Introduction to Environmental Economics

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Lecture – 40
Market Efficiency and Optimality – IV

Dear students, Efficiency and Optimality topic was in discussion. In the preceding lectures, I explained the concept of efficiency, concept of production and I also explained technical efficiency, allocated efficiency and economic efficiencies. Then, you also studied about efficiency in exchange using two good product as well as efficiency in exchange taking one good product and one bad product. Then, I also explained the efficiency in production with or without the good products. Initially I explained you by using the example of two good products wine and cheese and efficiency is achieved or Pareto optimality is achieved at the point where the production possibility curve slope is equal to the priceless of these two products.

Then, I also explained using one good product wine and other bad product garbage using the production possibility frontier to measure the optimality. In this lecture, you will study about equi-marginal principle. Actually overall efficiency in the economy is achieved at the point where each consumer consumes where the marginal utility is equal to the price of the product and each producers produces at the level where the marginal cost is equal to price of the product. And, then there should be equity in all the producers and consumers in the economy to achieve the overall optimality.

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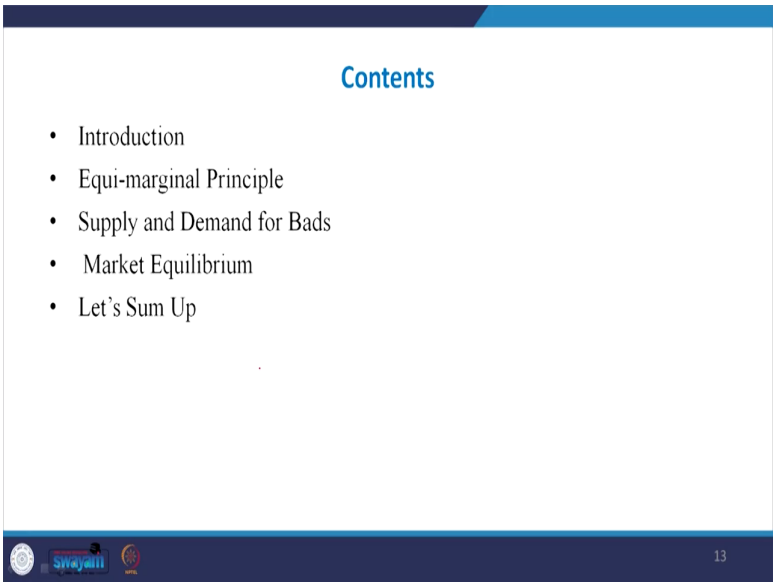

So, equi-marginal principle is discussed in this lecture. Then I also explain supply and demand for bad products means how the price of the bad product in the market is determined. So, how to drive supply curve and demand curve for garbage that is a bad product and once we know the supply and demand curve then at the point where supply and demand curve intersect each other equilibrium level of price is determined. So, this is discussed in the present lecture.

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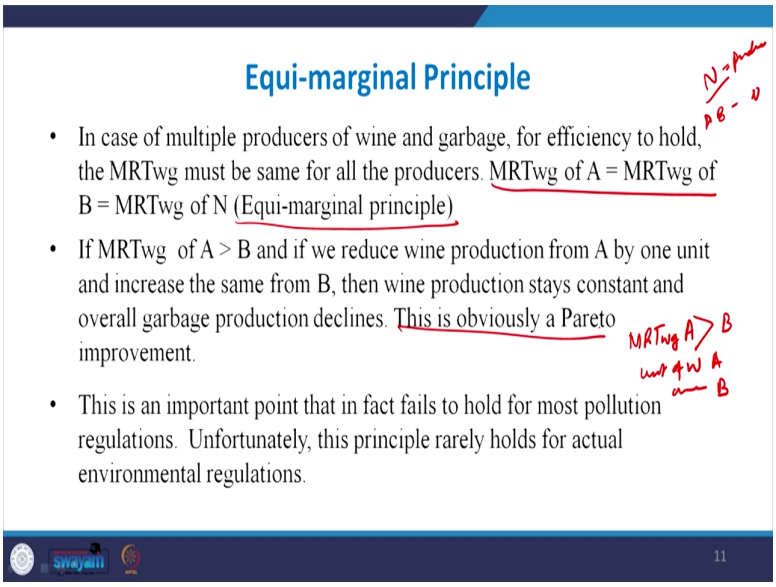

If we want to achieve overall efficiency in the economy, then what we have to do is we have to apply equi-marginal principle. For example, there may be a number of companies which are producing wine and generating garbage. There may be number of consumers consuming different kinds of products. So, if you take the production of wine and garbage only, and there are multiple producers of wine and garbage for efficiency to hold true then marginal rate of transformation between wine and g must be same for all the producers it means that this condition must be satisfied if we have the N number of N number of producers N number of producers.

