Environmental & Resource Economics
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Lecture 21
Market Failure and Coase Theorem Part - 4

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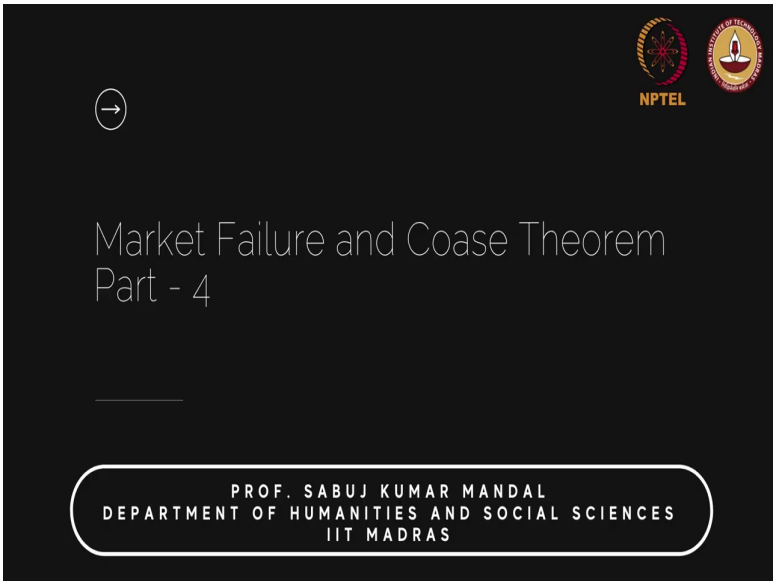

So, welcome once again to our discussion on environmental economics. And in our last class, we were discussing about market failure. And we discussed what is market, what is the objective of a market, and we mentioned that, market's objective is basically to allocate the resources efficiently. What is efficient resource allocation? Wherein, goods are produced by those producers who are cost effective, and goods are consumed by those consumers who are giving the maximum value to those goods and services.

And we said that, this efficient allocation of resources will also result in maximum social welfare. But one thing we have to keep in mind that the market what we are talking about here that is the competitive market. So, competitive market is social welfare maximizing. So, that means, in an economy if there is a complete set of market and property right is well defined.

So, that means, in presence of well-defined property right when the market is complete, that means, for each and every transaction, if there is a market, then market will automatically allocate the resources efficiently and that will result in maximum social welfare. We do not need any omnipotent social planner to actually allocate these resources efficiently. Rather, in

absence of market the task of the social planner would be very difficult that we have discussed.

Then lastly, we said that many a times we are unable to define the property right for all the goods and services and which results in incomplete set of market. That means market basically fails when property right is not well defined, and that calls for government intervention that is what we said. So, in presence of externality and market with imperfect competition, these are the two contexts when there is externality or imperfectly competitive market, market fails to allocate the resources efficiently and government intervention is required in the form of regulation.

But we have also mentioned that Ronald Coase, he came up and said long back that government intervention is not required, if we can define the property right, and if the transaction cost is free then the efficient bargaining, the bargaining between the polluter and the pollute that will result in efficient amount of pollution.

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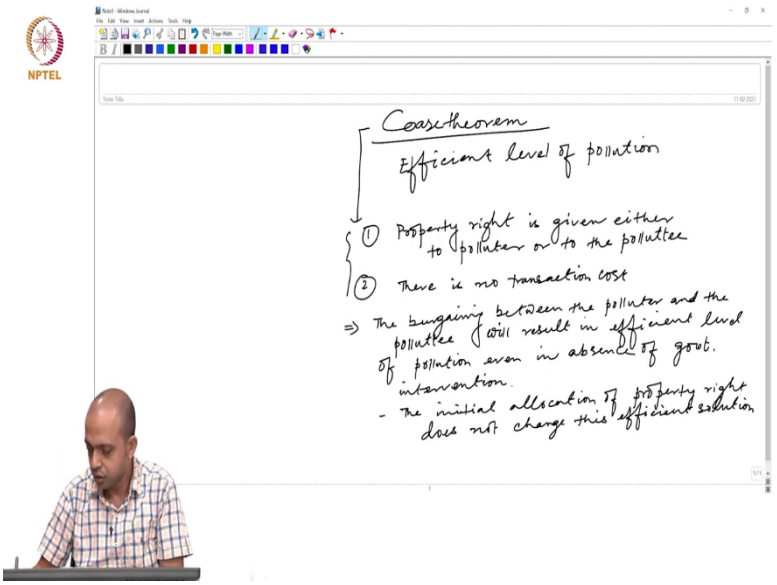

