

But OPEC has a long run strategy, because the OPEC countries are hugely endowed with oil. So, they want that they should be in the leadership position for a long time. So, unlike other cartels which were quite short lived and they increase the price very much OPEC has been there for long time.

So, we cannot deny the existence of OPEC. However, the oil price was not increased to that extent that OPEC could have done and we have already seen many instances where the intervention of Saudi Arabia and other OPEC countries have actually led to decline in oil price, because they increase the supply. So, we have already discussed that

And then in module 8 and 9 we are discussing the market structure of the global oil industry theoretically. So, we know that the cartel is an example of collusive oligopoly. So, we have already discussed the different types of collusive oligopoly. We have also discussed the characteristics of oligopoly overall and we have compared with other market structure.

Now, we have also discussed a brief a very brief overview of game theory, because we study oligopoly in a game theory framework. So, all these are already done and if you remember we have studied in detail the price leadership dominant firm model theoretically we have found out the output sold by the dominant firm or the leader firm and the output sold by the competitive fringe firms the small firms and what will be the total output in the market which is a sum of the leader’s output and the small firms output.

And also, the if you remember the price is the one which is determined by the leader firm or the dominant firm. So, in the price leadership dominant firm model you see total output is sum of the leader's output and the small firms output, but price the market price is set by the dominant firm which is its profit maximizing price, because the small firms take the profit maximizing price of the dominant firm as given and they behave like perfectly competitive firm. So, they are the price takers.

So, we have already solved the model numerically graphically and we have also discussed the intuition how to find out the equilibrium price and the quantities of the leader firm and the competitive fringe firm in the price leadership dominant firm model. Now, what we are going to do in today's class is we will start with some examples of cartel and we will study what are the conditions of a successful cartel and we will do.

So, by comparing the experience or the success stories or the failure stories of 2 famous cartel one is the OPEC of course, and the other is the copper cartel that is known as CIPEC which was not that successful. So, with reference to OPEC and CIPEC experience we will be getting the conditions for a successful cartel. So, we will be discussing these issues in today's lecture.

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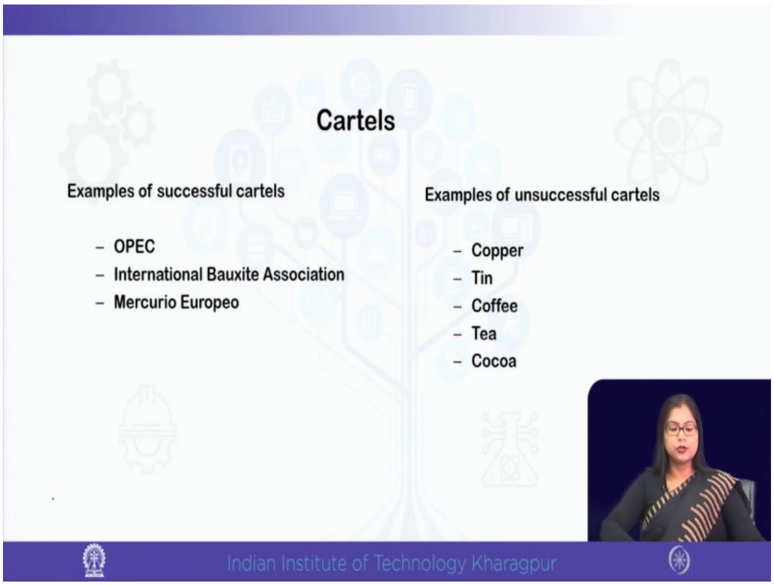

So, to start with we already know in cartel few firms agree. So, many times the agreement can be explicit, but within the domestic country often the explicit agreements are not allowed they are prohibited by the legal proceedings like the antitrust laws in the

US or the competition act in India, because if the firms collude and the price will be high the output will be less.

So, but we often see that the firms collude in the international market or even the countries can also collude like this example is the OPEC or the CIPEC where the countries collude and enter into agreement, they restrict the supply to influence the market price. So, what are the examples of successful cartel? So, one we already know OPEC. So, we have already discussed in detail now whether OPEC is a very successful or not that is up to lot of debates.

But we cannot deny that OPEC has been there as a leader in the world oil market for a very long time. We cannot deny the existence of OPEC for such a long time. Whereas, in other markets the cartel do not exist for such long time. They are generally short lived and they increase the price abruptly, but they cannot sustain because over time we know elasticity values increase. And that is why OPEC has not been that ambitious also it did not increase the price that much.

So, the price were very close to competitive level and mainly the apart from Saudi Arabia most of the other OPEC member countries have behaved like perfectly competitive firm as we have already seen with respect to their excess capacity. So, we saw that only Saudi Arabia operates with some excess capacity the most of the other OPEC member countries also they almost operate with full capacity right.

And there are some examples like Venezuela and Indonesia, because they ran out of the resource or means in Venezuela there are some problems in the internal economy and Indonesia also depleted the resource otherwise mostly, we see almost full capacity utilization and we know that in perfectly competitive market the firms utilize capacity; however, in imperfect competition the firms operate with excess capacity. So, this excess capacity we only find in case of Saudi Arabia ok.