So, if we have N number of producers, then say A, B up to N if these are the number of producers then MRT marginal rate of substitution a transformation between wine and g of A producer should be equal to MRT wg of B should be equal to C D up to N that is called equi-marginal principle. So, equi-marginal principle should apply in order to get the overall

optimum allocation of wine and garbage in the economy. For example, if MR MRTwg for say A producer is greater than that of B producers, what will be the result? If in this case if the production target is reallocated suppose if we reduce 1 unit of wine from A and the same 1 unit is added in B then we can achieve the same level of output, but at lower level of garbage.

So, it clearly indicate that by reallocating the production of wine among different companies in such a manner that in all the cases MRTwg is equal in each other optimization can be increase or overall level of garbage can be reduced by changing the production target of A and B. If there are only two producers A and B and that is called Pareto improvement because in this case, we can reduce the garbage in the economy without reducing the production of wine. So, that is obviously, Pareto improvement.

So, this is an important point that in fact, fails to hold for most pollution regulators. What we know when the regulator regulate the economy they hardly keep in view this equi-marginal principle and it is very difficult to apply a equi-marginal principle in case of command and control system of regulation. That is why many economists strongly advocate introduction of market based approach to solve the pollution problem because if market is allowed and if equi-marginal principle is hold true. Then overall efficiency can be improved and we can reduce pollution without reducing the.

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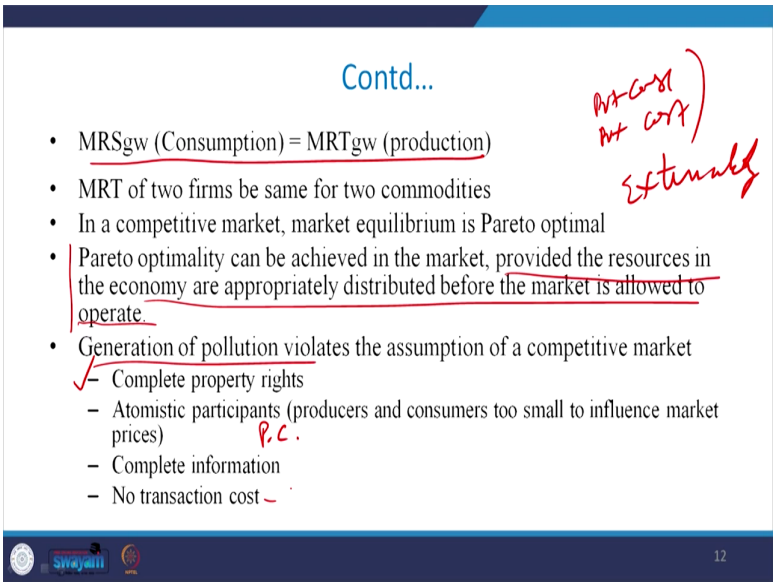

Now, in the preceding lecture you have studied about efficiency in consumption in this lecture you are studying efficiency in production. So, these are the two important things to achieve the overall efficiency in the economy. So, if MRS marginal rate of substitution between say garbage and wine in case of consumption is equal to marginal rate of transformation between garbage and w in case of wine in case of production so, that hold true.

As in the very beginning I told you if every consumer consume at the point where marginal utility is equal to price and every producer produced at the level where marginal cost is equal to price, then overall efficiency can be achieved. So, marginal rate of transformation have two form must be same for two products and in a competitive market, market equilibrium is

actually Pareto optimal. So, when we talk about market equilibrium it clearly means Pareto optimality.

So, parrot optimality can be achieved in the market provided resources in the economy are appropriately distributed before the market operate. So, this is very very important that the property rights should be well defined resources in the initially should be properly distributed and if all these things are hold true, then market can efficiently allocate the resources in Pareto optimality can be achieved.

So, generation of population pollution in any economy, generation of pollution violates the assumption of this competitive market. Why because private players take into account only the private costs and private benefit private cost and benefits, not externalities. So, externality is totally ignored in the absence of effective regulation and that is why market cannot allocate the resources efficiently in the economy. And, that is why major assumptions that must be made are complete property rights.

