**Environmental & Resource Economics**
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**Lecture 29**
**Incentive Design Under Uncertainity and Effectiveness Part – 5**

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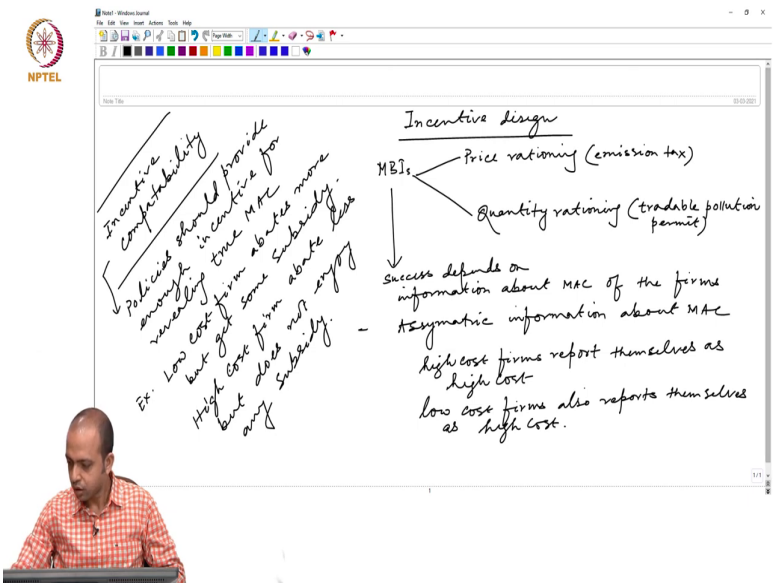


So, welcome once again to our discussion on incentive designing. In our last class, we discussed about tradable pollution permits as another instrument, market-based instrument or pollution control. Now, if we think about these two mechanisms of, so what we are discussing, incentive design. So, we have discussed two market-based instruments, these are called market-based instruments or in sort MBIs.

So, we have price rationing, first we discussed about price rationing, which is emission tax. And then we have also discussed about quantity rationing, which is tradable pollution permit. Now, success of these two instruments, these two market-based instruments depends on how well the policymaker or the regulator is aware of the marginal cost of pollution control. So, that means the success of these two instruments depends on information about marginal abatement cost or MACs of the firms.

Now, there is some kind of information asymmetry arises in the context of marginal abatement cost. Why information asymmetry? Because the firms know their marginal

abatement cost better than the regulator, we have some kind of uncertainty, regulator is suffering from some kind of uncertainty about the marginal abatement cost of the firms.

And in presence of asymmetric information about marginal abatement costs, because the firms know their MACs better than the regulator. And what happens in presence of information asymmetry, the high-cost firm they will anyway they put themselves as a high cost. So, high-cost firms report themselves as high cost, and low cost firm also report themselves as high cost, why this is so? Because if the cost of abatement is higher, then the regulator will ask them to abate less amount. Is that clear?

So, the moment I say that I have my cost of abatement is very high, regulator will ask them to abate less. As a result of which low-cost firm also reports themselves as high cost. So, low-cost firms also report themselves as high cost. Now, in this situation what the regulator or policymakers challenge is to do is to design a policy, so that the firms, they reveal their true marginal cost of abatement, which is called incentive compatibility this is very, very important concept I am talking about, incentive compatibility.

So, the regulator should give some incentives. So, policies should provide enough incentive for revealing true marginal cost of abatement. So, it is like you might be aware of insurance policies, in insurance market generally what happens everyone claims to be low risk, because if you claim as a high-risk person, your premium would be higher. So, everyone every individual while buying the insurance, they will claim themselves as low-risk individual whether it is health insurance or automobile insurance, so on and so forth.

So, in that case, the insurance companies challenge is to design a policy, so that high risk individual will reveal themselves as high, low risk individual will reveal themselves as low. And you have seen the different types of incentives that the insurance companies they give to provide your true risk in terms of driving as well as a health or they do, if you claim yourself as a low-risk individual then they will say that, I will give you a coverage, higher coverage, your premium will be low, but when you claim for benefit, then there will be some kind of deduction.

On the other hand, if your premium is higher, if you pay a higher premium, then there is no deduction. For example, if you claim 10,000 then they will say, that insurance companies will say that since your insurance premium is quite low, then they will say that out of those

10,000, 3000 or 4000 rupees you have to pay it from your own pocket, this is sometimes it is called co-payment also.

So, now in presence of co-payment or standard deduction, then I have less incentive to claim myself as low risk individual because my premium is low, but at the same time at the time of claiming there will be some kind of standard deduction. So, that is also called incentive compatibility.