So, we cannot deny that OPEC is there for long time. So, what are the other successful cartels another one is the International Bauxite Association. The third one is Mercurio Europeo. So, these are some examples of cartels which have been successful. Now, what are the examples in the other side; that means, the cartels which are not that successful. So, one as I already informed you that we will be discussing the experience of the copper cartel which is known as CIPEC.

And there are other cartels also like in the market for tin, coffee, tea, cocoa. So, these cartels were also not that successful. So, that means, there should be some conditions to be satisfied for a cartel to become successful.

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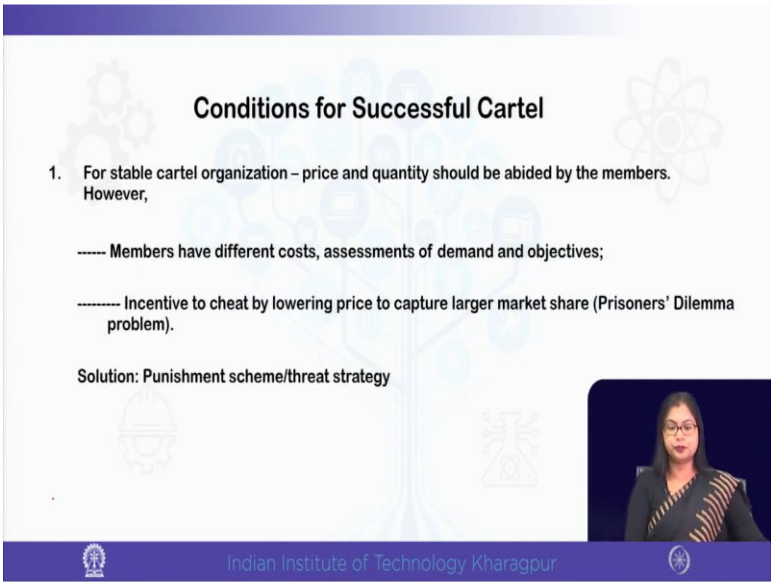

So, what are the conditions? So, first and foremost you see the cartel will be successful only if the members the ones who are forming the cartel, they follow the agreement right. So, actually they want to control the price. So, we already know how price can be controlled by controlling the quantity.

So, they should means what we have already seen how the OPEC they function we have seen the structure and the functionalities of OPEC. So, they meet and agree about some output level, but often we have also seen that the countries deviate from the agreement and this sale is slightly greater amount than what they agree upon right.

So, that is also one kind issue that also did not lead to huge increase in price of oil that OPEC could have exerted, but it has not done that ok, because the member countries they produce almost their full capacity level and also, they sometimes sell more than their agreed upon output.

So, what we need first and foremost for a cartel to be successful that the members should stick to the agreement. So, members have different cost and their objective can be different their the demand they will be facing that can also be different ok. So, members they have unilateral incentive to deviate by selling slightly higher amount. So, by doing so, they think that if I sell slightly higher amount, I will be able to earn more revenue, because we know that these OPEC countries are hugely dependent on oil rents.

So, is not it something that we are already accustomed to? Yeah, this is the Prisoner's Dilemma problem, because we have already studied the Prisoner's Dilemma game and we have seen that the Nash equilibrium is not the efficient outcome. However, the efficient outcome or the parato efficient outcome that means, both the Prisoner's that they should not confess that is not the Nash equilibrium because from not confessing each one had unilateral incentive to deviate, because each one can gain individually by deviating from not confessing.

So, both of them end up by confessing and that leads to a lower level of means payoff in the Prisoner's Dilemma game in terms of freedom, because if both of them confess they are in jailed for the major crimes. So, I am not repeating the game again, because we have already studied the Prisoner's Dilemma game in the previous module; that means, module 8. So, please refer to that lecture.

So, you see how the Prisoner's Dilemma game is so relevant for the context of the global petroleum industry. So, you think about the entire scheme. So, what is happening at the first place? First place the why the countries are forming the cartel means countries or firm whatever. So, why the agents are forming the cartel, because they think that if they individually they maximize their profit. So, they are earning positive profit, but that may be less.

So, if they collude with each other, they jointly means they join together, they join hands and then can exert greater market power, because they can then restrict the supply and price will increase and they will be able to earn more profit. So, this is the first incentive ok.

There should be an incentive that the firms or the economic agents should collude right because we have in one of the lecture if you remember we have already discussed collusive oligopoly vis a vis competitive oligopoly and we have seen that if the oligopoly firms they are competing with each other. So, such competition is aggressive competition, cutthroat competition they want to undercut each of their rival.

So, by doing. So, and they are actually losing out, because there are extreme cases like in the Bertrand model where they are not earning any positive profit or super normal profit. In other models they may be earning profit, positive profit, but that will be less than if they collude.

So, the incentive of collusion is increasing profit. Right? So, that is why at the first place they decide to collude rather than competing with each other. Now, after colluding you see again, they are cheating, because they again find that they have unilateral incentive to deviate from collusion.