So, if property rights are well defined and consumers as well as producers are too small to influence the market prices that is called that is the characteristic of perfect competition perfect competition and this would be complete information available to both producers as well as consumers and there should be no transaction costs.

So, market can allocate resources efficiently if these conditions are met, but in reality we hardly find these kind of characteristics especially in case of environmental product like property rights in water; we know who owned the water is a major issue and there is no well defined property rights similarly, tragedy of common occurs due to lack of well defined property rights.

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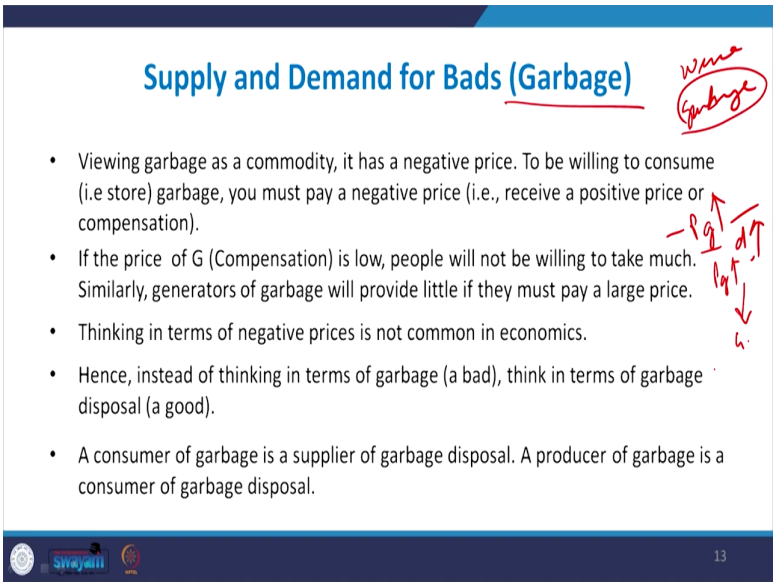

Now, how to draw demand curve and supply curve for the bad product which I taken as garbage because when we are producing wine, garbage is also generated or pollution is also generated. So, how to draw the supply curve and demand curve that for garbage which is generated by the manufacturer of wine?

Here garbage is also a commodity, but as I already told you the garbage has negative price, no one would like to consume garbage. So, if someone would like to consume garbage it means that someone has to take the garbage after receiving some price and simply dispose of if the price of garbage is low people will not be willing to take much. So, it clearly indicate higher the price of g higher the price of g more will be the demand for g; means demand, who is making demand for g? waste disposal companies.

So, waste disposal company will like to demand more garbage when the market price of garbage is very high because market price of garbage is negative; similarly, generator of garbage. Who is generating the garbage? Say, wine manufacturer. So, generator of garbage will provide little if they must pay a lot. For example, if market price of garbage g is very high, then wine manufacturing company would try to generate less garbage because it will add more cost to the company.

So, thinking in terms of negative price is not common in economics. So, you should actually understand it what do we mean by negative price of garbage because in economics we take price in a positive manner not a negative price. So, hence a consumer of garbage you can see is a supplier of garbage disposal and a producer of garbage is a consumer of garbage disposal. So, instead of taking garbage if we use the term garbage disposal, then it becomes a good product. So, try to understand garbage is a bad product, but bad product can be converted into good product that is garbage disposal.

So, garbage disposal becoming a good product and then if market price of garbage disposal increases, what will happen? More will be the supply of garbage disposal not the demand for garbage disposal. Now, demand for garbage disposal will come from those who are generating the garbage not coming from who are receiving the garbage for disposal.