So, that means, what is the context of Coase Theorem that we are going to discuss? Context is, when there is a market failure in presence of externality, and here we are talking about the negative externality that means pollution. Why pollution is called a negative externality, because pollution is generated by someone, it is affecting somebody else for which he or she is not getting compensated. That is why this is a case of market failure which calls for regulation.

But Ronald Coase said that, we need not have government intervention all the times if we can assign property right either to the pollute or to the polluter, and let them bargain, then that bargaining will actually result in efficient level of pollution. And once again, I mean, which I have already mentioned long back, that economist's objective is not to cut the pollution at the zero level, rather, all these economic policies what we are going to discuss and what we are going to design the objective is basically to result in efficient level of pollution, because there is null jointness between production of goods and services and pollution. You cannot produce any good or service without producing pollution.

So, that is why we all need some amount of pollution to tolerate it, because otherwise we cannot have any goods and services to enjoy. That is the reason, we know that there is some amount of pollution, which will definitely be generated in the process of producing goods and services, but that level of pollution should be efficient. So, what is our objective? Efficient level of pollution that is what we are trying to achieve without government intervention.

And what the Coase Theorem that assume? Coase Theorem basically assumes two things. Firstly, property right is given either to the polluter or to the pollute, and there is no transaction cost. So, that means, when the polluter and the pollute bargain with each other that does not involve any amount of transaction cost. So, if these two conditions are satisfied, then the bargaining between the polluter and the pollute will result in efficient level of pollution even in absence of government intervention.

And he also said the initial allocation of property right does not change this efficient solution. So, that means, basically he said, it does not matter whether we give the property right initially to the polluter or to the pollute. It does not matter. He only said, we have to give the property right to anyone. We can choose either polluter or the pollute, and then, let this polluter and this pollute bargain with each other and that costless bargaining, if the world is transaction cost free, then that will result in efficient level of solution that is what he said.

So, that means, on the outset, the Coase Theorem appears to be very interesting. Because at the one hand it says that it does not require any regulation or any government intervention, polluter and the pollute they themselves can bargain and reach out in a efficient solution, and it also said that it does not matter to whom we are assigning property right. That means, it is quite interesting and surprising also, how come the initial allocation of property right does

not matter. So, that is what we are going to explore now, with a simple diagram about the beauty of this Coase Theorem.

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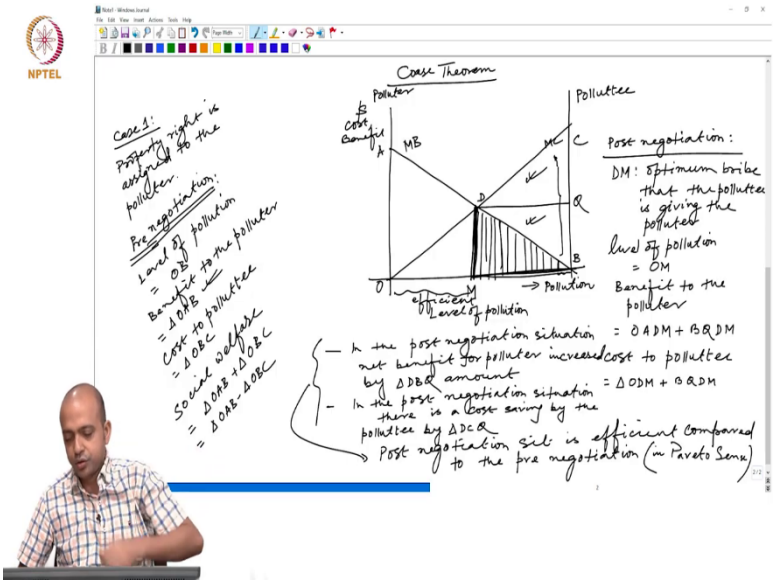

So, this is a simple diagram this is what Coase Theorem we are going to discuss. In the X axis we are measuring pollution, and in the Y axis we are measuring dollar. Why we are measuring dollar? Because the advantage of measuring dollar or rupee on the Y axis because you can measure cost benefit everything. So, cost and benefit of pollution. So, this axis is given for the pollute, this axis is given for the polluter.