So, they collude in case of OPEC also they collude and decide about some output level and then they end up selling more, because each one of them think that if I am sticking to the output level other members can produce a slightly more and they will be able to gain greater market share. So, let me also do it in the same way. So, let me sell a bit more. So, if all the members are thinking like this. So, total output is higher price will fall.

So, then then you may also ask then how is it possible for OPEC to be there for such a long time. So, you see the Prisoner’s Dilemma game as a I already mentioned in that lecture that we have studied that was a one-shot game in which we cannot sustain collusion. If the game is played only once then we cannot sustain collusion, because both of them will gain by cheating or deviating from collusion.

But if the same game is played repeatedly and that is the case in reality where the games are played infinite time. So, in that case we may be able to sustain collusion. So, we mentioned that with respect to the Prisoner’s Dilemma game also. So, if the same game is played many times, then the prisoners know that even if they come out of jail.

So, again they will be jointly committing a crime. So, they will be able to sustain the collusion, because they will cooperate because they know that again in the next period when they come out of jail. So, again they will be committing the crime jointly.

So, if they do not confess, they will be jailed for only 1 year. So, again after 1 year they will be committing similar type of, but other type of crimes. So, they will be able to sustain collusion if they value future. So, we I already informed you that in infinitely repeated game it is possible to sustain collusion depending on the value of the discount factor how you value your future. So, if the agents are forward looking, they think about the future they will be able to sustain cooperation.

But in finite stage game we cannot sustain cooperation, because if you know that the game is played let us say for n number of periods. So, what will happen in nth period that is the last period you gain by cheating. So, your partner will know that and your partner will cheat you in the n minus 1th period. So, you will cheat in the n minus 2th period. So, in this way if you fold back, you see that cheating will start from the very first period that means, period 1 ok.

But in infinitely repeated game so, collusion can be sustained. So, you see in cartel also the firms are actually playing the game for many times. So, the firms are cooperating with each other then they have a chance to play the game again. That means, they can agree within in the next period if the cartel is successful. So, in long run we will be able to stick to the agreed upon price and quantity and cartel can become successful.

Another is that you see there can be some punishment strategy also some threat strategy that if you deviate from the agreement then you will be punished. And the punishment can be a like going back to the perfectly competitive output level and then earn no profit no positive profit. So, if there is some underlying punishment scheme there are different types of strategies like tit for tat strategy, trigger strategy. So, in game theory if you are interested and if you go for more in detail analysis you will be able to learn all this.

So, in trigger strategy if you cheat your partner once then the partner will cheat you forever. In tit for tat strategy your partner will retaliate just by the way you are also behaving. So, if you cheat in one period your partner will cheat you in the next period and in the next two next periods suppose if you cooperate your partner will also cooperate in the next period.

So, tit for tat means you will be retaliated by the same strategy by your partner, but trigger means if you cheat only once you will always be means cheated by your partner. So, there are different types of strategy or threat strategy or punishment scheme often these cartels can also impose some punishment scheme on the members if they deviate.

So, how they will be punished. So, in WTO also you see there are these strategies like we often see sanctions imposed against the countries. So, same thing because we have already discussed that free trade followed by all the countries is the globally pareto optimum. But that is not the Nash equilibrium, because countries have unilateral incentive to impose trade barriers.

And that is why you see you need some trade agreement. Often, we see the free trade agreement or regional trade agreements and you also need some international bodies like the WTO to govern that free trade is followed by the countries and if not then the countries can be punished ok. So, the first condition for a successful cartel is the member should stick to the decided the agreement the price quantity whatever the they should stick to their agreement.

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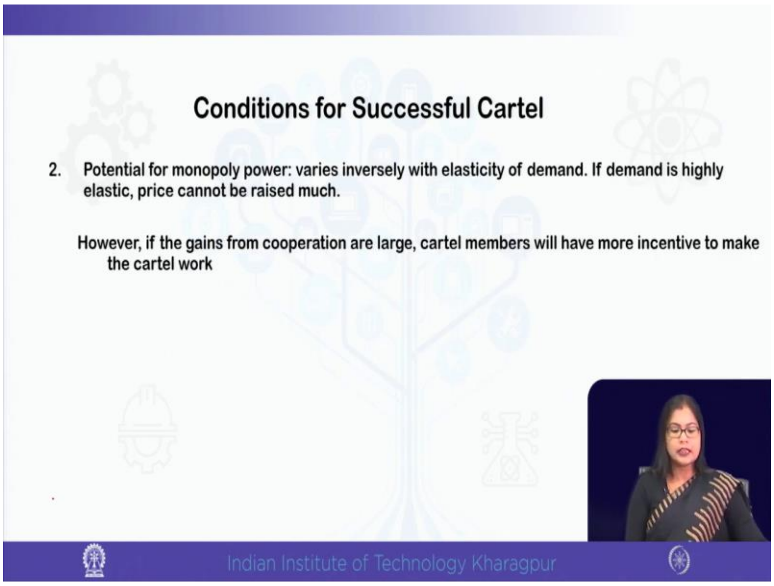

Second condition is that the potential for monopoly power should be large, is not it? Because if the monopoly power is less the cartels only able to increase the price. So, monopoly power means the extent to which the monopoly price will increase will go above the perfectly competitive price.