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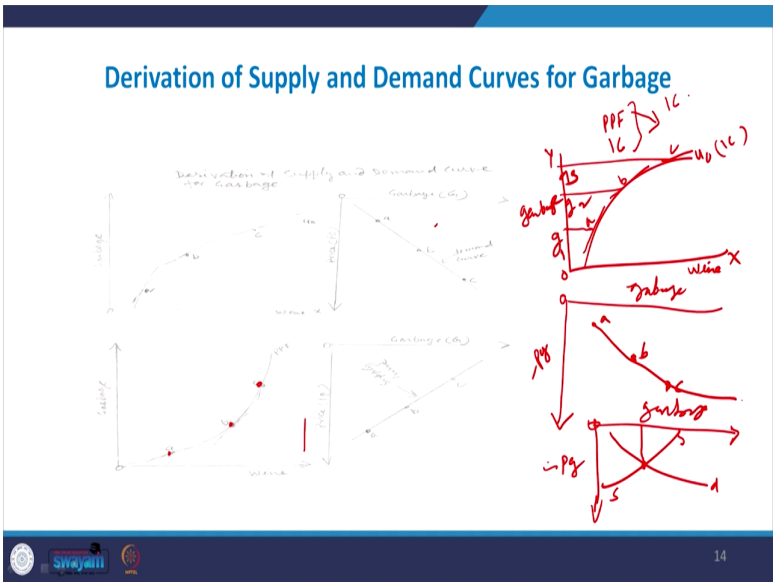

Now, how to determine the demand and supply for garbage? Actually, if you recall these two concepts which I just discussed one is production possibility frontier and other is indifference curve, these are the two things.

So, as a student of economics you might have studied if you have study economics that demand curve can be drawn from indifference curve. Similarly, supply curve can be drawn from production possibility curve. So, we can draw supply curve and demand curve from the production, possibility curve and indifference curve. Let me take first indifference curve. Look at this is our indifference curve. We take two products wine on x-axis and this garbage on y-axis now this is the utility curve say u 0 or indifference curve, IC indifference curve. And, this is not a conventional in difference curve because one product is good and other is bad which I already explained.

Now, take the different price ratio like this. So, these are a point, b point and c point on the indifference curve. Now, you can see how much is the quantity of garbage? So, at point a, this is the quantity at point b, this is the quantity at point c. Now, if we know the market price of garbage I am taking it like this, you can see this graph. Now, we take garbage since it is the indicative product so, we are taking from the upper side and pg is taken in a; this is minus point.

So, if take a point a point, b point, c point you can see the quantity say o at point a you see o say og 1, g 2, g 3 and in this way if you take this quantity corresponding to the market price and if you add all these points you will get a demand curve like this. So, this is called demand curve and this demand curve is measured from the upper side and it is appear to be like a supply curve from that side because price of the garbage is negative.

Similarly, you can also draw the supply curve from the production possibility curve. So, this is the a point, b point, c point and these are the price ratios different price ratios of the two products and at the point where these ratios tangent to the production possibility curve these are the different equilibrium point a point is equilibrium point, b is equilibrium point, c is equilibrium point. And, now, we can take garbage g on the upper on the horizontal axis and price of garbage that is pg which is negative on the vertical axis and since this is this side so, it is negative. And, adding all these points you will get a supply curve abc.

Similarly, you can see here a point, b point, c point. So, at point a this is the supply, at point b this is supply, at point c this is supply. So, in this way supply curve can be drawn, but these two curves supply curve and demand curve they are not conventional kind of supply and demand curve because here we have a negative price, but even then if you take these two supply curve and demand curve and take together then you will find like this. Supply and demand here garbage on this axis and pg negative on y axis and then you draw supply curve and demand curve. And, at the point where supply and demand curve intersect each other equilibrium level of equilibrium or market equilibrium is achieved.

So, market equilibrium is achieved at the point where supply and demand curve intersect each other, but since here we are taking garbage on horizontal axis and price of garbage on vertical axis and price of garbage is negative. So, it becomes very difficult to interpret. So, in order to make it better interpretation let me now convert it from garbage to garbage disposal. So, instead of using the term garbage if we take garbage disposal then these two curves will change. Supply curve becomes demand curve and demand curve become supply curve when we take these two and then the curve become like this you can see.