Let us say, that this is the marginal benefit of pollution. So, this is MB curve, this is the marginal benefit of pollution. Now, you may ask, what is the benefit of pollution, and that too marginal benefit of pollution? Let us say, I will give you a different name O, A and let us say this is point B.

What is the benefit of pollution? Benefit, pollution per se does not have any benefit, but why you are generating pollution because actually you are producing goods and services. So, when I am saying that it is the marginal benefit of pollution actually, we mean that it is the marginal benefit of the good that you are producing.

And let us assume also that this is OAB, let us say this is C and let us say this is D. This is marginal cost of pollution. That means, once there is a pollution you need to control for that pollution and that is the marginal cost. So, we will consider two cases. Case one, where the property right is assigned to the polluter. So, this is case one where property right is assigned to the polluter. And we will also discuss what is the pre-bargaining situation level of

pollution, what is the post bargaining level of pollution. So, this is pre. Pre means, pre-bargaining level of pollution.

So, when there is no bargaining property right is given to the polluter, so, how much pollution the polluter will generate? How much pollution the pollution will generate? Can you think of from this diagram? The polluter will make that much pollution wherein the marginal benefit of pollution is positive, and he will stop at a point where marginal benefit of pollution is zero, which is quite simple.

As long as MB is greater than zero, MB is positive polluters will keep on polluting, and he will stop at a point where marginal benefit of pollution is zero. So, that means in the pre-negotiation situation. This is called pre-negotiation or bargaining. So, level of pollution equals to OB, which is quite simple. So, at point B marginal benefit of pollution is zero, so that is why the pollution is up to B.

Now, we will calculate benefit to the polluter. What is the benefit? Obviously, OAB the triangle, this enter triangle is the benefit. And what is a cost to the pollute? Cost to the pollute, because of this pollution equals to the triangle OBC. If we assume, that in a society, we have only two individual the polluter and the pollute what is the social welfare then, social welfare equals to then the summation OAB, this triangle, plus OBC, this is the social welfare.

And since, this is the cost, we can actually say that this OBC triangle which have a negative sign, so ultimately this is OAB minus OBC. So, OAB minus this, because this is cost that is why negative. Now, whether the net benefit is, net social welfare is positive or negative that depends on the relative size of these two triangle OAB and OBC. We cannot confirmly say anything at this point of time because we do not know, whether the size of this triangle OAB is actually higher than OBC. So, that is the case. So, this is pre-negotiation situation, we are discussing for case one, when property right is assigned to the polluter.

Now, let us say that, this is post negotiation situation. What is the post negotiation? That means, the pollute is going to the polluter, can you reduce your pollution little bit because I am suffering a lot. Suppose this pollute is approaching to the polluter that please reduce your pollution, I am suffering a lot. But do you think that polluter will listen to the pollute? No,

because property right is given to the polluter. So, polluter has every right to pollute. Why should the polluter listen to the pollute, and reduce the pollution.

Then the pollute is saying, okay, I understand that you have a benefit of making pollution, so I will give you some money, I will bribe you. So, pollute is trying to bribe the polluter for reducing the pollution. So, he is saying that if you reduce the pollution from B to this level, I will give you this much of bribe.

Then pollute, polluter has no problem, because if he reduced this much, then what is the benefit that polluter is sacrificing only this amount, this vertical distance. So, if that is paid absolutely no problem because his benefit is derived from the MB curve, and it is beneficial for the pollute as well because at this level of pollution the cost to clean the pollution is huge, because that is determined from the MC curve. So, this is the cost.

So, while the cost is much higher than the bribe what is required, obviously, it is beneficial for both the polluter and the pollute. Polluter has no problem because he is a anyway getting the benefit, and pollute is also beneficial because the bribe what the pollute is paying to reduce this much amount of pollutionis much lower than the marginal cost of cleaning the pollution.