And if you remember we earlier also discussed about the Lerner index of monopoly power which captures the extent to which price exceed the marginal cost divided by the price and that price inversely with the elasticity of demand.

What is the intuition? See we already know that if demand is inelastic. So, if the firms they restrict the output price increases quantity demanded will fall by less amount less magnitude. But in case of elastic demand what happens? If the firms lower their output. So, then the responsiveness of price will be greater, price will increase means by a greater extent. So, so, if you have to think about the elasticity. So, the responsiveness is greater.

So, you will be able to exert more market power if you face the demand curve is in elastic. Then if you reduce the quantity. So, means if you lower the quantity price will increase ok. So, the potential for monopoly power is very important. So, and that varies with in inversely with the elasticity of demand. So, we will compare this with the case study of OPEC and CIPEC and we will see that in case of OPEC the demand curves are inelastic as compared to the CIPEC. The CIPEC demand curve is more elastic.

So, in case of more elastic demand what happens. So, if you change the quantity price will respond to means there is a more than proportionate change. So, these two are the conditions for a successful cartel. However, if the gains from the firms being colluding with each other. If that gain is greater the cartel members the individual members will have more incentive to make the cartel successful.

But if the gain from colluding is less. So, there will be greater incentive of cheating and you need punishment scheme.

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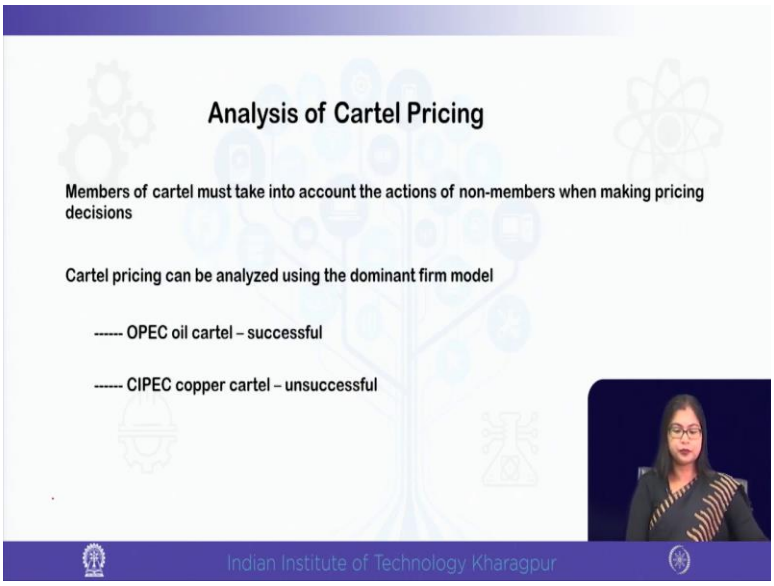

So, now we will discuss the OPEC a success story vis a vis the not. So, successful cartel that is the copper cartel of CIPEC ok. And we also know that members of the cartel should take into account the action of the non-members of cartel when taking the pricing decision, because after all its an oligopoly framework and in oligopoly we know that the firms have strategic interaction the strategies are interdependent.

And if you remember we have already seen that nowadays the non-OPEC suppliers are also supplying quite a lot of oil, because let us after the shale oil revolution US is supplying lot of oil and sometimes Saudi Arabia is also replaced by US as the major supplier of oil. So, the cartel members should also take into account the strategies or actions of the non-members of cartel while making their decisions ok.

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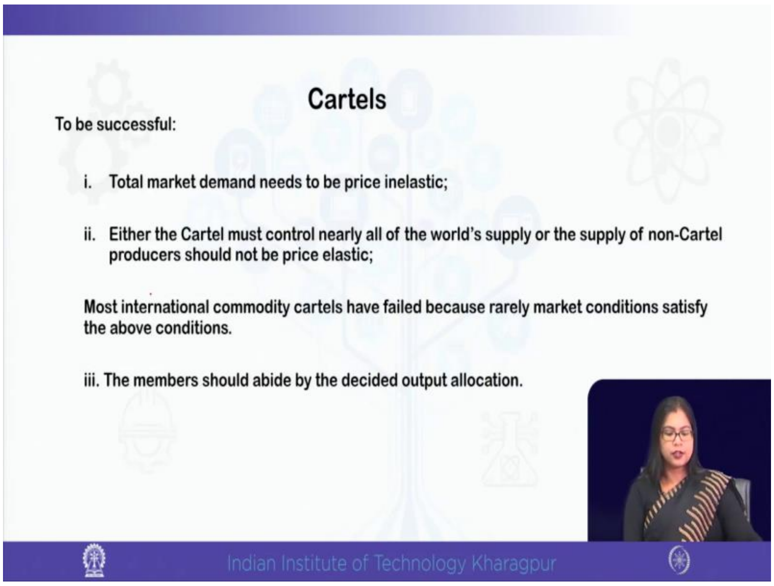

So, we have already discussed that first condition for successful cartel is that the market demand should be priced inelastic

And secondly, is either the cartel should be able to control a large part of the total supply of that particular product or the supply of the non-cartel producers should not be very price elastic. So, these are the conditions for a successful cartel. However, if we analyze the empirical situation, we see that most of the international commodity cartels could not become successful, because these two conditions are often violated.