Now, in this context also, while designing emission tax or any other market based instruments policymakers challenge is to design the policy so that these firms they reveal their true marginal cost of abatement, and what could be such policies, it may so happen that the policymakers design a policy wherein if you claim yourself as a low cost firm, if you say that my cost of abatement is low, then let us say that this is an example, low cost firm abates more but get some subsidy, high cost firm abate less but does not enjoy any subsidy, this may be one example I am just taking, there might be other incentives which is to satisfy incentive compatibility.

So, that means, well you are high cost from that is fine you abate less but I am not giving you any additional benefit. On the other hand, if you claim yourself as low-cost firm you abate more, but I will give you some subsidy which might help you to come up with better technologies or which will help you to come up with clean technologies which will reduce your emission. And you have to pay less amount of tax next round.

So, this is the challenge, because in reality, there is information asymmetry between the regulator and the firms. Firms they know better about their marginal cost of abatement than the regulator, regulator is only expecting, the regulator is only guessing, that is why in presence of uncertainty, we discussed about the policy initiatives taking expected marginal cost of abatement.

And this is what the policymakers should think that in which way I should design my policy. So, that policies become incentive compatible, high-cost firm will reveal themselves as high-cost low-cost firm will reveal themselves as low-cost firm, that is called incentive compatibility, a very, very important concept and a challenge for the policymakers to make the policies incentive compatible.

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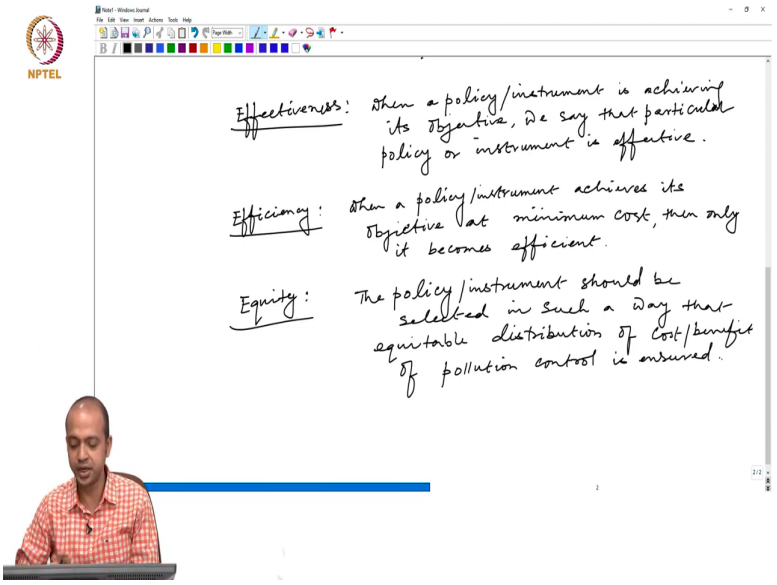


Now, once we talk about price rationing and quantity rationing, then next thing what do we need to do, we need to compare these two policies on effectiveness, efficiency, and equity crown, we have two alternative policies available. Now, which policies to adopt in which particular context that depends on their relative effectiveness, efficiency, and equity perspective.

That is why now, we are going to talk about effectiveness, efficiency, and equity qualifications of these two market-based instruments, namely emission tax and readable police and permit. So, we are going to talk about effectiveness. So, let us say that this is effectiveness. First of all, what is effectiveness, when a particular policy is able to achieve its objective, when a policy or instrument I will say, instrument is achieving its objective, we say that particular policy or instrument is effective.

So, that means, without knowing the policymaker's objective or the regulator's objective I cannot say that this policy is effective or this instrument is effective. For example, suppose, I am following a particular mode of teaching. Now, if I ask you whether my particular way of teaching is effective or not, you may not be able to answer that question unless and until I tell what is my objective of this course, what is the specific objective that I am going to attain out of teaching this particular course environmental and Resource Economics, if I specify my objective is to impart maximum amount of knowledge to the student, then at the end of the

course, you can easily evaluate whether my way of teaching was effective or not in achieving that particular object.

Similarly, if I specify that my objective of teaching this course is not to impart maximum amount of knowledge rather, I should teach in a way, so that students get maximum marks in exam. Now, you can very well understand gaining maximum amount of knowledge is not same as getting maximum marks in an exam. So, effectiveness of my way of teaching may also vary depending on my objective, it may be very, very effective in imparting maximum amount of knowledge to the student, but may not be effective, if my objective is to help the student getting maximum marks.