Similarly, again for this amount, the marginal cost is much higher than the bribe. So, that means, this bribing will continue, because for each of this point, this bribing amount is much lower than the cost of cleaning the pollution, and it will stop at this point. Let us say that this is DM, wherein, the bribe is actually equal to the cost of pollution, cleaning the pollution. So, that means, DM is actually optimum bribe that the pollute is giving to the polluter.

Now, the question is, then at post negotiation what is the level of pollution? Level of pollution equals to OM. Level of pollution is this much, so it has come down from OB to OM, so this is the level of pollution OM. Benefit to the polluter equals to OADM, this is a benefit. Because up to this much you are making the pollution, so obviously this is the benefit.

Apart from this, is there any other benefit can you think of? This is the benefit the polluter is getting due to its production only. Apart from this, the polluter is receiving some amount of bribes, right. So, we need to add that amount of bribe with this so as to get the total benefit at

the post negotiation period. Then, what is the total amount of bribe? This is the total amount of bribe, let us say this is Q.

Since this is the optimum level of bribe, and this is the level of pollution, what the polluter has reduced, so, that means plus BQDM, this is the total benefit. While OADM is coming from production, BQDM is coming from the bribe amount. So, this is the total benefit.

Now, what is the cost to the polluter? Cost to the pollute, sorry? So, since the pollution level is only up to OM, the cost is actually O triangle ODM that is the cost of cleaning the pollution. Apart from this, is there any other cost? Yes, the bribe amount, which is actually benefit to the polluter actually the cost. So, this is the cost of cleaning ODM this is the cost of cleaning derived from the marginal cost curve, and plus the bribe amount BQDM, plus BQDM.

Now, if we compare the cost and benefit of the polluter and the pollute, pre and post negotiation situation is there any improvement? Let us see. In the pre-negotiation the polluter's benefit was, what was the polluter benefit, OAB. Now, this is OAB, OADM plus this, so obviously that means BQD this is the net benefit to the polluter.

So, that means, in the post negotiation situation net benefit for the polluter increased by triangle DBQ amount. Earlier it was only OAB, now this is OADM plus this. So, that means there is a net benefit which is DQB or DBQ this is the net benefit to the polluter increased by DBQ amount. What is happening to the pollute? Is there any cost saving in the post negotiation situation, there is a cost saving by the pollute what is the amount.

See earlier the cost to the pollute was OBC, now, this is ODM plus this triangle, that means, we can say that ODQB. So, that means, this is the amount of cost, which is actually pollute is saving by DCQ amount. So, that means, compared to the pre-negotiation situation I can say that in the post negotiation situation both the polluter and the pollute they are better off.

If that is the case, we can say that,pre-negotiation situation was not efficient since in the post negotiation situation that is a net gain for both the polluter and the pollute, the post negotiation situation is more efficient compared to the pre-negotiation situation.

And what is the efficient level of solution, which is OM. So, that mean, OB amount was not the efficient level absolution. So, that means what Coase said that if you assign the property

type here we have assumed only case one. We have given the right to the polluter, and that right has resulted in this OM amount of pollution after costless bargaining between polluter and the pollute. There is a net gain for both the polluter and the pollute compared to the pre-negotiation situation.

So, that means, we can say, because of these two we can say that post negotiation situation is efficient compared to the pre-negotiation in Pareto sense. What is Pareto sense? What do you mean by Pareto sense? Because, Pareto said an allocation is not efficient if a reallocation makes at least one party of that bargaining better off.

So, pre-allocation was OB amount of pollution, that is not efficient, because the post bargaining resulted in OM amount of pollution, which resulted in a situation where both the polluter and the pollute is better off. That is why in Pareto sense the post negotiation or post bargaining situation is efficient, and resulted in OM amount of pollution, which is efficient compared to the pre-negotiation situation. So, this is called efficient level of pollution, OM.

So, that means, so far, we have discussed only case 1. We said that property right is given to the polluter, and then, the bargaining is costless. There is absolutely no problem in their bargaining, and that resulted in OM amount of pollution, which is efficient.

Now, what we will do, we will discuss about case 2.