Its hard difficult to meet this above two criteria. And third condition for cartel we have already decided or we have discussed in detail that the members should abide by the decided output allocation.

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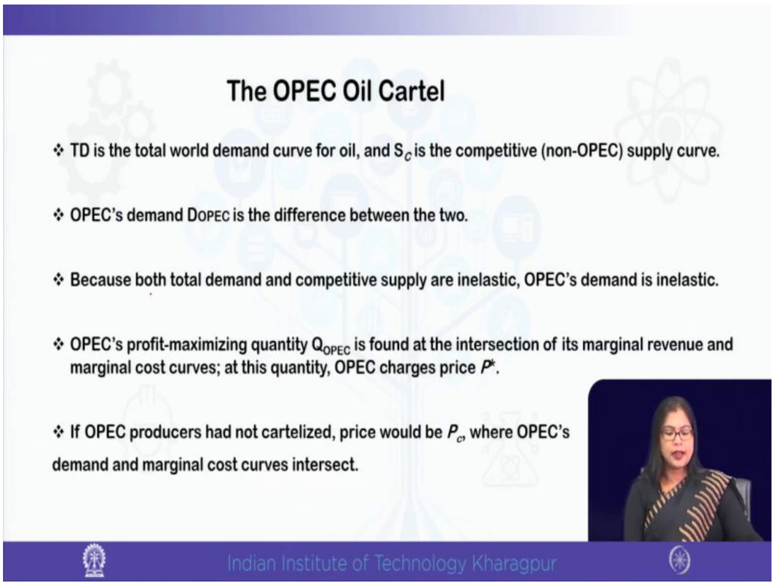

So, if we come to the pricing and the output decision of the OPEC oil cartel.

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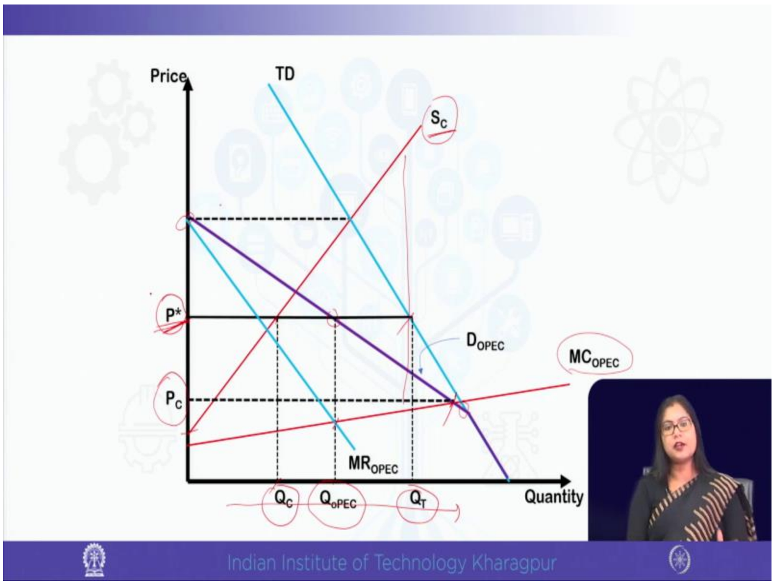

So, we follow the price leadership dominant firm model where the OPEC cartel is the leader's and we have non-OPEC supplier. So, they we can consider them acting as competitive firms, ok. So, the price is determined by the leader firm; that means, OPEC here.

So, as usual we know already when the price is in the vertical axis and quantity on the horizontal axis. So, this model you see we have already intuitively and graphically discussed in the previous lectures. We have also solved numerically. So, I am just not detailing out each and every step.

We already know the first step is to find out the demand curve for the dominant firm which is the difference between the total demand. Here you can see the demand curve for OPEC we can derive it by taking the difference between the total demand for oil and the non-OPEC supplier S_C, ok. For each price and hence we get the demand curve D_{OPEC}.

So, if price is very high then we see that the vertical intercept is; So, the demand curve starts demand curve for OPEC starts from here we can see easily and after if price is low then the non-OPEC suppliers are not able to sell and after a certain level of price we can see that the demand curve for OPEC will coincide with the total demand ok.

Because, OPEC has a cost advantage. So, we can see if you compare the supply curve which is also the marginal cost curve for the competitive firms with the marginal cost of OPEC you can see that the OPEC marginal cost is lying much below. So, it has a cost advantage.

So, if price falls too much OPEC will be able to supply. So, that is why you can see that at lower level of price the competitive firms are not able to sell ok, but OPEC is selling. So, that is why the for lower level of price the OPEC demand curve coincides with the market demand curve.

We have already discussed it in detail and we can also observe that the gap between the competitive supply curve and the marginal cost curve of OPEC it is accentuating as output is increasing. Is not it? You see the gap is increasing. So, much that means, as the OPEC is able to sell more and more it can enjoy its cost advantage.