For example, if my objective is to help the students to get maximum marks in the exam, probably I should discuss more sample questions, how to write the sample answers for these questions, how to be precise, how to complete all the answers in three hours of time, so on and so forth. So, I should be very, very particular towards the exam, focusing more than more on the exam and the evaluation components.

On the other hand, if my objective is to impart maximum knowledge, then instead of focusing too much on the exam, I should discuss the theory in detail, I should give proper examples of that, probably I should discuss all related concepts as well, which may or may not come directly in the exam. So, that is why with my way of teaching is effective or not, it all depends on what is my teaching objective.

Same thing is applicable here, when the regulator is designing a policy either emission tax or treatable permit, when I am judging about their effectiveness, I must also ensure what is the regulator's objective. So, depending on that, we will evaluate the effectiveness, and we will see there might be alternative objectives of the regulator's depending on that emission tax or treatable pollution permit will become effective, then efficiency.

When can I say that a particular policy or instrument is efficient? Do you know the definition of efficiency? Even though we use the word quite frequently, giving a proper definition of efficiency is rather difficult, but it is simple. So, we will say that when a policy or instrument achieves its objective at minimum cost then only it becomes efficient.

Suppose there are different modes of teaching, some professors are teaching, some professors are teaching by chalk and talk method, they will come to the class and then they will simply

use chalk and talk method. Some professors will use PowerPoint method, some professors will record and make a video of their lecture and then distribute.

And let us say that all these policies are effective that means all these policies are successful enough to impart maximum knowledge, then we have to evaluate which cost of each and every mode of teaching. And if we find that chalk and talk method involves minimum costs, then we will say that this method of teaching is most efficient.

Similarly, when there are different modes of controlling pollution, let us say that one is tradable pollution permit and another one is emission tax, then we have to see what is the cost involved in each of these two modes of controlling, two methods of controlling pollution, if we find that emission tax achieves its objective at minimum cost, then we will say that emission tax is more efficient compared to tradable pollution permit.

So, efficiency requires calculation of cost also. And third one is called equity. What is equity? Equity is a concept, it is rather involved then these two, whenever a policy is implemented or any instrument is chosen for controlling pollution, that generates some kind of distribution of cost and benefit. What I am saying, when a policy is taken for pollution control, then that policy will generate some kind of distribution of the benefit and cost.

For example, if you go back and recall the Coasian-bargaining framework, when the property right was given to the polluter and pollute he was asked to bargain or to bribe the polluter for controlling or reducing pollution, we saw that even though both of them are benefited, the benefit was more skewedly distributed in favour of the polluter than the pollute. On the other hand, when the property right is assigned to the pollute, then both of them are benefited, but distribution is more key skewed towards the pollute.

So that means any type of instrument, that means this emission tax of tradable pollution permits tradable, emission tax is based on the polluters pay principle that means property right is assigned to the pollute. So, it may so happen that benefit is mostly distributed in favour of the pollute. So, the policymakers challenge is to assign the policy, so that the distribution of the benefit is more equitable.

So, the policy or instrument should be chosen or selected in such a way that equitable distribution of cost and benefit of pollution control is ensured. So, policymakers must think

about this equity perspective. Now, let us take an example. Sometimes we see that some industries are highly inefficient as far as pollution control is concerned.

For example, let us take the example of leather industry highly inefficient in controlling pollution, leather industry is one of the most polluting industries among the manufacturing sector. So, if you think about their efficiency in controlling pollution, they are highly inefficient, but at the same time, these industries are one of those industry, leather industry is one of those industries, which generates maximum amount of employment and that too for low skilled labor, so while targeting these inefficient pollution making industries by heavy tax, we must also think about the benefit that it generates for the society in terms of employment.

So, the moment to impose heavy penalty, heavy regulation for this particular industry, we will lose a huge amount of employment from the low-cost labours. So, that means, we must think is this equitable distribution, who is going to be benefited when the industry is subject to regulation, who is going to be the sufferer of this regulation? So, the question is then should we allow these inefficient industries to operate, so that we can gain more equitable distribution. So, that means, efficiency and equity may not be achieved simultaneously.

Why this is so? Because, if you want to achieve efficiency, you must target these industries, you much subject them for regulation, but if you subject them for strict regulation, we will lose so much of employment and that means, the low skilled labourer will be suffering from their loss of jobs. So, these types of things, all these things, we must think about these three important criteria effectiveness, efficiency, and equity before we design a particular policy. Let us now talk about these two instruments emission tax, and tradable pollution permit on the grounds of effectiveness, efficiency and equity.