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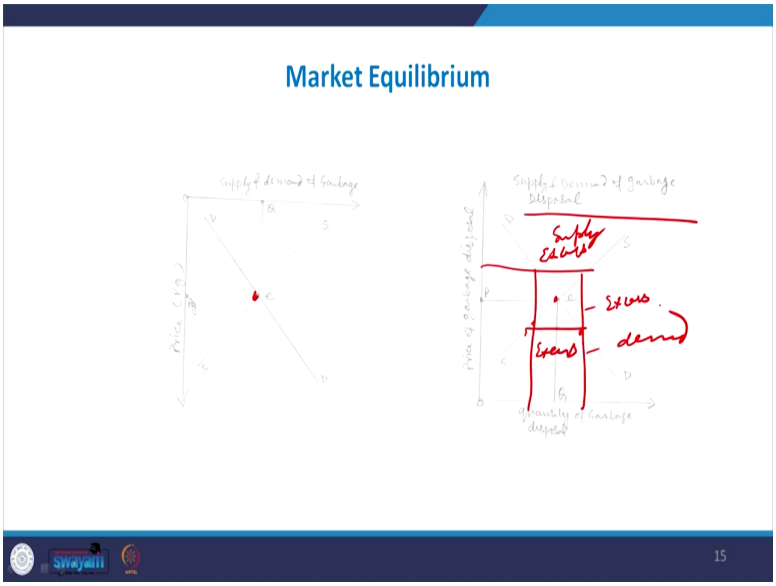

Here this is the curve which I just explained you that supply and demand for garbage this curve, this is the equilibrium point, but we had a negative price. So, equilibrium is achieved in case of negative price and supply is made by the household and demand is made by the company which if household garbage. Or in case of wine and garbage conditions you can see that wine companies producing wine and wine companies also producing garbage. So, wine

company is the supplier of garbage and company will supply the garbage less if market price is higher in negative terms.

But, anyways disposal company which you would like to take garbage for or make demand for garbage will make more demand for garbage if market price of garbage is high. So, that is since price is negative. Now, convert this negative price of garbage into positive price instead of using garbage we take garbage disposal.

So, in this graph you can see here the supply and demand of garbage disposal, and now supply curve is positively slope and demand curve is negatively slope indicating that when the price of garbage disposal increases then the quantity demanded of garbage will garbage disposal will come down and quantity demanded is made by the household, but supply of garbage disposal is positively associated.

So, this is the equilibrium point and that is called efficient point or Pareto optimal because if you move any point from this say this point or that point then you can see in this point there is a excess supply. So, gap between supply and demand so, so consumer surplus will come down and here in this case you can supply gap between supply and demand. So, supply and demand gap can come if suppose when the price excess when the price is high excess supply and excess demand excess demand ok.

So, this can easily be shown from this graph that consumer surplus is maximized only at point e where the quantity demanded is equal to quantity supplied.

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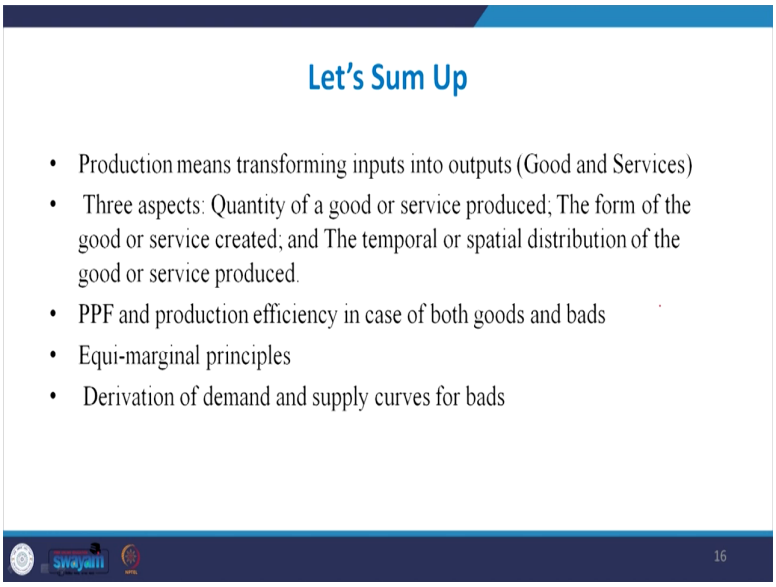

And, let me just briefly tell you what I have been discussed in this lecture. I discussed about the concept of the production; production means transforming inputs into output, output may be goods or services. There are three important aspects related to production – quantity of a good or service produced, form of the goods or services created and temporal or spatial distribution of goods and services produced.

Then, I also discuss production possibility frontier and production efficiency in case of two kinds of products – first conventional products like cheese and wine, and then to introduce the same concept in case of environmental bad products we discuss one good products say wine and other bad products say garbage. And, then for optimization in the overall economy or to maximize the welfare in the economy equi-marginal principles should be applied in all

kind of production and consumptions. Then, finally, I discussed derivation of demand and supply for bad product and to explain it I had taken an example of garbage.

Thank you very much.