So, with this we know that we can find out the price and output of OPEC. So, the equilibrium output decided by OPEC will occur at the intersection of MR and MCs given by the output level Q_{OPEC} and corresponding to Q_{OPEC} output from the demand curve D_{OPEC} we can find out the market price P*.

In the next step what we do? We can find out that how much the non-OPEC suppliers will sell at the market price P*. So, from the supply curve of the competitive firms we can see that the small firms will be or the non-OPEC suppliers are selling the output Q_C at the ongoing price at the market price decided by the OPEC countries. So, at the price P* the non-OPEC suppliers are selling output Q_C.

So, total output Q_T will be sum of Q_C and Q_{OPEC} and we can also check that you get the same total output Q_T if we take what will be the total supply at the price P*. So, from the market demand curve T_D corresponding to the price P* your output demanded is Q_T which is the total supply sum of the supply of OPEC and the competitive fringe firms.

So, in this way we can find out the market price in the oil industry that is P* output of OPEC countries and output of non-OPEC countries and we can also add these two to get the total output. Now, see we what we will do if you compare with the competitive price. So, suppose OPEC is not a cartel instead of becoming a cartel if OPEC countries have acted like a perfectly competitive firm, then what will be the price.

So, we can see that the price will occur at the intersection of the demand curve of OPEC and the marginal cost curve of OPEC. So, this is the competitive price P_C where the demand curve of OPEC intersect the marginal cost of OPEC. So, then price is P_C which is less than the profit maximizing price if OPEC is forming a cartel. So, P* is above P_C. So, you see that the cartel members have incentive to I mean the OPEC members have incentive to collude and form a cartel.

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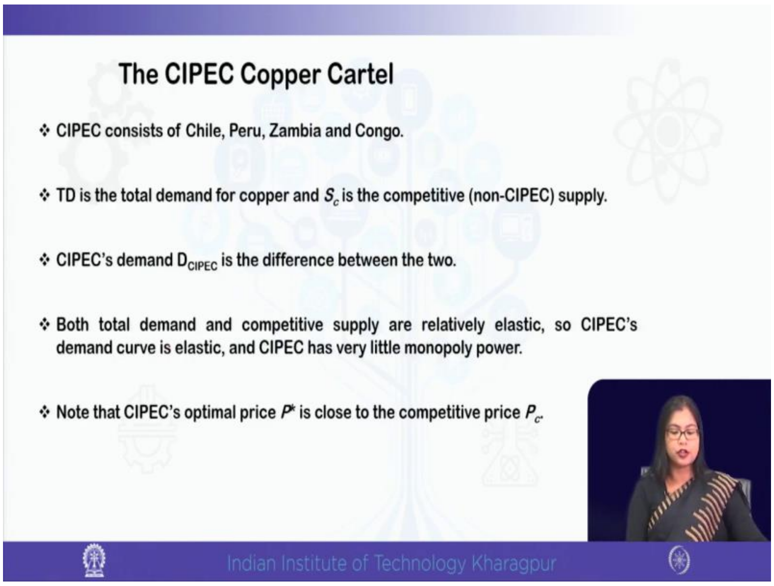

Now, with this if we compare the experience of CIPEC.

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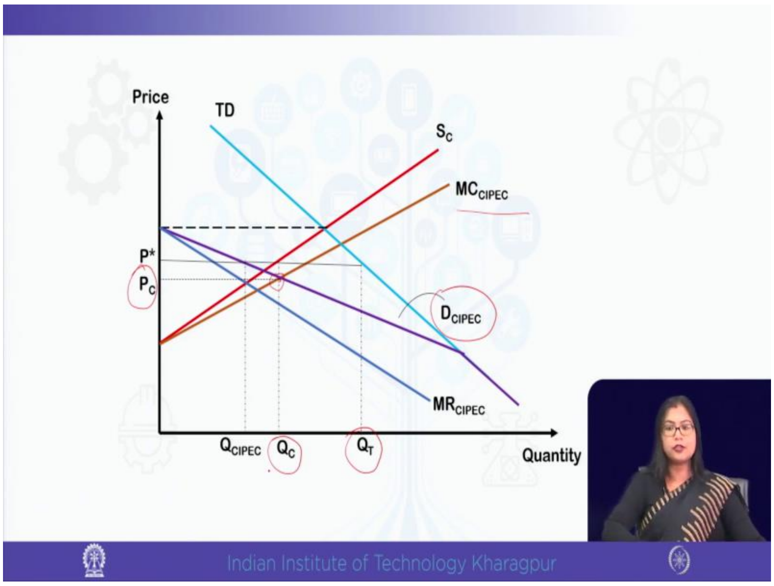

So, let us see the in let us proceed in the same fashion. So, if we plot the demand total demand for copper and the competitive supply of the non-CIPEC country. So, CIPEC is actually made of Chile, Peru, Zambia and Congo and they account for almost less than half of total supply of CIPEC when it was formed.

But the highest supply in CIPEC has been by Chile. So, now if we plot the total demand curve and the non-CIPEC supply and we take the difference between the two what we get we already know. We get the demand curve for CIPEC; that means, the copper cartel. So, it is the gap between the total demand for copper and the supply of the non- CIPEC members for each price, ok. Corresponding to D_{CIPEC} we also can draw the marginal revenue curve of CIPEC and here we have plotted the marginal cost of CIPEC.

And hence we know how to now proceed we will be finding out the output Q_{CIPEC} which occurs at the intersection of MR_{CIPEC} and MC_{CIPEC} and then you see we at the corresponding output we can also find out the price P* and at price P* we can also see what will be the output produced by the competitive firm.

So, that will be means the non- CIPEC member firm. So, that will be by the output denoted by the output Q_C. So, total output will be sum of output supplied by the CIPEC countries and the non- CIPEC members. So, the total output will be Q_T. And now if you compare the perfectly competitive solutions. So, if the CIPEC members these 4 countries that we just mentioned if they do not form the cartel.

So, what will happen then we know that price will be PC which occurs at the intersection of a demand curve of CIPEC with the marginal cost of CIPEC. So, you can find out this price P_C, ok. Now, if you compare the CIPEC experience with the OPEC experience if you go back and you can quickly see these two experiences.

So, what we can see that P* in case of OPEC this P_{OPEC} or P* you can say P* is much above P_C. Whereas, in case of CIPEC we have already seen that the gap between the competitive price and the the price set by CIPEC P* is very low P* and P_C they are quite close; that means, what we can easily conclude that CIPEC has not been able to exert that much of market power. So, what is the reason? Now if you look at the demand curves, we can easily see that whether the conditions has been successful or not.

So, if you remember what are the conditions. So, one of the important condition for a cartel to become successful is that the demand should be inelastic right. You see the total market demand needs to be price in inelastic and the cartel should be able to control a large part of world supply or the supply of non-cartel producers should not be price elastic.

Now, you see these conditions are not made in case of CIPEC whereas, these are satisfied in case of OPEC, because in case of OPEC now if you compare the demand curves total demand and competitive supply both are more in elastic in case of OPEC and they are more elastic in case of CIPEC. So, that is why CIPEC has not been able to capture a means have not been able to raise the price P* to a large extent compared to the competitive price P_C if you now take the OPEC case as the benchmark.

So, as compared to OPEC, CIPEC has not been that successful, because you can easily see that the demand curves over here are flatter. So, they are more elastic as compared to the demand curves the market demand faced by OPEC as well as the non-OPEC supply. So, both non-OPEC supply and the market demand in case of OPEC or in the oil market has been more inelastic. Whereas, in case of copper they are more elastic.

Another point you should also note now if you compare the cost advantage of OPEC and CIPEC. So, we just pointed out that in case of OPEC what happened you see the competitive supply or; that means, the marginal cost of the non-OPEC countries that is given by the supply curve S_C which is lying much above the marginal cost of OPEC and the gap between the 2 are accentuating its getting bigger and bigger as output increases.

So, it shows cost advantage enjoyed by the OPEC countries as output increases. Now, if you now compare these cost curves or marginal cost of CIPEC member countries with respect to the non-CIPEC countries. So, we can see that the gap is quite less is not it. And though the gap is increasing as output increases were very less as compared to the OPEC situation is not it.

So, that means, what; that means, CIPEC cartel did not have that much of cost advantage in the copper market compared to its non-member countries if we now compare it with the case of OPEC. So, OPEC member countries have huge amount of cost advantage. We have discussed many times that let us say Saudi Arabia it has cheap endowment of good quality oil and the oil is extracted in the coastal region.

So, the cost of transportation and storage is also quite low, but in case of CIPEC you see the marginal cost curve of the CIPEC countries and the non-CIPEC countries the other copper suppliers quite less the cost difference is quite less and with respect to output the difference is increasing, but very less as compared to the experience of OPEC.

So, this is one another reason why we can also find out that the CIPEC has not been that successful and an another reason being the elasticity of demand. So, oil demand is much inelastic as compared to the demand for OPEC. I mean sorry demand for copper ok. So, we see that these two conditions the cost advantage and the elasticities are not satisfied in case of CIPEC.

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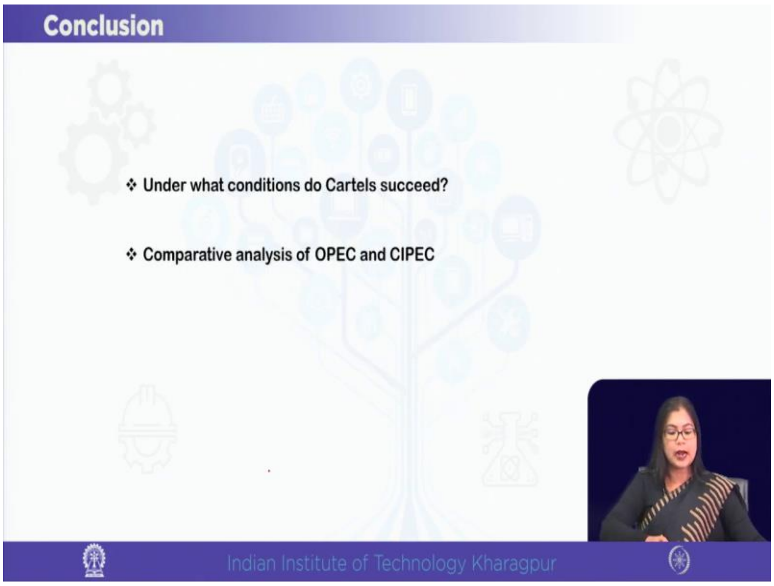

So, that is why CIPEC has not been that successful. So, what we have discussed in today's class. We have discussed very interesting scenario of what are the conditions under which the cartel succeed. So, we have already discussed that it’s the elasticity of demand which is a very important factor.

So, if the demand is more in elastic the ability of the cartel to exert a greater market power will be higher, because the extent of monopoly power will be higher. So, OPEC the or the cartel should be able to increase the price much above the competitive price as it has been the case with OPEC also.

But in case of CIPEC we saw that the elasticities were not that high the total elasticity of market demand as well as the elasticity of the non-CIPEC member countries supply. So, those were quite elastic as compared to the case of OPEC. So, that why that is why the CIPEC countries CIPEC as a cartel was not that successful.

So, one important factor of a cartel to be successful as that elasticity of demand should be less, because then the extent of market power will be greater. Second condition for successful cartel is what we have already discussed that the member should be able to member should stick to the agreed upon price quantity level. And, but we have already means seen and we have discussed with reference to the Prisoner’s Dilemma game that though the members are forming the cartel with an incentive to enjoy higher profit.

Because if they compete with each other and they individually they maximize profit. So, in, in an oligopoly framework they undercut they enter into aggressive competition. So, that may not be a very efficient outcome. So, they can gain by colluding. So, if they have enough incentive to enjoy higher profit by colluding. So, they enter into collusion. But after entering into collusion, they have this Prisoner’s Dilemma incentive of cheating or deviating from collusion. If they have unilateral incentive of cheating if they gain by cheating.

So, you see its so counter intuitive means at the first place they are colluding, because they can earn more. But then again after colluding they are deviating, because by deviating individually they earn more ok. So, but if the game is played repeatedly then we will be able to sustain collusion and that is why we see that cartels do exist.

But we also need some kind of a mechanism like some punishment scheme or threat strategy. So, if the members deviate from what they agree to they may be punished, ok. So, if the cartel is strong enough the agreement is very strong and they can the agreement can means the cartel should have the mechanism to monitor whether the cheaters are punished or not.

If you remember we also discussed when we detailed out the functionalities of OPEC, we saw that the punishment scheme in OPEC was not that very strict and that is one of the reason also that the member countries often deviate from what they agree to. To a smaller extent of course, but because if they deviated by larger extent then OPEC would not have been operating for such a long time.

So, this is also second reason for a successful cartel and with this we compared OPEC and CIPEC and we saw that OPEC was able to increase the market price above the competitive level as compared to CIPEC, because of two reasons because of the elasticities as well as the cost advantage of OPEC. So, OPEC enjoyed greater cost advantage and the cost advantage was greater for higher level of output as compared to the CIPEC member countries.

So, in a nutshell then we summarize our discussion by comparing the case studies of OPEC and CIPEC. So, it's a very interesting area and you can those who are interested you can also read means more advanced books.

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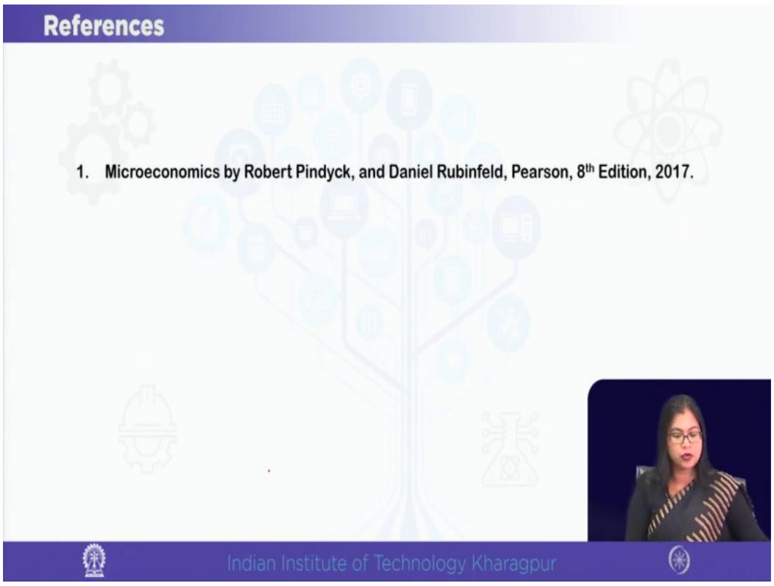

So, for our purpose we followed only Pindyck and Rubinfeld we stick to the same book that we are following, but you can also look at other means more advanced book on industrial organization like the book of Tirole and Oz Shy I mentioned earlier also, ok.

So, thank you very much look forward to meet you in the next module.